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FERNANDO CAMPOS
EXECUTIVE OFFICER

200 NORTH SPRING STREET
ROOM 361, CITY HALL
LOS ANGELES, CA 90012

TEL: (213) 978-0261
TDD: (213) 978-2310
FAX: (213) 978-0278

<http://bpw.lacity.org>

July 29, 2019

Honorable Herb J. Wesson, Jr., Los Angeles City President
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Honorable Jose Huizar, Los Angeles City Councilmember
Honorable David Ryu, Chair - Health, Mental Health, and Education Committee
Honorable Mitch O'Farrell, Member - Health, Mental Health, and Education Committee
Honorable Curren Price, Member - Health, Mental Health, and Education Committee

FROM: Uduak-Joe Ntuk, Petroleum Administrator
Office of Petroleum and Natural Gas Administration & Safety

**SUBJECT: COUNCIL FILE NO 17-0447 – FEASIBILITY OF AMENDING
CURRENT CITY LAND USE CODES IN CONNECTION WITH
HEALTH IMPACTS AT OIL AND GAS WELLS AND DRILL SITES**

On April 19, 2017, Council Motion #17-0447 (Wesson-Huizar) Feasibility of Amending Current City Land Use Codes in Connection with Health Impacts at Oil and Gas Wells and Drill Sites, was introduced and on June 14, 2017, the Health, Mental Health and Education Committee approved the motion with modified recommendations. On June 30, 2017, the City Council adopted the motion, with additional modifications, instructing the Petroleum Administrator in collaboration with the City Attorney, Los Angeles County Department of Public Health (LACDPH), relevant City departments, and other health agencies and regulatory entities as necessary to report on the following:

1. What types of health and environmental impacts can be measured at and around oil and gas wells and drill sites;
2. Whether, what kind, and what distance a setback and potential mitigation measures from sensitive receptors should be established;
3. An evaluation of the various types of materials used at oil and gas sites that can have health impacts, how those materials are used, and what authority the City has over regulating their use;
4. An evaluation of the various types of drill sites, including active oil fields, abandoned oil fields, and gas storage fields;



Oil and Gas Health Report

July 25, 2019

5. What agencies currently govern or regulate oil and gas sites, including a matrix of energy, oil, and gas operators and their respective regulatory agencies, related to health impacts in the City and what authority does the City have to regulate those health impacts;
6. The upcoming LACDPH Interim Guidance on Urban Oil and Gas Operations;
7. Any recommendations from the LACDPH on whether a Health Impact or Health Risk Assessment Report on oil and gas drill site operations within the City is recommended, including the necessary resources and time to complete each type of study;
8. Any recommendation to enhance public health collaboration regarding oil and gas drill site oversight between the City, County and other related health agencies;
9. A draft Memorandum of Agreement between the City and the LACDPH, and/or other regulatory agencies, with suggested terms, including emergency protocols, communication strategy, and clear delineation of public health roles and responsibilities;
10. An analysis of the economic, employment, and fiscal impacts of establishing a distance setback around oil and gas wells; and
11. Analysis of the human rights standards and environmental standards of the countries exporting oil used by the Los Angeles residents;

The Petroleum Administrator and the Office of Petroleum and Natural Gas Administration and Safety conducted an extensive inventory of oil and gas facilities within the City of Los Angeles, participated in public hearing on the report at the Los Angeles City Health Commission, collected historical records from multiple private and public databases, synthesized thousands of pages of technical reports, and retained a consultants to study the potential health impacts at oil and gas wells and drill sites within the City of Los Angeles.

The attached report identifies oil and gas infrastructure within the City of Los Angeles, evaluated materials used at such sites, studied the peer reviewed scientific literature on human health and oil & gas development, assessments of chemicals used at City oil & gas drill sites, and includes hundreds of appendices of referenced documents.

RECOMMENDATIONS

It is recommended that the Los Angeles City Council, subject to the Mayor's approval:

1. Instruct the City Planning Department with the assistance of the Petroleum Administrator and the City Attorney's Office to prepare a report outlining the feasibility of establishing in the zoning code a physical surface setback distance of 600 feet from sensitive receptors on existing oil and gas wells, associated production facilities, and drill sites. The report shall address the discontinuance of non-conforming land uses resulting from the new requirements. The report shall also address a requirement to provide relief and an administrative remedy to comply with state and federal due process and takings law for any oil and gas operators or stakeholders in an oil and gas production that are affected by the new zoning requirements. The estimated cost to the City is at least \$724 million in anticipated litigation, lost oil production, well abandonment, environmental remediation and cleanup, and surface land value;
2. Instruct the City Planning Department with the assistance of the Petroleum Administrator and the City Attorney's Office to prepare a report outlining the feasibility of establishing in the zoning code a physical surface setback distance of 1,500 feet from sensitive receptors on future oil and gas development. The report shall also address a requirement to provide relief and an

administrative remedy to comply with state and federal due process and takings law for any oil and gas operators or stakeholders in an oil and gas production that are affected by the new zoning requirements. The potential cost to the City could range from \$1.2 billion to \$97.6 billion in constitutional taking by mineral rights owners of the remaining 1.6 billion barrels of recoverable oil and gas reserves. The estimated cost of litigation over the anticipated property takings claims to the City is expected to be at least \$1 million per year for several years to defend the City;

3. Request that the City Attorney report back with legal analysis on the possible implementation of changes to the City's Zoning Code relative to establishing new setback requirements, as well as pursuing takings compensation for oil and gas operators;
4. Instruct the City Planning Department, with the assistance of the City Attorney and Petroleum Administrator, to report back on options on how to amend the Zoning Code relative to oil and gas facilities (LAMC Section 13.01) to better reflect alignment with surrounding sensitive land uses, align with Los Angeles County's code, enhanced operating conditions, and regulatory best practices; include the required funding, staffing, and environmental consultants cost estimates;
5. Instruct the Petroleum Administrator and the Los Angeles County Department of Public Health to report back on costs and coordination on conducting Health Risk Assessments (HRA) at each oil and gas drill site adjacent to residential and industrial zoned areas within the City of Los Angeles;
6. Instruct the Petroleum Administrator and other relevant City Staff to report back on possible measures to establish Community Emergency Preparedness and Comprehensive Safety Plans at oil and gas drills sites across the City;
7. Instruct the Petroleum Administrator and other relevant City staff to participate in California Air Resources Board Study of Neighborhood Air Near Petroleum Sources (SNAPS) and the Assembly Bill 617 studies to incorporate the findings into the development of citywide continuous fence-line air monitoring and community notification program;
8. Instruct the LAFD with the assistance of the City Attorney to negotiate with Los Angeles County to designate Health Officer Authority to Los Angeles City Fire Department through an MOU for enhanced local oversight and improved health coordination;
9. Instruct LAFD and the City Attorney to negotiate with Los Angeles County to transfer the Hazardous Waste Generator Program to Los Angeles City Fire Department for enhanced local oversight and improved health coordination;
10. Instruct CLA to add to the City's Legislative Agenda the funding for additional oil and gas health studies to be conducted by State, SCAQMD, and Los Angeles County Department of Public Health; and
11. Instruct the Petroleum Administrator, Office of Finance, CAO, and other relevant City Staff to establish Oil and Gas Restricted Funds for drill site abandonment, environmental remediation, consultant studies, clean up assessment, strengthening current oversight, as outlined in this report. Additionally, explore re-establishing a barrel tax to support these new funds and provide revenue to support enhanced oil and gas oversight.

DISCUSSION

Background - The Office of Petroleum and Natural Gas Administration and Safety (OPNGAS) is an Office within the Board of Public Works and its daily activities are managed by the Petroleum Administrator. The City's Petroleum Administrator is responsible for administering and managing all functions and related components of the petroleum and natural gas pipeline franchise agreements that authorize the transportation of various hydrocarbon commodities throughout the City via underground pipelines. The Administrator and OPNGAS partners with local, state, and federal agencies to implement and enforce the various laws, rules and regulations. The Administrator provides policy advice to the Mayor, City Council, and Board of Public Works on petroleum and natural gas matters. The OPNGAS is divided into three functional areas – Franchise and Contract Administration, Safety and Compliance, and Community Engagement and Policy.

The Franchise and Contract Administration is responsible for overseeing and monitoring the City's franchise agreements, including acting as lead negotiator, and reporting on evaluation of oil, gas, and electric utility fees. The Safety and Compliance performs comprehensive inspection and safety compliance function, including examining safety measures and best practices. The Community Engagement and Policy is responsible for community engagement and conducting public outreach to neighborhood councils, non-profit organizations, stakeholders, and intergovernmental relations with local regulatory agencies.

OPNGAS conducted an unprecedented extensive review and analysis of the Los Angeles County Department of Public Health report, City of Los Angeles Health Commission Report, Community Reports, Industry Reports, and multiple government agency technical reports from the California Department of Conservation Division of Gas and Geothermal Resources (CA DOGGR), California Regional Water Quality Control Board (RWQCB), South Coast Air Quality Management District (SCAQMD), Los Angeles County Department of Public Health (LADPH), City of Los Angeles Fire Department (LAFD), Department of Building & Safety (LADBS), Bureau of Sanitation (LASAN), Industrial Waste Management Division and Watershed Protection Division (WPD). This report includes the oil and facilities inventory oil fields, wells, and drill site facilities in all the council districts.

Disclaimer: If the scope of this request had been broader or additional items requested for evaluation, then the findings may have been different. There may also be additional records that were not accessible or available for consideration in this report.

If you have any questions, please call me at (213) 978-1697 or via email at Uduak.Ntuk@lacity.org.

Courtesy Copy:

Kevin James, President, Board of Public Works
Dr. Fernando Campos, Executive Officer, Board of Public Works
Ted Jordan, City Attorney's Office
Tanea Ysaguirre, City Attorney's Office
Lisa Webber, Planning Department
Estineh Mailian, Interim Chief Zoning Administrator

City of Los Angeles
Department of Public Works
Office of Petroleum and Natural Gas Administration and Safety

Oil and Gas Health Report

A Report on Council File 17-0447
Land Use Codes / Oil and Gas Development /
Impact on Resident Health and Safety / Code Change Proposals
July 25, 2019

Prepared by:

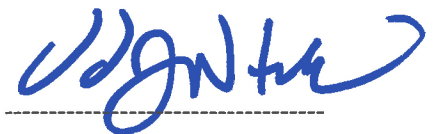
Uduak-Joe Ntuk, Petroleum Administrator

Erica Blyther, Environmental Affairs Officer

Sonny Berberabe, Senior Environmental Engineer

Seth Shonokoff, PSE Healthy Energy Consultant

Lee Ann Hill, PSE Healthy Energy Consultant



UDUAK-JOE NTUK
Petroleum Administrator

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Section 1. Introduction

On April 19, 2017, Los Angeles City Council Motion #17-0447 was introduced by Council President Wesson and seconded by Councilmember Huizar to report back on the Feasibility of Amending Current City Land Use Codes in Connection with Health Impacts at Oil and Gas Wells and Drill Sites. The motion was considered at the Mental Health and Education Committee on June 14, 2017, and instruction #4 was approved with modified recommendations. On June 30, 2017, the City Council adopted the committee report with additional modifications, instructing the Petroleum Administrator in collaboration with the City Attorney, Los Angeles County Department of Public Health (LACDPH), relevant City departments, and other health agencies and regulatory entities as necessary to report on the following:

1. What types of health and environmental impacts can be measured at and around oil and gas wells and drill sites;
2. Whether, what kind, and what distance a setback and potential mitigation measures from sensitive receptors should be established;
3. An evaluation of the various types of materials used at oil and gas sites that can have health impacts, how those materials are used, and what authority the City has over regulating their use;
4. An evaluation of the various types of drill sites, including active oil fields, abandoned oil fields, and gas storage fields;
5. What agencies currently govern or regulate oil and gas sites, including a matrix of energy, oil, and gas operators and their respective regulatory agencies, related to health impacts in the City and what authority does the City have to regulate those health impacts;
6. The upcoming LACDPH Interim Guidance on Urban Oil and Gas Operations;
7. Any recommendations from the LACDPH on whether a Health Impact or Health Risk Assessment Report on oil and gas drill site operations within the City is recommended, including the necessary resources and time to complete each type of study;
8. Any recommendation to enhance public health collaboration regarding oil and gas drill site oversight between the City, County and other related health agencies;
9. Memorandum of Agreement between the City and the LACDPH, and/or other regulatory agencies, with suggested terms, including emergency protocols, communication strategy, and clear delineation of public health roles and responsibilities;
10. Analysis of the economic, employment, and fiscal impacts of establishing a distance setback around oil and gas wells; and
11. Analysis of the human rights standards and environmental standards of the countries exporting oil used by the Los Angeles residents.

The Board of Public Works, Office of Petroleum and Natural Gas Administration and Safety (OPNGAS) staff conducted an extensive inventory of oil and gas facilities within the City of Los Angeles, participated in a public hearing at the Los Angeles City Health Commission, collected historical records from multiple private and public databases, held dozens of meetings with

multiple agencies, and retained a consultant to study the potential health impacts at oil and gas wells and drill sites within the City of Los Angeles. This report outlines the findings of this work.

Section 2. Regulatory Agencies

In the City of Los Angeles (City), oil fields, gas storage fields, and associated infrastructure are regulated by a variety of local, state, and federal agencies. Each of the agencies have their own distinct environmental monitoring requirements. The City provides regulatory oversight of oil fields through the City's Department of City Planning, Fire Department, Building and Safety Department, City Attorney's Office, and with the assistance of the Petroleum Administrator. The South Coast Air Quality Management District is the air pollution control agency that has regulatory oversight of emissions from oil and gas operations. Key state agencies include the California Division of Oil, Gas, and Geothermal Resources, the State Regional Water Quality Control Board, and the California Department of Fish & Wildlife. The following summarizes the applicable local, state and federal agencies tasked with the oversight of oil field operations within the City.

A. Federal Regulatory Agencies

U.S. Environmental Protection Agency (EPA)

The US EPA was established in December 1970 by an executive order of United States President Richard Nixon. The EPA is an agency of the United States federal government whose mission is to protect human and environmental health. Headquartered in Washington, D.C., the EPA is responsible for creating standards and laws that promote the health of individuals and the environment.

The EPA was established in response to widespread public environmental concerns that gained momentum in the 1950s and 1960s. The EPA seeks to protect and conserve the natural environment and improve the health of humans by researching the effects of and mandating limits on the use of pollutants. The EPA regulates the manufacturing, processing, distribution, and use of chemicals and other pollutants. In addition, the EPA is charged with determining safe tolerance levels for chemicals and other pollutants in food, animal feed, and water. The EPA enforces its findings through fines, sanctions, and other procedures.

The EPA also runs programs to prevent, control, and respond to oil spills, control air pollution and forecast air pollution levels, and foster the manufacture of more fuel-efficient vehicles. The EPA works to enforce laws such as the Clean Air Act, the Safe Drinking Water Act, the National Environmental Education Act, and the Clean Water Act, some of which predate the formation of the agency itself.

The EPA is also responsible for the detection and prevention of environmental crimes, monitoring pollution levels, and setting standards for the handling of hazardous chemicals and waste.

Occupational Safety and Health Administration (OSHA)

The General Duty Clause of the OSH Act (the law that created OSHA) requires employers to provide workers with a safe workplace that does not have any recognized hazards that cause or are likely to cause death or serious injury. Exposures to hazards present in the oil and gas well drilling, servicing, and storage industry are addressed in specific standards for general industry.

Federal law, 29 CFR 1926, applies only to oil and gas well drilling and servicing operations site preparation. Site preparation includes activities such as leveling the site, trenching, and excavation. All other aspects of oil and gas well drilling and servicing operations are covered by 29 CFR 1910. When a serious hazard exists in the workplace that is not addressed by a specific OSHA standard, Section 5(a)(1) ("General Duty Clause") of the OSH Act applies. The general industry clause provides specifications for Physical Work Environment, Powered Platforms, Manlifts, and Vehicle-mounted Work Platforms, Environmental Controls, Personal Protective Equipment, Toxic and Hazardous Materials, Materials Handling and Storage, Fire Protection and Welding, Machinery, and Electrical.

OSHA maintains a listing of the most frequently cited standards for specified 2 to 6-digit North American Industry Classification System (NAICS) codes. For oil and gas industry the NAICS codes are the following:

- Oil and Gas Field Services Industry Group (NAICS Code 213111)
- Crude Petroleum and Natural Gas (NAICS Code 211111)
- Drilling Oil and Gas Wells (NAICS Code 213111)
- Oil and Gas Field Exploration Services (NAICS Code 213112)
- Oil and Gas Field Services, Not Elsewhere Classified (NAICS Code 213112)

OSHA's complete language on Oil and Gas Extraction can be found here:

<https://www.osha.gov/SLTC/oilgaswelldrilling/standards.html>

Federal Oil and Gas Regulatory Summary

CERCLA/RCRA Oil and Gas Production Exemption

The Comprehensive Environmental Response Compensation, and Liability Act (CERCLA or Superfund) authorizes EPA to respond to releases, or threatened releases, of hazardous substances that might endanger public health, welfare, or the environment. It also grants EPA the authority to force parties responsible for environmental contamination to clean it up or to reimburse response costs incurred by EPA.

The Resource Conservation and Recovery Act (RCRA) is the federal public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. RCRA gives EPA the authority to control hazardous waste from the "cradle-to-grave."

In December 1978, EPA proposed hazardous waste management standards that included reduced requirements for several types of large volume wastes. Generally, EPA believed these large volume "special wastes" are lower in toxicity than other wastes being regulated as

hazardous waste under RCRA. Among the wastes covered by the 1978 proposal were “gas and oil drilling muds and oil production brines.” The oil and gas exemption was expanded in the 1980 legislative amendments to RCRA to include “drilling fluids, produced water, and other wastes associated with the exploration, development, or production of crude oil or natural gas...” According to the legislative history, the term “other wastes associated” specifically includes waste materials intrinsically derived from primary field operations associated with the exploration, development, or production of crude oil and natural gas. The phrase “intrinsically derived from the primary field operations” is intended to distinguish exploration, development, and production operations from transportation and manufacturing operations.

Below is an excerpt from “Exemption of Oil and Gas Exploration and Production Wastes from Federal Hazardous Waste Regulations, EPA” (Appendix A2-27):

EPA Exempt Oil and Gas Exploration and Production Wastes:

- Produced water
- Drilling fluids
- Drill cuttings
- Rigwash
- Drilling fluids and cuttings from offshore operations disposed of onshore
- Geothermal production fluids
- Hydrogen sulfide abatement wastes from geothermal energy production
- Well completion, treatment, and stimulation fluids
- Basic sediment, water, and other tank bottoms from storage facilities that hold product and exempt waste
- Accumulated materials such as hydrocarbons, solids, sands, and emulsion from production separators, fluid treating vessels, and production impoundments
- Pit sludges and contaminated bottoms from storage or disposal of exempt wastes
- Gas plant dehydration wastes, including glycol-based compounds, glycol filters, and filter media, backwash, and molecular sieves
- Workover wastes
- Cooling tower blowdown
- Gas plant sweetening wastes for sulfur removal, including amines, amine filters, amine filter media, backwash, precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber liquid and sludge
- Spent filters, filter media, and backwash (assuming the filter itself is not hazardous and the residue in it is from an exempt waste stream)
- Pipe scale, hydrocarbon solids, hydrates, and other deposits removed from piping and equipment prior to transportation
- Produced sand

- Packing fluids
- Hydrocarbon-bearing soil
- Pigging wastes from gathering lines
- Wastes from subsurface gas storage and retrieval, except for the non-exempt wastes
- Constituents removed from produced water before it is injected or otherwise disposed of
- Liquid hydrocarbons removed from the production stream but not from oil refining
- Gases from the production stream, such as hydrogen sulfide and carbon dioxide, and
- Volatilized hydrocarbons
- Materials ejected from a producing well during blow down
- Waste crude oil from primary field operations
- Light organics volatilized from exempt wastes in reserve pits, impoundments, or production equipment

Oil Pollution Prevention (Spill Prevention, Control and Countermeasures Regulations)

Spill prevention, control and countermeasures (SPCC) regulations promulgated pursuant to the Clean Water Act (CWA) are designed to protect our nation's waters from oil pollution caused by oil spills that could reach the navigable waters of the United States or adjoining shorelines. The regulations apply to non-transportation-related facilities with a specific aboveground or underground oil storage capacity that, due to its location, can be reasonably expected to discharge oil into the navigable waters of the United States.

SPCC Regulations Resources:

- 40 CFR Part 112
- RCRA Call Center: 800 424-9346
- Internet Access: www.epa.gov/oilspill/index.htm

Discharge of Oil

The section of the CWA regulations commonly known as the “sheen rule” provides the framework for determining whether a facility or vessel responsible for an oil spill must report the spill to the federal government. These rules require oil spills that may be “harmful to the public health or welfare” to be reported to the National Response Center. Usually, oil spills that cause a sheen or discoloration on the surface of a body of water violate applicable water quality standards and cause a sludge or emulsion to be deposited beneath the surface of the water or on adjoining shorelines that must be reported.

Discharge of Oil Regulations Resources:

- 40 CFR Part 110

- RCRA Call Center: 800 424-9346
- Internet Access: www.epa.gov/oilspill/index.htm
- Reporting discharges to the National Response Center: 800 424-8802.

Oil Pollution Act (OPA)

OPA of 1990 amended the CWA, and provided new requirements for contingency planning by government and industry under the National Oil and Hazardous Substances Pollution Contingency Plan. OPA also increased penalties for regulatory noncompliance, broadened the response and enforcement authorities of the federal government, and preserved state authority to establish laws governing oil spill prevention and response.

OPA Resources:

- 40 CFR Parts 110, 112, and 300 subparts C, D, E
- 49 CFR Part 194
- 33 CFR Part 154
- Internet Access: www.epa.gov/oilspill/index.htm

B. State Regulatory Agencies

California Air Resources Board (CARB)

The California Air Resources Board (CARB) is the primary state agency responsible for actions to protect public health from the harmful effects of air pollution and developing programs and actions to fight climate change. CARB was created by the California Clean Air Act of 1988. CARB is charged with:

- Acting as the state agency responsible for complying with the federal Clean Air Act, including preparation of the State Implementation Plan(SIP) as required;
- Adopting state ambient air quality standards;
- Overseeing the operations of the 35 local air pollution control districts;
- Identifying pollutants that pose the greatest health risks and implementing air pollution control programs for these pollutants, such as air toxics, diesel exhaust particles, benzene in gasoline and formaldehyde in consumer products;
- Leading the state's efforts to address global climate change;
- Conducting research; and
- Reducing air pollution and protecting public health guide CARB's actions.

CARB's role is to:

- Set the state's air quality standards at levels that protect those at greatest risk – children, older adults and people with lung and heart disease;
- Measure the state's progress in reducing pollutants utilizing the nation's most extensive air monitoring network;

- Verify automakers' emissions compliance;
- Research the causes and effects of air pollution problems – and recommend potential solutions – using the best available science and technology;
- Study the costs and benefits of pollution controls, paying particular attention to individuals and communities most at risk; and
- Lead California's efforts to reduce climate-changing emissions through measures that promote a more energy-efficient and resilient economy.

From requirements for clean cars and fuels to adopting innovative solutions to reduce greenhouse gas emissions, CARB has pioneered many of the approaches now used worldwide to address air quality problems.

California Department of Fish and Wildlife (CDFW)

The California Department of Fish and Wildlife (CDFW) manages California's diverse fish, wildlife and plant resources, and the habitats upon which they depend. CDFW is the state agency responsible for entering into a Streambed Alteration Agreement with an applicant in the event that the various oil and gas development projects could affect streams, creeks, rivers or other sensitive habitats near bodies of water within the state. CDFW's Office of Spill Prevention and Response (OSPR) is the state's lead for responding to oil spills in its inland and marine waters. OSPR aims for best achievable protection of California's natural resources. It is one of the few State agencies in the nation that has both major pollution response authority and public trustee authority for wildlife and habitat. This mandate ensures that prevention, preparedness, restoration and response will provide the best protection for California's natural resources.

The Department of Toxic Substances Control (DTSC)

The Department of Toxic Substances Control (DTSC) is a department of the California Environmental Protection Agency (CalEPA). It consists of over 1,000 scientists, engineers, toxicologists, chemists, geologists, attorneys, criminal investigators and administrative staff. DTSC strives to research toxic substances to enforce public health standards across industries and other government agencies. This agency also restores and evaluates community sites for further development or protection.

The mission of DTSC is to protect California's people and environment from harmful effects of toxic substances by remediating contaminated resources, enforcing hazardous waste laws, reducing hazardous waste generation, and encouraging the manufacture of chemically and environmentally safer products.

DTSC protects the public health of communities and the environment from toxic contamination left behind from past industrial and commercial activities through its brownfields and environmental remediation programs under RCRA (Resources Conservation and Recovery Act), CERCLA/Superfund, as well as eight (8) or nine (9) other laws governing the clean-up of contaminated land, water and air.

DTSC protects the public health of communities and the environment from toxic substances in current economic use and hazardous waste being generated by present-day industrial and

commercial activities through permitting and regulatory programs to ensure the safe handling, transport, storage and disposal of toxic substances and waste.

DTSC protects future generations by its long term stewardship of hazardous substances through pollution prevention business assistance programs, and its new green chemistry mandate - to reduce use of toxic substances in everyday products used by California consumers.

California Division of Oil, Gas, and Geothermal Resources (CA DOGGR)

CA DOGGR is one of five (5) divisions that comprise the California Department of Conservation (DOC). CA DOGGR ensures the safe exploration and development of energy resources. It is the state agency responsible for issuance of well permits for production and injection wells. The Division oversees the drilling, operation, maintenance, and plugging and abandonment of oil, natural gas, and geothermal wells. All California oil and gas wells (existing and prospective wells), enhanced recovery wells, water-disposal wells, service wells (e.g., structure, observation, temperature observation wells), core-holes, and gas-storage wells, onshore and offshore (within three nautical miles of the coastline), located on state and private lands, are permitted, drilled, operated, maintained, plugged and abandoned under requirements and procedures administered by CA DOGGR. Its oversight is an important step in guarding drinking and agricultural waters against pollution. DOC is also the clearinghouse for information about the state's oil, gas and geothermal industry, with more than 170,000 well records, production and injection statistics, well logs and field maps.

Division responsibilities are detailed in Section 3000 of the California Public Resources Code and Title 14, Chapter 4 of the California Code of Regulations. These regulations address issues such as well spacing, blow-out prevention devices, casing requirements, plugging and abandonment of wells, maintenance of facilities and safety systems, fencing, inspection frequency and reporting requirements. Section 1774 of Title 14 CCR Division 2, Chapter 4 specifies maintenance practices related to oil field facilities and pipelines. Written approval from CA DOGGR is required prior to changing the physical condition of any well. The operator's notice of intent (notice) to perform any well operation is reviewed on engineering and geological bases. For new wells and alteration of existing wells, approval of the proposal depends primarily on the following: protecting all subsurface hydrocarbons and fresh waters; protection of the environment; using adequate blowout prevention equipment; and utilizing approved drilling and cementing techniques.

CA DOGGR must be notified to witness or inspect all operations specified in the approval of any notice. This includes tests and inspections of blowout-prevention equipment, reservoir and freshwater protection measures, and well-plugging operations. In addition, the operator must have a bond on file with CA DOGGR before certain well operations can begin. The purpose of the bond is to secure the state against any expenses that the state may incur in obtaining operator compliance with applicable laws, regulations, and orders of CA DOGGR. The operator must also designate an agent, residing in the state, to receive and accept service of all orders, notices, and processes of CA DOGGR or any court of law.

Wells that are found to be hazardous are required to be re-abandoned by the operator. If no former operator of the well can be found, CA DOGGR contracts to have a well be re-abandoned.

They also maintains a database of historical wells. CA DOGGR requirements related to construction projects that are near or on top of historically abandoned wells are promulgated by CA DOGGR, including the submission of plans to CA DOGGR.

California Waste Regulatory Summary

Hazardous Waste Control Law (HWCL) of 1972, as amended

California Health and Safety Code, § 25100 et seq; 22 Cal. Admin. Code § 66680 et seq.

Intent: To protect the public health through the regulation of the transportation, storage, and disposal of hazardous waste.

The California HWCL predates the federal RCRA statute and is often more stringent or more extensive than the federal law. Additionally, there are some, though minor and sometimes subtle, differences in the two laws, particularly with regard to some of California's toxicity tests to determine hazardous classification.

City and county health departments, through Memoranda of Understanding (MOU) with the California Department of Health Services, are the primary agencies responsible for administering the state program, including issuing permits which fall into three categories: interim permits, hazardous waste facility permits, and permits by rule. Interim permits and facility permits under HWCL are essentially equivalent to the permits under RCRA. Permits by rule allow certain types of facilities that operate under other similar permits such as a National Pollutant Discharge Elimination System or (NPDES) permit to use their existing permit instead of a facility permit under the HWCL.

California was authorized to operate the state program in lieu of the federal RCRA program in 1992.

The Carpenter-Presley Tanner Hazardous Substance Account Act (HSAA) of 1981, as amended in 1986 & The Johnston-Filante Hazardous Substance Cleanup Bond Act of 1984

California Health and Safety Code, §§ 25300-25382

California Health and Safety Code, §§ 25385-25386.6

Intent: To establish state authority to clean up hazardous substance releases and to provide funds to enhance the state's ability to respond to hazardous waste problems.

These two acts form the State's Superfund statutes which supplements the federal program and provides the State's required funding share. In California, DTSC protects the public health of communities and the environment from toxic contamination left behind from past industrial and commercial activities. Under CERCLA, states are required to contribute 10% of the costs to cleanup of sites within their state listed on the National Priorities List (NPL). The state program accelerates private and state-funded cleanups of sites not on the NPL while using the EPA's methodology for ranking contaminated sites.

Under the state system, sites are ranked in three tiers based on their threat to the public health and placed in three general categories: sites being cleaned up by the responsible parties under order or agreement with the Department of Health Services (DHS); sites being evaluated or characterized by the DHS with no responsible party identified; sites that have been fully characterized and that have no identified responsible party. State funds may only be spent on sites of the third kind.

Once characterized, a Remedial Action Plan (RAP) is prepared to determine how a site will be cleaned and how the cleanup costs will be allocated among the responsible parties. Since the state program operates as a supplement to the federal, the RAP must comply with the National Contingency Plan. Once a RAP is finalized, site remediation may proceed.

The state statutes also require that persons/facilities handling "acutely hazardous materials" (defined as any chemical designated as an extremely hazardous substance as listed in Appendix A of 40 CFR, Part 355) must submit a risk management and prevention program (RMPP) that provides extensive information on the materials handled, the methods employed, history of accidents, risk assessments, controls to minimize risks, and a schedule for implementing additional safety procedures.

Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)

California Health and Safety Code, §25249 et seq

Intent: To protect drinking water supplies from toxic chemicals and to provide warnings of exposure to toxic chemicals.

- 1) Requires the Governor to provide a list of chemicals known to cause cancer or reproductive harm.
- 2) Prohibits the "knowing" discharge of any listed chemical into water or onto land where it could pass into the groundwater. Public water and sewer systems are exempt.
- 3) Requires public warning to be given where listed chemicals are in use or for sale.
- 4) Requires that "designated government employees" who discover or otherwise obtain information of any illegal discharge or threatened discharge within the geographic area of their jurisdiction report that knowledge within 72 hours to their local health officer and to the local board of supervisors.

C. Regional Regulatory Agencies

California Regional Water Quality Control Board (RWQCB)

Created by the California Legislature in 1967, the five-member State Water Board protects water quality by setting statewide policy, coordinating and supporting the Regional Board efforts, and reviewing petitions that contest Regional Board actions. Together with the regional boards, the State Water Board is authorized to implement the federal Clean Water Act in California. The

Water Board is housed within state government and are part of the California Environmental Protection Agency (CalEPA).

There are nine regional water quality control boards statewide. The nine (9) Regional Water Boards are semi-autonomous and are comprised of seven part-time Board members appointed by the Governor and confirmed by the Senate. Regional boundaries are based on watersheds and water quality requirements are based on the unique differences in climate, topography, geology, and hydrology for each watershed. Each Regional Board makes critical water quality decisions for its region, including setting standards, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions.

The State Water Board and the Regional Water Boards do not permit oil and gas wells, but Regional Water Boards do regulate oil and gas waste discharge ponds, while the State Water Boards oversee certain well stimulation activities and Class II underground injection wells as requested by the agency.

South Coast Air Quality Management District (SCAQMD)

The SCAQMD is the air pollution control agency for all of Orange County and the urban portions of Los Angeles, Riverside and San Bernardino counties. This area of 10,743 square miles is home to over 16.8 million people—about half the population of the whole state of California. Its mission is to clean the air and protect the health of all residents in the South Coast Air District through practical and innovative strategies. The SCAQMD is responsible for controlling emissions primarily from stationary sources of air pollution.

The California Legislature created the District in 1977 as the agency responsible for developing and enforcing emission control rules and regulations in the South Coast Air Basin (Basin) and portions of the Salton Sea Air Basin and Mojave Desert Air Basin. In 1977, amendments to the federal Clean Air Act (CAA) included requirements for submitting State Implementation Plans (SIPs) for nonattainment areas, which are those that fail to meet all federal ambient air quality standards (CAA Section 172), and similar requirements exist at the state Health and Safety Code, Section 40462. The federal CAA was amended in 1990 to specify attainment dates and SIP requirements for criteria pollutants: ozone, carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), sulfur dioxide (SO) and particulate matter with an aerodynamic diameter of less than 10 microns (PM₁₀). In 1997, the U.S. EPA promulgated ambient air quality standards for particulate matter with an aerodynamic diameter less than 2.5 microns (PM_{2.5}). The U.S. EPA is required to periodically update the national ambient air quality standards (NAAQS). Criteria pollutants are the only air pollutants with national air quality standards that define allowable concentrations of these substances in ambient air.

In addition, the California Clean Air Act (CCAA), adopted in 1988, requires the SCAQMD to achieve and maintain state ambient air quality standards for ozone (O₃), CO, sulfur dioxide (SO₂), and NO₂ by the earliest practicable date (Health and Safety Code Section 40910). The CCAA also requires a three-year plan review, and, if necessary, an update to the SIP. The CCAA requires air

districts to achieve and maintain state standards by the earliest practicable date and for extreme non-attainment areas, to use all feasible measures pursuant to Health and Safety Code Sections 40913, 40914, and 40920.5. The term “feasible” is defined in the California Environmental Quality Act (CEQA) Guidelines Section 15364, as a measure “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.”

By statute, SCAQMD is required to adopt an air quality management plan (AQMP) demonstrating compliance with all federal and state ambient air quality standards for the areas under the jurisdiction of the SCAQMD. Furthermore, SCAQMD must adopt rules and regulations that carry out the AQMP. The AQMP is a regional blueprint for how SCAQMD will achieve air quality standards and healthful air. The 2016 AQMP contained multiple goals promoting reductions of criteria air pollutants, greenhouse gases, and toxic air contaminants (TACs). The 2016 AQMP specifically stated that both oxides of nitrogen (NO_x) and volatile organic compounds (VOC) emissions need to be addressed, and emphasized that NO_x emission reductions are more effective to reduce the formation of ozone and PM_{2.5}. Ozone is a criteria pollutant shown to adversely affect human health and is formed when VOCs react with NO_x in the atmosphere. NO_x is a precursor to the formation of ozone and PM_{2.5}, and NO_x emission reductions are necessary to achieve the ozone standard attainment. NO_x emission reductions also contribute to attainment of PM_{2.5} standards.

In the 2016 AQMP, the Governing Board adopted a resolution that directed staff to transition facilities participating in the Regional Clean Air Incentives Market (RECLAIM) program to a command-and-control regulatory structure requiring Best Available Retrofit Control Technology (BARCT) as soon as practicable. In addition, the 2016 AQMP included Control Measure CMB-05 which intended for further NO_x reductions from RECLAIM Assessment. The rule committed to achieving additional NO_x emission reductions of five (5) tons per day to occur by 2025. Further, California State Assembly Bill 617, approved by the Governor on July 26, 2017, requires air districts to develop an expedited schedule by January 1, 2019, for the implementation of BARCT no later than December 31, 2023 for facilities that are subject to a market-based compliance programs.

The SCAQMD also regulates oil and gas production equipment such as oil wells, flares, micro-turbines, gas separators, and other facility processing equipment. Oil field activities are regulated via standard air quality permits which are pulled by operators or suppliers of equipment and are enforced by SCAQMD inspectors. In addition, groups of oil and gas wells require a registration permit. At present, the SCAQMD standard air quality permits or registration permits are independent of State or City permitting processes.

Under SCAQMD Rule 1148.2 (2013) – “Notification and Reporting Requirements for Oil and Gas Well and Chemical Suppliers,” onshore oil and gas well operators and chemical suppliers are

required to electronically submit to the SCAQMD various types of reports related to well drilling, well completion, and well reworks. The public notifications include basic information about the owner or operator, the well location, the type of activity that will be conducted, and the distance to the nearest sensitive receptor up to 1,500 feet from the well. The District hosts two publically accessible online databases for 1) chemicals usage and 2) oil and gas activity reports from across the Air Basin.

D. Local Regulatory Agencies

City of Los Angeles – Department of City Planning (DCP)

The Department of City Planning is charged with the responsibility of preparing, maintaining, and implementing a General Plan for the development of the City of Los Angeles. The General Plan consists of the Framework Element, which provides overall guidance for the future of the City and other citywide elements including State mandated elements such as the Circulation, Noise, Housing, Open Space, Land Use, Conservation, and Safety.

The DCP's Office of Zoning Administration is responsible for approving the creation of Oil Drilling Districts, as set forth in Los Angeles Municipal Code (LAMC) section 13.01 et.seq. The Zoning Administrator determines the methods and conditions for all oil drilling activity in approved drilling districts pursuant to LAMC sections 13.01-H and I.

Well operation with the oil districts may also require clearances by the Los Angeles Fire Department (LAFD), the Petroleum Administrator in the Public Works Department, the Department of Building and Safety (LADBS), and the Department of Water and Power ("LADWP").

LAMC Section 13.01 addresses the creation of oil districts, "where the drilling of oil wells or the production from the wells of oil, gases or other hydrocarbon substances (are) permitted." This section does not apply to subterranean gas holding areas which are operated as a public utility. In addition, this section does not apply to Heavy Industrial (M3) zones unless oil drilling operations or the establishment of an oil drilling district are within 500 feet of a more restrictive zone. It should be noted that, according to Council File records, the last oil district was established in May of 1990, approximately 29 years ago.

LAMC Section 13.01 is written as an applicant-initiated zoning overlay used primarily to establish oil drilling districts and has comparatively little to do with land use compatibility or potential noxious emissions. Many of the Section 13.01 provisions were established in the Code prior to 1970, and thus do not specifically address requisite state or City environmental review procedures implemented under the California Environmental Quality Act (CEQA).

Since there is no mention of extraction methods within Section 13.01, the use of specific well stimulation treatments does not require City clearance or review. Requests to initiate modifications of existing entitlements and/or conditions would trigger the appropriate environmental clearance and public hearing as part of the Zoning Administrator's review process.

A brief summary of Section 13.01 is provided below for context:

- A. **Application** for the establishment of oil drilling districts where wells of oil, gases, or other hydrocarbon substances are permitted.
- B. **Definitions** include, but are not limited to, "Class A" and "Class B" wells that distinguish between production and injection wells, respectively.
- C. **Status of Areas** classified as either "Urbanized" or "Non-Urbanized." Such classifications determine the allowable size of the oil districts and the total drillable land area.
- D. **Requirements for Filing** an application for the establishment of an oil drilling district that is either in a (n): Urbanized area, Non-Urbanized area, Offshore area, Los Angeles City Oil Field Area, or General-All Areas. The establishment of "General-All Areas" requires a submittal to the authorized person in - charge of Petroleum Administration.
- E. **Standard Conditions** within each oil drilling district described in part D.
- F. **Additional Conditions** imposed when establishing an oil district (for example, equipment delivery hours, landscaping and fencing requirements, subsurface production and storage equipment, fire safety precautions, etc.).
- G. **Description of Districts** referenced in maps held in the City Planning Office showing boundaries for each oil drilling district described in Part D.
- H. **Drilling Site Requirements** determined by the Zoning Administrator to drill or deepen a well in an oil drilling district that has been established by ordinance, or to drill or deepen and subsequently maintain an oil well in an M3 zone that is within 500 feet of a more restrictive zone.
- I. **Permits** are required for drilling, deepening or maintaining oil wells, or converting an oil well from one class to another, and are issued by the Zoning Administrator or Area Planning Commission.
- J. **Termination of District** and how to extend the timeline for that process under the discretion of the Zoning Administrator, the City Petroleum Administrator, and the City Planning Commission.
- K. **Maintenance of Drilling and Production Site** for existing and future oil and gas wells within the City.

The Department of City Planning recently released a Zoning Administrator Memorandum No. 133 (ZA Memo 133), on September 19, 2016. ZA Memo 133 established a comprehensive set of procedures for the acceptance and processing of applications for oil drilling approvals pursuant to LAMC Section 13.01-H . It also establishes City procedures for the CEQA review of Section 13.01-H oil drilling applications.

The memorandum does not amend or modify existing regulations pursuant to ordinances established in the LAMC, nor does it establish any authority beyond that currently maintained by the Zoning Administrator. Charter Section 561 recognizes that the Chief Zoning Administrator may adopt rules necessary to carry out the requirements prescribed by ordinance, which are not in conflict or inconsistent with those ordinances. As the LAMC contains no express procedural requirements for filing applications for entitlements under Section 13.01-H, ZA Memo 133 fulfills that purpose.

The memorandum identifies review procedures that focus on a scope of information specific to oil drilling and gas operations. The new forms and instructions issued in association with the

Memo are similar to other application forms used by the Department that include special questions or requirements tailored to a particular land use entitlement, e.g., eldercare facilities, alcohol-related uses, density-bonus applications for affordable housing, schools, daycare facilities, coastal development permits; in this particular case, to the unique characteristics of oil and gas projects.

ZA Memo 133 also details the process for considering the appropriate environmental clearance related to an entitlement request, including those projects that may be categorically exempt, and thus not subject to the provisions of CEQA. The process does not exclude consideration of categorical exemptions. Projects may be reviewed to determine if the project is exempt under any applicable categorical exemption in CEQA Guidelines Section 15300-15333 or any City Guidelines (adopted pursuant to CEQA). While any application to drill, re-drill, deepen, or convert a well is not eligible for a categorical exemption, and is required to file an Initial Study, the filing of an Initial Study does not automatically result in a determination by the Department to require preparation of an EIR. Ultimately, the memorandum allows for a closer connection between Department procedures and CEQA guidelines, and complies fully with state law.

The memorandum emphasizes public participation as critical to the complete process, with the opportunity for stakeholder involvement made available throughout the entitlement review, from acceptance of the application through consideration of the environmental clearance and the final discretionary action. The Department practices prescribed in the memorandum reflect the direction of the City Council to fully recognize that people living and working in proximity to oil and gas operations have a substantial interest in participating in the review process for these projects. There is a 1,500 foot hearing notification radius and 35-day comment period on any proposed environmental clearances prior to the Zoning Administrator issuing a determination.

City of Los Angeles - Fire Department (LAFD)

The City of Los Angeles Fire Department (LAFD) is designated by the state of California as a Certified Unified Program Agency (CUPA) and is authorized to apply statewide standards to each facility within its jurisdiction that treats on site or generates hazardous waste, operates underground storage tanks, or stores hazardous materials. The LAFD Fire Prevention Bureau issues two types of permits to oil and gas well operators. The first is an operational permit known as Division 4 Permit. This permit is required to engage in the operation of an oil well. The second is an action permit for the drilling, re-drilling, or abandonment of an oil well.

City of Los Angeles – Building and Safety (LADBS)

The Los Angeles Department of Building and Safety (LADBS) provides permitting, plan check, inspection, and code enforcement services for residential and commercial buildings in the City of Los Angeles. LADBS advises, guides, and assists customers to achieve compliance with the Building, Zoning, Plumbing, Mechanical, Electrical, Disabled Access, Energy, and Green codes and local and state laws. LADBS enforces the Los Angeles building code to ensure that buildings are safe for employees and patrons. LADBS issues permits that allow building, renovation, repairs and demolition. LADBS conducts inspections of oil and gas drill sites on behalf of the DCP Office of Zoning Administration to ensure construction and renovation work are completed properly. LADBS also enforces the required operating conditions for each drill site.

City of Los Angeles – Bureau of Sanitation – Watershed Protection Division (WPD)

The mission of the Watershed Protection Program (WPD) is to protect the beneficial uses of receiving waters while complying with all flood control and pollution abandonment mandates. The program employs a multi-pronged approach to ensure the City of Los Angeles is in compliance with regulations to reduce the amount of pollution flowing into and through regional waterways. WPD Enforcement Section of the Bureau of Sanitation enforces local, state and federal laws, investigates environmental crimes and refers cases to the Los Angeles City Attorney’s Office for evaluation and possible prosecution. Enforcement of the City’s Storm Water and Urban Runoff Pollution Control ordinance (LAMC 64.70) is an integral part of protecting LA’s watersheds. WPD is one of the City’s first responders to oil spills or environmental emergency events.

City of Los Angeles – Board of Public Works (BPW)

The Petroleum Administrator serves as the Director of the City’s Office of Petroleum and Natural Gas Administration and Safety Office under the Board of Public Works. Los Angeles Administrative Code (LAAC) sections 19.48 -19.50 of the code address the duties of the Director with respect to the management of petroleum matters affecting the City. These include, but are not limited to, addressing all matters related directly or indirectly to petroleum exploration and production and any matters concerning the creation of oil well drilling districts under the LAMC. Sections 19.53 - 19.71 address duties including referrals, investigations of applications, consultation with experts, recommendations to decision makers, publications, conditions, award of leases or agreements, execution of leases, sureties, forfeitures, and reservations (subject to the State Lands Commission). The Petroleum Administrator is also responsible for the oversight of the City’s pipeline franchise agreements that were formerly administered by the Department of Transportation.

E. Federal, State, and Local Regulatory Agencies Matrix

Table 1. Federal, State, and Local Oil and Gas Regulatory Agencies

Agency Permit or Approval	Requirement	Applicability
Federal Agencies		
Environmental Protection Agency (U.S. EPA)	Resource Conservation and Recovery Act (RCRA), 40 CFR Parts 260 – 279	Hazardous waste generators.
		Requires proper handling of hazardous waste material.
U.S. Department of Transportation (U.S. DOT)	Pipeline Identification Numbers	Oil and gas pipelines.

	Pipeline construction and operations inspections	Oil and gas pipelines.
	Hazardous and flammable materials certificate	Oil, natural gas, and Natural Gas Liquids (NGLs).
Occupational Safety and Health Administration (OSHA)	General Industry Standards OSHA 29 CFR Part 1910	Worker process safety standards.
State Agencies		
California Air Resources Board (CARB)	Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities	Emissions controls at all oil and gas facilities in California. Oil and gas production, processing, storage, and transmission compressor stations
California Department of Fish and Wildlife (CDFW)	Inland and marine oil spill pollution response authority	Oil spill response
California Department of Toxic Substances Control (DTSC)	Toxic contamination, brownfields, and environmental remediation programs	Pollution prevention. Hazardous waste. Green chemistry.
	Hazardous Waste Control Law (HSC, Division 20, Chapter 6.5)	Required if facility stores, treats or disposes of hazardous waste as described in the regulation.
California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR)	Permits to drill wells	Oil, gas, and water wells.
	Permits to conduct well operations	Oil, gas, and water wells.
	Class II underground injection control permit	Water injection wells and slurry injection well.
California Division of Occupation Safety and Health Administration (Cal OSHA)	Construction - related permits	Excavation, construction, and demolition.
	Boiler and pressure vessel permits	Separation pressure vessels and NGL storage tank.
Office of the State Fire Marshall (OSFM)	Pipeline review and approval	Oil and gas pipelines.
	Pipeline hydro test review and approval	Oil and gas pipelines.
	Periodic inspection and hydrotesting	Oil and gas pipelines.

Regional Agencies		
Regional Water Quality Control Board (RWQCB)	Storm Water Pollution Prevention SWPPP Permit Section 401 Certification	Facility-wide plan and operations.
South Coast Air Quality Management District (SCAQMD)	Various Rules for New Stationary Sources under Regulations II, IV, XI, XIII, and XIV.	Equipment such as flares, tanks, wastewater separators, and process heater.
	Authority to Construct	Permit to construct for stationary sources.
	Permit to Operate	Permit to operate for stationary sources.
	Rule 1148.2	Oil and gas well activity notification. Chemical disclosure.
		Prohibits visible emissions from single emission sources.
		Prohibits discharges (e.g., odors) which cause a nuisance to the public.
		Requires control of fugitive dust from earth moving.
City Agencies		
Fire Department (LAFD), Fire Prevention Bureau	Fire Suppression System Permits; Well Drilling Permits, Well Abandonment Permits. Compliance with NFPA Requirements.	Oil, gas, and water injection wells. Drill site operations.
Fire Department, , Certified Unified Program Agency (CUPA)	Hazardous Waste Permits. Business Plan Approvals.	Drill site operations. Oil spills.
Department of Building & Safety (LADBS)	Zoning Operating Conditions inspections	Drill site operations.
Department of City Planning (DCP), Office of Zoning Administration (OZA)	Land use permits. Permits to drill wells. Permits to re-drill wells. Permits to abandon wells.	Oil, gas, and water injection wells. Drill site operations.
Watershed Protection Division (WPD)	Storm water and urban runoff pollution control.	Oil spills. Hazardous waste.
Petroleum Administrator (PA)	Permit Applications Review. Zoning Hearings. Report writing. Petroleum research and investigations. Pipeline Franchise Agreements.	Oil, gas, and water injection wells. Drill site operations. Crude oil & natural gas pipelines.

Section 3. Evaluation of Drill Sites and Oil Fields

Oil and natural gas production is also known as upstream, because it includes the extraction and initial separation of oil, water and natural gas from hydrocarbon formations, but not the subsequent transportation, processing and storage (midstream), or the refining of petroleum or marketing and use of petroleum products (downstream). An upstream oil and natural gas producer sells the oil from the field where it is produced to a midstream pipeline company, which transports oil and natural gas to downstream companies that operate refineries or natural gas to utilities to operate power plants, and to natural gas storage and distribution facilities. These different activities are conducted by specialized companies and governed by sector-specific regulations. Upstream oil and natural gas production is thus distinct in terms of both operations and regulations from midstream pipeline companies, downstream refining and marketing companies, and utilities that operate natural gas storage facilities and power plants and sell natural gas and electricity. This report is primarily focused on upstream operations within the City of Los Angeles.

The Los Angeles geological basin has one of the highest concentrations of crude oil per acre in the world. There are thousands of feet of oil-bearing sandstone rock formations underlying the City and the surrounding areas in Orange and Los Angeles Counties that comprise the Los Angeles Basin. In 1892, Edward Doheny and Charles Canfield drilled the first successful oil well in the Los Angeles City Oil Field (modern day Echo Park). Their discovery set off a series of major oil discoveries in the early 1900's and led to the City's first major population boom. Even after more than century of prolific production, the US Geological Survey estimates 1.6 billion barrels of recoverable oil remain in place beneath the City, rivaling the reserves in the Middle Eastern countries, like Saudi Arabia, Iraq, and Kuwait 14,000 miles away.

Petroleum production in most fields in the City and most of the Los Angeles Basin has several natural characteristics that are distinct to each field's specific geochemistry, depth, sulfur content, and production volumes. Oil and natural gas wells in the City are distinguished by their low pressures and low flow rates. Associated production facilities in the City also typically hold small fluid volumes, since the oil is generally sent directly by pipeline to local refineries. In addition, there are two key attributes of the produced fluids that comes from wells in the City – the gas-to-oil (GOR) ratio and the water-to-oil (WOR) ratio. The gas-to-oil ratio, a measure of the natural gas content in the produced fluid from the formation, is very low in the Los Angeles Basin, which means that it is typically less volatile and generates lower air emissions of methane and volatile organic compounds. The water-to-oil ratio, a measure of the water content in the production fluid, is very high in the Los Angeles Basin, which means that the vast majority of the fluid produced is water, rather than oil or gas. After the oil is separated, the water is either disposed of via a local sanitation district or re-injected into the subsurface formation in a closed loop.

Table 2. City of Los Angeles Oil Fields

	Oil Fields	Discovered	Status	Era	Type
1.	Aliso Canyon	1938	Producing	Pliocene	Sandstone
2.	Beverly Hills	1900	Producing	Pliocene	Sandstone
3.	Boyle Heights	1955	Abandoned	Miocene	Sandstone
4.	Cascade	1954	Producing	Pliocene	Sandstone
5.	Cheviot Hills	1958	Producing	Miocene	Sandstone
6.	El Segundo	1935	Producing	Miocene	Sandstone
7.	Horse Meadows	1952	Abandoned	Pliocene	Sandstone
8.	Hyperion	1944	Producing	Miocene	Sandstone
9.	Inglewood	1924	Producing	Pliocene	Sandstone
10.	La Cienegas	1961	Producing	Pliocene	Sandstone
11.	Los Angeles City	1890	Producing	Pliocene	Sandstone
12.	Los Angeles Downtown	1965	Producing	Pliocene	Sandstone
13.	Mission	1961	Abandoned	Pliocene	Sandstone
14.	Pacoima	1978	Abandoned	Miocene	Sandstone
15.	Playa Del Rey	1929	Producing	Miocene	Sandstone
16.	Potrero	1928	Abandoned	Miocene	Sandstone
17.	Rosecrans	1927	Producing	Miocene	Sandstone
18.	Salt Lake	1902	Producing	Pliocene	Sandstone
19.	Salt Lake, South	1970	Producing	Pliocene	Sandstone
20.	San Vicente	1968	Producing	Pliocene	Sandstone
21.	Sawtelle	1965	Producing	Pliocene	Sandstone
22.	Torrance	1922	Producing	Miocene	Sandstone
23.	Union Station	1967	Abandoned	Pliocene	Sandstone
24.	Venice Beach	1966	Abandoned	Miocene	Sandstone
25.	Wilmington	1932	Producing	Miocene	Sandstone
26.	Old Wilmington	1932	Abandoned	Miocene	Sandstone

Table 3. Oil and Gas Wells Inventory By Oil Field

Oil Field	Active	Idle	Plugged	Buried	Total
1. Aliso Canyon	24	6	9	0	39
2. Any Field	1	5	235	32	273
3. Beverly Hills	98	37	80	3	218
4. Boyle Heights (Abd)	0	0	4	0	4
5. Cascade	21	2	12	0	35
6. Cheviot Hills	14	14	45	0	73

7. El Segundo	2	0	1	0	3
8. Horse Meadow (Abd)	0	0	5	0	5
9. Hyperion	0	0	6	0	6
10. Inglewood	0	0	4	0	4
11. La Cienegas	66	37	30	0	133
12. Los Angeles City	5	9	317	855	1,186
13. Los Angeles Downtown	13	15	6	0	34
14. Mission (Abd)	0	0	13	0	13
15. Old Wilmington (Abd)	0	0	483	0	483
16. Pacoima (Abd)	0	0	12	0	12
17. Playa Del Rey	42	7	284	4	337
18. Rosecrans	14	6	135	3	158
19. Salt Lake	5	2	373	29	409
20. San Vicente	38	4	2	2	46
21. Sawtelle	0	0	1	0	1
22. South Salt Lake	11	6	9	4	30
23. Torrance	80	17	175	1	273
24. Union Station (Abd)	0	0	12	0	12
25. Venice Beach (Abd)	0	0	2	0	2
26. Wilmington	385	129	926	0	1,440
Total:	819	296	3,181	933	5,229

Note: Sawtelle field has 14 active wells and 1 idle well that were zoned by the City of Los Angeles, but are outside the city boundaries on federal lands and under federal authority.

Table 4. City of Los Angeles Oil Fields by City Council District

Council District/Member	Oil Fields
1. Gilbert Cedillo	La Cienegas Los Angeles City
2. Paul Krekorian	None
3. Bob Blumenfield	None
4. David Ryu	Salt Lake Salt Lake South
5. Paul Koretz	Cheviot Hills Salt Lake Beverly Hills Salt Lake South Inglewood San Vicente Sawtelle
6. Nury Martinez	Pacoima

7. Monica Rodriguez	Pacoima	
8. Marqueece Harris Dawson	Inglewood La Cienegas	
9. Curren D. Price Jr.	Los Angeles Downtown La Cienegas	
10. Herb J. Wesson Jr.	Beverly Inglewood	La Cienegas Salt Lake South
11. Mike Bonin	Hyperion Playa Del Rey Venice Beach (Abd)	Sawtelle
12. Greig Smith	Aliso Canyon Cascade Horse Meadows (Abd)	Mission (Abd)
13. Mitch O'Farrell	Los Angeles City	
14. Jose Huizar	Boyle Heights (Abd) Los Angeles Downtown Union Station (Abd)	
15. Joe Buscaino	Old Wilmington (Abd) Rosecrans Torrance Wilmington	

B. Oil & Gas Wells

All oil and gas wells, located on state and private lands are permitted, drilled, operated, maintained, plugged and abandoned under requirements and procedures administered by CA DOGGR. There are 5,229 oil and gas wells in the City based on the March 2018 data from the CA DOGGR website database. CA DOGGR oil and gas well database has been frozen since April 2018 due to computer system upgrades. The table shows the status of the oil and gas inventory by council district.

Table 5. Well Count and Status by Council District

Council District	Active	Idle	Plugged	Buried	Total
1. Gilbert Cedillo	0	23	267	414	704
2. Paul Krekorian	0	0	3	1	4
3. Bob Blumenfield	0	0	2	3	5
4. David Ryu	1	1	176	17	195

5. Paul Koretz	115	42	343	26	526
6. Nury Martinez	0	0	11	0	11
7. Monica Rodriguez	0	0	28	4	32
8. Marqueece Harris Dawson	29	7	11	0	47
9. Curren D. Price Jr.	0	0	10	0	10
10. Herb J. Wesson Jr.	88	29	61	16	194
11. Mike Bonin	44	8	327	7	386
12. Greig Smith	45	9	82	0	136
13. Mitch O' Farrell	5	7	67	426	505
14. Jose Huizar	13	16	53	9	49
15. Joe Buscaino	479	154	1,740	10	2,383
Total:	819	296	3,181	933	5,229

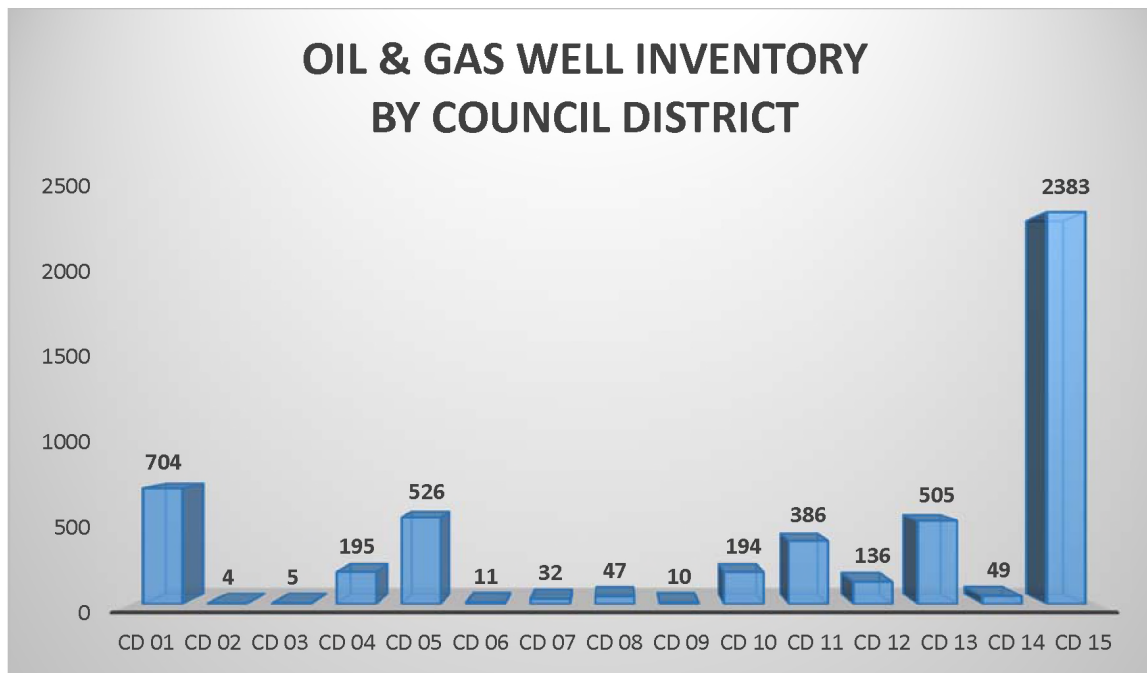


Figure 2. Oil and Gas Well Inventory by Council District

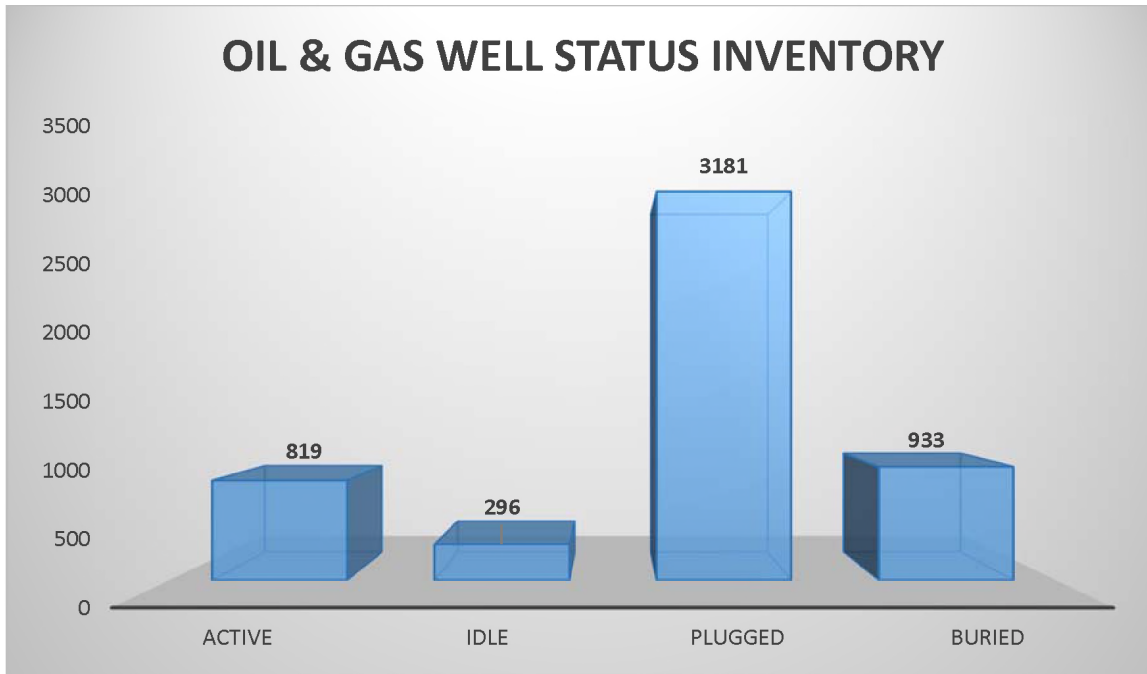


Figure 3. Oil and Gas Well Status Inventory

C. Drill Sites

There are seventeen (17) drill sites that are either active or idle oil or gas drill site operations across the City. Approximately sixty-seven percent (67%) of oil and gas wells are within drill sites. The remaining wells are dispersed throughout the City in urban and rural locations. The following table lists the drill sites by Council District and Neighborhood Council that have been approved for operations by the City Planning Department:

Table 6. Oil & Gas Drill Sites by Council District and Neighborhood Council

Oil & Gas Drill Sites	Council District	Neighborhood Council
1. AllenCo (Idle)	CD 1	Empowerment Congress North
2. Jefferson	CD 8	Empowerment Congress North
3. Murphy	CD 10	United Neighborhoods
4. West Pico	CD 5	Westside
5. Rancho Park Golf Course	CD 5	Westside
6. Hillcrest Country Club	CD 5	Westside
7. San Vicente	CD 5	Mid-City West
8. Packard	CD 10	Pico
9. Mission Visco	CD 12	Granada Hills North
10. Aliso Canyon	CD 12	Porter Ranch
11. Filipino Town	CD 13	Westlake North
12. Echo Park	CD 13	Greater Echo Park

13. Broadway	CD 14	Downtown Los Angeles
14. Harbor Gateway 1	CD 15	Harbor Gateway
15. Harbor Gateway 2	CD 15	Harbor Gateway
16. Joughin	CD 15	Harbor City
17. Warren E&P	CD 15	Wilmington

There are also nine (9) abandoned drill sites across the City, notably: Fox Studios #1, Fox Studios #2, Fox Studios #3, Fourth Avenue, Garey, Gilmore, Pacific Electric, Paxson, and Venice Beach. The Playa Del Rey and Aliso Canyon sites are former oil fields that are now gas storage facilities operated by the Southern California Gas Company.

Each well at approved urban oil and gas drill site is categorized as a “critical well” by CA DOGGR according to the California Code of Regulations, Title 14, Division 2, Chapter 4, Section 1720(a). This designation requires increased safety measures, such as additional requirements for blow out prevention equipment, emergency backup systems, and control valves. Critical wells can meet any of the following criteria:

1. Be located within 300 feet from the following:
 - a. Any building intended for human occupancy that is not necessary to the operation of the well; or
 - b. Any airport runway.

2. Be located within 100 feet from the following:
 - a. Any dedicated public street, highway, or nearest rail of an operating railway that is in general use;
 - b. Any navigable body of water or watercourse perennially covered by water;
 - c. Any public recreational facility such as a golf course, amusement park, picnic ground, campground, or any other area of periodic high-density population; or
 - d. Any officially recognized wildlife preserve.

D. Gas Storage Fields

There are two (2) gas storage fields within the City, the Aliso Canyon and the Playa Del Rey Fields (PDR) which are both operated by the Southern California Gas Company (SCG). The Aliso Canyon Oil Field is an oil field and natural gas storage facility located in the Santa Susana Mountains in Los Angeles County, California, north of the Porter Ranch neighborhood of the City of Los Angeles (Council District 12). The Playa del Rey gas storage field is located near the Ballona Wetlands between Marina Del Rey and the LAX airport (Council District 11).

In the early twentieth century oil was extracted from these fields and in 1942, SCG converted the depleted Playa del Rey oil field into a natural gas storage reservoir. It’s one of five (5) gas storage facilities operated and maintained by SCG in the Los Angeles region. The Playa del Rey oil field geology is a sandstone formation holding the gas at around 6,100 feet below ground level. This formation is covered by 1,500 feet of impermeable shale, sealing the porous sandstone storage area. SCG operates approximately 50 active wells in order to inject and withdraw gas from the

reservoir formation. Three compressors are used to inject the gas underground. The PDR facility has a maximum storage capacity of seven (7) billion cubic feet (BCF) of natural gas.

SCG acquired the depleted Aliso Canyon oil field and converted it into a gas storage field in 1973. Natural gas is transported to the facility and injected through wells into a natural gas storage zone of porous rock formations about 7,000 to 10,000 feet below ground. SCG operates approximately 130 active wells at the facility. Natural gas is injected down storage wells into the storage zone through 3- to 5-inch wide pipes called “tubing,” which are surrounded by 7- to 9-inch wide pipes called “production casing.” Both the tubing and production casing extend from the surface of the well down to the gas bearing geologic formations. The tubing and production casing are in turn surrounded by another pipe called the “surface casing,” which runs on average from the surface of the well to approximately 800 feet deep. At the surface, each well ties into a series of pipelines that are connected to the SCG regional pipeline network. The Aliso Canyon facility has a maximum storage capacity of eighty-eight (88) billion BCF of natural gas.

Natural gas is a highly combustible material which constitutes a risk of upset potential. SCG is the primary operator of underground natural gas fields, natural gas storage wells, and natural gas transmission facilities within the City. The fields and wells are also regulated by CA DOGGR. The State mandates that the fields be closely monitored to establish that no damage to health, property, or natural resources is occurring (Title 14, California Administrative Code [CAC], Section 1724.10). In addition, natural gas storage wells located near homes, commercial buildings, and public roads must be equipped with surface and subsurface safety valves in accordance with Title 14, CAC, Section 1724.3. Title 14, Division 2, Chapter 4 which regulates the extraction and injection of natural gas.

The California Public Utilities Commission (CPUC) regulates the transmission of natural gas under the State guidelines set forth by General Order 112D. All SCG operations are also closely monitored for compliance with the safety standards of the state’s Occupational Safety and Health Administration (Cal OSHA).

E. Los Angeles County Oil and Gas Well Inventory

On July 28, 2015, the Los Angeles County Board of Supervisors directed the County Department of Regional Planning (DRP), in consultation with County Department of Public Health, to develop a detailed inventory of all oil fields and the associated level of environmental monitoring for all oil wells currently operation within the unincorporated areas of the County of Los Angeles (County). Marine Research Specialists, a consulting firm with expertise in the oil and gas industry, along with County DRP staff prepared this report in response to the Board of Supervisors motion.

The well inventory research included a review a review of local, state, and federal regulatory requirements for the drilling of oil and gas wells. The well inventory research effort was based on information obtained from CA DOGGR in their oil and gas well database. According to the DOGGR data base, there are 1,687 active oil and gas wells in the unincorporated County with approximately 85% of these wells within zones that allow the use “by-right” (ministerial) and the remainder within zones that require discretionary permit review. To streamline the report, the focus of the oil and gas permit research was centered on twelve operators representing 95% or

1,604 of the total 1,687 oil and gas wells identified. The research indicated that 57% of wells operating within the unincorporated Los Angeles County are under regulatory entitlements from the DRP (with the majority of wells, 874, being within the Baldwin Hills Community Standards District). Overall review of those entitlements noted a lack of consistency in permit conditions from project to project. However, these permits spanned a timeframe from 1949 to present and reflect mitigation measures of the time periods in which they were approved.

Wells, with regulatory entitlements not found, may be attributed to some wells predating the County Zoning Ordinance and other applicable land use regulations such as zone changes, past County practices deferring primary permit jurisdiction and responsibility to the state (CA DOGGR), and the County's DRP not requiring plot plan application for permitted uses, unless referred to by other agencies. A review of Zoning Enforcement records indicated that no complaints were verified regarding oil wells within the unincorporated County. Based on the conclusions of the County's report, the staff made the following recommendation:

"Instruct the Los Angeles County Department of Regional Planning to conduct a zoning study, when additional funds and resources are available, to review oil and gas well regulations against current regulatory standards to protect the health, safety and welfare of the surrounding communities to determine if updated standard conditions and/or amendments to Title 22 are needed; and evaluate the appropriateness of "by-right" use of oil and gas wells within Title 22."

F. Los Angeles City Oil & Gas Production

Oil and natural gas production data within the City are not publically available until six months to one year after the production occurs. The most recent full year production data is from calendar year 2017. The average daily crude oil production rate from within the City of Los Angeles has ranged from approximately 7,600 - 8,000 barrels of oil per day (BOPD). The standard volumetric measurement of a barrel of crude oil is forty-two (42) gallons. The annual cumulative oil production in 2017 was equivalent to 2.5 million barrels (bbl) of oil and more than 4.9 million cubic feet (MCF) of natural gas was produced according to the propriety data provided by software vendor, DrillingInfo LLC (see Figure 4). Oil and gas production in the City represents approximately two percent (2%) of the state's total production.

City of Los Angeles Oil and Gas Production (2000 - 2018)

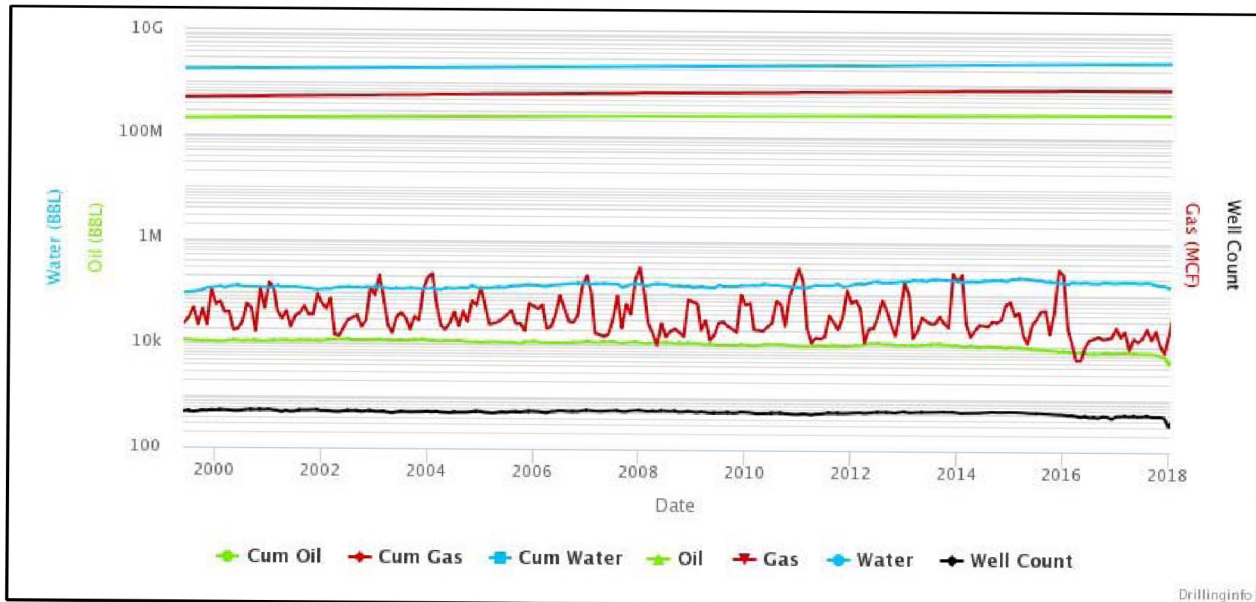


Figure 4: Oil and Gas Production from with the City of Los Angeles; Drilling Info Database

G. Recoverable Oil and Gas Reserves

In 2012, as part of a larger national project, the U.S. Geological Survey (USGS) estimated that between 1.4 and 5.6 billion barrels of recoverable oil remain in just ten (10) of the Los Angeles basin’s oil fields. Three (3) of the fields (Inglewood, Torrance, and Wilmington/Belmont) partially lie within the City of Los Angeles boundaries. In an updated 2018 geological evaluation done by retired USGS geologist Don Gautier concluded that about 1.6 billion barrels of additional volume of recoverable crude oil exists within City that could be produced using existing technology (U.S. Geological Survey, “Remaining Recoverable Petroleum in Ten Giant Oil Fields of the Los Angeles Basin, Southern California,” 2013 and “Large volumes of potentially recoverable petroleum in the City of Los Angeles”, Gautier, 2018 - Appendix A2-29 and A2-30).

Table 7. Estimated mean volumes of recoverable oil remaining in L.A. basin oil fields located within the City of Los Angeles (volumes are in millions of barrels).

Field Name	Known Recoverable Oil	Original Oil In Place (OOIP)	Current %RE	Max %RE	Additional Oil	Remaining Oil in City
BEVERLY HILLS	159	1,100	14.5	40	287	230
BOYLE HEIGHTS	0.27	22	1.2	35	8	8
CHEVIOT HILLS	28.1	620	4.5	35	189	189
EL SEGUNDO	15	75	20	35	11	1
HYPERION	0.96	7	13.7	30	1	1
INGLEWOOD	430	1,400	30.7	45	250	13

LAS CIENEGAS	73.4	163	45	45	1	1
LOS ANGELES CITY	23.2	217	10.6	60	107	107
LOS ANGELES DOWNTOWN	15.8	48	33	35	1	1
PLAYA DEL REY	63.5	250	25.6	30	11	10
POTRERO	15.2	367	4.1	35	113	11
ROSECRANS	87	475	18.3	35	79	24
SALT LAKE	54	439	12.3	60	209	209
SALT LAKE, South	11.5	28	41.1	45	1	1
SAN VICENTE	28.5	1,000	3	30	272	136
SAWTELLE	19.4	97	20	35	15	5
TORRANCE	232	1,000	23.2	40	227	23
UNION STATION	2	570	<1%	30	170	170
VENICE BEACH	3.6	27	13.3	30	5	2
WILMINGTON	2,984	9,000	33.2	40	973	486
Totals:	4,246	16,905			5,930	1,628

In Gaiter’s report, the known oil is the sum of cumulative production and proved reserves. %RE is the recovery efficiency. The potential recovery efficiency (Max %RE) is estimated from recovery efficiencies modeled in engineering studies, achieved in similar reservoirs elsewhere, or indicated by laboratory results reported in technical literature.

Section 4. Evaluation of Materials Used at Sites

A. LAFD CUPA Hazardous Materials/Waste Inventory Summary

In compliance with state guidelines, each governmental agency designated by the State of California as a Certified Unified Program Agency (CUPA) is authorized to apply statewide standards to each facility within its jurisdiction that treats on site or generates hazardous waste, operates underground storage tanks, or stores hazardous materials.

Chemical Inventory: Title 42, Section 11022 of the United States Code and Chapter 6.95 of the California Health and Safety code require the reporting of hazardous materials when used or stored in certain quantities. These regulations require that businesses within LAFD’s jurisdiction complete and file a chemical inventory to disclose hazardous materials stored, used or handled on site. This disclosure information assists emergency responders in planning for and handling emergencies which involve hazardous materials. The program objective is to safeguard lives and minimize property loss.

Business Emergency Plan (BEP): Chapter 6.95 of the California Health and Safety code also requires that businesses which use, store or handle hazardous materials file an emergency plan indicating their preparations for and actions in an emergency. The information is also shared with emergency response personnel to mitigate a release and to minimize harm or damage to human life, the environment, and property.

Any business that handles a hazardous material and/or hazardous waste of quantities at any one time during a year equal to, or greater than a total volume of 55 gallons, a total weight of 500 pounds, or 200 cubic feet of a compressed gas is a hazardous materials handler and must report Owner/Operator, Business Activities, Inventory, Site Map, and Emergency Response and Contingency Plan and Employee Training Plan information in the California Environmental Reporting System (CERS).

CalEPA operates CERS with Participating Agencies (PA) like LAFD CUPA. All oil and gas drill sites within the City are active facilities in CERS Hazardous Materials/Waste Inventory. Each year they submit their Annual Hazardous Materials Business Plans (HMBP) to the CERS database which is accessible by LAFD CUPA. The specific information, size, and quantities for each site is not available to the public. However, below is a listing of some general names of types of hazardous materials in the City's CERS HMBP inventory database from oil and gas drill sites:

- Acetylene
- Biocide
- Bleach
- Crude Oil
- Crude Oil/Production Water
- Corrosion Inhibitor
- Oxygen Scavenger
- Scale Inhibitor
- Iron Sulfide Dissolver
- Emulsion Breaker
- Gasoline
- Oxygen
- Propane
- Nitrogen
- Diesel
- Sulfur
- Motor Oil
- Sodium Hypochlorite
- Degreaser
- Lubricating Oil
- Deionized Water
- Fire Foam
- Hydraulic Oil
- Degreaser-Cleaner
- Engine Oil
- Synthetic Based Lubricating Oil

The CERS database of materials were not evaluated for this report, nor used in our consultant's assessments.

B. South Coast Air Quality Management District's Annual Emissions Reports

SCAQMD's Annual Emission Reporting (AER) program was developed to track emissions of air contaminants from permitted facilities. Criteria and toxic emissions are collected annually. Toxic air contaminants (TAC), according to the California Health and Safety Code is an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health. Fees for emissions of air contaminants are assessed based on the reported data. These fees help to cover the costs of evaluating, planning, inspecting, and monitoring air quality efforts. Currently emissions are estimated for the year rather than measured as they occur. The emission data from 2000-2001 to the present are available for public access. The TAC emissions are in alphabetical order and the pollutant ID is the Chemical Abstract Service (CAS) number. Facilities are required to file an annual emissions report, including oil and gas drill sites. Below is a summary of the AER reporting standards:

- Every facility that receives an Annual Emissions Reporting notification from SCAQMD, regardless of the estimated annual emissions levels, even if no fees are due, to update the facility's emissions records.
- Every facility that has estimated annual emissions of four (4) or more tons of sulfur oxides (SO_x), volatile organic compounds (VOCs), nitrogen oxides (NO_x), specific organics (SPOG), particulate matter (PM), or emissions of 100 tons per year or more of carbon monoxide (CO).
- Every facility subject to the AB 2588 Program for reporting quadrennial updates to its toxics emissions inventory (per Health and Safety Code Section 44344).

Furthermore, facilities are required to report their emissions (both criteria and toxics) for the calendar year and pay their emission fees using the current fee rate specified in Tables III and IV in SCAQMD Rule 301(e). Facilities have 75 days from the official due date (January 1st) to submit both the emissions report and fee payment to avoid being subject to late filing surcharges.

The following eighteen (18) oil and gas drill sites in Los Angeles have emissions data that were retrieved on 11-8-2018 and verified on 7-23-2019 (See Emission Reports in Appendix A2-34):

- 1) Warren E & P Site
- 2) AllenCo
- 3) Jefferson Drill Site
- 4) Murphy Drill Site
- 5) Fourth Ave. Drill Site (Note: 4th Ave is no longer a drill site as of January 2019, but operated prior to that date)
- 6) Harbor City/Joughin Drill Site

- 7) Packard Drill Site
- 8) San Vicente Drill Site
- 9) West Pico Drill Site
- 10) Rancho Park Drill Site (Note: Same Facility ID as Hillcrest Country Club)
- 11) Broadway Drill Site
- 12) Mission Visco Drill Site (O'Melveny Park)
- 13) Paxon Drill Site (Abandoned)
- 14) Sawtelle Drill Site
- 15) Echo Park Drill Site
- 16) Filipino Town Drill Site (Note: Filipino town does not have a Facility ID and has not submitted AER to SCAQMD.)
- 17) Harbor Gateway Drill Site #1
- 18) Harbor Gateway Drill Site #2

The AER is not available for 12 of the 18 drill sites (or two thirds) including: Warren E & P Site, AllenCo, Murphy Drill Site, Fourth Ave. Drill Site, Packard Drill Site, San Vicente Drill Site, Rancho Park Drill Site (Note: Same Facility ID as Hillcrest Country Club), Paxton Drill Site, Echo Park Drill Site, Filipino Town Drill Site, Harbor Gateway Drill Site #1 and Harbor Gateway Drill Site #2. Partial information is available for 2 of the 18 sites. Both the Broadway Drill Site and the Sawtelle Drill Site are missing data from 2005- 2012, but have data for 2013-2018.

Of note is that while most emissions at drill sites have gone down, the emissions at the Sawtelle Drill site recently increased in type and volume. In 2017, there were twenty-three (23) Toxic Pollutants reported on with twelve (12) of those estimated at more than 0 pounds per year at the site. In 2018, there were forty-six (46) Toxic Pollutants reported on with thirty-four (34) of those estimated at more than 0 pounds per year. That is nearly a 3-fold increase in the number of pollutants emitted over a one year time period. In some categories, the volume of emissions has also increased dramatically, some as much as a ten-fold increase in a two-year time frame.

Table 8. Sawtelle Drill Site, Facility ID 174544, Annual Emission Reporting

Sawtelle Drill Site, Facility ID 174544, Annual Emission Reporting			
Toxic Pollutants	Year		
	2016	2017	2018
1,3-Butadiene	0.275 lbs/year	9.180 lbs/year	19.065 lbs/year
Ammonia	0 lbs/year	231.757 lbs/year	496.84 lbs/year
Formaldehyde	81.349 lbs/year	326.329 lbs/year	620.422 lbs/year

These emissions are all estimated rather than measured. However, when the estimated emissions vary so much, it underscores the need for real-time air monitoring at all drill sites to better understand and characterize the timing, events and processes leading to emissions. The SCAQMD emissions data is very challenging to interpret due to major data gaps, unclear timing of emissions, and reported emissions are not based on actual measurements.

South Coast Air Quality Management District Chemical Inventory Database

SCAQMD is the only regulatory agency in the US that requires mandatory disclosure of oil field chemical use for well drilling, well completion and well rework activities. Under SCAQMD Rule 1148.2, operators and chemical suppliers are required to submit and make publicly available chemical usage data related to routine oil and gas activities.

A study performed by Stringfellow, et al. using the SCAQMD dataset for the period June 4, 2013 to September 2, 2015 showed the potential hazards associated with chemicals used in routine oil and gas development activities. Chemicals are used routinely in oil and gas development as part of drilling and cementing of the well casing, repair of formation damage, wellbore clean-outs, scale and corrosion control, and for other production activities. Chemical additives are also used in enhanced oil recovery (EOR) to change fluid properties of oil (e.g. viscosity) and to otherwise increase production of oil within the formation. During well construction, hazardous chemicals may be added to drilling fluids, drilling muds, and cements and are also used to remove debris from wellbores prior to cementing of the annular space between the steel casing and geological formations. Chemical additives, including strong acids, are used for well completion and rework to facilitate hydrocarbon production.

In total, 548 chemical additives were used in the SCAQMD between June 2013 and September 2015, with 525 of these being used for routine oil and gas development activities. The most frequently used chemicals include solvents (e.g. methanol), petroleum products (e.g. distillates), and salts (e.g. sodium chloride) that are employed in formulating commercial blends of production chemicals. Also on the list of frequently used chemicals are carboxylic acids (e.g. citric acid and erythorbic acid) used for scale and iron control, biocides, and corrosion inhibitors. For routine acidizing (e.g., acid cleaning for well-maintenance), hydrochloric acid (HCl) and hydrofluoric acid (HF) were used extensively and in large quantities (mean masses of 1,791 and 161 kg per event, respectively). Other additives used in the highest masses include minerals and other chemicals used for gravel packing (e.g. silica), cementing of well casings (e.g. Portland cement and additives), and sealing wells (e.g. bentonite). The tables in Appendix 6 (A6-1 and A6-2) list the chemicals used in the oil and gas wells routine activities.

C. Chemical Inventory Assessment by Physicians, Scientists and Engineers for Healthy Energy

Physicians, Scientists and Engineers for Healthy Energy (PSE) is a multidisciplinary, non-profit research institute that studies the way energy production and use impact public health and the environment. PSE was retained by the Office of Petroleum and Natural Gas Administration and Safety on behalf of the City of Los Angeles to conduct an assessment of chemical use in upstream oil and gas development in the Los Angeles Basin and the City of Los Angeles in particular.

SCAQMD manages air quality for Los Angeles and Orange Counties, and parts of Riverside and San Bernardino Counties. The SCAQMD requires oil and gas operators within its jurisdiction to disclose chemicals used during multiple types of oil and gas development events in their wells. In this study, PSE analyzed the chemical and event dataset maintained by the SCAQMD with respect to inhalation hazards. Event data was analyzed spatially and temporally. Individual chemicals

were identified, characterized using public databases, and assessed for potential inhalation hazards.

Human health and oil and gas development: An assessment of chemical usage in oil and gas activities in the Los Angeles Basin and the City of Los Angeles (The Full Chemical Assessment Report is Appendix A4-2 and A4-3)

The assessment found a total 1,688 events were reported in the SCAQMD dataset from June 2013 to August 2018. Events include well drilling, well completion, or rework of an onshore oil or gas well. A brief description of these terms as defined by SCAQMD are provided below (SCAQMD, 2015).

- Well drilling: digging or boring into the earth to develop, extract, or produce oil or gas. Does not include remediation or clean-up efforts.
- Well completion: production, stimulation, or treatment activities, which establish flow paths for hydrocarbons between the reservoir and the surface, in order to prepare a well for production
- Rework: any operation involving deepening, re-drilling, stimulation, or treatment activity of an existing well.

Well completion and rework events can be further categorized according to activity type including: acidizing, maintenance acidizing, acid fracturing, matrix acidizing, gravel packing, and hydraulic fracturing. A brief description of these activities are provided below (CCST et al., 2015b; SCAQMD, 2015):

- Acidizing: use of acid to clean out scale, damage, or other debris in the wellbore/formation, or to react with the soluble substances in the formation, thereby enhancing permeability and well production.
- Matrix acidizing: use of low-pressure acid injection into a formation to dissolve solids and sediments, thereby enhancing permeability and well production.
- Maintenance acidizing: use of acid to clean out scale, damage, or other debris in the wellbore or reservoir formation.
- Acid fracturing: stimulating a formation by pressurized injection of acidic fluid to fracture the formation and etch walls of fractures, thereby enhancing permeability and well production.

- Gravel packing: use of water and additives to place sand and gravel near the wellbore to limit entry of formation sand and particles into the wellbore.
- Hydraulic fracturing: stimulating a formation by pressurized injection of hydraulic fracturing fluid (typically carrier fluid, chemical additives, and proppant) to fracture the formation, thereby enhancing permeability and well production.

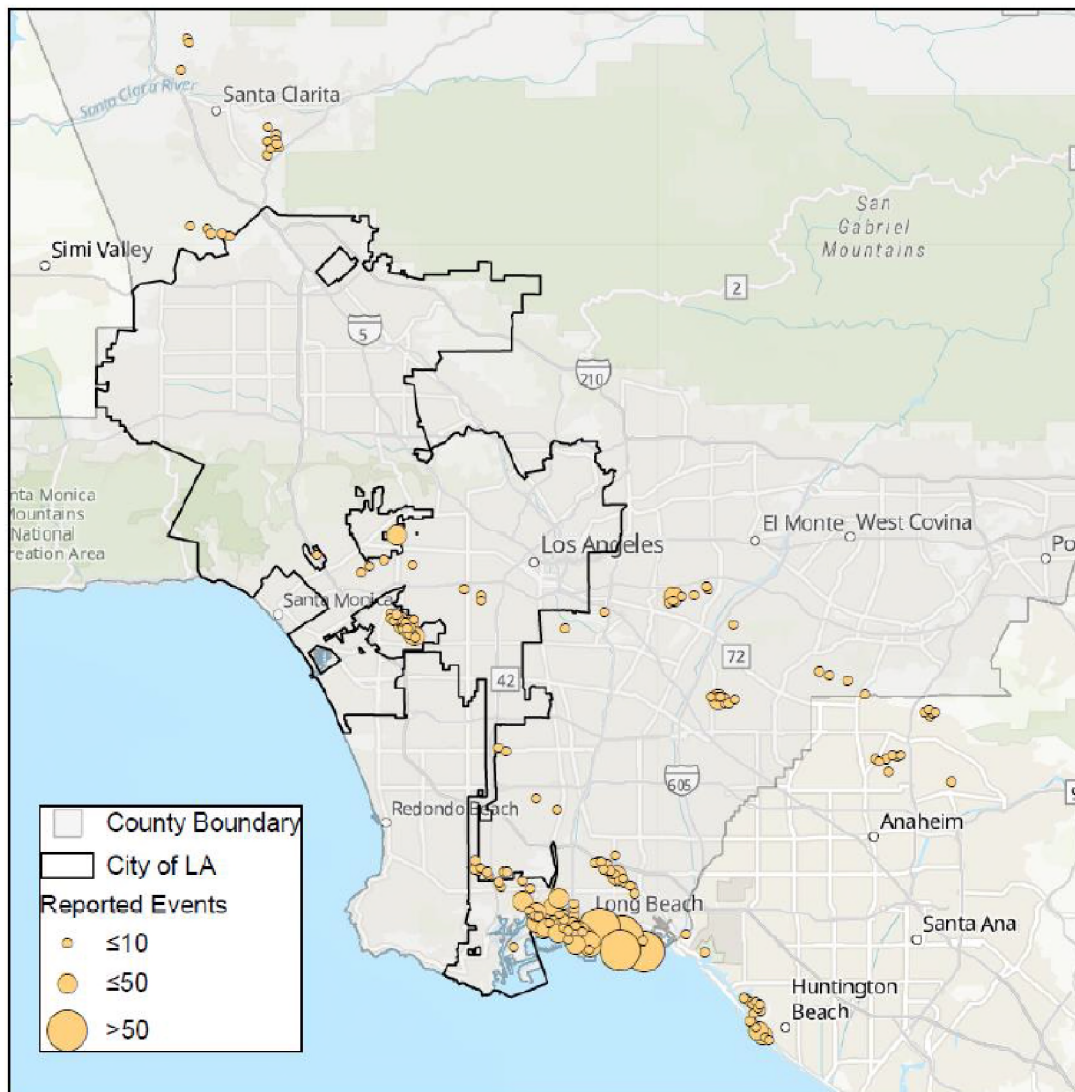


Figure 5. Events reported in the SCAQMD database from 2013 to 2018. Events within a 100-meter range of each other were combined and assigned weighted symbols.

Events were mapped using latitude and longitude (Figure 5). 131 events occurred within the boundaries of the City of Los Angeles and 1,437 events occurred in the rest of Los Angeles County (not counting the City). The majority of all events reported occurred in Long Beach,

which borders the City. 120 events took place in Orange County, with the majority occurring near Huntington Beach.

Operators are required to notify SCAQMD if an event occurs within 1,500 feet of a sensitive receptor such as a residence, school, hospital, or other health care facility (SCAQMD, 2015). A total of 597 (35%) events in the SCAQMD were located near sensitive receptors, of which 368 were within 600 feet of the receptor. 106 of 131 (81%) events in the City were located near a sensitive receptor. 81 of the 131 events were within 600 feet of the receptor.

A temporal analysis of the SCAQMD dataset reveals that the majority (71.5%) of reported events took place from 2013-2015, with a sharp drop-off after 2014. This trend is consistent with statewide trends in well drilling and completion operations reported by DOGGR for the entirety of California from 2013-2017 and with the overall decrease in state oil and gas production from the same period. An investigation into underreporting on part of SCAQMD would involve a detailed comparison of submissions to both CA DOGGR and SCAQMD and is beyond the scope of this report.

Potential Chemicals of Concern

Potential chemicals of concern were identified using the Estimated Hazard Metric (EHM) and various screening lists. In this study, the major criterion for being considered a chemical of concern is being ranked in the top 10 for acute or chronic inhalation EHM, being a known toxic air contaminant, or being a known carcinogen.

Additional information concerning volatility and biodegradability is provided to assist with evaluating risk. As discussed previously, readily biodegradable chemicals are expected to rapidly degrade when released in the environment, reducing the risk of human exposure. Volatile chemicals, as determined by vapor pressure or boiling point, are expected to readily evaporate (or sublime) and have a higher risk of inhalation exposure. The definition of a volatile chemical varies between regulatory and governmental agencies (Brandt et al., 2015). The U.S. EPA defines volatile organic compounds (VOCs) as organic chemicals that have vapor pressure greater than 1 Torr (~1mm Hg) at 25°C and 760 mm Hg (U.S. EPA, 1999). The European Union defines VOCs as having a boiling point of less than or equal to 250°C under standard atmospheric conditions (European Union, 2004). Chemicals that met either one of these requirements were classified as volatile.

Fifty-six (56) potential chemicals of concern are listed in the report, of which thirty-six (36) were used in events in the City of Los Angeles. Chemicals that are identified as hazardous air pollutants, carcinogens, and volatile compounds are of high concern, with those meeting several of these requirements being of the highest concern. However, many chemicals that meet these standards are also readily biodegradable and as a result have a reduced risk of human exposure. Only four (4) chemicals were classified as not readily biodegradable and one (1) chemical had inadequate biodegradability data; the remaining fifty-one (51) chemicals are considered biodegradable or inorganic.

As previously mentioned, inorganic minerals and oxides used extensively in well drilling and gravel packing are of particular concern due to their high median mass usage and frequency of use. The mixing, handling, and use of these chemicals can release respirable particulates that (in the case of silica compounds) are known to cause cancer.

Based on available data concerning inhalation toxicity, occupational exposure limits, air pollutant screening lists, and volatility, a total of 72 chemicals used in the City of LA were identified as having the potential for travel by air and subsequent inhalation exposure (Table 9 Below). Chemicals that were considered volatile according to U.S. EPA or EU standards, that were on any air pollution screening lists, or that had any available inhalation toxicity data (acute, chronic, sub-chronic, occupational, etc.) were included in Table 10. This is a conservative estimate due to data gaps regarding chemical volatility and the particle sizes of chemicals used. It is important to note that depending on operational and atmospheric conditions (e.g. well blow-out, high wind speeds, height of release, particle size, etc), almost any chemical has the potential to travel by air and present an inhalation exposure risk.

Table 9. Potential chemicals of concern based on EHM and available air pollutant and carcinogenicity data. This list currently contains the top 10 for Acute and Chronic EHM rankings, along with most air pollutants and carcinogens within the entire SCAQMD dataset. Listed in alphabetical order starting with chemicals used in the City of Los Angeles.

Chemical Name	CASRN	Acute Inhalation EHM Rank	Chronic Inhalation EHM Rank	Known Air Pollutant	Known or Probable Carcinogen	Volatile Compound	Biodegradability	Used in City of LA
1,2,4-Trimethylbenzene	95-63-6	36	41	X ¹		X	Readily biodegradable	X
1-Methoxy-2-propanol	107-98-2	43	72	X ¹		X	Readily biodegradable	X
2-Butoxyethanol	111-76-2	14	29	X ¹		X	Readily Biodegradable	X
Aluminum	7429-90-5		30	X ¹			Inorganic	X
Aluminum oxide	1344-28-1		18	X ¹			Inorganic	X
Ammonium sulfate	7783-20-2			X ¹			Inorganic	X
Barite	7727-43-7		10				Inorganic	X
Calcium oxide	1305-78-8		3				Inorganic	X
Crystalline silica (cristobalite)	14464-46-1		14		X		Inorganic	X
Crystalline silica (quartz)	14808-60-7		1		X		Inorganic	X
Crystalline silica (tridymite)	15468-32-3		27		X		Inorganic	X
Cumene	98-82-8	30	43	X	X	X	Readily Biodegradable	X
Ethanol	64-17-5		69		X	X	Readily Biodegradable	X
Ethylbenzene	100-41-4	28	20	X	X	X	Readily Biodegradable	X
Ethylene glycol	107-21-1		53	X	X ²	X	Readily Biodegradable	X
Formaldehyde	50-00-0	8	13	X	X	X	Readily biodegradable	X

Chemical Name	CASRN	Acute Inhalation EHM Rank	Chronic Inhalation EHM Rank	Known Air Pollutant	Known or Probable Carcinogen	Volatile Compound	Biodegradability	Used in City of LA
Glutaraldehyde	111-30-8	6	5	X ¹		X	Readily Biodegradable	X
Glyoxal	107-22-2	10				X	Readily Biodegradable	X
Hydrochloric acid	7647-01-0	2	2	X	X	X	Inorganic	X
Hydrofluoric acid	7664-39-3	1	4	X		X	Inorganic	X
Isopropanol	67-63-0		70	X ¹		X	Readily Biodegradable	X
Limestone	1317-65-3		9				Inorganic	X
Methanol	67-56-1		49	X	X ²	X	Readily Biodegradable	X
Mica	12001-26-2		8				Inorganic	X
Naphthalene	91-20-3	5 ³	11	X	X	X	Inherently biodegradable	X
Nitrilotriacetic acid	139-13-9		28	X ¹	X		Readily biodegradable	X
Non-crystalline silica (impurity)	7631-86-9	9 ³	16	X			Inorganic	X
Phosphogypsum	13397-24-5		7				Inorganic	X
Phosphoric acid	7664-38-2	7 ³	25	X ¹			Inorganic	X
Portland cement	65997-15-1		6				Inorganic	X
Potassium chloride	7447-40-7	3					Inorganic	X
Quinoline	91-22-5			X		X	Not readily biodegradable	X
Sodium hydroxide	1310-73-2		37	X ¹			Inorganic	X
Sulfuric acid	7664-93-9	39	46	X ¹	X		Inorganic	X

Chemical Name	CASRN	Acute Inhalation EHM Rank	Chronic Inhalation EHM Rank	Known Air Pollutant	Known or Probable Carcinogen	Volatile Compound	Biodegradability	Used in City of LA
Toluene	108-88-3		52	X	X ²	X	Readily Biodegradable	X
Xylenes	1330-20-7	27	42	X		X	Readily Biodegradable	X
2,2"-oxydiethanol (impurity)	111-46-6			X		X	Readily Biodegradable	
Acetophenone	98-86-2			X		X	Readily biodegradable	
Acrylamide	79-06-1	50 ³	38	X	X	X	Readily Biodegradable	
Benzene	71-43-2		45	X	X	X	Readily biodegradable	
Bis(isopropyl)naphthalene	38640-62-9			X	X		Not readily biodegradable	
Cyclohexanol	108-93-0	49 ³	76	X ¹		X	Readily biodegradable	
Diethanolamine	111-42-2		68	X	X		Readily biodegradable	
Diethylene glycol mono-n-butyl ether	112-34-5		36	X		X	Readily biodegradable	
Diisopropyl naphthalenesulfonic acid	28757-00-8			X			Not readily biodegradable	
Ethylene oxide	75-21-8	40	35	X	X	X	Readily biodegradable	
Gilsonite	12002-43-6				X		Inadequate data	
Lithium carbonate	554-13-2	33			X ²		Inorganic	
Magnesium nitrate	10377-60-3				X		Inorganic	

Chemical Name	CASRN	Acute Inhalation EHM Rank	Chronic Inhalation EHM Rank	Known Air Pollutant	Known or Probable Carcinogen	Volatile Compound	Biodegradability	Used in City of LA
Methyl isobutyl ketone	108-10-1	48	75	X	X	X	Readily Biodegradable	
Naphthalenesulfonic acid, bis(1-methylethyl)-, compd. with cyclohexanamine (1:1)	68425-61-6			X			Not readily biodegradable	
n-Butyl alcohol	71-36-3	46	71	X ¹		X	Readily biodegradable	
Peracetic acid	79-21-0	25		X ¹		X	Readily Biodegradable	
Petroleum distillates	64741-44-2	4				X	Readily Biodegradable	
Tributyl phosphate	126-73-8		58	X ¹			Readily biodegradable	
Trimethylbenzenes	25551-13-7			X ¹		X	Not readily biodegradable	

1. Not identified as Clean Air Act Hazardous Air Pollutants, but on California Air Resources Board TAC and Hot Spots Lists
2. On Prop 65 List for developmental toxicity
3. Acute inhalation EHM calculated using “floor level” toxicity estimate

Table 10. Chemicals used in the City of LA identified as having the potential for travel by air and subsequent inhalation exposure.

Chemical Name	CASRN	Chemical Name	CASRN
1,2,3-Trimethylbenzene	526-73-8	Hydrochloric acid	7647-01-0
1,2,4-Trimethylbenzene	95-63-6	Hydrofluoric acid	7664-39-3
1,3,5-Trimethylbenzene	108-67-8	Hydrotreated Light Petroleum Distillate	64742-47-8
1-Methoxy-2-propanol	107-98-2	Iron oxide	1309-37-1
2-Butoxyethanol	111-76-2	Isopropanol	67-63-0
2-Ethylhexan-1-ol	104-76-7	Isoquinoline	119-65-3
Acetic acid	64-19-7	Isotridecanol, ethoxylated	9043-30-5
Acetone	67-64-1	Limestone	1317-65-3
Alkenes, C>10 a-	64743-02-8	Limonene	138-86-3
Aluminum	7429-90-5	Magnesium oxide	1309-48-4
Aluminum oxide	1344-28-1	Methanol	67-56-1
Ammonium chloride	12125-02-9	Mica	12001-26-2
Ammonium sulfate	7783-20-2	Naphthalene	91-20-3
Barium sulfate	7727-43-7	Nitrilotriacetic acid	139-13-9
Calcium oxide	1305-78-8	Non-crystalline silica (impurity)	7631-86-9
Calcium sulfate	7778-18-9	Octamethylcyclotetrasiloxane	556-67-2
Carbon	7440-44-0	Orange terpenes	68647-72-3
Cellulose, microcrystalline	9004-34-6	Phosphogypsum	13397-24-5
Citrus terpenes	94266-47-4	Phosphoric acid	7664-38-2
Crystalline silica (cristobalite)	14464-46-1	Pine oil	8002-09-3
Crystalline silica (quartz)	14808-60-7	Poly(oxy-1,2-ethandiyl), a-(nonylphenyl)-w-hydroxy-	9016-45-9
Crystalline silica (tridymite)	15468-32-3	Portland cement	65997-15-1
Cumene	98-82-8	Potassium chloride	7447-40-7
Cyclohexasiloxane, 2,2,4,4,6,6,8,8,10,10,12,12-dodecamethyl-	540-97-6	Potassium hydroxide	1310-58-3
Cyclopentasiloxane, 2,2,4,4,6,6,8,8,10,10-decamethyl-	541-02-6	Propargyl alcohol	107-19-7
Dimethyl siloxanes and silicones	63148-62-9	Propylene glycol	57-55-6
Ethanol	64-17-5	Quinaldine	91-63-4
Ethyl octynol	5877-42-9	Quinoline	91-22-5
Ethylbenzene	100-41-4	Sodium carboxymethylcellulose	9004-32-4
Ethylene glycol	107-21-1	Sodium chloride	7647-14-5
Formaldehyde	50-00-0	Sodium hydroxide	1310-73-2
Formic acid	64-18-6	Sodium sulfate	7757-82-6
Glutaraldehyde	111-30-8	Solvent naphtha, petroleum, light arom.	64742-95-6
Glycolic acid	79-14-1	Sulfuric acid	7664-93-9
Glyoxal	107-22-2	Toluene	108-88-3
Heavy aromatic naphtha	64742-94-5	Xylenes	1330-20-7

Table 9. Potential chemicals of concern based on EHM and available air pollutant and carcinogenicity data. This list currently contains the top ten (10) for Acute and Chronic EHM rankings, along with most air pollutants and carcinogens within the entire SCAQMD dataset. Listed in alphabetical order starting with chemicals used in the City (Appendix A6-3).

Table 10. Chemicals used in the City identified as having the potential for travel by air and subsequent inhalation exposure (Appendix A6-4).

PSE's analysis of chemical use in upstream oil and gas operations in the City and the SCAQMD more generally, resulted in six (6) findings, conclusions and research and policy recommendations (FCR):

FCR 1: Chemicals of concern are used in upstream oil and gas operations in the City of Los Angeles and in the SCAQMD more generally.

Findings: The identity of three hundred twenty-four (324) chemicals used in the SCAQMD were verified, of which one hundred forty (140) were used in events taking place in the City of Los Angeles. Biodegradability data was generally more available with seventy-four percent (74%) of relevant chemicals being classified according to the United Nations Organization for Economic Cooperation and Development (OECD) biodegradability standards. Forty (40) chemicals were identified on air pollution screening lists and twenty-three (23) chemicals were identified as known or possible carcinogens. When screened against lists of biodegradability, air pollutants, and carcinogenic screening lists, a total of fifty-six (56) chemicals of concern were identified as used in the SCAQMD, of which thirty-six (36) were used in the City of Los Angeles.

Conclusion: Chemicals of concern pose a risk to nearby residents if environmental and exposure pathways are present (e.g. inhalation). Although some chemicals are clearly of greater concern than others (e.g. highly toxic chemicals used in large quantities that are also air pollutants), chemicals of concern are not explicitly ranked. Additional information regarding environmental profiles, acute and chronic toxicity is needed before a more thorough assessment of risk can be completed. There are no regulations in place to limit the use of chemicals of concern in upstream oil and gas development operations.

Recommendation: Given the findings of toxicological hazard, engineering controls, increased environmental monitoring, and increased minimum surface setbacks between these operations and sensitive receptors should be considered. Furthermore, agencies with jurisdiction may consider the implementation of green chemistry principles to all oil and gas operations to limit risk by reducing the use of hazardous and poorly understood chemicals and replacing hazardous chemicals with less hazardous chemicals.

FCR 2: Events taking place outside the City of Los Angeles may still negatively impact residents within the city.

Finding: A total of one thousand six hundred eighty-eight (1,688) oil and gas events were reported from the period of 2013-2018, with one hundred thirty-one (131) events occurring

within the City. Although the majority of oil and gas events reported in the SCAQMD took place outside of the City, specifically in the City of Long Beach, they are located relatively close to City boundaries, and there is nothing to prevent more events from occurring within the City. Chemicals used in oil and gas events within the City did not significantly differ from chemicals used outside of the City in terms of type, frequency of use, and median masses used.

Conclusion: The close proximity of oil and gas events occurring outside the City to communities that lie within the City suggest that negative impacts associated with emissions of toxic air containments (TACs) and other chemicals from events (particularly in Inglewood and Long Beach) could be transported via air pathways into the City. Furthermore, our analysis of chemical usage across oil fields, event types, and City boundaries revealed significant overlap in chemicals used, regardless of location or oil field, suggesting potential air pollution and inhalation hazards from events outside the City would be similar to those within the City.

Recommendation: Agencies with jurisdiction should consider implementing a uniform and effective plan to reduce exposure to potential inhalation hazards associated with chemical use in oil and gas operations. Operations outside the City should be monitored and subjected to the same regulations as those within the City to prevent negative impacts from airborne hazards migrating across City or jurisdictional boundaries.

FCR 3: Major data gaps regarding chemical identities, properties, and data reliability need to be addressed before a full chemical risk assessment can be completed.

Finding: Major data gaps exist regarding the identities of chemicals and associated environmental and toxicological profiles. A total of 327 chemicals reported in the SCAQMD dataset could not be definitively identified by Chemical Abstracts Service Registry Numbers (CASRN) and were labeled trade secret chemicals. Seventy-nine percent (79%) and seventy-seven percent (77%) of chemicals identified by CASRN did not have available acute inhalation toxicity data or chronic inhalation toxicity data, respectively. Furthermore, chemical information that is submitted by operators includes errors, such as incorrect CASRNs, obvious misspellings, and inconsistent data entries. The SCAQMD dataset is maintained as separate event and chemical reporting datasets, which themselves are further divided into the periods before and after September 4, 2015.

Conclusions: The lack of strict quality control over operator submitted data and the disjointed nature of the SCAQMD dataset hinders analysis of the dataset. Furthermore, major data gaps regarding chemical identities, physical and chemical properties, toxicity, and environmental fate and transport prevent further characterization of chemical hazards and risk. Assessing chemicals for toxicity, biodegradability, and hazard is a vital first step; however, more data is needed before a risk analysis can be completed.

Recommendations: SCAQMD should verify and validate all submitted chemical and mass usage information. Mass, density, concentration, and volume data should be required for all chemical disclosures, including trade secret chemicals, to ensure mass usage data is adequate and

verifiable. Data reported to SCAQMD should be compared to and verified against other datasets, including those which are only reported to regulators and not publicly available. SCAQMD should maintain their data as one integrated dataset that combines both event and chemical reporting data from all time periods. SCAQMD should adopt approaches to chemical use reporting similar to Senate Bill 4 but also require operators to disclose all trade secret chemicals for all events associated with oil and gas operations in general and not only for hydraulic fracturing and well stimulation. SCAQMD should continue to work with chemical suppliers to come up with solutions to protecting trade secrets while at the same time encouraging disclosure, such as is exercised under Assembly Bill 1328. Comprehensive environmental and toxicological profiles should be developed for all oil and gas chemicals that are missing key data such as chronic and acute toxicity and biodegradability and ideally agencies with jurisdiction could consider phasing out the use of chemicals for which toxicological and environmental profiles have not been developed.

FCR 4: Setback distances and other controls may reduce health impacts of events taking place near sensitive receptors.

Finding: Of the one thousand six hundred eighty-eight (1,688) events where chemical use was reported in the SCAQMD, five hundred ninety-seven (597) events (106 in the City) were located within 1,500 feet of sensitive receptors such as residences, preschools, K-12 schools, hospitals, and other health care facilities. Of all one hundred thirty-one (131) events reported in the City, eighty-one (81) events (62%) were within 600 feet of the sensitive receptor.

Conclusion: These events have the potential to negatively impact surrounding populations and should be prioritized for engineering controls and monitoring. The City currently only has a two hundred (200) foot setback requirement for upstream oil and gas development operations which has multiple conditions which can circumnavigate this requirement.

Recommendation: Agencies with jurisdiction should consider the implementation of a larger minimum surface setback between oil and gas development and sensitive receptors to reduce the risk of exposure to chemicals of concern. A minimum surface setback distance should also be accompanied by increased emission control and environmental monitoring appropriate to reported chemical use should be implemented, in particular at locations in close proximity to sensitive receptors.

FCR 5: SCAQMD reporting follows the overall statewide trend of declining well drilling and completion.

Finding: The number of events reported by the SCAQMD has significantly decreased since 2014. This trend is consistent with statewide oil and gas production and with the number of wells drilled and completed statewide over the same period.

Conclusion: Overall, California has seen a steady decline in oil and gas production since the mid 1980's. It has been suggested anecdotally that SCAQMD Rule 1148.2 under-reports oil and gas

events in its jurisdiction; however, this cannot be determined without a thorough comparison of SCAQMD event submissions and DOGGR records.

Recommendation: A detailed comparison of SCAQMD and DOGGR records is suggested to determine if oil and gas events are accurately reported in the 1148.2 database.

FCR 6: The majority of events reported by SCAQMD are conventional oil and gas operations and data suggests this trend will continue.

Finding: Maintenance acidizing, gravel packing, and well drilling account for approximately 83% of reported events that involve the use of chemicals in the SCAQMD. In contrast, well stimulation activities such as hydraulic fracturing, matrix acidizing, and acid fracturing play a minimal role in oil and gas development, accounting for approximately 1% of all events. The distribution of events by activity type has remained relatively consistent throughout the study period.

Conclusion: Despite the decrease in reported events since 2014, the distribution of events by activity type remained relatively consistent, suggesting that maintenance acidizing, gravel packing and well drilling will continue to be the dominant oil and gas activities in the SCAQMD and the City. An examination of the underlying petroleum geology of the Los Angeles Basin revealed the similarity between the oil producing reservoirs in the region. If new oil fields are developed in the basin, development practices are not expected to significantly differ from past development.

Recommendation: Future studies should focus on chemical hazards in routine and conventional oil and gas operations in the SCAQMD. Full disclosure of chemical identities in a manner similar to Senate Bill 4 is required for a more thorough understanding of chemical use in oil and gas operations in the City and the Los Angeles Basin.

Section 5. Los Angeles County Public Health Department Report

A. Report Summary

In February 2018, The Los Angeles County Department of Public Health (DPH) released a report titled, “Public Health and Safety Risks of Oil and Gas Facilities in Los Angeles County” (See Appendix A2-1). It evaluated the potential risks associated with living in close proximity to oil and gas facilities. It was intended to provide local policy-makers with an overview of relevant public health research and investigations. The DPH report noted that there are approximately 3,500 active oil wells in the county with approximately 880 of these wells operating in the City. A number of these oil facilities are within 100 to 300 feet of residential properties. It concludes with an overview of measures to reduce potential health impacts.

DPH synthesized information from multiple lines of evidence, including a review of epidemiological literature, environmental and health impact assessments, neighborhood health

investigations, and consultations with various jurisdictions regarding oil and gas ordinances. The scope of each is described in the following sections.

B. Epidemiological Literature Review

The review of the scientific literature synthesizes information from epidemiological studies and other published reviews on the potential health impacts associated with living near oil and gas activities. These peer-reviewed studies examine a variety of short-term and long-term health indicators such as birth outcomes; cancer; and respiratory neurological, gastrointestinal, dermatological, and psychological effects. While epidemiological studies have found limited associations between adverse health effects and living near oil and gas operations, high-quality exposure data measured over long periods of time is lacking. Therefore, the epidemiological studies are not able to conclude whether or not living near oil and gas activities is associated with long-term health impacts.

C. Environmental and Health Impact Assessments

These impact assessments help to fill data gaps in the literature by predicting potential health and safety impacts from air emissions, odors, noise, vibration, and other environmental hazards associated with oil and gas development projects. However, it should be noted that conventional risk assessment tools can be limited in their ability to anticipate certain risks given the complexity of health and quality-of-life consequences and the need for more robust, local-level monitoring data. The mitigation measures proposed for specific projects can be used to inform policies and plans involving oil and gas activities and operations that do not require such assessments to avoid or minimize potential adverse impacts.

D. Neighborhood Health Investigations

When DPH is notified of environmental or operational conditions at industrial facilities that may pose a threat to public health, DPH conducts a neighborhood health investigation and recommends action to protect and preserve public health. In response to community health complaints, DPH conducted two neighborhood health investigations of oil and gas facilities located in densely populated communities (Firmin Street and AllenCo Drill Site). In both investigations, DPH responded to resident health complaints of headaches, nausea, vomiting, respiratory irritation, and eye, nose and throat irritation. Such impacts often warrant immediate action to protect health. These two neighborhood health investigations revealed insufficient regulatory oversight and inadequate mitigation measures to reduce exposures and associated impacts in the adjoining community.

E. Consultations with Other Jurisdictions

To understand oil and gas ordinances adopted by other jurisdictions, DPH conducted one-on-one interviews with 10 jurisdictions throughout the nation and convened one joint meeting. These jurisdictions have established requirements, such as setback distances and/or mitigation measures, to limit adverse health and safety impacts of oil and gas production.

F. LADPH Recommendations

DPH determined that there is sufficient evidence to provide the following guidance and recommendations for oil and gas facilities in order to protect health:

1. Expand Setback Beyond 300 Foot Distance:

Los Angeles County and local jurisdictions within the County should expand the minimum setback distance beyond 300 feet, as currently specified in their local zoning codes, and apply these requirements to both the siting of new wells and to the development of sensitive land uses near existing operations. It is important to note that a setback distance is not an absolute measure of health protection and additional mitigation measures must also be considered. For existing oil and gas operations, a site-specific assessment at each facility throughout the County is necessary to identify current distances to sensitive land uses and other site characteristics that can be used to inform whether further mitigation measures are warranted to reduce potential public health and safety risks.

2. Add continuous air monitoring systems around oil and gas operations:

In coordination with CARB and SCAQMD, Los Angeles County should require the operators of facilities within urban areas of the County to implement continuous air monitoring systems around oil and gas operations to:

- Measure air pollutants released by oil and gas operations;
- Ensure oil and gas sites comply with environmental regulations;
- Evaluate the impact of releases from oil and gas sites on surrounding neighborhoods; and
- Monitor setbacks for these sites regularly, based on air monitoring and emerging science, and revise setback distances and/or other mitigation requirements when necessary to protect public health.

It should be noted that SCAQMD has imposed some requirements related to public notification and monitoring, but only after concerns are identified at a particular oil and gas operation, such as odor complaints. Current monitoring and enforcement activities can be sporadic, and it is difficult to understand long-term exposure risks for people living near oil and gas operations in the absence of continuous monitoring. To better characterize air quality in communities near oil and gas operations, SCAQMD completed a fence-line monitoring study and CARB launched the Study of Neighborhood Air near Petroleum Sources (SNAPS); results from these efforts should be used to inform air monitoring policies.

3. Preventative Testing and Monitoring:

A variety of state and federal regulations require routine inspections, maintenance, testing, and leak detection systems for oil and gas facilities; however, local oversight of these regulations is limited. Optimal local oversight would enhance monitoring for public health and safety risks associated with aging infrastructure, and should include a local

auditing and certification process, streamlined coordination, and data sharing among agencies. A local auditing program would confirm that operators are complying with federal, state and local regulations.

4. Comprehensive Community Safety Plan:

Operators should prepare and make available to the public a comprehensive Community Safety Plan, in coordination with City and County departments, including Fire, Building and Safety, and law enforcement. The plans for each site should include information on hazardous chemicals stored onsite; air emission monitoring efforts; and health-based exposure thresholds to identify the need for additional mitigation. For operations to plug wells permanently or to perform well maintenance, the responsible party should also prepare and implement a Community Safety Plan. The Community Safety Plan should facilitate communication and input from local stakeholders, and be submitted to Los Angeles County Department of Public Health for review and approval. The Plan should include protocols and procedures for immediate notification to the County Health Officer in the event of odor or health complaints.

5. Updated Emergency Preparedness Plans:

Operators should maintain enhanced Emergency Preparedness Plans that account for proximity to sensitive land use. These plans must include communication procedures to immediately notify local government agencies of any emergencies, such as spills or other releases.

The Los Angeles County Department of Public Health report further requests collaboration with County partners, local and state enforcement agencies, and interested stakeholders to enact these recommendations. The County's report also recommends site-specific health assessments at existing oil and gas operations located near sensitive land uses to determine the appropriate mitigation measures citywide.

The County generated the following table (Table 11) to summarize information compiled from various scientific publications focused on health and safety targets, remaining hazards and where additional measures could be beneficial:

Table 11. Review of Key Public Health and Safety Hazards and Setback Distance Guidance.

Setback Distance	<i>Air Quality</i>	<i>Noise</i>	<i>Odors</i>	<i>Fires, Explosions, and Other Emergencies</i>	<i>Additional Mitigation and Assessment Notes</i>
300 feet					Some health and safety impacts may still be unavoidable regardless of additional mitigation.
600 feet	✓				Additional mitigation and assessment would likely be needed to avoid most impacts. Odors may be unavoidable, regardless of mitigation. Air monitoring is advised.
1,000 feet	✓	✓			Additional mitigation and assessment may be needed to avoid noise impacts during certain operations, e.g. well advancement. Odors may be unavoidable in loss of containment events, regardless of additional mitigation.
1,500 feet	✓	✓	✓		Additional mitigation not likely to be needed. Some uncertainty remains due to gaps in long-term health and exposure data.

***“Check” symbols represents the distance at which the impacts are likely mitigated only by a setback distance.**

The County noted that epidemiological studies are observational, and by themselves cannot determine causal relationships between exposures from oil and gas production and specific health effects; however, they provide useful information to guide future research. Studies with well-designed exposure monitoring and measurements are needed to elucidate the actual health implications for populations near oil and gas sites. Meanwhile, acute adverse health effects have been well documented in emergency response and disaster events involving oil and gas operations such as oil spills. The literature to date provides limited evidence to link adverse health effects to living near oil and gas operations; however, quality exposure data that measures people’s exposure over long periods of time is missing. Findings from existing epidemiological studies were not able to conclude whether or not living near oil and gas activities is associated with long-term health effects, but rather highlight the need for further research. Given the limitations of epidemiological studies, the County recommended comprehensive exposure monitoring of oil and gas activities and precautionary measures that are appropriate to minimize exposures to substances that may adversely affect health.

Section 6. Health and Environmental Impacts

A. Toxic Air Emissions

SCAQMD is the agency responsible for developing and enforcing emission control rules and regulations in the South Coast Air Basin and portions of the Salton Sea Air Basin and Mojave Desert Air Basin.

The federal Clean Air Act (CAA) specifies attainment requirements for national ambient air quality standards (NAAQS) and identifies two types. Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The EPA has set NAAQS for six (6) principal pollutants, which are called "criteria" air pollutants: Carbon Monoxide (CO), Lead (Pb), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Ozone (O₃), particulate matter with an aerodynamic diameter of less than 10 microns (PM₁₀) and particulate matter with an aerodynamic diameter less than 2.5 microns (PM_{2.5}).

In addition, the California Clean Air Act (CCAA), requires the SCAQMD to achieve and maintain state ambient air quality standards for O₃, CO, SO₂, and NO₂ by the earliest practicable date. The SCAQMD must adopt rules and regulations that work to achieve air quality standards and healthful air, reduce criteria air pollutants, greenhouse gases, and toxic air contaminants (TACs).

A TAC, according to section 39655 of the California Health and Safety Code, is "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." In addition, substances which have been listed as federal hazardous air pollutants (HAPs) pursuant to section 7412 of Title 42 of the United States Code are TACs under the state's air toxics program pursuant to section 39657 (b) of the California Health and Safety Code. The Air Resources Board formally made this identification on April 8, 1993 (Title 17, California Code of Regulations, section 93001). (<https://oehha.ca.gov/air/toxic-air-contaminants>)

OEHHA List of Toxic Air Contaminants:

- Acetaldehyde
- Asbestos
- Benzene
- Benzo[a]pyrene
- 1,3-Butadiene
- Cadmium
- Carbon Tetrachloride
- Chlorinated Dioxins
- Chloroform
- Diesel Exhaust
- Ethylene Dibromide
- Ethylene Dichloride
- Ethylene Oxide
- Formaldehyde
- Hexavalent Chromium
- Inorganic Arsenic
- Inorganic Lead
- Methylene Chloride
- Methyl Tertiary Butyl Ether

- Naphthalene
- Nickel
- Perchloroethylene
- Trichloroethylene
- Vinyl Chloride

Source: <https://oehha.ca.gov/air/general-info/toxic-air-contaminant-list-staff-reportsexecutive-summaries> (As of July 17, 2008)

CARB Toxic Air Contaminant Identification List:

- Acetaldehyde
- Asbestos [asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), tremolite, actinolite, and anthophyllite]
- Benzene (C₆H₆)
- Benzo[a]pyrene
- Dibenzo-p-dioxins and Dibenzofurans chlorinated in the 2,3,7 and 8 positions and containing 4,5,6 or 7 chlorine atoms
- 1,3-Butadiene (C₄H₆)
- Cadmium (metallic cadmium and cadmium compounds)
- Carbon Tetrachloride (CCl₄; tetrachloromethane)
- Chloroform (CHCl₃)
- Diesel Exhaust /Particulate Emissions from Diesel-Fueled Engines
- Ethylene Dibromide (BrCH₂CH₂Br; 1,2-dibromoethane)
- Ethylene Dichloride (ClCH₂CH₂Cl; 1,2-dichloroethane)
- Ethylene Oxide (1,2-epoxyethane)
- Formaldehyde (HCHO)
- Hexavalent chromium (Cr (VI))
- Inorganic Arsenic
- Inorganic Lead
- Methylene Chloride (CH₂Cl₂; Dichloromethane)
- Methyl Tertiary Butyl Ether
- Naphthalene
- Nickel (metallic nickel and inorganic nickel compounds)
- Perchloroethylene (C₂Cl₄; Tetrachloroethylene)
- Trichloroethylene (CCl₂CHCl; Trichloroethene)
- Vinyl chloride (C₂H₃Cl; Chloroethylene)
- Environmental Tobacco Smoke

Source: <https://www.arb.ca.gov/toxics/id/taclist.htm> (As of July 18, 2011)

In addition, criteria and toxic emissions are collected annually through SCAQMD's Annual Emission Reporting Program (AER). Additionally, SCAQMD Rule 1148.2 is a chemical data source designed to collect information from oil and gas field production facilities to better

quantify potential air emissions from well development activities including drilling, well completion, and well reworks.

B. Fluxsense Report Summary

SCAQMD sponsored several measurement projects to study VOC, NO₂ and SO₂ emissions in 2015 using optical remote sensing methods. The Fluxsense Report included experimental studies of emissions from refineries, oil depots, treatment facilities, oil & gas wells, gas stations, fuel islands, barges and shipping. In addition, a technology demonstration and validation study was conducted to assess the uncertainties of different optical techniques using side-by-side measurements of real sources and controlled source gas releases. From September to November of 2015, the SCAQMD used Solar Occultation Flux and other Optical Remote Sensing Methods to measure VOC emissions from a variety of stationary sources in the South Coast Air Basin (See Appendix A2-25).

Emission fluxes of alkanes were measured by mobile optical Solar Occultation Flux (SOF) measurements. Emission fluxes of NO₂ and SO₂ were measured using zenith-looking a Differential Optical Absorption Spectrometer (DOAS). The remote sensing techniques were complemented by mobile extractive optical methods, i.e. MeFTIR (Mobile extractive Fourier Transformed Infrared spectrometer) and MWDOAS (Mobile White cell DOAS) to map ground concentrations of alkanes, methane and aromatic VOCs and to calculate inferred fluxes of methane and the chemicals benzene, toluene, ethylbenzene and xylene (BTEX) when combined with measured SOF fluxes. A wind-profiling Light Detection and Ranging (LIDAR) instrument supplied by SCAQMD allowed for the continuous measurements of vertical wind profiles. Wind data was also obtained from a mobile 10 m wind mast and from local meteorological stations. Measurements were conducted on land from the FluxSense mobile laboratory.

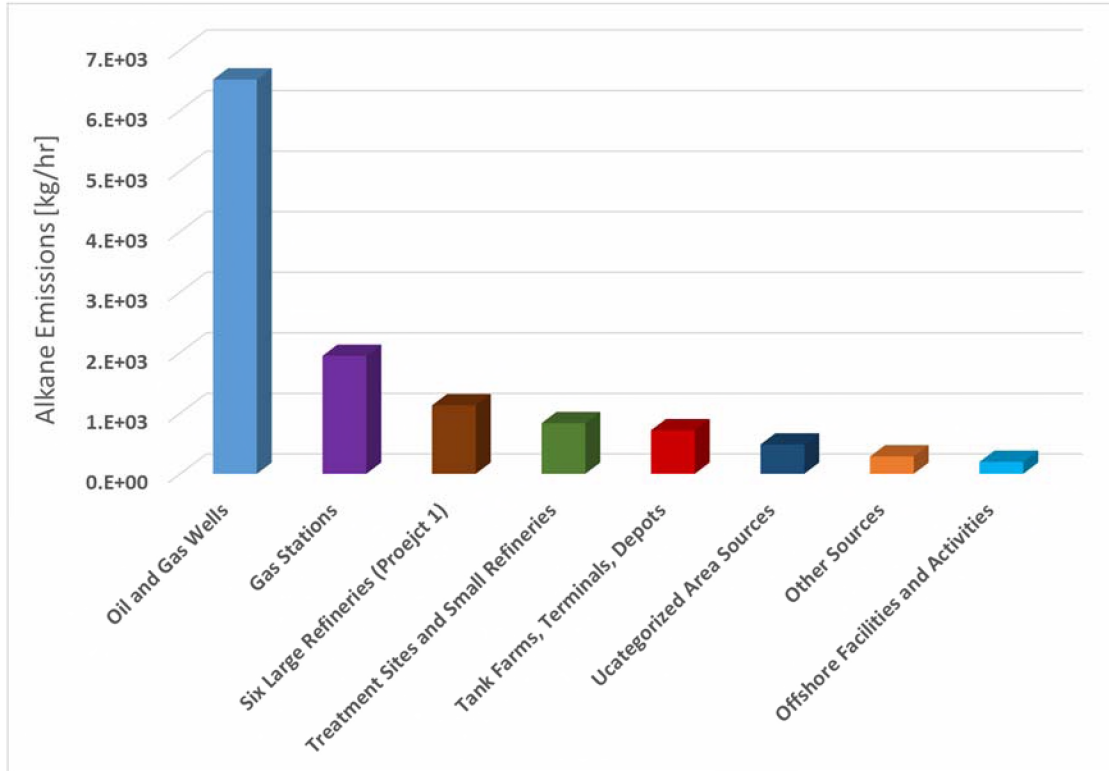


Figure 6. Relative contribution to total alkane emissions from the various source categories investigated in Projects 1 and 2. Emission rates for each category were calculated by multiplying the average measured emission per unit by the estimated number of total units. Total alkane emissions are approximately 12,000 kg/h from all included sources.

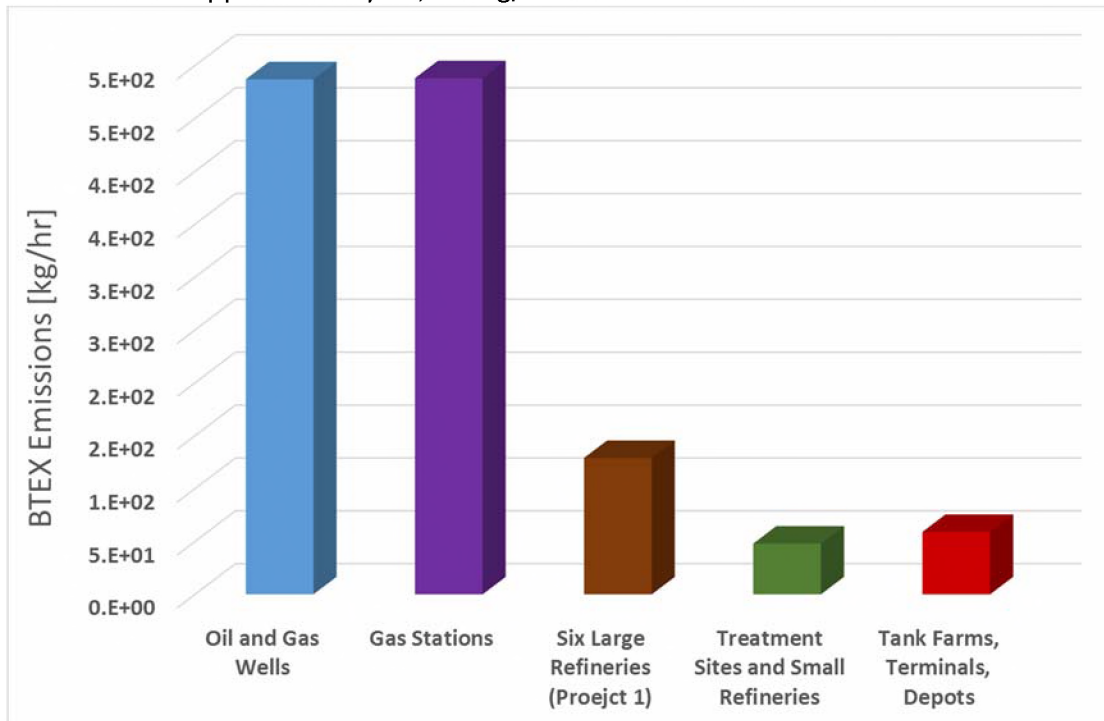


Figure 7. Relative contribution to total BTEX emissions from the various source categories investigated in Projects 1 and 2. Emission rates for each category were calculated by multiplying the average measured emission per unit by the estimated number of total units. Total BTEX emissions are approximately 1,200 kg/h from all included sources. Note that BTEX emissions were not included for Offshore Facilities, Other Sources or for the Uncategorized Area Source, due to lack of measurements.

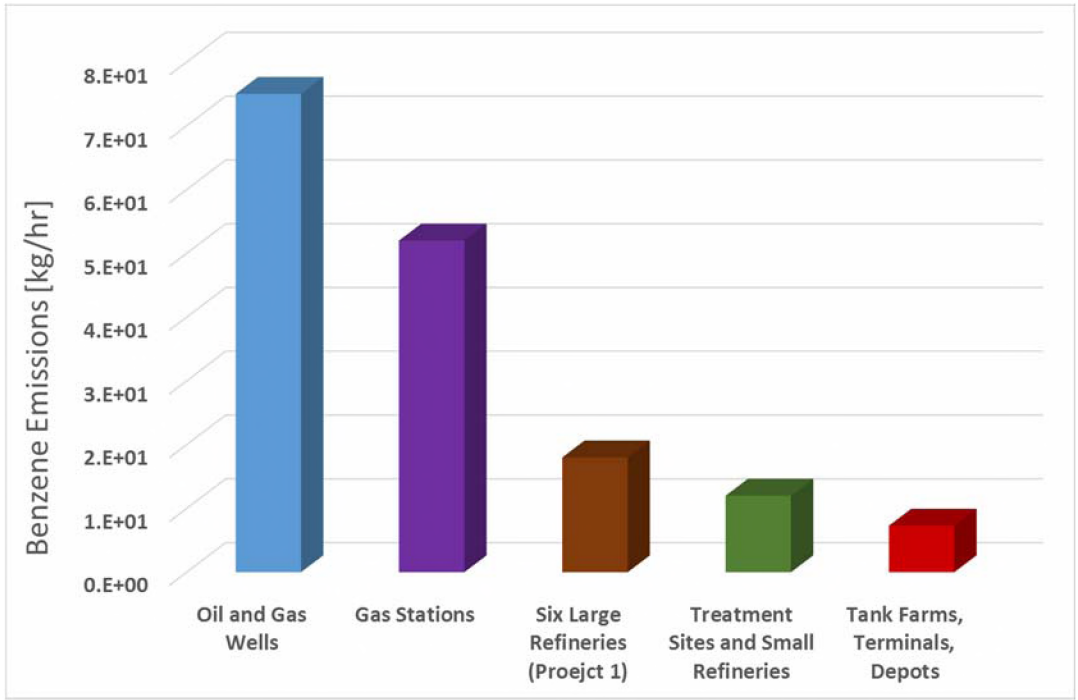


Figure 8. Relative contribution to total benzene emissions from the various source categories investigated in Projects 1 and 2. Emission rates for each category were calculated by multiplying the average measured emission per unit by the estimated number of total units. Total benzene emissions are approximately 160 kg/h from all included sources. Note that Benzene emissions from Offshore Facilities, Other Sources or for the Uncategorized Area Source were not included due to lack of measurements.

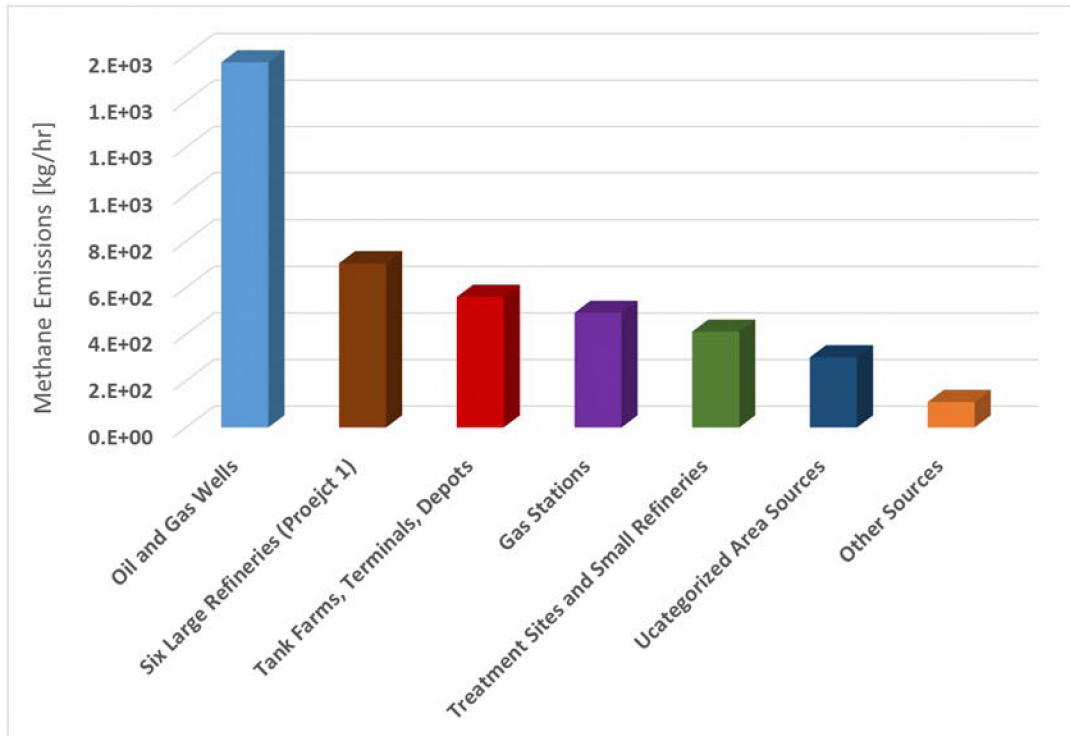


Figure 9. Relative contribution to total methane emissions from the various source categories investigated in Projects 1 and 2. Emission rates for each category were calculated by multiplying the average measured emission per unit by the estimated number of total units. Total methane emissions are approximately 4,100 kg/h from all included sources. Note that methane emissions from Offshore Facilities were not included due to lack of measurements.

In all categories of measurement, oil and gas wells were the greatest contributor to emissions in the Study. These findings strongly establishes the need for oversight and air monitoring of oil and gas production sites.

It past SCAQMD Multiple Air Toxin Exposure Studies (MATES) the overall contribution of upstream oil and gas production has been approximately 1% of the total regional air basin’s emissions. The super majority of air toxins come from diesel particulate matter (PM 2.5) which are mostly attributed to diesel power truck and engines. The Wilmington, Carson, and West Long Beach (WCWLB) areas have the worst air pollution rates in the region. As part of the Assembly Bill 617 regional air study, SCAMD staff presented (April 2019) an evaluation of air pollution sources in this area. They identified oil and gas production (from combustion) as 1% of the diesel particulate matter and nitrogen oxide sources. Also, they found that oil and gas production contributed 3% to the volatile organic compound (VOC) sources in WCWLB.

C. Literature Review by Physicians, Scientists and Engineers for Healthy Energy

Physicians, Scientists and Engineers for Healthy Energy (PSE) was retained by the Office of Petroleum and Natural Gas Administration and Safety on behalf of the City to conduct a separate review of the peer-reviewed literature focused on public health and oil and gas development and assess the applicability of the body of literature to the context of the City of Los Angeles.

Human health and oil and gas development: A review of the peer-reviewed literature and assessment of applicability to the City of Los Angeles (The Full Literature Review Report is Appendix A4-1).

The PSE study incorporates the findings contained in the public health sections of the California Council on Science and Technology Senate Bill 4 Independent Scientific Study (CCST, 2015 SB4 Report) and synthesized the available peer-reviewed literature on oil and gas development, air quality and human health that has been published since. PSE screened 1,676 studies to arrive at 24 peer-reviewed studies that met their criteria to be included in this study. Five (5) studies focus on air pollution and health and 19 studies focus on public health outcomes. All were published between 2015 and 2018.

PSE finalized their assessment with a discussion of the applicability of this body of peer-reviewed literature to the context of oil and gas development and human health in the City of Los Angeles context and provided conclusions and recommendations. This report employed a top-down assessment to evaluate hazards associated with upstream oil and gas development by starting with population health outcomes and working backwards to evaluate potential associations between health outcomes and oil and gas development activity.

Upstream activities include the transport of equipment and materials to and from the well pad; well drilling, mixing, handling, and injection of oil and gas chemicals; and management of recovered fluids/produced water, drill cuttings, and other waste products. Sources of air pollutants include products of incomplete combustion and chemicals emitted directly and indirectly from surface and subsurface equipment including, but not limited to, wells, pumps, generators, compressors, pneumatic devices, storage and separator tanks, surface impoundments, solid and liquid waste handling and from venting and flaring of gases. Air pollutant emissions from upstream oil and gas development can include toxic air contaminants (See CARB's Toxic Air Contaminant Identification List of 40 + substances at <https://www.arb.ca.gov/toxics/id/taclist.htm>), criteria pollutants [Carbon Monoxide (CO), Lead (Pb), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Ozone (O₃), particulate matter with an aerodynamic diameter of less than 10 microns (PM₁₀) and particulate matter with an aerodynamic diameter less than 2.5 microns (PM_{2.5}).], and reactive organic gases which are associated with the formation of tropospheric ozone (i.e., smog).

Please note that air pollution and health impacts associated with midstream emissions (e.g., transmission pipelines and underground gas storage) and downstream emissions (e.g. emissions from refining and use of hydrocarbon products) were not considered in the CCST SB 4 Report (2015) or in this report.

For studies published since 2015, in this assessment PSE focused primarily on two broad categories of studies:

- (1) studies of human health hazards, risks and impacts in the context of air pollution from upstream oil and gas development; and
- (2) human health hazards, risks and impacts as a function of distance from and density of upstream oil and gas development.

A single peer-reviewed oil and gas development and health study focused in California has been published to date [Shamasunder et al. (2018) conducted household health surveys within two 1,500 foot buffer areas (West Adams and University Park) surrounding oil production sites in the City]. There are however a variety of results and conclusions drawn from the greater peer-reviewed literature outside of California that are applicable in many ways to the City of Los Angeles context.

PSE compiled the following findings, conclusions, and research and policy recommendations (FCR):

FCR-1: Conduct studies in the State of California to assess the relationship between oil and gas development and public health as a function of distance.

Finding: Only one peer-reviewed oil and gas development and health study has been conducted in the state of California. There are however a variety of results and conclusions drawn from the greater peer-reviewed literature outside of California that are applicable to the California context.

Conclusion: There is a dearth of peer-reviewed studies on oil and gas development that are specific to the state of California and the City, yet there are results and conclusions drawn from the weight of the peer-reviewed literature outside of California that are relevant to the California context.

Recommendations:

- (1) Conduct health studies in the City on the health dimensions of oil and gas development as a function of distance and oil and gas well density that incorporate multiple potential environmental and exposure pathways. These studies should assess active oil and gas development and could also include inactive oil and gas development such as plugged and abandoned wells and associated infrastructure. Given the increasingly expansive body of health literature on the topic, consider promulgating health-protective policies based on the existing literature.
- (2) Ensure that field-based air pollution monitoring at the community scale and in close proximity to oil and gas development continues and expands and that it is implemented in ways that properly characterize emissions from these processes. This includes, but is not limited to, ensuring that air monitoring methods are deployed to capture the intermittent and periodic

nature of emission events throughout the oil and gas development process and that there is access to well pad-level activity information to inform the monitoring approaches.

FCR-2: Consider the implementation of a minimum surface setback requirement, caps on oil and gas development density and deployment of increased emission control strategies in the City.

Finding: The majority of peer-reviewed studies that assess human health in the context of oil and gas development as a function of distance and density have noted increased hazards, risks and health impacts as distance decreases and density increases. A number of neighborhoods in the City have higher densities of oil and gas wells than the areas found in peer-reviewed studies to be associated with poor human health outcomes.

Conclusion: The development of oil and gas close to human populations poses higher risks of exposure to health-damaging air pollutants than the development of oil and gas further away from human populations. The same trend tends to exist for higher vs. lower density of oil and gas development.

Recommendations:

(1) Agencies with jurisdiction should consider the implementation of minimum surface setbacks between oil and gas development and sensitive receptors including but not limited to residences, schools, daycare centers and hospitals in the City. The decision as to how large the setback is should also take the available body of epidemiological studies on oil and gas development into account. Studies to date conducted in regions with migrated hydrocarbon reservoirs have found associations with increased health risks associated with oil and gas development ranging from approximately 0.1 miles (500 feet) to one mile (5,280 feet). As such, a setback greater than 500 feet and up to 5,280 feet should be considered.

(2) Given that the density of oil and gas development has been found across a number of health studies to be associated with increased health risks, agencies with jurisdiction may consider limiting the density of wells and other oil and gas development infrastructure at oil and gas producing areas within and near the City.

(3) Best available emission control technologies and management approaches should be deployed on all oil and gas wells and ancillary infrastructure to limit emissions of health-damaging air pollutants. Target air pollutants should include both those that are regularly monitored for (e.g., Criteria Air Pollutants, Toxic Air Contaminants and aromatic hydrocarbons such as benzene) as well as those pollutants that are less frequently monitored for including, but not limited to chemicals reported to SCAQMD pursuant to Rule 1148.2 that are known air pollutants.

SCAQMD Rule 1148.2 requires reporting distance of oil and gas well events from sensitive receptors. Of note, sixty-two (62%) of oil and gas well events reported to this database between 2013 and 2018 in the City of Los Angeles occur within 600 feet of sensitive receptors. This may be important given that forty (40) (or 12%) chemicals reported to the SCAQMD dataset were identified on air pollution screening lists, of which twenty-four (24) were used in the City of Los

Angeles. Of all chemicals reported to the SCAQMD dataset, twenty-two (22) were identified as hazardous air pollutants (HAPs) under the Clean Air Act, half of which were reported as used in the City of Los Angeles (Shonkoff et al. 2019b).

D. OSHA Air Contaminants Exposure Limits for Oil and Gas Workers

Occupational exposure limits/standards for workers are reported as time weighted averages for healthy adults for an 8-hour workday over the course of a working lifetime of 45 years. An employee's exposure to any substance in an 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance. Occupational exposure limits are not appropriate for direct comparison with chronic inhalation screening values. It must be noted that occupational exposure limits are not developed for protection of the general public and are inappropriate for community-based decision making.

The intake fraction is defined as the ratio of the mass of a pollutant inhaled or ingested to the mass of the pollutant emitted. In the case of emissions of most pollutants to the air, intake fraction is the proportion of the total air pollutants emitted that are taken into the lungs of a human. The intake fraction of the community would be expected to be much less than workers, however the closer people are to oil and gas activities, the higher their potential exposure to air pollutants emitted from these facilities and the higher their risk of associated health effects.

(a) Table Z-1— Limits for Air Contaminants

(1) Substances with limits preceded by “C”—Ceiling Values. An employee's exposure to any substance in Table Z-1, the exposure limit of which is preceded by a “C”, shall at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time during the working day.

(2) Other substances—8-hour Time Weighted Averages. An employee's exposure to any substance in Table Z-1, the exposure limit of which is not preceded by a “C”, shall not exceed the 8-hour Time Weighted Average given for that substance in any 8-hour work shift of a 40-hour work week.

(b) Table Z-2. An employee's exposure to any substance listed in Table Z-2 shall not exceed the exposure limits specified as follows:

(1) 8-hour time weighted averages. An employee's exposure to any substance listed in Table Z-2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in Table Z-2.

(2) Acceptable ceiling concentrations. An employee's exposure to a substance listed in Table Z-2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under “acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift.”

(3) Example. During an 8-hour work shift, an employee may be exposed to a concentration of Substance A (with a 10 ppm TWA, 25 ppm ceiling and 50 ppm peak) above 25 ppm (but never above 50 ppm) only for a maximum period of 10 minutes. Such exposure must be compensated by exposures to concentrations less than 10 ppm so that the cumulative exposure for the entire 8-hour work shift does not exceed a weighted average of 10 ppm.

Table 12. OSHA Limits for Air Contaminants (Table Z-1)

Substance	CAS No. (c)	ppm (a) ¹	mg/m ³ (b) ¹	Skin designation
Benzene; see 1910.1028	71-43-2			
See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028^d				
Ethyl benzene	100-41-4	100	435	
Hydrogen sulfide	7783-06-4		(2)	
Naphthalene	91-20-3	10	50	
Toluene	108-88-3		(2)	

¹The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 °C and 760 torr.

(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound, measured as the metal, the CAS number for the metal is given—not CAS numbers for the individual compounds.

(d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, **oil and gas drilling and production**, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted sub segments, the **benzene limits in Table Z-2 apply**. See 1910.1028 for specific circumstances.

Table 13. Trimethyl Benzene (not in OSHA tables: ACGIH 25 ppm airborne exposure limit averaged over an 8-hour workshift, but Fact Sheet is Appendix A2-36) [Table Z-2]

Substance	8-hour Time Weighted Average (TWA)	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
Benzene ^a (Z37.40-1969)	10 ppm	25 ppm	50 ppm	10 minutes
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 minutes once, only if no other

				measurable exposure occurs.
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 minutes

^a This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL (Short Term Exposure Limits) of the benzene standard at 1910.1028.

(Occupational Safety and Health Standards, Code of Federal Regulations - 1910.1000 Air contaminants is Appendix A2-35)

OSHA Worker Standards Definitions:

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

The abbreviation “ppm” means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

“TLV” is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

Clarification of term “Active Hydrocarbon Zone”; as it relates to the oil and gas well drilling operations; and the need to use FRC when performing drilling operations.

<https://www.osha.gov/laws-regs/standardinterpretations/2010-10-19>

Source: OSHA Air contaminants

<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1000>

F. Summary of Community Submitted Reports

The Office of Petroleum and Natural Gas Administration and Safety collected input from residents, neighborhood associations, advocacy groups, industry, and stakeholders. On November 2017, the City of Los Angeles Health Commission held a hearing for public input into this report. Dozens of public speakers provided input, documents, and information that was considered. Below is a summary of relevant community and industry reports.

1. Nicole J. Wong, MPH “Existing scientific literature on setback distances from oil and gas development sites” (2017):

The Report focused on fourteen (14) studies. Ten (10) of 14 reports considered the distance to an active well from residence and four (4) of the 14 reports considered concentration of wells proximate to residences. Setback recommendations in studies range from 1,320 to 8,202 feet. The scientific literature makes a strong case for a far more protective health and safety setback than currently exists in the law and creates a substantial basis for the 2,500 feet setback proposed by community advocates (Appendix A1-11).

2. Liberty Hill, “Drilling Down: The Community Consequences of Expanded Oil Development in Los Angeles” (2015):

Oil Extraction in Los Angeles: Health, Land Use, and Environmental Justice Consequences included; History of Oil Production and Land Use, The Geographic Distribution of Oil Production, Methods of Oil Extraction, Environmental and Toxic Chemical Impacts, Air Toxics and Human Health Hazards, Demographic Characteristics in Selected Areas Hosting Oil Production Facilities, Sensitive Land Uses in Selected Areas Hosting Oil Production Facilities, Oil Extraction and Environmental Justice, Population Density and Percent Children and Elderly in Selected Areas Hosting Oil Production Facilities, The Problem of Proximity). Additional sections were Families on the Frontlines: When Oil is Your Neighbor (University Park: AllenCo Drill Site, Historic West Adams: Jefferson Drill Site, Historic West Adams: Murphy Drill Site, Wilmington: Warren E&P Drill Site, Baldwin Hills: Inglewood Oil Field Drill Site), Oil Drilling and the Law: The Basis for Municipal Authority, Toward a Healthy and Sustainable Los Angeles (Appendix A1-12).

3. “Community-Based Health and Exposure Study around Urban Oil Developments in South Los Angeles” (2018)

This study gathered household surveys nearby two oil production sites in Los Angeles. Tested the capacity of low-cost sensors for localized exposure estimates. Bilingual surveys of 205 randomly sampled residences were collected within two 1500 ft. buffer areas (West Adams and University Park) surrounding oil development sites. Surveyors used a one-sample proportion test, comparing overall rates from the California Health Interview Survey (CHIS) of Service Planning Area 6 (SPA6) and Los Angeles County for variables of interest such as asthma. Field calibrated low-cost sensors recorded methane emissions. Physician diagnosed asthma rates were reported to be higher within both buffers than in SPA6 or LA County. For both University Park and West Adams, compared with SPA6, resident-reported asthma prevalence was significantly higher. Respondents in West Adams (15.5%) and University Park (12.1%) reported experiencing asthma symptoms of coughing and wheezing on a weekly or daily basis.

This preliminary community-based survey and low-cost sensor field experiment considers resident health and the rights of residents to have knowledge about their communities and supports hypothesis generation for future air monitoring or health studies. It also points to the need for regulatory agencies to provide community education about reporting experiences such as odors as well as facilitate diverse methods to be able to do so. It leads to questions that require

more complex scientific design than possible in this study with limited resources and raises the imperative that communities be involved in the research (Appendix A2-3).

E. Summary of Industry Submitted Information

The California Independent Petroleum Association (CIPA) submitted nineteen (19) excerpts of studies on air quality/emissions and eleven (11) excerpts of studies health related to oil and gas operations around the county. CIPA is a non-profit, non-partisan trade association representing approximately 500 independent crude oil and natural gas producers, royalty owners, and service and supply companies operating in California. Below is a listing of their submissions (no complete documents were provided) from the 2017 City Council Health, Mental Health, and Education Committee Meeting:

Air Quality/Emissions:

1. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014; U.S. Environmental Protection Agency April 15, 2016

"Natural gas systems were the largest anthropogenic source category of CH₄ emissions in the United States in 2014 with 176.1 MMT CO₂ Eq. of CH₄ emitted into the atmosphere. Those emissions have decreased by 30.6 MMT CO₂ Eq. (14.8percent) since 1990. The decrease in CH₄ emissions is largely due to the decrease in emissions from transmission, storage, and distribution."

2. Finding the Facts on Methane Emissions: A Guide to the Literature; ICF International, for the Natural Gas Council April 2016

"According to the EPA Inventory, methane emissions from the natural gas industry have been declining continuously since the early 1990s. Absolute emissions declined by 15% between 1990 and 2014. Methane emissions per unit of gas produced declined by 43% over that same period. Reasons for the decline in methane emissions include: turnover and replacement of equipment, voluntary actions by industry to reduce emissions, and the co-benefit of recent regulations requiring reductions in volatile organic compound (VOC) emissions."

3. The Barnett Shale: From problem formulation to risk management; Texas Commission on Environmental Quality September 2015

"Long-term VOC levels were all below their health-based comparison values."

4. Atmospheric Emission Characterization of Marcellus Shale Natural Gas Development Sites; Drexel University, et al. April 21, 2015

"In contrast to observations from other shale plays, elevated volatile organic compounds, other than CH₄ and C₂H₆, were generally not observed at the investigated sites. Elevated submicrometer particle mass concentrations were also generally not observed."

5. EQT Airborne Monitoring at EQT Marcellus Drilling Site; Professional Service Industries, for Makel & Associates March 18, 2015

"Airborne gas and TVOC levels appear to have been at or near background levels for the entire monitoring periods in the three locations monitored."

6. Quantifying atmospheric methane emissions from the Haynesville, Fayetteville, and northeastern Marcellus shale gas production regions University of Colorado Boulder, Cooperative Institute for Research in Environmental Sciences March 13, 2015

"The regions investigated in this work represented over half of the U.S. shale gas production in 2013, and we find generally lower loss rates than those reported in earlier studies of regions that made smaller contributions to total production. Hence, the national average CH₄ loss rate from shale gas production may be lower than values extrapolated from the earlier studies,"

7. SE Mansfield Padsite: Air Monitoring Report; Modem Geosciences, for Beacon E & P Company December 2014

"None of the observed VOCs were noted above the comparison criteria."

8. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012; U.S. Environmental Protection Agency April 15, 2014

"Natural gas systems were the second largest anthropogenic source category of CH₄ emissions in the United States in 2012 with 29.9 Tg CO₂ Eq. of CH₄ emitted into the atmosphere. Those emissions have decreased by 26.6 Tg CO₂ Eq. (17.0percent) since 1990. The decrease in CH₄ emissions is largely due to the decrease in emissions from production and distribution. The decrease in production emissions is due to increased voluntary reductions, from activities such as replacing high bleed pneumatic devices, and the increased use of plunger lifts for liquids unloading, and increased regulatory reductions."

9. Measurements of methane emissions at natural gas production sites in the United States; University of Texas, Austin, Center for Energy and Environmental Resources, et al. October 29, 2013

"The measurements indicate that well completion emissions are lower than previously estimated,"

10. Evaluation of impact of shale gas operations in the Barnett Shale region on volatile organic compounds in air and potential human health risks ToxStrategies, funded by the Barnett Shale Energy Education Council August 25, 2013

"... the body of evidence demonstrates that shale gas production activities have not resulted in community-wide exposures to those VOCs in air at levels that would pose a health concern, despite the dramatic increase in shale gas operations in the region over the last decade."

11. Air Quality Impacts Occurring From Horizontal Well Drilling and Related Activities; West Virginia Department of Environmental Protection, Office of Oil and Gas June 28, 2013

"Based on a review of completed air studies to date, including the results from the well pad development monitoring conducted in West Virginia's Brooke, Marion, and Wetzel Counties, no additional legislative rules establishing special requirements need to be promulgated at this time."

12. Technical Memorandum: Town of Erie Air Quality Review; Cynthia Ellwood, Pinyon Environmental February 4, 2013

"Based on the Colorado Department of Public Health and Environment information, and the understanding that the data set from the CDPHE study is limited in scope and quantity of data, the risk of Erie residents of experiencing an adverse health effect over a lifetime exposure to the CDPHE reported benzene concentrations is low."

13. Air Emissions Case Study Related to Oil and Gas Development in Erie, Colorado; Colorado Department of Public Health & Environment December 5, 2012

"The monitored concentrations of benzene, one of the major risk driving chemicals, are well within acceptable limits to protect public health, as determined by the U.S. Environmental Protection Agency. The concentrations of various compounds are comparatively low and are not likely to raise significant health issues of concern. "

14. Shale gas production: potential versus actual greenhouse gas emissions; Massachusetts Institute of Technology November 26, 2012

"The use off-flaring and reduced emission completions reduce the levels of actual fugitive emissions from shale well completion operations to about 216 Gg CH₄, or 50 Mg CH₄ per well, a release substantially lower than several widely quoted estimates."

15. Data Show Public Health Impacts from Natural Gas Production Overstated; Susan Mickley, Northern Wayne Property Owners Alliance October 19, 2011

“...even as natural gas development expanded significantly in the area over the past several years, key indicators of health improved across every major category during those times.”

16. City of Fort Worth Natural Gas Air Quality Study: Final Report; Eastern Research Group and Sage Environmental Consulting, for City of Fort Worth July 13, 2011

“The ambient air monitoring data did not reveal any evidence of pollutants associated with natural gas exploration and production activity reaching concentrations above applicable screening levels.”

17. Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report; Pennsylvania Department of Environmental Protection January 12, 2011

“Results of the limited ambient air sampling initiative in the northeast region did not identify concentrations of any compound that would likely trigger air-related health issues associated with Marcellus Shale drilling activities.... when looking at the individual operations, the emissions do not seem to create ambient air pollution conditions where acute adverse health impacts are expected.”

18. Mismeasuring Methane: Estimating Greenhouse Gas Emissions from Upstream Natural Gas Development IHS CERA 2011

“If methane emissions were as high as EPA and Howarth [Cornell University researcher] assume, extremely hazardous conditions would be created at the well site. Such conditions would not be permitted by industry or regulators. For this reason, if no other, the estimates are not credible.”

19. Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report; Pennsylvania Department of Environmental Protection November 1, 2010

“Results of the limited ambient air sampling initiative conducted in the southwest region did not identify concentrations of any compound that would likely trigger air-related health issues associated with Marcellus Shale drilling activities.”

Health:

1. Emissions of Polycyclic Aromatic Hydrocarbons from Natural Gas Extraction into Air [Corrected version of a now retracted study that had suggested that “natural gas extraction may be contributing significantly to PAH (polycyclic aromatic hydrocarbon emissions) in the air, at levels that are relevant to human health.”] Oregon State University, et al. July 11, 2016.

"This work suggests that natural gas extraction is contributing PAHs to the air, at levels that would not be expected to increase cancer risk."

2. Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) Study Report; Perma-Fix Environmental Services, Inc., for the Pennsylvania Department of Environmental Protection May 2016

"There is little or limited potential for radiation exposure to workers and the public from the development, completion, production, transmission, processing, storage, and end use of natural gas. "

3. Analysis of Hydraulic Fracturing Flowback and Produced Waters Using Accurate Mass: Identification of Ethoxylated Surfactants University of Colorado Boulder, Center for Environmental Mass Spectrometry (Press release: "Major class of fracking chemicals no more toxic than common household substances") August 2014

Lead author Michael Thurman: "This is the first published paper that identifies some of the organic fracking chemicals going down the well that companies use. ... We found chemicals in the samples we were running that most of us are putting down our drains at home. ... What we have learned in this piece of work is that the really toxic surfactants aren't being used in the wells we have tested. "

4. Updated Summary Report: Occurrence of Cancer In Zip Codes 75022 & 75028, Flower Mound, Denton County, Texas Texas Department of State Health Services July 30, 2014

"The observed number of childhood leukemias, childhood brain/CNS cancers, and childhood liver cancers was not higher than expected in both males and females in zip code 75022 (Table 4), zip code 75028 (Table 5), and both zip codes combined (Table 6). "

5. Detailed Human Health Risk Assessment of Oil and Gas Activities in Northeastern British Columbia; Intrinik Environmental Services, for the British Columbia Ministry of Health 2014

"The overall findings of the detailed HHRA [human health risk assessment] of oil and gas activity in northeastern British Columbia suggest that, while there is some possibility for elevated chemicals of potential concern concentrations to occur at some locations, the probability that adverse health impacts would occur in association with these exposures is considered to be low."

6. Review of the potential public health impacts of exposures to chemical and radioactive pollutants as a result of shale gas extraction Public Health England October 30, 2013

"The currently available evidence indicates that the potential risks to public health from exposure to the emissions associated with shale gas extraction are low if the operations are properly run and regulated."

7. Evaluation of impact of shale gas operations in the Barnett Shale region on volatile organic compounds in air and potential human health risks ToxStrategies, funded by the Barnett Shale Energy Education Council August 25, 2013

"... the body of evidence demonstrates that shale gas production activities have not resulted in community-wide exposures to those VOCs in air at levels that would pose a health concern, despite the dramatic increase in shale gas operations in the region over the last decade. "

8. Technical Memorandum: Town of Erie Air Quality Review; Cynthia Ellwood, Pinyon Environmental February 4, 2013

"Based on the CDPHE [Colorado Department of Public Health and Environment] information, and the understanding that the data set from the CDPHE study is limited in scope and quantity of data, the risk of Erie residents of experiencing an adverse health effect over a lifetime exposure to the CDPHE reported benzene concentrations is low. "

9. DISH, Texas Exposure Investigation; Texas Department of State Health Services May 12, 2010

"The blood samples were analyzed for volatile organic compounds (VOCs) to determine whether people living in and around DISH had higher levels of these contaminants in their blood than 95% of the general United States (U.S.) population. Although a number of VOCs were detected in some of the blood samples, the pattern of VOC values was not consistent with a communitywide exposure to airborne contaminants, such as those that might be associated with natural gas drilling operations. Other sources of exposure would explain many of the findings. For instance, all four people who had higher levels of benzene in their blood were cigarette smokers. "

10. Pathway Analysis and Risk Assessment for Solids and Fluids Used In Oil and Gas Exploration and Production in Colorado Quality Environmental Professional Associates, for the Colorado Oil and Gas Association June 2008

"Results of air sampling at 4 pad locations indicate that there are no significant chronic health risk associated with the chemicals present in the air downwind from the pads."

11. Community Health Risk Analysis of Oil and Gas Industry Impacts in Garfield County; Saccomanno Research Institute and Mesa State College 2008

"At the present time - based on our data sources - there is not a health crisis in Garfield County, but there are some health trends that should be monitored. We cannot say conclusively that any of these health trends are directly related to the presence of natural gas industry activities or to other factors."

F. Additional Health Studies - SNAPS, AB 167, & MATES

CARB is performing extensive air monitoring for criteria pollutants and toxic air contaminants this year near oil and natural gas production wells and facilities under two fully-funded programs, the Community Air Protection (CAP) Program and the Study of Neighborhood Air near Petroleum Sources (SNAPS) Program (Appendix A2-39).

Study of Neighborhood Air near Petroleum Sources (SNAPS)

CARB developed SNAPS to study air quality in communities near oil and gas operations, particularly production facilities near disadvantaged neighborhoods.

As part of SNAPS, stationary and mobile trailers equipped with state-of-the-art monitoring technologies will be placed within selected communities in Los Angeles to determine air quality and measure toxic air contaminants, volatile organic compounds, particulate matter, heavy metals, and criteria pollutants. Two (2) of the statewide sites selected to participate in the program are located in the Los Angeles area: Baldwin Hills/Inglewood Oil Field and South Los Angeles/Las Cienegas Oil Field, which includes the Jefferson, Murphy, AllenCo, and 4th Avenue drill sites.

Assembly Bill 617

In response to the 2017 Assembly Bill 617 (AB 617), the California Air Resources Board established the Community Air Protection Program (CAPP or Program). The program will conduct detailed air monitoring and risk assessments in disadvantaged communities. Based on this monitoring and risk assessment results, AB 617 authorizes CARB to require fence-line monitoring and Best Available Retrofit Control Technology (BARCT) on industrial sources (See AB 617 Fact Sheets in Appendices A2-40 and A2-41).

The Program's focus is to reduce exposure in communities most impacted by air pollution. SCAQMD is the air pollution control agency for all of Orange County and the urban portions of Los Angeles, Riverside and San Bernardino counties. The SCAQMD recommended 3 communities: Wilmington/West Long Beach/Carson and East Los Angeles/ Boyle Heights and San Bernardino/Muscoy. All 3 were proposed for both monitoring and the Community Emission Reduction Program (CERP). On Sept 27, 2018 the CARB made selection of the initial 10 communities statewide, which included both Wilmington/West Long Beach/Carson and East Los Angeles/ Boyle Heights.

At the same time, CARB is already conducting air monitoring program (SNAPS) immediately adjacent to oil and natural gas production facilities in select locations. These programs will validate the performance of existing emission controls, identify constituents and potential sources that affect community air quality, and identify measures that can improve air quality. The City should not expand existing setbacks without studying the results of these ongoing local oil and gas monitoring programs.

In July 2019 the Community Monitoring begins. The AB 617 Community Steering Committees are currently deciding on the specific monitoring locations and technology that will be used. The City

should not expand existing setbacks without studying the results of these ongoing local oil and gas monitoring programs in SNAPs and AB 617.

Multiple Air Toxics Exposure Study

The Multiple Air Toxics Exposure Study is a monitoring and evaluation study conducted in the South Coast Air Basin by SCAQMD. The study is a follow up to previous air toxics studies in the Basin since the late 1980's.

The MATES V Study includes a fixed site monitoring program with ten stations (located in Burbank, Central Los Angeles, Pico Rivera, Huntington Park, Compton, North Long beach, West Long Beach, Anaheim, Inland Valley San Bernardino and Rubidoux), an updated emissions inventory of toxic air contaminants, and a modeling effort to characterize risk across the Basin from January 2018 to 2020. The study focuses on the carcinogenic risk from exposure to air toxics but does not estimate mortality or other health effects from particulate exposures.

The purpose of the MATES V fixed site monitoring is to characterize long-term regional air toxics levels in residential and commercial areas. To complement and enhance the fixed site monitoring, MATES V efforts will include advanced state-of-the-art monitoring technologies, low-cost sensor networks, and near real-time data and community engagement to conduct enhanced air toxics monitoring at local scales with a focus on EJ communities, especially those near refineries to assess the air toxics exposures and associated health risks in these communities.

The motivation behind the enhanced monitoring efforts is to better characterize air toxics levels in highly impacted areas, to provide higher resolution air quality data, and to better understand emissions from petroleum refineries and warehouses. MATES V is currently underway and is scheduled to be released in 2020.

Section 7. Health Assessments

A. Health Impact Assessments (HIA) are forward looking assessment tools for systematically evaluating, synthesizing, and communicating information about potential health impacts for more informed decision making. Northern and York Public Health Observatory defines an HIA as a multidisciplinary process within which a range of evidence about the health effects of a proposal is considered in a structured framework, based on a broad model of health which proposes that economic, political, social, psychological, and environmental factors determine population health.

HIA's aims to do the following:

- Provide a focused mechanism for bringing attention to these upstream determinants of health as they are affected by public policy decisions
- Suggest alternatives to maximize the potential benefits and minimize potential harm, especially when public health considerations are not already a major consideration.

Key Components of an HIA report:

- Description of proposed policy or project + alternatives
- Description of linkages to health (general & case-specific)
- Profile population subgroups, characteristics, health risks, vulnerabilities
- Analysis to estimate magnitude, significance, likelihood & distribution of impacts
- Recommendations: Specify agency action, Minimize harm, Maximize benefits

The ZA Memo 133 requires a Health Impact Assessment for certain projects, as set forth in the MEMO. After an Initial Study is completed (and the HIA, if necessary), the Zoning Administrator will determine whether the proposed environmental clearance for the proposed project is a Negative Declaration (ND) or a Mitigated Negative Declaration (MND) or whether an EIR is required pursuant to CEQA Guidelines.

ZA Memo 133 defines an HIA as a study of the project for the surrounding vicinity identifying pollution and population indicators, such as, but not limited to, those analyzed in the California Communities Environmental Health Screening Tool; the number of people affected by the project; short term or permanent impacts caused by the project; likelihood that impacts will occur; and recommended mitigation measures.

Any HIA required under these procedures shall be used to inform whether an EIR is required and whether to approve, condition, or deny the application under Section 13.01- H.

B. Health Risk Assessments (HRA) are retroactive risk assessment tools which is a scientific process of evaluating the adverse effects caused by a substance, activity, lifestyle, or natural phenomenon. The Centers for Disease Control and Prevention define a HRA as: “a systematic approach to collecting information from individuals that identifies risk factors, provides individualized feedback, and links the person with at least one intervention to promote health, sustain function and/or prevent disease.” The four steps involved in the risk assessment process are 1) hazard identification, 2) exposure assessment, 3) dose-response assessment, and 4) risk characterization.

Oil and gas HRA’s evaluate potential calculated cancer risk and acute and chronic health risk from toxic emissions associated with well construction, drilling, and completion as well as oil and gas processing equipment:

1) Emissions Estimations of Hazardous Air Pollutants:

Emission estimates involve identifying and quantifying emissions of potential regulated toxic substances from each source. OEHHA determines the relative toxicity of chemicals regulated by the State of California and determines whether or not they are carcinogenic or possibly associated with short-term or long-term non-cancer health impacts. Toxic emissions from each source were quantified.

2) Exposure Assessments:

Exposure assessment includes air dispersion modeling, identification of emission exposure routes and estimation of exposure levels. The modeling estimates ground level concentrations based on

an emission rate of one gram per second. This rate is then multiplied by the worst case potential emission rate for each substance to obtain ground level concentrations. In addition to inhalation, potential pathways of exposure to offsite receptors include dermal exposure and ingestion.

3) Dose-response Assessments:

The dose-response assessment describes the quantitative relationship between a human's exposure to a substance (the dose) and the incidence or occurrence of an adverse health impact (the response). For carcinogens, OEHHA has developed cancer potency factors. A cancer potency factor represents the upper bound probability of developing cancer based on a continuous lifetime exposure. The cancer potency factor does not represent a threshold under which a person would not develop cancer, but instead is used to estimate the probability of developing cancer.

For non-carcinogenic chemicals, OEHHA has developed Recommended Exposure Limits (RELs) for acute and chronic impacts. RELS represent concentration thresholds at which no adverse non-cancer health effects are anticipated. For chemicals that are not deemed by the State of California as possible carcinogens, but which may pose either short-term (acute) or other non-cancer long-term (chronic) health effects, a Hazard Index (HI) calculation of potential risk is also required by the air district and the state as part of a Health Risk Assessment.

4) Potential Health Risk Quantification;

Currently, risks from a project that are less than the following regulatory thresholds are considered not to be significant and are, therefore, acceptable:

- Cancer risk equal to or less than 10 in one million
- Chronic hazard index equal to or less than 1
- Acute hazard index equal to or less than 1

These metrics are generally applied to the maximally exposed individual (MEI). There are separate MEIs for residential exposure (i.e., residential areas) and for worker exposure (i.e., offsite work places).

Kern County recently conducted an HRA in connection with CEQA when they updated their oil code in 2015 (See Kern County HRA's in Appendices A1-3 and A1-4). Their approach is instructive since the County prepared a comprehensive Environmental Impact Report (EIR) and Health Risk Assessment (HRA) in 2015 to support its amended code for oil and natural gas operations. Kern County specified a 210-foot setback in its updated code, predicated on noise since the HRA demonstrated no health basis for establishing a longer setback. Kern County's updated ordinance includes a collaborative site plan review process with specific time limits that results in the issuance of permits for activities such as new drilling or re-drilling and construction of associated facilities in a 7- to 120-day period. The operator submits a site plan which includes the planned activity and changes to the location, as well as surrounding residences, other structures and roads. The review period allow for coordination between the operator and the surface owner, with the County Department of Planning and Natural Resources resolving any dispute during the 120-day period.

The only type of operation that Kern County's HRA identified as warranting additional consideration beyond the County's 210-foot setback is deep drilling at greater than 10,000 feet using diesel powered drilling rigs. The HRA applied the Office of Environmental Health Hazard Assessment's Air Toxics Hot Spots Program Risk Assessment Guidelines from March 2015 and the San Joaquin Valley Air Pollution Control District's (APCD) more stringent risk threshold (twice as stringent as their current threshold), which yielded a distance of 367 feet during that deep drilling using diesel powered drilling rigs before taking into account any mitigation measures.

It is noteworthy that: (1) this condition is not relevant in the City, where wells are typically half that depth, with no producing wells in the City deeper than 10,000 feet; and (2) under the current APCD risk threshold in Kern County, the spacing for even such a deep well would be 184 feet before mitigation – less than the City's existing building code setback.

The Kern County's Permitting Handbook (Appendix A2-11) identified the following mitigation measures that would enable drilling of even the deepest wells within the 367-foot distance:

1. Placement of engines in the potential impact area away from the sensitive receptor.
2. Utilize directional drilling to locate rig away further from the sensitive receptor.
3. Use of late-model engines, low-emission diesel products, alternative cleaner fuels (e.g., natural gas or liquefied petroleum gas), engine retrofit technology, add-on devices such as diesel particulate filters or oxidation catalyst, and/or other options as such become available to reduce emissions from off-road and other equipment.
4. Utilize electricity line power if available.
5. Shutdown all equipment when not in use, and otherwise minimize engine idling by limiting idling to 15 minutes.
6. Use of automatic rigs.
7. Assist and pay to relocate residents to temporary lodging during well construction, drilling, and completion activities, if such residents voluntarily agree to such relocation.

After the drilling of even the deepest well is complete, the HRA demonstrated that the County's 210-foot setback safeguards neighbors and the community during operation, maintenance and ultimate plugging and abandonment.

C. Air Toxics Hot Spots Program Risk Assessment

Risk assessments are a scientific process of evaluating the adverse effects caused by a substance, activity, lifestyle, or natural phenomenon. OEHHA is responsible for developing and providing risk managers in state and local government agencies with toxicological and medical information relevant to decisions involving public health. State agency users of such information include all boards and departments within Cal/EPA, as well as the Department of Public Health, the Department of Food and Agriculture, the Office of Emergency Services, the Department of Fish and Wildlife, and the Department of Justice.

Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA, March 2015):

<https://oehha.ca.gov/air/crnrr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0>

D. Los Angeles County Department of Public Health Recommendations

The County Department of Public Health report's first guidance was on health assessments. "For existing oil and gas operations, a site-specific assessment at each facility throughout the County is necessary to identify current distances to sensitive land uses and other site characteristics that can be used to inform whether further mitigation measures are warranted to reduce potential public health and safety risks." A health risk assessment as part of an EIR process or a health impact assessment for each specific oil and gas sites will inform potential health impacts. The assessments must be done for each site and not city wide because each site is unique and near different sensitive receptors. Based on future policy makers' directives, the City and County can potentially develop a cost estimate to perform HRA's for each oil and gas drill site citywide, if instructed.

Section 8. Enhanced Public Health Collaboration

A. Local Health Officer Authority

As a result of significant flood disasters and the severe medical care crisis during the winter of 1997-98, the California State Department of Health Services (DHS) received numerous inquiries from local health departments, local emergency services agencies, and others regarding the definition of "health emergencies" and the authority vested in the health officer during emergencies or disasters. The authority and responsibilities are outlined in the applicable sections of the State's Health and Safety Code, Government Code (State Health and Safety Code Appendix A2-37), and other statutes that apply to the authority and responsibility of the health officer. The following sections are related to cities and counties:

Contracts for county performance of city health functions:

"The board of supervisors may contract with a city in the county, and the governing body of a city may contract with the county for the performance by health officers or other county employees of any or all enforcement functions within the city related to ordinances of public health and sanitation, and all inspections and other related functions. (HSC § 101400)

Powers of county health officers in city:

"Whenever a contract has been duly entered into, the county health officer and his or her deputies shall exercise the same powers and duties in the city as are conferred upon city health officers by law. (HSC § 101405)

B. Health Officer Authority Designation

The City currently does not have Health Officer Authority from Los Angeles County. The County could deputize the LAFD with health officer authority for oversight and inspections of oil and gas facilities within the City. The action would be proactive for potential future incidents similar to the events that lead to the voluntary shuttering of the AllenCo Drill Site. It would allow for our local emergency services agency, LAFD, to have more oversight and authority in the event an emergency related to oil and gas operations. The agreement needs to be memorialized in Memorandum of Understanding (MOU) that itemizes emergency protocols, communication strategy, and clean delineation of public health roles and responsibilities. Appendix A2-38 is a copy of similar type of health coordination MOU between the County and Los Angeles World Airports.

C. Hazardous Waste Generator Program Re-Alignment

Hazardous waste is broadly defined as a waste or combination of wastes, which because of its quantity, concentration, or physical or chemical characteristics may either: 1) Cause or significantly contribute to an increase in mortality or an increase in serious irreversible illness; or 2) Pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Hazardous waste can be a solid, semi-solid, liquid or a contained gaseous substance that may have one or more of the following properties:

- Ignitability
- Toxicity
- Reactivity
- Corrosivity
- Persistence or Bioaccumulation
- Carcinogenicity

In California, hazardous waste is classified as either RCRA or non-RCRA. “RCRA” is the acronym for the Resource Conservation and Recovery Act, which was enacted in 1976 to address the huge volumes of municipal and industrial solid wastes generated nationwide. It is important to differentiate between RCRA and non-RCRA waste because the appropriate code numbers must be assigned and used for various legal purposes such as filling out transportation papers (manifests), disposal fees, and treatment determinations. RCRA wastes are federally regulated and non-RCRA wastes are those determined by the State to be hazardous—even though the federal government has not. California has adopted RCRA hazardous wastes from the United States Environmental Protection Agency (USEPA)’s RCRA program [Title 22 of the California Code of Regulations (22 CCR), §66261.100]. Thus, California’s hazardous waste universe is larger than the federal’s. This is an example of state regulations being more stringent than the federal regulations.

Any business that handles a hazardous material and/or hazardous waste of quantities at any one time during a year equal to, or greater than a total volume of 55 gallons, a total weight of 500

pounds, or 200 cubic feet of a compressed gas is a hazardous materials handler and must report Owner/Operator, Business Activities, Inventory, Site Map, and Emergency Response and Contingency Plan and Employee Training Plan information in the California Environmental Reporting System (CERS).

In compliance with state guidelines, each governmental agency designated by the State of California as a Certified Unified Program Agency (CUPA) is authorized to apply statewide standards to each facility within its jurisdiction that treats on site or generates hazardous waste, operates underground storage tanks, or stores hazardous materials. CUPA's are mandated by the State to establish a single billing statement process for the collection of the fees and surcharges associated with the practices of each of the regulated businesses. Some agencies designated as CUPA's collect billing information directly from the facilities themselves. On the other hand, billing information can be supplied to the CUPA by each Participating Agency (PA) that falls within the jurisdiction of that CUPA and that regulates businesses under the Unified Program.

The Hazardous Waste Generator Program and the Hazardous Waste Generator Onsite Treatment activities are authorized under the permit-by-rule, conditionally authorized, and conditionally exempt tiers. The Los Angeles County Fire Department Health Hazardous Materials Division (LACoFD HHMD) Inspections Section implements the Hazardous Waste Generator element of the Unified Program for all businesses in the City of Los Angeles. LACoFD HHMD regulates the storage and disposal of hazardous wastes generated by business and industry through an agreement with LAFD.

Regulations:

- California Health & Safety Code, Division 20, Chapter 6.5
- California Code of Regulations, Division 4.5, Title 22
- Unified Program Ordinance, LA County Code Chapter 12.50
- Los Angeles Municipal Code, Article 7 of Chapter V, Divisions 8, 14

The LACoFD HHMD staff of their Inspections Section inspect hazardous waste-generating businesses to assure compliance with federal, state, and local laws and regulations. The Hazardous Materials Specialists review hazardous materials inventories, contingency plans, tiered permitting notification forms, and recyclable materials reporting forms. Staff use their education and expertise in industrial hygiene and chemistry to identify and assess the use of hazardous materials and environmental fate of hazardous wastes generated by industry. Inspections assure compliance and assist businesses in preventing pollution. Also, the staff investigates complaints about hazardous material and hazardous waste mismanagement at businesses.

LACoFD HHMD continues to have performance problems in the Hazardous Waste Generator inspection and compliance program implementation within the City of Los Angeles. They are currently in a “program improvement agreement” with LAFD CUPA. The program should be transitioned to the City in a phased approach over a specific time period.

LAFD's Strategic Plan 2018-2020 has identified an opportunity to enhance local oversight and improved health coordination related to oil and gas facilities. LAFD's primary goal is to provide exceptional public safety and emergency service. The Department's Strategy #14 is to explore the development of a program to regulate hazardous waste management with the City. The objective is to partner with State and local agencies to explore transferring waste from LA County oversight to the LAFD.

D. Health Coordination Recommendations

1. Instruct LAFD, with the assistance of the City Attorney to negotiate with Los Angeles County in designation of Health Officer Authority to LAFD to enhance local oversight and improve health coordination.
2. Instruct LAFD and Los Angeles County to explore transferring Hazardous Waste Generator program from Los Angeles County Fire Department Health Hazardous Materials Division to the LAFD CUPA for enhanced local oversight and improve health coordination.

Section 9. Potential Mitigations

Relevant Oil & Gas Development Environmental Impact Reports (EIRs) Summary

EIRs are reports that inform the public and public agency decision-makers of significant environmental effects of proposed projects, identify possible ways to minimize those effects, and describe reasonable alternatives to those projects. There have been several EIRs done on oil and gas developments in Southern California in recent years that are relevant to the City of Los Angeles oil fields. The Council directive for this report requested to explore potential mitigations that could be employed by the City. The following listing of eight (8) reports were reviewed for this report back (See Appendix A3-1 for Summaries of each EIR):

1. Baldwin Hills Community Standards District Final Environmental Impact Report (**Baldwin Hills**)
2. ERG Operating Company West Cat Canyon Revitalization Plan Project County Final Environmental Impact Report (**ERG**)
3. E & B Oil Drilling & Production Project, Final Environmental Impact Report for Hermosa Beach (**Hermosa**)
4. Environmental Impact Report for Revisions to the Kern County Zoning Ordinance – 2018 (**Kern County**)
5. Draft Environmental Impact Report for OXY USA Inc. Dominguez Oil Field Development (The proponent withdrew the application for the project in 2015, so there was no final EIR) (**Oxy**)
6. County of Santa Barbara Planning & Development Department, FINAL Environmental Impact Report, Santa Maria Energy Production Plan and Development Plan (**SME**)

7. Aspen Environmental Group. Final Environmental Impact Report. Analysis of Oil and Gas Well Stimulation Treatments in California – Los Angeles Basin (**SB4 EIR**)
8. Whittier Main Oil Field Development Project Final Environmental Impact Assessment (**Whittier**)

Each EIR was evaluated for potential environmental impacts and specific mitigation measures were proposed for each project based up each study. The following are summaries of those mitigations that could be considered as new standard operating conditions for new approvals under LAMC 13.01-H within the City:

Air Quality Related Mitigation Measures

Measure 1: Fugitive Dust Control Plan (Synthesized from Hermosa, Kern, & SB4)

The Applicant shall submit and implement a Fugitive Dust Control Plan that includes SCAQMD mitigations for fugitive dust mitigation, according to Rule 403, and SCAQMD CEQA Guidelines to further reduce emissions, during construction, of particulate matter that is 10 microns or less and 2.5 microns or less in diameter. The Fugitive Dust Control Plan shall include:

- a. Name(s), address (es), and phone number(s) of person(s) responsible for the preparation, submission, and implementation of the plan.
- b. Description and location of operation(s).
- c. Listing of all fugitive dust emissions sources included in the operation.

The following dust control measures shall be implemented:

1. All onsite unpaved roads and all construction areas that have been previously graded and are inactive for ten days or more shall be effectively stabilized using water or non-toxic soil stabilizers that can be determined to be as efficient as or more efficient for fugitive dust control than California Air Resources Board approved soil stabilizers, and that shall not increase any other environmental impacts including loss of vegetation
2. All material excavated or graded will be sufficiently watered to prevent excessive dust. Watering will occur as needed with complete coverage of disturbed areas. The excavated soil piles will be watered as needed to limit dust emissions to less than 20% opacity or covered with temporary coverings.
3. Construction activities that occur on unpaved surfaces will be discontinued during windy conditions when winds exceed 20 miles per hour and those activities cause visible dust plumes. Construction activities may continue if dust suppression measures are used to minimize visible dust plumes.
4. Track-out debris onto public paved roads shall not extend 50 feet or more from an active operation and track-out shall be removed or isolated such as behind a locked gate at the conclusion of each workday.
5. Expeditiously remove the accumulation of mud or dirt from adjacent public streets at least once every 24 hours when construction activities are occurring.

6. Use enclosures, covers, flexible intermediate bulk containers, or rigid intermediate bulk containers for the storage, handling, and transfer of bulk dry materials such as sand, gravel and other dry additives used in well drilling or reworks
7. All hauling materials should be moist while being loaded into dump trucks.
8. All haul trucks hauling dirt, soil, sand, and other loose materials on public roads shall be covered (e.g., with tarps or other enclosures that would reduce fugitive dust emissions).
9. Soil loads should be kept below 6 inches from the freeboard of the truck.
10. Drop heights should be minimized when loaders dump soil into trucks.
11. Gate seals should be tight on dump trucks.
12. Traffic speeds on unpaved roads shall be limited to 25 miles per hour and speeds of construction vehicles on unpaved surfaces shall be limited to 15 miles per hour.
13. All grading activities shall be suspended when visible dust emissions exceed 20%.
14. Other fugitive dust control measures as necessary to comply with South Coast Air Quality Management District Rules and Regulations.
15. Disturbed areas should be minimized; i.e. limit the size of the area subject to excavation, grading, or other construction disturbance at any one time to avoid excessive dust.
16. Disturbed areas should be re-vegetated as soon as possible after disturbance if area is no longer needed for oil and gas activities.

Measure 2: Air Monitoring Plan (Synthesized from Baldwin Hills, Hermosa, SB4, Whittier)

The Operator shall develop and implement an Air Monitoring Plan. The Plan shall provide for the monitoring of total hydrocarbon vapors and hydrogen sulfide and total hydrocarbon vapors at all perimeter locations of the facility as well as at strategic locations near processing equipment. At all times during operations, drilling, re-drilling and workover operations, the Operator shall maintain monitoring equipment that shall monitor and digitally record the levels of hydrogen sulfide and total hydrocarbon vapors. Such monitors shall provide automatic alarms that are audible and visible to the Operator of the drilling equipment for the drill rig monitors, and gas plant for the gas plant monitors, shall be triggered by the detection of hydrogen sulfide or total hydrocarbon vapors. Alarm points shall be set at a maximum of 1 and 5 ppm H₂S and 500 and 1,000 ppm hydrocarbons, with the higher level requiring shut-down of drilling or plant operations and the lower level requiring notification to appropriate agencies, including the Fire Department and SCAQMD. A meteorological station to monitor wind speed and direction under the guidance and specification of the SCAQMD shall be installed at the site. The Air Monitoring Plan shall be reviewed and approved by the local municipalities and the SCAQMD.

Measure 3: Odor Minimization Plan (Synthesized from Baldwin Hills and Kern)

The Operator shall develop and implement an Odor Minimization Plan, submitted to and approved by the City and the SCAQMD. The Odor Minimization Plan shall address reducing the frequency from potential sources of odors from all site equipment, including oil field equipment, wells and drilling operations, any bioremediation farms, any mud handling systems, temporary operations such as truck loading, and measures to reduce or eliminate these odors (e.g., containment, design modifications, carbon canisters). The Plan shall include a designated contact for odor complaints. The Plan shall address issues such as facility information, buffer zones, signs with contact information, logs of odor complaints, the protocol for handling odor complaints and

odor release investigations and methods instituted to prevent a re-occurrence. The Plan shall require that all odor complaints and issues be immediately communicated to the City and that the City shall have the authority to implement and enforce contingency measures to ensure that any nuisance odors from the facility are eliminated. The Odor log and report files shall be available for public review upon request.

Measure 4: Equipment Emission Reductions (Synthesized from Hermosa, SME and SB4)

The Operator shall implement a NO_x, SO_x and ROC reduction program including the following, or equivalent, measures to the satisfaction of the SCAQMD:

- Electrify service equipment and auxiliary power units where feasible; i.e. any temporary electric power shall be obtained from the electrical grid, rather than portable diesel or gasoline generators.
- All off-road construction equipment shall be tuned and maintained according to manufacturers' specifications.
- All off-road trucks shall meet EPA 2010 model year NO_x emission requirements. If the operator determines that a 2010 model year truck fleet or portion thereof cannot be obtained the operator shall require the use of trucks that meet EPA 2007 model year NO_x emissions requirements. If the drill site fleet requirements cannot be met with 2010 or 2007 EPA model year truck emissions or portion thereof the operator shall require a certified NO_x emissions level of less than 2.0g/bhp-hour for trucks used at the drill site.
- All off-road diesel engines shall meet at a minimum the Tier 3 (with proper diesel particulate controls), or better (Tier 4) California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations (CCR) Title 13, Division 3, Chapter 9, Article 4, Sec. 2423(b)(1).
- All off-road diesel construction equipment with greater than 100- horsepower engines shall meet EPA Tier 4 NO_x requirements.
- In addition, if not already supplied with a factory-equipped diesel particulate filter, all construction equipment shall be outfitted with Verified Diesel Emissions Control Strategies (VDECS) devices certified by CARB. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 VDECS diesel emissions control strategy for a similarly sized engine as defined by CARB regulations.
- The Operator shall install CARB-Verified Level 3 diesel catalysts on all diesel-powered drilling equipment or utilize diesel engines that have an equivalent PM emission rate (Tier 4 engines) or electric drilling rigs. The current list of CARB-Verified Level 3 diesel catalysts is located at <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>. Catalysts or engine certifications shall demonstrate achieving 85% reduction for diesel particulate matter.
- Limit onsite truck idling to less than 5 minutes.
- A copy of the certified tier specification, best available control technology documentation, or the CARB or SCAQMD operating permit for each piece of equipment shall be kept onsite during all operations.
- The Operator shall limit any microturbine PM emissions to 0.0035 lbs/mmBtu, or an equivalent reduction in the number and/or size of the microturbines, in order to reduce

emissions to below the localized thresholds. The City shall be responsible for ensuring that the applicant will be subject to permit conditions that limit emissions from the set of microturbines, not just individual permit units.

- The Operator shall limit routine flaring during the peak day to the equivalent of less than 4 hours per day (at full produced gas flow or the hours with the associated equivalent throughputs), or longer with the use of a low emissions flare systems and ensure that all field-wide produced gas is directed to the steam generators, if capacity allows.
- The Operator shall ensure that any steam generators are operated with a limit of 151.5 mmBTU/hr, as specified by the Applicant, through fuel gas monitoring and other applicable methods, as specified by the APCD.

Further reduce NOx emission if needed by either:

(1) Mandatory participation in a proposed or established program for offsetting criteria air pollutants operated by an air pollution control district or air quality management district by purchasing emission offsets to reduce remaining NOx emissions to less than significant levels;

(2) Utilize BACT steam boilers with a NOx limit of 9 ppm;

(3) Utilize trucks that meet EPA 2010 emission standards and off-road equipment that meets EPA Tier 4 to the extent feasible.

Measure 5: Use of Tier III diesel engines on off-road construction equipment (Synthesized from Hermosa, SB4, and Whittier)

- All diesel equipment used at the site shall meet EPA Tier 3 or better (Tier 4) emission requirements and be equipped with a CARB Level 3 diesel particulate filter to reduce Diesel PM emissions. Workover rigs operated at the project site shall have cumulative total DPM emissions below 1.5 lbs/year or shall utilize electric drive/sources.
- All off-road diesel engines to meet at a minimum the Tier 3 (with proper diesel particulate controls), or better (Tier 4) California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations (CCR) Title 13, Division 3, Chapter 9, Article 4, Sec. 2423(b)(1).
- All off-road diesel construction equipment with greater than 100-horsepower engines shall meet EPA Tier 3 or better (Tier 4) NOx requirements. If the operator determines that a Tier 4 fleet or portion thereof cannot be obtained, the lead agency shall require the use of construction equipment that meets Tier 3 emissions requirements or utilize other CARB-verified emission control technologies to achieve the same level of emission reduction.
- All off-road trucks shall meet EPA 2010 model year NOx emission requirements. If the operator determines that a 2010 model year truck fleet or portion thereof cannot be obtained the operator shall require the use of trucks that meet EPA 2007 model year NOx emissions requirements. If the drill site fleet requirements cannot be met with 2010 or

2007 EPA model year truck emissions or portion thereof the operator shall require a certified NOx emissions level of less than 2.0g/bhp-hour for trucks used at the drill site.

Measure 6: Use of Tier II diesel engines on drilling rigs. (Synthesized from Baldwin Hills)

- The Operator to conduct engine certifications of all drill rig engines to ensure they meet EPA Tier 2 emission requirements.
- The Operator to maintain records of the installation of second generation heavy duty diesel catalyts on all drill rig engines.
- The Operator to include activity limitations and engine exhaust performance specifications with contracts for Construction Activity, Drilling Rigs, Workover Rigs and PERP Engines. Implement activity limitations and engine exhaust performance specifications.

Measure 7: Tank and system monitoring. (Synthesized from Baldwin Hills, Oxy, SME, SB4, and Whittier)

The Operator shall install a detection system that will monitor vapor space on all crude oil tanks. The detection system shall be capable of monitoring pressure in the vapor space of the tanks and notifying the operator via an alarm when the pressure in the tanks gets within 10 percent of the tank relief pressure. If the tank pressure exceeds the relief pressure, the Operator shall report the incident to the SCAQMD as a breakdown pursuant to Rule 430, and submit a report of the breakdown to the Los Angeles County Fire Chief and the SCAQMD, which shall detail the corrective actions the Operator shall take to avoid exceeding the tank relief pressure.

All flanges and valves will be monitored quarterly for leakage per the requirements of SCAQMD Rule 1173. This rule is specifically intended to control VOC emission leaks from components in hydrocarbon processing facilities, and requires a rigorous testing, record keeping and, when required, repair program.

Ambient air monitoring for total hydrocarbon compounds and H₂S concentrations shall be used to verify the goals of the leak detection program.

The operator is to install methane and carbon dioxide sensors at existing wells and new wells within the drill site. The operator shall collect data and study methane leaks and other vented or fugitive emission sources. The CARB Draft Test Protocol “Detection and Quantification of Fugitive and Vented Methane, Carbon Dioxide, and Volatile Organic Compounds from Crude Oil and Natural Gas Facilities” (December 2010) may be used as a means of complying with this measure.

The operator is to reduce emissions by implementing the following emission control strategies defined by United Nations Framework Convention on Climate Change (UNFCCC) “Approved Methodologies” for projects in the Clean Development Mechanism (CDM) program, as follows:

Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities. (AM0023 CDM Methodologies Booklet; Tenth edition, Information up to EB 101; November 2018)

Measure 8: Closed Systems (Synthesized from Baldwin Hills, Oxy, and SB4)

The Operator to develop a procedure that requires the use of closed systems for all produced water and crude oil during production, processing and storage, except those used for sampling only. In addition, the Operator is to install vapor recovery systems for organic liquid storage tanks.

Any potential odor sources, such as produced fluids and gases, and treating chemicals, will be maintained in closed systems. In addition, all flanges and valves will be monitored quarterly for leakage per the requirements of SCAQMD Rule 1173. This rule is specifically intended to control VOC emission leaks from components in hydrocarbon processing facilities, and requires a rigorous testing, record keeping and, when required, repair program.

Measure 9: Vapor Recovery (Synthesized from Hermosa and Whittier)

- The Operator shall install a compressor seal vent collection system. In the event of a seal leak, vapors shall be collected and sent to the vapor recovery system or flare for destruction.
- Vapor recovery on crude oil tanks shall achieve a minimum of 99 percent recovery of fugitive emissions.
- The Operator shall use an odor suppressant spray system or vapor capture hood and carbon filter system on any mud shaker tables, and shall install carbon capture canisters on all tanks (permanent and portable) that are not equipped with vapor recovery, containing potentially odiferous materials (for example; the mud baker-type tanks) for all drilling operations so that no odor can be detected at the closest receptor (e.g., residences or other sensitive receptors).

Measure 10: Flares (Synthesized from Hermosa, SB4, and Whittier)

- The Operator shall at all times have a gas buster and SCAQMD-approved portable flare at the site and connected for immediate use to circulate out and combust any gas encountered during well completions, reworks, and drilling. The flare shall be capable of recording the volume of gas that is flared. The operator shall report any flared gas from drilling to the local Fire Chief and the SCAQMD.
- The Operator shall use low-emissions flare systems to achieve flare NO_x emissions of less than 0.06 lb/mmBTU, according to SCAQMD BACT requirements.
- The Operator shall limit flaring and drilling during the peak day to the equivalent of drilling and full-flow flaring combined to less than 3 hours per day (at full gas plant flow or the equivalent throughput) or limiting flaring only to less than 4 hours per day (at full gas plant flow or the equivalent throughputs).
- The Operator shall limit flaring to a total of 5 hours per day at the full flaring capacity (or to an equivalent volume of flared gas) during all emergency or routine flaring events in order to ensure that NO_x emissions are reduced below the thresholds. Lower NO_x emission combustors or other equivalent measures can also be used to satisfy the

requirement.

- The Operator shall install a compressor seal vent collection system. In the event of a seal leak, vapors shall be collected and sent to the vapor recovery system or flare for destruction.

The Operator is to reduce emissions by implementing the following emission control strategies defined by UNFCCC “Approved Methodologies” for projects in the Clean Development Mechanism (CDM) program, as follows:

- Recovery and utilization of gas from oil fields that would otherwise be flared or vented. (AM0009. CDM Methodologies Booklet - Tenth edition - Information up to EB 101 - November 2018.)
- Flare (or vent) reduction and utilization of gas from oil wells as a feedstock. (AM0037. CDM Methodologies Booklet - Tenth edition - Information up to EB 101 - November 2018.)
- Recovery of gas from oil wells that would otherwise be vented or flared and its delivery to specific end-users. (AM0077. CDM Methodologies Booklet - Tenth edition - Information up to EB 101 - November 2018.)

Measure 11: Permit to Operate (Synthesized from Whittier)

The Operator shall comply with all SCAQMD regulations, including but not limited to Regulation IV (Prohibitions), Regulation XIII (New Source Review), Regulation XI (Source Specific Standards), and Regulation XIV (New Source Review for Toxic Air Contaminants). The operator shall implement best available control technology and obtain emission offsets as required by SCAQMD Regulation XIII and/or Regulation XX for new and modified permitted emission sources. Emission offsets are required for all emission increases associated with stationary sources, thus, minimizing the impacts associated with emissions from stationary sources.

Measure 12: Odor Suppressant Chemicals (Synthesized from Baldwin Hills, Hermosa, Oxy, and Whittier)

The Operator shall use an odor suppressant spray system or vapor capture hood and carbon filter system on the mud shaker tables for all drilling operations, and shall install carbon capture canisters on all tanks (permanent and portable) that are not equipped with vapor recovery, containing potentially odiferous materials (for example; the mud baker-type tanks) for all drilling operations so that no odor can be detected at the closest receptor (e.g., residences,). Procedures shall be included in the Odor Minimization Plan.

Measure 13: Distance from Sensitive Receptors (Synthesized from Kern)

The Site Plan shall include a Site Vicinity Figure showing the location of any sensitive receptor(s) within 3,000 feet of the construction site (potential impact area) for proposed new wells or other ancillary facility or equipment.

a. If there are no sensitive receptors within this potential impact area, then no construction mitigation measures shall be required.

b. If there are sensitive receptors within the potential impact area, then additional information must be provided showing the setback from the closest edge of the well pad to the property line of the nearest sensitive receptor. The minimum distances shall be as follows:

Well Depth => Minimum Setback

- (10,000 Feet) => (367 Feet)
- (5,000 Feet) => (116 Feet)

c. If the above setbacks cannot be met, the Operator shall implement the following risk minimization measures, or other such measures that are demonstrated by the Operator to achieve a level of risk less than the threshold risk level:

1. Placement of engines in the potential impact area away from the sensitive receptors.
2. Utilize directional drilling to locate rig further away from the sensitive receptor(s).
3. Use of late-model engines, low-emission diesel products, alternative cleaner fuels (e.g., natural gas or liquefied petroleum gas), engine retrofit technology, add-on devices such as diesel particulate filters or oxidation catalyst, and/or other options as such become available to reduce emissions from off-road and other equipment.
4. Utilize electricity line power if available.
5. Shutdown all equipment when not in use, and otherwise minimize engine idling by limiting idling to 5 minutes.
6. Use of automatic rigs.
7. Assist and pay to relocate residents to an area hotel during well construction, drilling, and completion activities.

Measure 14: Sulfur Content of Fuel (Synthesized from ERG)

The Operator to design gaseous fuel supply system to achieve specified sulfur content. The Operator shall maintain and operate the gaseous fuel supply system to achieve specified sulfur content.

Measure 15: Meteorological Station (Synthesized from Baldwin Hills)

The Operator to install a meteorological station at the Oil Field. Develop a meteorological station specification and install the station and use in managing odor and air quality concern tracking.

Measure 16: Emission Offsets or RECLAIM credits (Synthesized from Hermosa and Whittier)

The Operator shall implement a program to quantify and reduce greenhouse gas emissions associated with operations, such as using green electrical power to run equipment, using high efficiency pumps and electrical devices, requiring diesel engines to use biodiesel, or offsite

measures that could offset greenhouse gas emissions. GHG emissions levels shall be quantified and reported to the City and to the SCAQMD for operations on an annual basis, and, if GHG emissions exceed the SCAQMD thresholds, then a GHG Emission Reporting and Reduction Program shall be implemented to reduce emissions to less than the threshold value of 10,000 metric tonnes CO₂e annually. The reduction program shall focus on on-site and local/basin area methods for GHG reductions.

The Operator shall provide credits for all GHG emissions generated above the threshold of 10,000 MTCO₂e per year. A GHG Reporting and Reduction Plan shall be submitted to the SCAQMD and the City detailing the measures to be implemented to achieve the required reductions, updated annually, and shall include specifications on the protocol, vintage, and registry for any offsite mitigation. The following mitigation credits shall not require prior City or SCAQMD approval:

1. Credits generated within Los Angeles County per an approved SCAQMD protocol;
2. Credits generated within the State of California per an approved SCAQMD protocol;
3. Credits that are generated and verified under the CAPCOA GHG Rx program;
4. Credits that are generated and verified under the voluntary SCAQMD Regulation XXVII;
5. Verified credits registered with the Climate Action Reserve or the American Carbon Registry.

In addition, independently verified GHG credits available through other carbon registries that follow specific protocols may be eligible for offsite mitigation, subject to review and prior approval by the City and the SCAQMD. The general criteria for acceptable credits include:

- Real: emission reduction must have actually occurred, as the result of a project yielding quantifiable and verifiable reductions or removals.
- Additional/Surplus: an emission reduction cannot be required by a law, rule, or other requirement.
- Quantifiable: reductions must be quantifiable through tools or tests that are reliable, based on applicable methodologies, and recorded with adequate documentation.
- Verifiable: The action taken to produce credits can be audited and there is sufficient evidence to show that the reduction occurred and was quantified correctly.
- Enforceable: An enforcement mechanism must exist to ensure that the reduction project is implemented correctly.
- Permanent: Emission reductions or removals must continue to occur for the expected life of the reduction project. Operational/drilling GHG emissions from stationary and mobile sources shall be quantified and reported to the City and to the SCAQMD annually. Emissions reporting will follow the same reporting format and procedures as required by the Mandatory Reporting Rule.

Noise Related Mitigation Measures

Measure 1: Construction Noise Control Plan (Synthesized from ERG and Kern)

The Operator shall develop and implement a Construction Noise Control Plan to minimize and avoid noise from construction activities to the maximum extent feasible. The Plan shall be prepared by an acoustic consultant approved by the City and the Plan shall be subject to City review and concurrence. The Plan shall document nighttime baseline conditions. The Operator shall implement noise reduction techniques. The Operator shall resolve public noise complaints and inform the City of complaint resolution within 48 hours. The Operator shall limit the number of wells developed to no more than three (3) annually where occupied sensitive receptors are affected by nighttime noise levels greater than 40 dBA.

The Construction Noise Control Plan shall include a Site Vicinity Figure showing the location of any sensitive receptor(s) within 3,000 feet of the drill site (potential impact area) for the wells or other ancillary facility or equipment.

a. If there are sensitive human noise receptors within the potential impact area, then additional information must be provided showing the type of equipment being used and the noise contours with levels not exceeding 65 dBA at the nearest exterior wall of the sensitive receptor or more than 1 dBA higher than the ambient noise levels, if in excess of 65 dBA. If noise levels are shown to exceed 65 dBA or more than 1 dBA higher than the ambient noise levels in excess of 65 dBA, then one or more of the following mitigation measures shall be taken:

1. A temporary sound attenuation wall(s) shall be placed at the optimal distance to the sensitive receptor, as determined by an acoustical expert.
2. Construction of a temporary berm shall be placed at the optimal distance to the sensitive receptor, as determined by an acoustical expert.
3. Modification of equipment to reduce noise impacts.
4. Implementation of a quiet mode drilling plan or other sound reduction technology or practices as documented in a report submitted to the City.
5. Arranging for the voluntary, temporary relocation of the occupants of the sensitive receptor during the construction period.
6. Use the following setback distances for the activities specified:

Construction Noise Setbacks - Activity -Setback Distance (feet):

- Well Pad Preparation- 800 ft
- Drilling (Well Advancement) - 1,420 ft
- Drilling (Pull Out Of Well/Borehole) – 750 ft
- Large-Scale Exploratory Drilling - 3,000 ft
- Well Workover – 850 ft

Measure 2: Cumulative Construction Noise Control Plan (Synthesized from ERG)

The Operator shall prepare and implement a Cumulative Construction Noise Control Plan to minimize and avoid noise from cumulative construction activities to the maximum extent feasible. The Plan shall be prepared by an acoustic consultant approved by the City and the Plan

shall be subject to City review and concurrence. The Plan shall document nighttime baseline conditions. The Operator shall implement noise reduction techniques. The Operator shall resolve public noise complaints and inform the City of complaint resolution within 48 hours. No cumulative well drilling is to occur when a 3 dBA increase to ambient nighttime conditions could occur at sensitive receptors.

Measure 3: Operations Noise Control Plan (Synthesized from ERG and Whittier)

The Operator shall prepare and implement an Operations Noise Control Plan. The Plan shall be prepared by an acoustic consultant approved by the City and the Plan shall be subject to City review and concurrence.

The Operator shall ensure that Leq noise levels from operational activities, measured as 1-hour Leq, produce less than a 3 dBA increase over the minimum baseline hourly average level at the closest residential receptor to the facility.

The Operator shall implement noise reduction techniques.

The Operator shall avoid noise from workover drilling activities to the maximum extent feasible.

The Operator shall limit workover drilling of wells developed under any project to no more than three (3) annually where occupied sensitive receptors are affected by nighttime noise levels greater than 40 dBA.

The Plan shall document nighttime baseline conditions.

The measures in the Plan shall include, but not be limited to:

- (1) installing sound enclosures or buildings around all compressors;
- (2) installing noise barriers around all pumps and air coolers;
- (3) installing ambient-sensitive backup indicators on all equipment requiring backup indicators;
- (4) installing sound enclosures or buildings around all the oil area pumps (e.g., shipping, IGFC, water injection, water booster, reject pumps);
- (5) installing sound enclosures or buildings around refrigeration units;
- (6) installing a secondary, 16-foot tall sound wall on the south, west and north sides of any gas plants;
- (7) ensuring that all office equipment (i.e., air conditioners, heating, ventilation) produces low noise levels or is surrounded by noise barriers; and
- (8) limiting traffic on the drill site access roads to within 7 a.m. to 7 p.m., except for emergencies.

Measure 4: Drilling Noise (Synthesized from Baldwin Hills, Kern, and Whittier)

The Operator shall develop and implement a Noise Reduction Plan for all drilling (testing, development, and re-drills and workovers) to ensure that the Leq (Equivalent Continuous Sound Level) noise levels from activities, measured as a 1-hour Leq, is less than a 3-dBA increase at the closest sensitive residential receptor and the closest sensitive recreational receptor. The Plan shall be prepared by an acoustic consultant approved by the City and the Plan shall be subject to City review and concurrence. The measures in the Plan shall include but not be limited to the following:

- (1) Enclose the drill rig area in soundproof barriers 30 feet high on the south and west sides;
- (2) Utilize a central generator type drilling rig, with the generators the only diesel engines onsite and enclosed in a soundproofed generator house with appropriate grade muffler systems, or install sound enclosures around all diesel engines with appropriate grade muffler systems
- (3) Install noise barriers around the drill rig floor, mud mixers, cleaners, conveyers, and shakers;
- (4) Enclose drawworks brake area with soundproofing shroud;
- (5) Install pads on V-door and other appropriate areas, timbers and pads on drill deck, pads between drill and casing pipe while in storage, and pad and timbers at the boards on the mast to reduce metal-on-metal noise (for both drilling and workover operations);
- (6) Enclose the drilling mast boards area (on drilling and workover rigs) with barriers 2 inches thick and 2 pounds per square foot in density at least 5 feet above and below any noise sources; and
- (7) Install ambient sensitive backup indicators on all equipment requiring backup indicators.
- (8) Implementation of a quiet mode drilling plan or other sound reduction technology or practices as documented in a report submitted to the City.
- (9) The Operator to provide noise monitoring at sensitive receptors likely to be affected by any and all future new well drilling to verify that the baseline noise level is not exceeded by 3dBA.

Measure 5: Sound Barriers (Synthesized from Baldwin Hills, Hermosa, Kern, Oxy, SB4 and Whittier)

Utilize Sound Barriers to Reduce Noise for all construction:

- Operator to utilize temporary construction noise barriers to block the line-of-sight between construction activity and the nearest sensitive uses
- Increase the height of the noise barrier on all sides of the site to 35-feet. Minimum sound insulation performance of the barrier shall be at the appropriate Sound Transmission Class (STC) as determined by an acoustic consultant approved by the City.
- Any gates shall have no holes or gaps in them and shall be designed to deliver a minimum sound insulation performance at the appropriate STC as determined by an acoustic consultant approved by the City. Any gaps above the gates must be closed off, by

extending the acoustical barrier material from the sides. The intent is to maintain the acoustical integrity of the noise barrier in all locations.

- Provide full acoustical enclosures around the mud pumps. The enclosures shall be factory-assembled by a manufacturer with a proven track-record of building noise-reducing enclosures for industrial applications. The total sound power level radiated by the enclosure shall not exceed 77 dBA, including noise contributions from: the access door(s), observation windows, ventilation openings and ventilation fans (if required).
- Apply outdoor acoustical panels to all available surfaces of walls that face the production operations above a height of 10-feet above the ground. The purpose of the acoustical panels is to control reflection of production noise in the direction of the sensitive uses. The acoustical panels shall offer the minimum sound absorption performance determined by an acoustic consultant approved by the City.
- Placement of a temporary sound attenuation wall(s) shall be placed at the optimal distance to the sensitive receptor, as determined by an acoustical expert.
- Construction of a temporary berm shall be placed at the optimal distance to the sensitive receptor, as determined by an acoustical expert.
- Quieted generators or portable barriers shall be used around the generators for all off-site pipeline construction locations.

Utilize Sound Barriers to Reduce Noise for all drilling (testing, development, and re-drills and workovers) to ensure that the Leq noise levels from activities, measured as a 1-hour Leq, is less than a 3-dBA increase at the closest sensitive residential receptor and less than a 5-dBA increase at the closest sensitive recreational receptor:

- Enclose the drill rig area in soundproof barriers 30 feet high on areas near sensitive receptors;
- Utilize a central generator type drilling rig, with the generators the only diesel engines onsite and enclosed in a soundproofed generator house with appropriate grade muffler systems, or install sound enclosures around all diesel engines with appropriate grade muffler systems;
- Install noise barriers around the drill rig floor, mud mixers, cleaners, conveyers, and shakers;
- Enclose drawworks brake area with soundproofing shroud;
- Install pads on V-door and other appropriate areas, timbers and pads on drill deck, pads between drill and casing pipe while in storage, and pad and timbers at the boards on the mast to reduce metal-on-metal noise (for both drilling and workover operations);
- Enclose the drilling mast boards area (on drilling and workover rigs) with barriers 2 inches thick and 2 pounds per square foot in density at least 5 feet above and below any noise sources; and

Utilize Sound Barriers to Reduce Noise for all operations to ensure that Leq noise levels from operational activities, measured as 1-hour Leq, produce less than a 3 dBA increase over the minimum baseline hourly average level at the closest residential receptor to the facility:

- Installing sound enclosures or buildings around all compressors;
- Installing noise barriers around all pumps and air coolers;
- Installing sound enclosures or buildings around all the oil area pumps (e.g., shipping, IGFC, water injection, water booster, reject pumps);
- Installing sound enclosures or buildings around refrigeration units;
- Installing a secondary, 16-foot tall sound wall on the south, west and north sides of the gas plant;
- Ensuring that all office equipment (i.e., air conditioners, heating, ventilation) produces low noise levels or is surrounded by noise barriers; and

Utilize Sound Barriers to Reduce Noise Levels near Sensitive Land Uses. Within 900 feet of a property containing a sensitive receptor, including residential, school, or hospital land uses Operator to incorporate noise control features to reduce all noise from well stimulation activities to Ldn to 70 dBA or less at the nearest residential property lines. These conditions include, but are not limited to:

- Install 16-ft high noise barriers between residential land uses and well pad,
- Place pump diesel engine drives into enclosures that provide 15 dBA reduction, and
- Install best available muffler technology on all diesel engines.

This performance standard includes cumulative noise should multiple well operations occur simultaneously and affect the same sensitive receptor(s).

Measure 6: Location/Setbacks/Logistics (Synthesized from Baldwin Hills, Kern, Oxy, SME, SB4, Whittier)

Location/Setbacks:

- 1) The Site Plan shall include a Site Vicinity Figure showing the location of any sensitive receptor(s) within 3,000 feet of the drill site, construction site or other ancillary facility or equipment. If there are sensitive human noise receptors within the potential impact area, then additional information must be provided showing the type of equipment being used and the noise contours with levels not exceeding 65 dBA at the nearest exterior wall of the sensitive receptor or more than 1 dBA higher than the ambient noise levels, if in excess of 65 dBA. Use the following setback distances for the activities specified:

Construction Noise Setbacks: Activity -Setback Distance (feet):

- Well Pad Preparation – 800 ft
- Drilling (Well Advancement) - 1,420 ft
- Drilling (Pull Out Of Well/Borehole) – 750 ft
- Large-Scale Exploratory Drilling - 3,000 ft
- Well Workover - 850 ft

2) Control Noise Levels near Sensitive Land Uses. Within 900 feet of a property containing a sensitive receptor, including residential, school, or hospital land uses, the Operator is required to incorporate noise control features to reduce all noise from drilling, maintenance or construction activities to Ldn to 70 dBA or less at the nearest residential property lines. This performance standard includes cumulative noise should multiple activities occur simultaneously and affect the same sensitive receptor(s).

- Operator to locate all stationary noise-generating construction equipment as far as possible from sensitive land uses
- Construction staging sites shall be located on properties restricted to industrial and commercial uses only.
- To the extent possible, construction staging sites shall not be located within 500 feet of a sensitive receptor. Where this is not possible, the contractor shall erect noise barriers, or ensure that existing structures provide adequate noise barriers between the staging site and the sensitive receptor.
- Stationary noise sources such as generators and compressors shall be positioned as far away as possible from noise sensitive areas.
- New oil and gas wells shall be a minimum of 500 feet from the closest sensitive receptor.

Logistics:

To minimize the time during which any single noise-sensitive receptor is exposed to construction noise, construction shall be completed as rapidly as possible.

- Locate the construction parking and staging area away from sensitive receptors (schools and residences).
- Construction equipment shall be operated only when necessary, and shall be switched off when not in use.
- To the extent practicable, construction equipment shall be stored in the construction zone while in use. This will eliminate noise associated with repeated transportation of the equipment to and from the site.

- **Construction Hour Limits.** To minimize potentially significant noise impacts to adjacent residences, activities involving heavy equipment or heavy-duty truck traffic within 1,600 feet of residences shall be limited to the hours of 7 AM to 5 PM, with no work on weekends.

Measure 7: Scheduling (Synthesized from Baldwin Hills, Hermosa, Oxy, SME, and Whittier)

- **Construction Hour Limits.** The Operator to develop and implement an oil field policy for construction that limits construction (including arriving and departing workers and construction activities) to between the hours of 7:00 AM and 7:00 PM weekdays. There shall be no construction on Saturdays, Sundays or legal holidays.
- **Construction Hour Limits near sensitive receptors.** To minimize potentially significant noise impacts to adjacent residences, activities involving heavy equipment or heavy-duty truck traffic within 500 feet of residences shall be limited to the hours of 7:00 AM to 5:00 PM, with no work on weekends and legal holidays.
- **Deliveries.** Limit all deliveries at the Project Site (including all material, supplies, well workover, gas plant, and other operations deliveries) to the hours from 7:00 AM to 6:00 PM, Monday through Friday, and prohibit activities on weekends and legal holidays. Within 500 feet of a sensitive receptor, limit all activity between the hours of 7:00 AM to 5:00 PM and prohibit activities on weekends and legal holidays.
- All contracts with construction personnel shall specify the allowable work hours.
- **Quiet-mode.** The operator shall institute a quiet-mode for all drilling activities between 7:00 PM and 7:00 AM Quiet-mode operation would apply to both drilling and operations. The operator shall implement a “Super-Quiet Mode” of operation between the hours of 2:00 AM and 5:00 AM, during which time drilling would essentially be suspended to minimize noise.
- **Access Roads.** The operator shall limit traffic on the access roads to within 7:00 AM to 7:00 PM, except for emergencies.
- **Public Notice.** Public notice shall be given to residents and business at least two weeks prior to the commencement of construction activities. The notice shall identify the location and dates of construction, and the name and phone number of the contractor’s contact person in case of complaints. The public notice shall encourage the residents to contact this person rather than the police in case of complaint. Residents shall also be kept informed of any changes to the schedule. The contractor’s designated contact person shall be on-site throughout Project construction with a mobile phone. If a complaint is received, the contact person shall take whatever reasonable steps are

necessary to resolve the complaint. If possible, a member of the contractor's team shall also travel to the complainant's location to understand the nature of the disturbance.

Measure 8: Quiet Mode/Low Noise (Synthesized from Baldwin Hills, Hermosa, Kern, Oxy, and Whittier)

The operator shall implement a quiet mode drilling plan or other sound reduction technology or practices as documented in a report submitted to the City.

Quiet-mode. The Operator shall institute a quiet-mode for all drilling activities between 7:00 PM and 7:00 AM. Quiet-mode operation would apply to both drilling and operations. The operator shall implement a "Super-Quiet Mode" of operation between the hours of 2:00 AM and 5:00 AM, during which time drilling would essentially be suspended to minimize noise. Quiet mode actions would include:

- 1) Using signalers for all backup operations instead of backup alarms and turning off backup alarms;
- 2) Using radios instead of voice communication;
- 3) Minimizing crane use and pipe handling operations, pipe offloading from trucks and board loading during daytime to the maximum extent feasible and nighttime loading only for safety reasons; and
- 4) Limiting process alarms and communications over any broadcast system to the maximum extent feasible during all operations and use only for safety reasons.

Equipment selection.

- Operator to select construction equipment for low- noise output. All construction equipment powered by internal combustion engines shall be properly muffled and maintained.
- Where possible, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used rather than pneumatic power. If compressors powered by diesel or gasoline engines are used, they shall be contained or have baffles to help abate noise levels.
- Well workover rigs shall be powered by electric drive/sources or "ultra-quiet" generators or engines - either diesel or natural gas-powered - that are capable of operating below the noise significance thresholds for daytime operation.

Measure 9: Metal on Metal Noise (Synthesized from Baldwin Hills, Hermosa, Kern, Oxy, and Whittier)

The Operator shall develop and implement an equipment maintenance program that includes regular inspection for worn bearings; metal-on- metal contact etc., to limit tonal noise from well workover equipment, pumps, gas plant equipment and any other operations maintenance.

To reduce metal-on-metal drilling noise, the Operator shall install pads on V-door and other appropriate areas, timbers and pads on drill deck, pads between drill and casing pipe while in

storage, and pad and timbers at the boards on the mast to reduce metal-on-metal noise (for both drilling and workover operations).

All construction equipment shall be properly maintained to reduce metal-on-metal noise.

The Operator shall maintain all construction machinery according to the manufacturers' specifications and ensure that mufflers and silencers are maintained properly.

Measure 10: Acoustical Treatments/Silencers (Synthesized from Hermosa, Kern, Oxy, and Whittier)

The Operator shall modify equipment to reduce noise impacts:

- All construction equipment shall be equipped with suitable exhaust and air-intake silencers in proper working order.
- Provide enhanced inlet and outlet silencers for any Hydraulic Power Unit enclosures and upgrade the walls, roof and floor of the enclosure as necessary to limit the total sound power level radiated by the enclosure to 77 dBA.
- The acoustical shroud around the drilling mast shall be comprised of acoustical blankets with a minimum STC rating of 25, or the rating as determined by an acoustical expert. The acoustical blankets shall provide continuous coverage of three sides of the mast and shall cover the uppermost portion of the fourth side.
- Provide acoustical treatment within the combustor fan housing and/or at the ventilation openings, as necessary to limit the total sound power level radiated by the housing (including contributions from the door and ventilation openings) to 86 dBA.
- Provide acoustical treatment within the combustor fan housing and/or at the ventilation openings, as necessary to limit the total sound power level radiated by the housing (including contributions from the door and ventilation openings) to 86 dBA.
- Provide enhanced inlet and outlet silencers for the Hydraulic Power Unit enclosure and upgrade the walls, roof and floor of the enclosure as necessary to limit the total sound power level radiated by the enclosure to 77 dBA.
- Enclose drawworks brake area with soundproofing shroud;
- Install sound enclosures or buildings around all compressors;
- Ensuring that all office equipment (i.e., air conditioners, heating, ventilation) produces low noise levels or is surrounded by noise barriers

Measure 11: Alarms (Synthesized from Baldwin Hills and Whittier)

The operator to develop and implement an Oil Field Alarm policy that requires the following:

- Back-up OSHA noise indicator/alarms on all equipment (workover equipment, gas plant backup alarms, other operations) to be ambient sensitive and self-adjusting to minimize backup indicator noise or as allowed by OSHA signalers/flaggers shall be used in the place of backup alarms.

- Limit process alarms and communications over the broadcast system to the maximum extent feasible during all operations and use only for safety reasons.

Measure 12: Vibration Monitoring (Synthesized from Baldwin Hills and Whittier)

The Operator to provide a comprehensive noise abatement study, including noise and vibration monitoring at nearby sensitive receptors and continuous monitoring near drilling activities, under contract and supervision of the City, to monitor noise and vibration from the drilling and operations in the community. The City shall have the authority to shut-down operations and require additional mitigation if the noise criteria are exceeded.

The Operator to conduct periodic vibration monitoring of drilling activities to verify that the required vibration standards are being met.

Measure 13: Monitoring (Synthesized from Baldwin Hills and Whittier)

The Operator to provide a comprehensive noise abatement study, including noise and vibration monitoring at nearby sensitive receptors and continuous monitoring near drilling activities, under contract and supervision of the City, to monitor noise and vibration from the drilling and operations in the community. The City shall have the authority to shut-down operations and require additional mitigation if the noise criteria are exceeded.

The Operator to provide noise monitoring at sensitive receptors likely to be affected by any and all future new well drilling and well workover operations to verify that the baseline noise level is not exceeded by 5dBA. A fully-calibrated noise monitoring system shall be used, which satisfies the requirements for a type S2A sound level meters as defined by ANSI Standard S1.4-1983, or most recent revision thereof. The Operator shall submit one interim and one final report including continuous hourly Leq histograms. The Operator to monitor and provide a report confirming that drilling or redrilling noise levels at any sensitive receptors nearby comply with the required noise limits.

Measure 14: Tonal Noise (Synthesized from Baldwin Hills)

The Operator to conduct periodic 1/3-octave Leq spectra to demonstrate compliance with the special requirements for mitigation of tonal noise for Well Workover Noise Pure Tones, Well pump tonal noise, Gas plant tonal noise and Other operations tonal noise.

Measure 15: Noise Code Compliance (Synthesized from Baldwin Hills)

Operator to perform noise measurements and calculations to demonstrate that all well pumps, the gas plant and other operation equipment comply with the Noise Standards in section 12.08.390 Los Angeles County Code.

Operator to perform noise measurements and calculations to demonstrate that construction equipment complies with the Noise Standards in section 12.08.440 Los Angeles County Code.

Measure 16: New Flare (Synthesized from Baldwin Hills)

The operator to design, permit and install a flare for the gas plant that does not elevate vibration or low-frequency noise levels at the oil field perimeter.

Measure 17: Idling (Synthesized from Baldwin Hills)

Operator to implement a policy prohibiting unnecessary idling of internal combustion engines near noise-sensitive areas.

Measure 18: Equipment Elimination (Synthesized from Hermosa)

Eliminate the use of noise inducing combustors during drilling.

Measure 19: Temporary Relocation of Occupants (Synthesized from Kern and SB4)

The Operator shall arrange for the voluntary, temporary relocation of the occupants and sensitive receptors during the construction period.

If operational activities proposed within 900 feet of a property containing a sensitive receptor (including residential, school, or hospital land uses) and it is technically infeasible to reduce all noise from well activities to Ldn to 70 dBA or less, then the operator shall provide temporary lodging for the duration of well activities.

Traffic and Transportation Related Mitigation Measures**Measure 1: Traffic Plan/Routes/Scheduling (Synthesized from Hermosa, Kern, Oxy, SME, SB4, and Whittier)****Construction Traffic Management Plan**

The Operator shall prepare and implement a Construction Traffic Management Plan (CTMP) during construction that shall include, at a minimum, the following: Haul Truck Routes, Queue Areas, and Deliveries. The Plan shall be prepared by a registered traffic engineer. It shall include the following pursuant to the procedures and subject to approval of the City of Los Angeles:

- 1) Require the contractor(s) to obtain and follow street construction permits in the affected areas;
- 2) Develop detour and traffic management plans consistent with the affected City's standard roadway plans, the California Manual of Uniform Traffic Control Devices (MUTCD), or the Work Area Traffic Control Handbook (WATCH);
- 3) Revise construction schedules to minimize access impacts to adjacent residents and businesses; and 4) Ensure that all affected residences and business have adequate emergency access during all times and phases of construction.

The Operator shall coordinate with adjacent jurisdictions throughout the design and construction phase. The plan shall include, but not be limited to, the following issues:

- Timing of deliveries of heavy equipment and building materials
- Method of safeguarding traffic flow, i.e. placing temporary signing, lighting, and traffic control devices (including warning signs, flashing arrows, traffic cones and delineators, barricades, etc.) and flaggers as necessary to indicate the presence of heavy vehicles and construction traffic.
- Method of re-routing or detouring traffic
- Temporary modifications to existing signals and signal timing (if needed)
- Determining the need for construction work hours and arrival/departure times outside peak traffic periods (i.e. limited to weekdays between the hours of 9:00 a.m. and 3:00 p.m.)
- Ensuring access for emergency vehicles to the Project site
- Any temporary closure of travel lanes or disruptions to street segments and intersections during well development.
- Method to re-route or re-locate temporary loss of any bus stops
- Method to maintain access to adjacent property
- Method to maintain access to parcels fronting the construction area (e.g., use of street plates)

For routes, all large trucks shall use major roadways and intersections except where infeasible. The Operator shall be prohibited from routing heavy trucks exceeding 20,000 pounds. The Operator shall comply with all requirements of the applicable city. The Operator shall route inbound and outbound heavy (>20,000 pounds) truck traffic along designated truck routes.

If the traffic associated with the proposed well activities is found to exceed a Level of Service (LOS) standard on local, state, and interstate haul routes and roadways used for project access established by the city or county congestion management agency, and/or Caltrans, the Traffic Management Plan shall include some or all of the following components and requirements that the applicant shall implement:

- Identify the number of anticipated truck trips to be generated by drill site activities, their proposed route, and the time of day when trucks shall operate;
- Define the locations of project access points and location;
- Evaluate baseline conditions of local, state and interstate routes used by trucks;
- Identify and make provision for circumstances requiring the use of flag persons, warning signs, lights, barricades, cones, etc., to provide safe work areas in the vicinity of the project site and to warn, control, protect, and expedite vehicular and pedestrian traffic;
- Implement traffic control (flag persons, signage, barricades, cones, etc.) along all roadway segments that have substandard width (less than 18 feet)
- Include signage placed along all proposed water and haul routes and alternate haul routes at appropriate intervals notifying drivers of the presence of construction traffic on those roadways
- Address the potential for project-related traffic to impede emergency response vehicles and present a specific training and information program for project workers and drivers

to ensure awareness of emergency procedures from project-related accidents and spills, including those in the project's Spill Contingency Plan

- All project-related truck drivers are informed of and required to adhere to the designated traffic haul routes, if applicable

Operational Traffic Plan/Routes/Scheduling (Synthesized from ERG, Hermosa, Kern, Oxy, SB4, and Whittier)

The Operator shall prepare and implement an **Operational Traffic Program**, in coordination with the municipality. The Plan shall be prepared by a registered traffic engineer and evaluate:

- 1) Traffic levels and periods of heavy traffic along access streets;
- 2) Longer-term traffic monitoring to capture events and variation in traffic flow due to seasonal variations in populations and event traffic;
- 3) Construction truck traffic impacts on roadway capacity due to parking limitations and event activities;
- 4) Coordination with any schools, colleges and universities to reduce impacts of events and parking issues along streets;
- 5) Alternative parking locations and routes for any large events;
- 6) Implementing safety improvements, including enhanced pedestrian crosswalks and signage;
- 7) Identifying sources of local traffic and ensuring the drill site truck traffic during operations (not construction) does not increase average truck traffic levels on local streets;
- 8) Limited hours for Drill site truck traffic on local streets to avoid congested or impacted periods (e.g., between 9:00 a.m. and 3:00 p.m.);
- 9) Coordinate periods of heavy traffic flow on local streets due to events and prevent use of local streets for proposed Project-related truck traffic during these events;
- 10) Prohibiting parking of Project-related traffic along any residential street for non-emergency purposes;
- 11) Implementing policies for trucks along local streets, including speed limits for trucks, yielding requirements to automobiles, and other issues as applicable.

Measure 2: Roadway Repair (Synthesized from ERG, Hermosa, Kern, SB4, and Whittier)

The Operator is required to ensure that damaged roads are restored to at least their pre-construction, pre-drill site condition and to the satisfaction of the responsible agency.

Roadway Maintenance Agreement.

The Operator is required to enter into a Roadway Maintenance Agreement with the City of LA and LA County regarding pavement or other infrastructure damage caused by the net increase in drill site-related truck trips and daily haul trucks. The Operator is required to adhere to all Agreement requirements.

Roadway Damage Repair.

The Operator is required to include information intended to establish baseline road conditions. Such conditions shall be established by photographing, videotaping or otherwise documenting existing conditions of all affected rural roadways and residential streets. The evaluation of the structural condition of the existing pavement shall be performed by a soils engineer.

After receiving this information regarding baseline road conditions, the city shall consult with Caltrans (if applicable) before determining whether the information is sufficient.

The local municipality should require the Operator to enter into a Roadway Repair Agreement with the public works department of the city or with Caltrans with respect to state highways in order to secure an Encroachment Permit, and to post a cash damage bond. This agreement would identify where trucks can be driven, their size and weights and time of day. The road use agreement would hold the applicant responsible for damages and repairs to roads and related infrastructure that may be impacted by truck use. The local municipality may hold applicants responsible for any roadway pavement damage and may charge them a fee to mitigate/rehabilitate the damage on roadway pavement.

Require the Operator, within 60 days after well drilling is completed, to meet with the local municipality and Caltrans (if applicable) to review the baseline road conditions and survey these same roadways and residential streets in order to identify any damage that has occurred. The condition shall further require that, following completion / compensation of the identified public Right of Way (ROW) repairs, the Operator shall provide to the local municipality a letter signed by the local public works department and Caltrans (if applicable) stating their satisfaction with the repairs.

Measure 3: Warning Lights (Synthesized from Hermosa)

The Operator shall install, subject to the approval of the City of Hermosa's Public Works Department, warning signs and blinking yellow lights one block north and south of the Project Site warning vehicle traffic that trucks may be entering and exiting the roadway. Blinking lights shall only operate when trucks are utilizing the roadway (not 24 hours per day).

Measure 4: Transport Hazardous Materials (Synthesized from SB4)

Know Spill Prevention Measures. The Operator shall, as part of the Spill Contingency Plan required by Section 1722.9 of Title 14 of the California Code of Regulations a requirement that each truck driver know how to carry out the emergency measures described in the Spill Contingency Plan (therefore reducing roadway hazards if an accidental spill were to occur).

The Operator shall submit a log to the local municipality demonstrating that every driver has received and reviewed the applicable portions of the Spill Contingency Plan.

Measure 5: Oversize Vehicle (Synthesized from ERG)

Oversize Vehicle Permits. The Operator shall obtain and adhere to all necessary haul and oversize vehicle permits. During construction; provide copies of Permits to LA County and the local municipality within 30 days of any oversize vehicle trips. Obtain all necessary haul permits (or other transportation permits) from LA County. Obtain Oversize Vehicle Permits from Caltrans and provide copies to the County and the local municipality. Adhere to all Permit requirements during oversize vehicle trips.

Measure 6: Crossing Guard (Synthesized from Hermosa)

When in close proximity to a school, the Operator shall fund, through and in consultation with the Los Angeles Unified School District and Safe Routes to School, an afternoon crossing guard to be stationed at the Drill Site area to ensure pedestrians passing nearby the Drill Site have assistance in crossing the streets and the entrances/exit of the Drill Site.

Alternately, the Operator shall ensure that trucks only travel to and from the Drill Site when school is in session (i.e. truck travel prohibited after 2:48 p.m., on Wednesdays after 1:45 p.m. or on school minimum days after 12:45 p.m.). The Operator shall consult with the School District to ensure that the timing is current.

Measure 7: Parking Demands (Synthesized from Hermosa)

The Operator shall supply private parking sufficient to meet all parking demands and shall direct all employees and contractors to park within Operator's private parking areas, or to utilize an alternative parking program approved by the City.

Measure 8: Landscape Buffer (Synthesized from Hermosa)

If the Drill Site affects the sidewalk, then the design shall incorporate a sidewalk design which utilizes a landscape buffer to separate the pedestrians from the street.

Measure 9: Carpooling Program (Synthesized from Whittier)

A worker carpooling program shall be instituted offsite and away from congested areas to reduce Drill site traffic through congested areas during all phases, in coordination with the LA City traffic engineer.

B. LA County Oil & Gas Strike Team Mitigation Recommendations

On March 29, 2016, the Los Angeles County Board of Supervisors (Board) passed a motion instructing the Director of Regional Planning, in coordination with the Fire Chief, Interim Director of the Department of Public Health, and Director of the Department of Public Works to:

1. Convene a Strike Team to assess the conditions, regulatory compliance and potential public health and safety risk associated with existing oil and gas facilities in unincorporated LA County.
2. Review LA County Title 22: Zoning Code to ensure that oil and gas facilities may no longer operate by right in the unincorporated portion of the County and to ensure that

regulations reflect best practices and current mitigation measures and technologies, minimize environmental impacts and protect sensitive uses and populations.

3. Coordinate with cities throughout the County that are interested in collaborating on the development of regulatory requirements and protocols for monitoring and evaluating their local oil and gas facilities.
4. Create an advisory panel consisting of independent experts in oil and gas exploration and production as appointed by the Board of Supervisors to assess the biannual reports of the Strike Team.
5. Ensure that County Planning and Code Enforcement services are not negatively impacted.

MRS Environmental (MRS), a consulting firm with expertise in the oil and gas industry prepared the Los Angeles Oil & Gas Strike Team Oil and Gas Facility Compliance Review Project.

The Strike Team's report recommendations are the following:

1. The well inventory must be corroborated by on-the-ground site visits of oil and gas facilities to determine compliance and to review potential issues associated with health, safety, and environmental concerns.
2. Review and update the existing County Zoning Code for oil and gas facilities to bring it in line with surrounding sensitive land uses and current technological advances and to bring it up to today's standards. The updated code should contain provisions to address these issues:
 - a. Removal of by right permitting
 - b. Setback distances
 - c. Well Stimulation techniques
 - d. Air quality monitoring
 - e. Odor plan & monitoring
 - f. Down hole chemical use during drilling, maintenance or production activities
 - g. Transportation of chemicals through residential areas
 - h. Pipeline systems monitoring and leak detections
 - i. Gas gathering systems operated under a vacuum
 - j. Well site berms
 - k. Well cellar size, volume and length
 - l. Fire water supply and monitors
 - m. Abandonment of long idle wells
 - n. Review of emergency response plan
 - o. Decommissioning and removal of out of service equipment
 - p. Storm water discharge handling with spills, drain and valve control plans
 - q. Secondary containment
 - r. Community communication

3. The Strike Team’s report has no recommendations with regard to legal positions as of the date of this report.

The County’s report and recommended mitigations are relevant to the City of Los Angeles’ oil and gas operations. Updates to the City’s zoning code should consider the adoption of these types of mitigation as well to protect public health and safety. Additionally, our consultant PSE Healthy Energy, recommend the alignment of regional public policy on the oversight of oil and gas operations in the LA Basin.

C. CARB Oil and Gas Methane Rule

In 2017, the CARB adopted the “Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities” regulation (California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4, Sub Article 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities, § 95665 – 95677) to control emissions at all oil and gas facilities in California (CARB’s Oil and Gas Methane Regulation Fact Sheet – Appendix A2-42).

The Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities (commonly referred to as CARB’s Oil and Gas Methane Rule) is designed to reduce methane emissions from oil and gas production, processing, storage, and transmission compressor stations, which accounts for four percent of methane emissions in California. Regulated entities are required to take actions to limit intentional (vented) and unintentional (leaked or fugitive) emissions from equipment and operations.

The provisions of the regulation are:

1. Collection and use (or destruction) of methane and associated gases from uncontrolled oil and water separators and storage tanks with emissions above a set methane standard;
2. Collection and use (or destruction) of methane and associated gases from all uncontrolled well stimulation circulation tanks;
3. Leak Detection and Repair (LDAR) requirements for components, such as valves, flanges, and connectors, currently not covered by local air district rules;
4. Methane emission standards for large reciprocating compressors in addition to LDAR for the other large compressor components and smaller compressors;
5. Collection and use (or destruction) of methane and associated gases from specified centrifugal compressors, or replacement of higher emitting “wet seals” with lower emitting “dry seals”;
6. Use of “no bleed” pneumatic pumps and “no bleed” continuous bleed pneumatic devices with limited exemptions and restrictions on intermittent bleed pneumatic devices;
7. Enhanced monitoring for underground natural gas storage facilities including leak detection and ambient air monitoring; and
8. Reporting requirements for liquids unloading and well casing vents.

The CARB's Oil and Gas Methane Regulation requires facilities to either permit or register equipment with CARB or their local air district, perform emissions testing, and comply with emission standards. As part of the regulation, crude oil and natural gas facilities that operate crude oil and natural gas separator and tank systems must comply with emissions testing, and systems that exceed the emissions standard must comply with emission control requirements. Crude oil facilities with separators and tank systems that process less than fifty (50) barrels per day of oil are exempt from the testing and emissions control requirements. Additionally, natural gas facilities that receive less than two hundred (200) barrels per day of produced water are also exempt.

CARB's Oil and Gas Methane Rule Implementation Timeline:

January 1, 2018

- Leak Detection and Repair (LDAR) begins;
- Underground natural gas storage facilities' monitoring plans due; and
- Equipment reporting and flash testing data due.

July 1, 2018

- CARB staff will decide to approve or request modifications of underground natural gas storage facilities' monitoring plans.

January 1, 2019

- Vapor collection on separator and tank systems installed;
- Pneumatic devices and compressor seal change-outs required; and
- Circulation tank technology assessment complete.

July 1, 2019

- Annual reporting of LDAR results, compressor and pneumatic concentrations or flow rates, and liquids unloading and well casing vent reporting all due.
- CARB is working with a contractor to develop a web-based tool for this reporting.

January 1, 2020

- Circulation tank vapor collection installed, pending technology assessment.

CARB's Oil and Gas Methane Regulation is implemented at the local level by SCAQMD. Oil and gas production equipment, such as separators, tanks and compressors that are regulated under specific SCAQMD permits that mandate vapor recovery to capture emissions as well as quarterly air monitoring for leak detection, repair and reporting. Air District regulations require valves and fittings at the wellhead and throughout the production process to be inspected quarterly with air monitoring for leak detection, repair and reporting. Under SCAQMD Rule 1173, a specialized contractor with SCAQMD certifications inspects and performs air monitoring on equipment throughout the field quarterly and reports monitoring results to SCAQMD. SCAQMD requires that all processing tanks have vapor recovery to minimize air emissions under Rule 463.

D. Fenceline Air Monitoring

A fenceline monitoring program is at the periphery of a facility, consisting of a chemical analyzer station, an air sampling system (typically containing no less than four [4] sampling inlet points at site specific locations around a facility), and a meteorological weather station. Fenceline air monitoring systems are used to measure specific pollutants that cross the facility's fenceline in real time. A system should have the ability to monitor, record, and report air pollutant levels of multiple compounds. Both the Los Angeles County Health Department and PSE consultants recommend continuous real time Fenceline monitoring systems at oil and gas drill sites across the City. A local monitoring program should continuously monitor and samples air emission for each site in real time for methane, non-methane hydrocarbons, and hydrogen sulfide, and collects and evaluates species of non-methane hydrocarbons (including benzene) in canisters on a 12-day cycle. Prior to the adoption of a city wide program, subject matter expertise is needed from SCAQMD to calibrate with existing technologies and avoid regulatory redundancy.

The only drill site fenceline monitoring program in the City is at the idled AllenCo Drill site facility. The monitoring program was agreed upon in a 2016 court injunction to address concerns raised by community groups that live around the AllenCo oil production facility located at 814 West 23rd Street in the City of Los Angeles. The parties agreed to install a system that is operated by a third party Monitor. The Monitor is required to have relevant experience with air monitoring, regulation, compliance, and evaluation. The judgment also specified that the Monitor shall not have any financial ties to the operator beyond payment for duties as the Monitor. It's important to note the monitoring program is temporary and funded by the operator pursuant to the legal settlement agreement.

The AllenCo Judgment (Appendix A2-33) specified the following sampling criteria:

- Methane (not an OSHA Air Contaminant);
- Total Non-Methane Hydrocarbons (not an OSHA Air Contaminant); and
- Hydrogen Sulfide.

Also canister sampling every 12 days and grab samples as warranted for:

- Benzene
- Toluene
- Ethylbenzene
- Trimethyl Benzene
- Naphthalene
- Total Petroleum Hydrocarbons (C5-C12 fraction - not an OSHA Air Contaminant)

While the system has been installed, it has yet to be utilized as the drill site has not been in operation for the last five years. However, it does give a baseline example of system because there are no regulations or industry standards at this time. In 2018, City Council took action on establishing a city wide Fenceline air monitoring program which is under development by the Petroleum Administrator (CF-18-0203).

Section 10. Oil & Gas Well Setback Analysis

A. Existing City Setback Distance

Physical setback restrictions are typical land use policies used by local governments for safety, privacy, and/or environmental protection. They are usually a certain distance from a curb, property line, or structure within which building is prohibited by ordinance. The City has an existing setback distance of 200 feet from an oil well in the Building Code.

LAMC 91. 6105, "Separation from an oil well," states the following:

- *No school, hospital, sanitarium or assembly occupancy shall be with 200 feet from the center of the oil well casing.*
- *No public utility fuel manufacturing or public utility electrical generating, receiving or distribution plant shall be located within 200 feet from the center of an oil well casing.*
- *No building more than 400 square feet in area and taller than 36 feet in height shall be erected within 50 feet from the center of an oil well casing.*

A distance separation between the exterior wall of the building and the center of an oil well casing shall be maintain with a horizontal distance equal to 1 ½ times the building's height, provide however, that that distance need not exceed 200 feet. The building shall be measured vertically from the adjacent ground elevation adjoining the building to the ceiling of the top story.

Exceptions - The distance separation between a building and an oil well may be reduced to the following:

- 1. Thirty-five feet (35 ft.) if a solid masonry wall not less than 6 feet high and six inches thick is constructed between the oil well and all portions of the buildings, which are less than 50 feet from the wall;*
- 2. Twenty-five feet (25 ft.) if all walls of the building, which are located less than 50 feet from the oil well, are of 1-hour fire-resistive construction, have no openings, and are surmounted by a 3-foot high parapet;*
- 3. Fifteen feet (15 ft.) if all walls of the building, which are located less than 50 feet (15 240 mm) from the oil well, are of 2-hour fire-resistive construction, have no openings, and are surrounded by a 3-foot high parapet.*

A parapet is a barrier that is an extension of the wall at the edge of a roof (or other structure). This requirement in the Building Codes is for fire safety and not based on human health effects. The City's Building Code is scheduled to be updated in 2020.

The Los Angeles County Department of Public Health recommended to expand the minimum setback distance beyond 300 feet. They reported a site-specific assessment is needed for each existing oil and gas facility to identify current distances to sensitive land uses and other site characteristics that can be used to inform whether further mitigation measures are warranted to reduce potential public health and safety risks. Additionally, the LA County Oil & Gas Strike Team

also recommended establishing a setback distance with air monitoring and enhanced operating conditions as a health and safety precaution.

B. Distance from Sensitive Receptors

The City Council directive inquired about the proximity of sensitive receptors to oil and gas wells within the City. There are multiple definitions of the term, “sensitive receptor.” The US EPA defines it to include, but are not limited to, hospitals, schools, daycare facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants. The federal government notes extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognized as sensitive receptors. At the state level, CARB defines sensitive receptors as children, elderly, asthmatics and others who are at a heightened risk of negative health outcomes due to exposure to air pollution. While the SCAQMD definition is more broadly defined as any residence including private homes, condominiums, apartments, and living quarters; education resources such as preschools and kindergarten through grade twelve (k-12) schools; daycare centers; and health care facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

For this report, we considered sensitive receptors to include residents, children attending schools, elder care facilities, and daycare facilities. The City may consider creating its own definition of sensitive receptors for future reporting or policy purposes.

Table 14. Numbers of residents and other sensitive receptors within various proximities of active oil and gas wells. Source: Adapted from Shonkoff et al. (2015b)

Buffer Distance (ft)	Buffer Distance (m)	Number of residents	Number of Schools	Number of Children Attending Schools	Number of Elderly Facilities	Number of Daycare Facilities	Under 5	Over 75
328	100	32,071	4	3,270	12	5	2,295	1,664
1,312	400	233,102	50	34,819	94	72	16,685	14,005
2,625	800	627,546	130	89,241	213	184	4,050	35,189
3,281	1,000	866,299	180	135,797	258	262	62,547	47,759
5,249	1,600	1,677,594	348	242,833	429	524	122,321	91,452
6,562	2,000	2,257,933	470	332,855	582	718	164,992	122,737

C. California Environmental Health Screening Tool

The California Communities Environmental Health Screening Tool Version 3.0 (CalEnviroScreen) was developed by the Office of Environmental Health Hazard Assessment (OEHHA), on behalf of the California Environmental Protection Agency (CalEPA). CalEnviroScreen is a science-based assessment tool that helps identify California communities that are most affected by many sources of pollution, and that are often especially vulnerable to pollution’s effects (Cal Enviro Screen Fact Sheet – Appendix A2-43).

The Liberty Hill, Drilling Down Report (2015) (Appendix A1-12) evaluated oil and gas sites within the City based on the CalEnviroScreen Version 2.0. The Liberty Hill report found that many oilfields inside City boundaries are located in areas identified by as among the most overburdened in the entire state. Their report identified that some oilfields in the Los Angeles region are surrounded by open space or industrial, commercial, or vacant land. However, in other neighborhoods, operations activity takes place adjacent to residences, schools, parks, and public facilities. The Drilling Down report lists populations and proximity to oil and gas wells in the City.

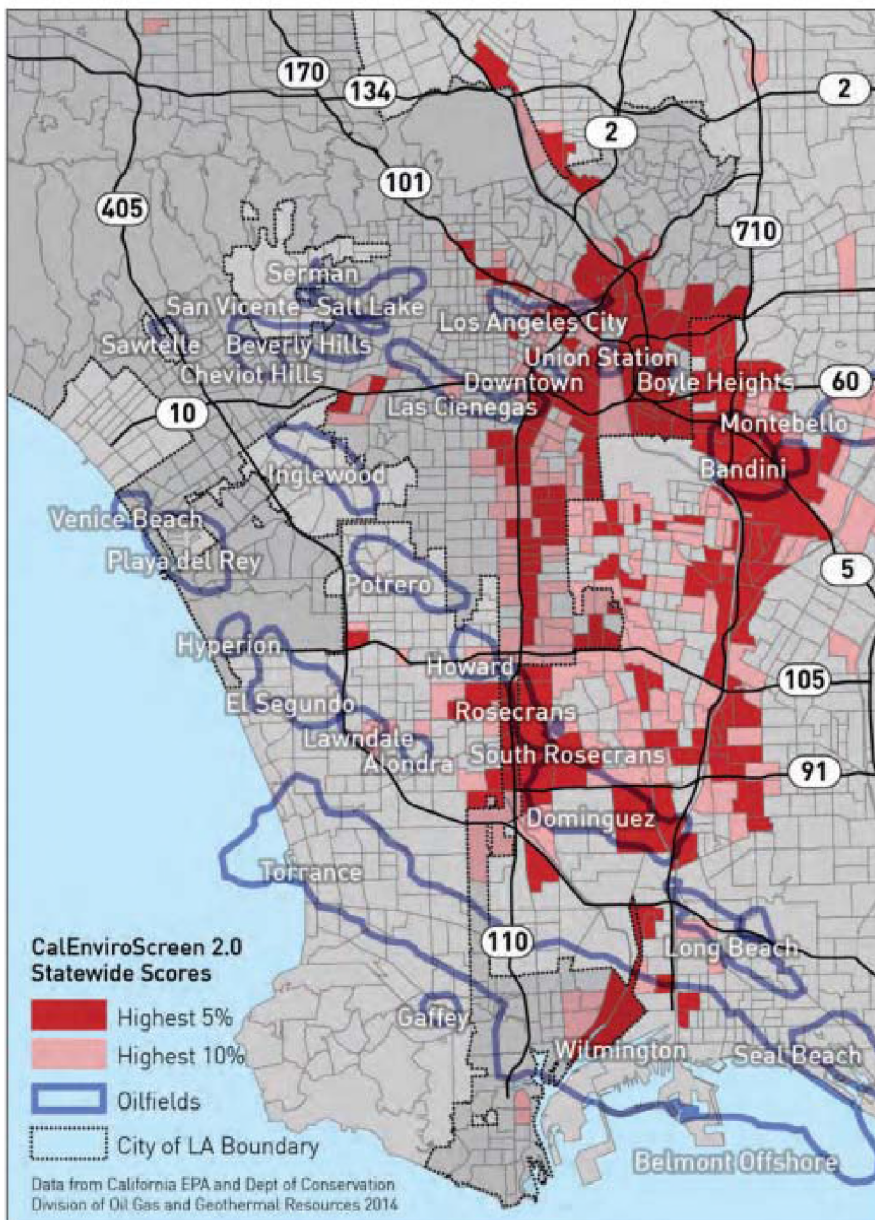


Figure 10. Proximity of Environmental Justice Community to Oil Fields in the Los Angeles Region (Liberty Hill, Drilling Down Report, pg. 14)

D. Setbacks by Other Jurisdictions

Los Angeles County and our PSE consultants both evaluated setback distances from oil and gas wells by other jurisdictions across the state and around the county. Table 15 is an adaptation of both reports findings.

Table 15. Summary of minimum surface setback distances from oil and gas development in the United States. Updated from LACDPH (2018)

State	Jurisdiction	Year Adopted	Setback Distance (ft)	Setback Target	Source
California	City of Arvin	2018	300	New Development	City of Arvin (2018)
			600	Sensitive sites, such as parks, hospitals, and schools	
	City of Carson	2015	750	Housing, schools, hospitals	LACDPH (2018)
	City of Los Angeles	2011	200	School, hospital, sanitarium, or assembly occupancy	City of Los Angeles (2011)
			50	Building (>400 ft ² area, 36 ft tall)	
	Los Angeles County	2013	100	Building not necessary to the operation of a well	LA County Fire Department (2013)
			300	Place of assembly, institution, or school	
Kern County	2015	210	Housing, schools, hospitals	LACDPH (2018)	
SCAQMD ¹	2015	1,500	Requires notification of nearby sensitive receptors (residences, schools, health care facilities)	SCAQMD Rule 1148.2 (2015)	
Colorado	State	2013	500	Housing or commercial buildings	LACDPH (2018); Haley et al. (2016)
			1000	High occupancy buildings – schools, day care centers, hospitals, nursing homes, and correctional facilities)	Haley et al. (2016); (COGCC (2013)
			350	Outdoor recreational areas (playgrounds and sports fields)	Haley et al. 2016; COGCC (2013)
			150	Surface property line	Haley et al. (2016); COGCC (2013)
Maryland	State	2016	1,000	Housing, schools, faith institutions	LACDPH (2018)
			2,000	Private drinking water wells	

State	Jurisdiction	Year Adopted	Setback Distance (ft)	Setback Target	Source
New Mexico	Santa Fe County	2008	750	Housing, schools	LACDPH (2018)
			1,000	Groundwater and surface water resources	LACDPH (2018)
Oklahoma	Oklahoma City	2015	300	Housing, fresh water well	LACDPH (2018)
			600	Faith institutions	LACDPH (2018)
Pennsylvania	State	2012	500	Housing and commercial buildings	Haley et al. (2016)
Texas	City of Arlington	2011	200	Fresh water well	LACDPH (2018)
			600	Housing, schools, faith institutions, hospitals	
	City of Dallas	2013	1,500	Housing, schools, faith institutions	LACDPH (2018)
	City of Flower Mound	2011	1,500	Housing, schools, faith institutions, hospitals, existing water wells	LACDPH (2018)
	City of Fort Worth	2010	200	Fresh water well	LACDPH (2018)
600			Housing, schools, faith institutions, hospitals		

1. Setback table updated with information from the peer-reviewed literature and California county and city policies.
2. Distance that requires notification of sensitive receptors, not a setback distance.

The PSE report noted that while California has no established statewide setback for oil and gas development, other local jurisdictions have established setbacks for residences and sites of sensitive receptors. Recently in California, the City of Arvin adopted an ordinance that establishes setback distances of 300 feet for new development and 600 feet for new drilling operations near sensitive sites, such as parks, hospitals, and schools (City of Arvin, 2018; See Appendix A2-31). In addition to localized setback distances, California Code of Regulation defines a critical well as within 300 feet of a residence or airport runway or within 100 feet of a dedicated public street, highway, or operating railway; any navigable body of water; any public recreational facility, or any other area of periodic high-density population; or any officially recognized wildlife preserve (State of California, 2011). The CA DOGGR requires operators to disclose if a proposed well for drilling meets critical well (CA DOC, 2018), implying that wells in close proximity to populations may pose greater risk to public health and safety.

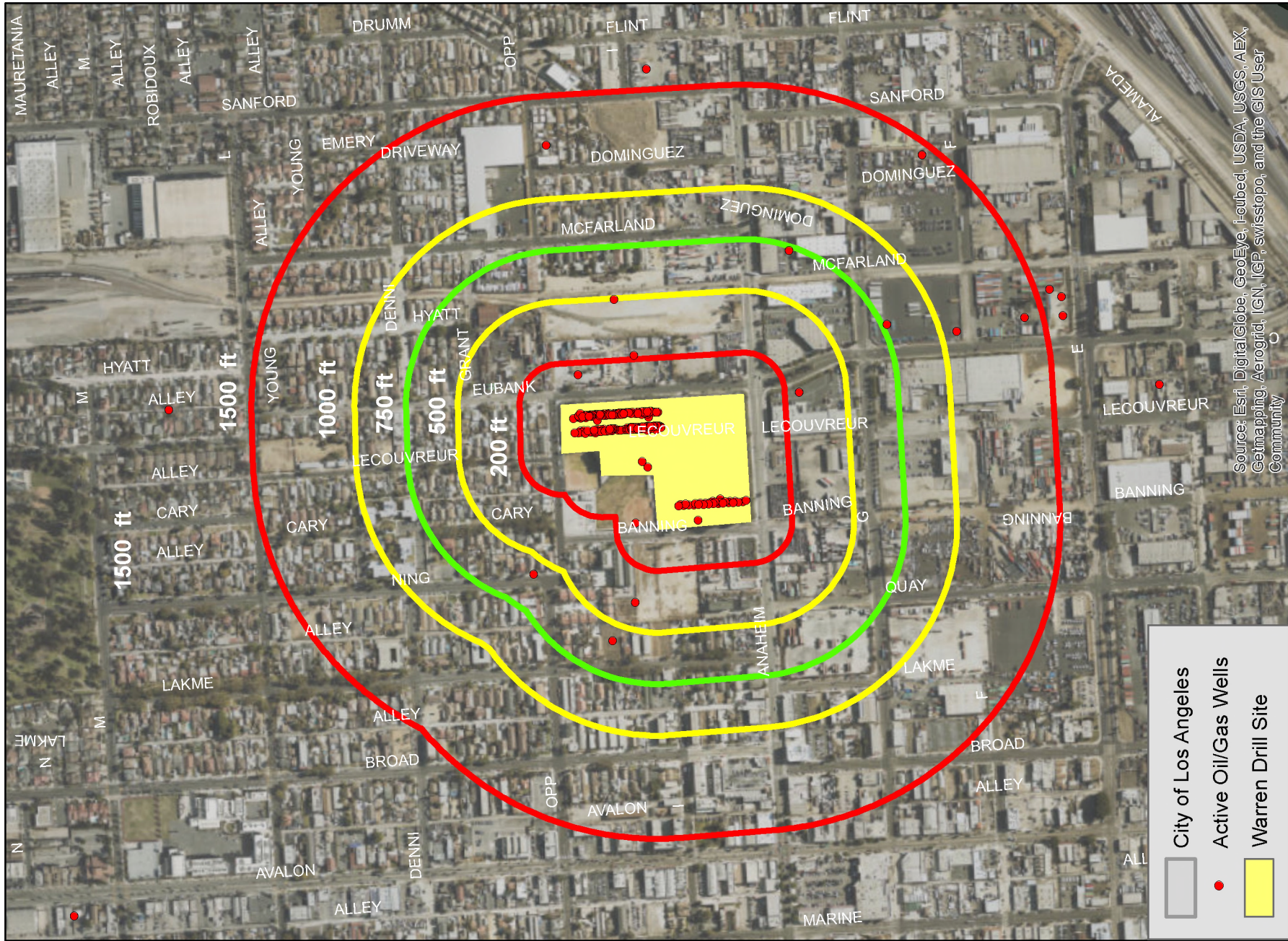
Setback distances

Appendix A5 provides visual maps for potential setback distances from each oil and gas drill site in the City. The distances in the maps range from 200 feet to 1,500 feet. The following two (2) maps are for the Rancho Park and Wilmington Drill Sites.



- City of Los Angeles
- Active Oil/Gas Wells
- Rancho Park Drill Site

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community. Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, ICP, swisstopo, and the GIS User Community



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

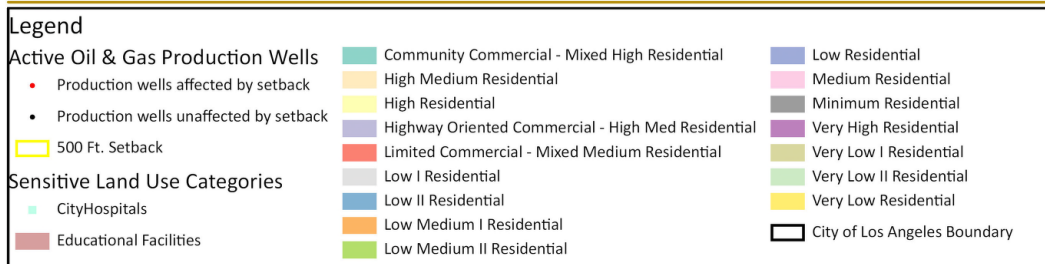
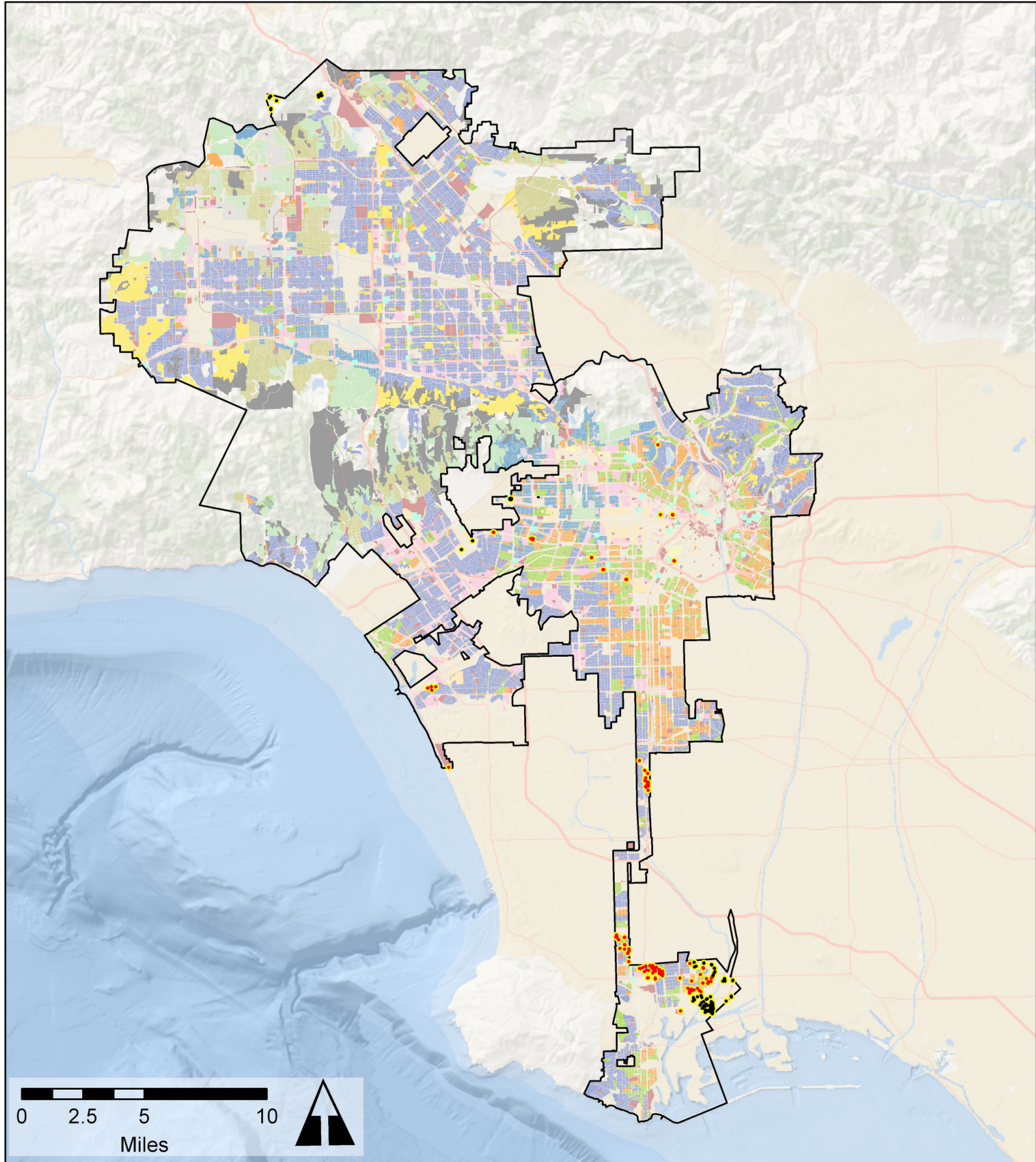
E. Impacted Oil & Gas Production by Setback Distance

Catalytic Environmental Solutions provided a report evaluating the potential effects of setback requirements on oil and gas production in the City of Los Angeles. They obtained the locations for all wells documented within the City from GIS shape files developed and maintained by CA DOGGR. The production data was reported to CA DOGGR by local operators for calendar year 2016.

Table 16. City of Los Angeles oil and gas production loss under setback scenario analyzed


Setback (Feet)	Production Loss from Setbacks	
	Oil (bbl)	Gas (MCF)
500	2,514,462	4,415,960
1000	2,640,349	4,509,947
1500	2,697,553	4,516,967
2500	2,735,105	4,524,706

The following two (2) maps from Catalytic Environmental Solutions show the potential impact of oil and gas well setback distances across the City for 500 feet and 1,500 feet.

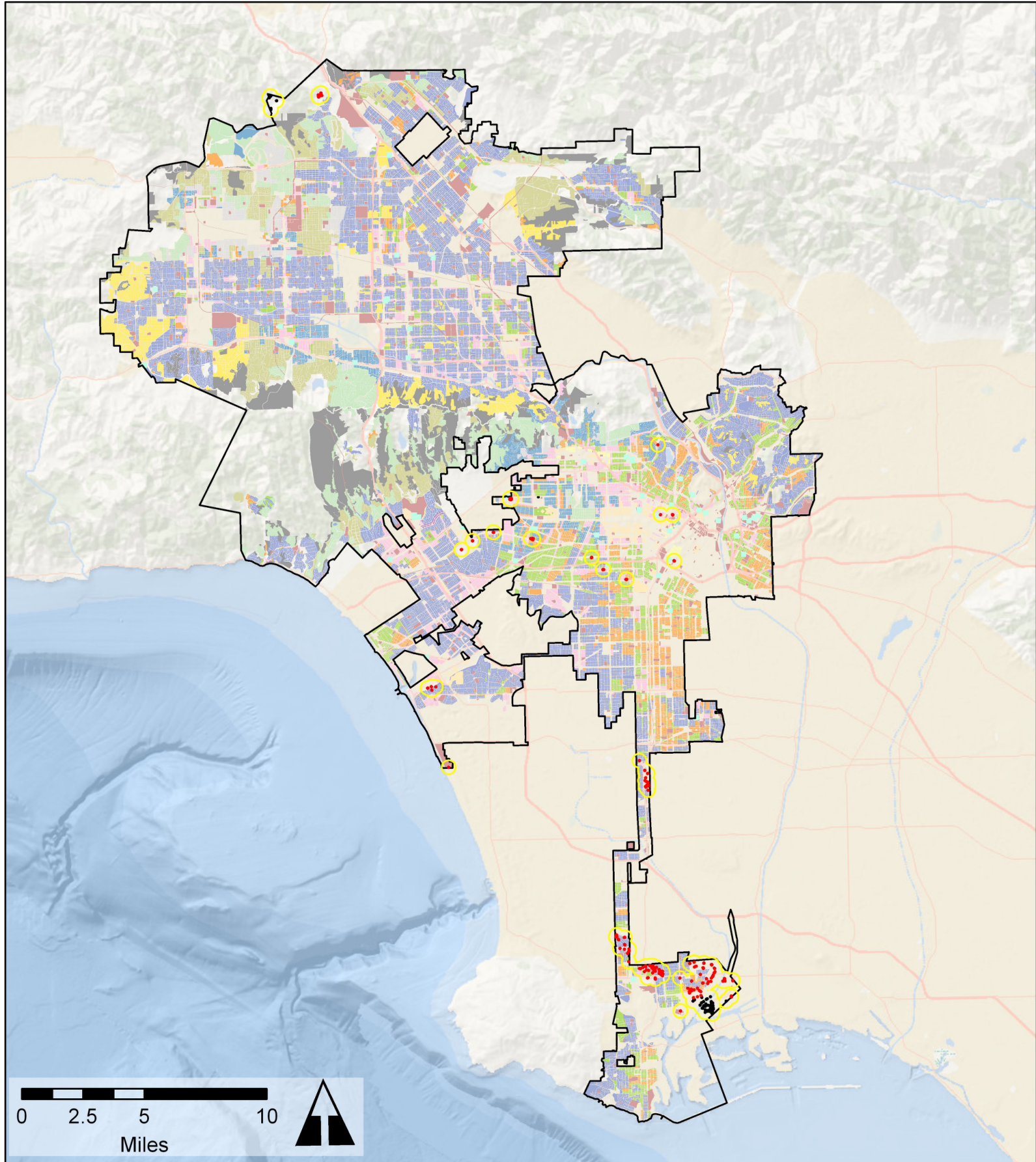


500 FT. SETBACK

Figure 2
California Independent Petroleum Association
Oil & Gas Production Well Setback Analysis
Date: March 2018




Catalyst
ENVIRONMENTAL SOLUTIONS



Legend		
Active Oil & Gas Production Wells		
•	Production wells affected by setback	
•	Production wells unaffected by setback	
□	1,500 Ft. Setback	
Sensitive Land Use Categories		
□	CityHospitals	
□	Educational Facilities	
□	Community Commercial - Mixed High Residential	□
□	High Medium Residential	□
□	High Residential	□
□	Highway Oriented Commercial - High Med Residential	□
□	Limited Commercial - Mixed Medium Residential	□
□	Low I Residential	□
□	Low II Residential	□
□	Low Medium I Residential	□
□	Low Medium II Residential	□
□	Low Residential	□
□	Medium Residential	□
□	Minimum Residential	□
□	Very High Residential	□
□	Very Low I Residential	□
□	Very Low II Residential	□
□	Very Low Residential	□
□	City of Los Angeles Boundary	□

1,500 FT. SETBACK

Figure 4
California Independent Petroleum Association
Oil & Gas Production Well Setback Analysis
Date: March 2018



F. Implementation of Setback Distance

The establishment of physical surface setback distance from oil and gas wells from sensitive receptors would need to be based on the City's land use zoning codes. City Council may consider adopting an ordinance that requires a specific setback from sensitive land uses that applies to existing wells, future wells, or both. Any future ordinance will be subject to legal challenges by landowners and operators as a "taking" under the federal and state Constitutions. The City does have a prescribed method for the termination of nonconforming oil and gas wells within the City's Zoning Code. Establishing a setback distance on existing oil and gas wells may be declared as a non-conforming land use. The land use decision would be required by the City Council to instruct the City Planning Department to prepare an ordinance. LAMC 12.23-C.4, is the pertinent code section:

(a) No well for the production of oil, gas or other hydrocarbon substances, which is a nonconforming use, shall be re-drilled or deepened.

(b) All such wells, including any incidental storage tanks and drilling or production equipment, shall be completely removed within 20 years from June 1, 1946, or within 20 years from date such use became nonconforming, if said date was subsequent to June 1, 1946; provided, however, a Zoning Administrator may, upon individual application, allow such wells to continue to operate after said removal date, if he determines that such continued operation would be reasonably compatible with the surrounding area and in connection therewith may impose such conditions, including time limitations, as he deems necessary to achieve such compatibility.

The City Planning Department is prepared to provide a follow up summary of the outreach and adoption process with an approximate timeline for completion, an estimate of funding needs for anticipated contractual services, such as preparation of appropriate environmental review and other technical studies, and necessary staff resources to research, prepare, and process the ordinance through adoption and implementation.

Section 11. Economic and Fiscal Impacts of Establishing Setbacks

In 2015, the Los Angeles Economic Development Corporation produced a report on the economic impacts of the Oil and Gas Industry in California. The report estimated that the industry's statewide direct output of more than \$111 billion generates more than \$148 billion in direct economic activity, contributing 2.7 percent of the state's gross domestic product (GDP) and supporting 368,100 total jobs in 2015, or 1.6 percent of California's employment. Additionally, the oil and gas industry generates \$26.4 billion in state and local tax revenues and \$28.5 billion in sales and excise taxes. For Los Angeles County, it found the direct output of more than \$5.2 billion in direct economic activity, contributing \$133 million in tax revenue, and supported 31,236 total jobs in 2015. The report covered employment, economic activity, and jobs of all sections of the industry, not just the upstream sector.

A. Community Economic Report

“The Oil and Gas Extraction Sector in the City of Los Angeles,” by David Rigby, Ph.D. and Michael Shin, Ph.D. and Geografio LLC (2017) (Report is Appendix A2-4)

This report estimates the economic impact of potential oil and gas well closures within the City. Analysis focuses on 2015, the most recent year for which input-output data were available when the project started. Data from DOGGR, supplemented where possible by the U.S. Energy Information Administration, along with benchmark oil and gas well-price data valued economic output in the oil and gas extraction industry for the state of California in 2015 at approximately \$9.7 billion. This represents approximately half of 1% of the state’s overall output, its gross product. Within the City, the oil and gas extraction sector generated output valued at \$182 million in 2015, accounting for about one-tenth of 1% of the City’s gross product.

According to data from the California Employment Development Department (EDD) and the U.S. Bureau of the Census Non-Employer Survey, the oil and gas extraction industry (North American Industrial Classification 211) employed 345 workers in the City of Los Angeles in 2015 out of a total city-wide workforce of just under 2 million. CA DOGGR data identified 508 active wells within the City in 2015 with positive levels of production. A geographic information system fixed the location of these well sites and then mapped protective buffers, setback distances of 1,500 feet and 2,500 feet, around sensitive land uses as identified by CARB. The GIS analysis established that 429 of the active 508 wells in the City were located within 2,500 feet of sensitive land uses. These 429 wells were responsible for approximately 78% of the value of output in the oil and gas extraction sector of the City in 2015. Input-output analysis of the Los Angeles economy reveals that closing 429 oil and gas wells and eliminating 78% of production within the oil and gas extraction industry (consistent with the 2,500 feet setback distance) would have the following impacts:

- 269 jobs would be lost within the oil and gas extraction industry
- 266 jobs would be lost within other sectors of the economy
- 535 total jobs would be lost across the City.

The report noted that use of the 1,500 feet setback distance would result in the overall loss of approximately 532 jobs citywide. They do not believe that the loss of local oil and gas extraction capacity would have a significant impact on local energy prices. However, they believe that there could be additional employment loss in local parts of the oil and gas transportation system associated with well closures.

Table 17: Private non-farm employment in California, Los Angeles County and the City of Los Angeles, 2015 (Wage and salary employment and self-employment: EDD+NES)

NAICS	Industry name	California	Los Angeles County	City of Los Angeles
21	Mining, Quarrying, Oil & Gas	29,758	5,051	577 (0.03%)
211	- Oil & Gas Extraction	14,175	3,201	345(0.02%)
22	Utilities	58,757	12,229	2,833(0.17%)
23	Construction	948,370	188,155	59,208(3.46%)
31-33	Manufacturing	1,332,133	370,694	94,481(5.53%)
42	Wholesale	777,742	246,213	75,494(4.41%)
44-45	Retail	1,890,618	447,935	164,770(9.64%)
48-49	Transportation & Warehousing	720,142	198,544	81,657(4.78%)
51	Information	543,425	233,992	74,911(4.38%)
52	Finance & Insurance	610,496	147,087	70,676(4.13%)
53	Real Estate, Renting & Leasing	594,401	197,494	64,838(3.79%)
54	Professional, Scientific & Technical Services	1,748,815	431,917	183,392(10.72%)
55	Management of Companies	229,682	57,365	17,819(1.04%)
56	Waste Management	1,303,984	341,548	116,050(6.79%)
61	Educational Services	388,039	120,311	59,151(3.46%)
62	Health Care & Social Assistance	2,352,714	718,366	291,769(17.06%)
71	Arts, Entertainment & Recreation	497,317	178,458	73,858(4.32%)
72	Accommodation & Food Services	1,575,749	416,088	158,371(9.26%)
81	Other Services (except Public Administration)	1,000,805	295,717	120,112(7.02%)
	Total	16,602,947	4,607,164	1,709,967

A second way that the report proposed city ordinance might generate benefits to the city that offset some of the anticipated employment losses, noted in Section 4 of this report, is through job creation related to remediation activities at oil and gas well sites that are shut down. Once a decision has been made to halt production at an oil well, a process of remediation can begin. Remediation is undertaken to ensure that underground reserves of oil and gas, and any saline or fresh water aquifers penetrated by the well, remain isolated from one another over time. Well remediation requirements vary with local and state regulations, but typically involve the “plugging and abandonment” of a well site. The California Code of Regulations, Section 1723 outlines the requirements for well plugging and abandonment in California. The process of plugging typically involves the filling of the well hole with drilling mud and the placement of cement plugs across all oil or gas zones, any water interfaces and at the surface. Additional cement plugs may be required depending on the condition of the well. Plugs placed into the well-bore prevent communication between subsurface rock layers (Testa and Jacobs, 2014).

The process of remediation involves use of a drilling rig to remove equipment inside the well and to ensure that the well is unobstructed so that isolation plugs can be effectively installed.

Additional work involves removal of the well-head, sampling and testing for soil, and possibly water, contamination surrounding the well site. Older wells might have above surface or underground tanks that require further clean up, removal and additional testing for subsurface leakage and contamination. Contaminated soils require careful disposal, before the well site can be brought back to the required standards for commercial or even residential use. It is important for the city and oil producers to ensure timely remediation at oil and gas wells for idle wells pose significant concerns. Indeed, the California Department of Conservation's Division of Oil, Gas, & Geothermal Resources (DOGGR), estimated more than 23,000 idle wells in the state pose risks of desertion and contamination. State Assembly Bill 2729 (2016) is aimed at reducing such risk.

However, remediation work, calculated over the year, for each of these sites was estimated to involve 0.5 workers. Thus, 215 full-year jobs would be generated in the city if all wells in the proposed setback zone were remediated at once. These jobs would generate additional employment across the city as a result of multiplier effects associated with the purchase of inputs and consumption from wages; an additional 141 jobs would be generated elsewhere in the Los Angeles economy. These figures are based on the closure of 429 active wells and assume an average well site remediation cost of approximately \$109,000. Pollution savings summary also included the removal of 199,000 metric tons of carbon dioxide equivalents released each year in the City of Los Angeles as a result of oil and gas extraction and supporting industrial activities.

B. Industry Economic Reports

Economic and Fiscal Effects of Set-Back Requirements on the Oil and Gas Industry in Los Angeles, by Capital Matrix Consulting, March 2018 (Appendix A2-8)

According to the Capital Matrix Consulting (CMC) report, oil production within Los Angeles City comes primarily from six fields located fully or partly within its boundaries. About forty percent (40%) of the total is from onshore portions of the Wilmington Field, pumped by wells located in and around the Port of Los Angeles. Other significant sources of oil are the Las Cienegas, San Vincente, and Cascade fields, as well as portions of the Beverly Hills and Torrance fields.

They found that there were about thirty (30) producers operating in Los Angeles City in 2016. About eighty-five percent (85%) of total oil production came from the top six (6) companies. These include: Sentinel Peak Resources (with production in Beverly Hills, Las Cienegas, and San Vincente fields), Warren E&P (Wilmington Field), California Resources (primarily its Tidelands operations in Wilmington Field), DCOR (Cascade Field), and Pacific Coast Energy Company (Beverly Hills Field).

Los Angeles City: Of the County-wide totals, \$430 million in economic output, \$270 million in gross regional product, 1,480 jobs, \$155 million in labor income, and \$35 million in state and local tax payments are related to oil and gas production in the City. The effects on Los Angeles City production would be even more pronounced. A 500-foot setback would eliminate sixty-three

percent (63%) of production, and a 2,500-foot setback would eliminate eighty-seven percent (87%) of oil production in the City in the CMC report.

Corresponding economic and fiscal impacts: As shown in Table 18, a 500-foot setback imposed by Los Angeles City would result in losses of \$255 million in economic output, 890 high paying jobs, \$88 million in labor income, and \$22 million in state and local taxes. Adoption of a 2,500-foot setback would result in job losses of 1,221, labor income losses of \$122 million, and state and local tax reductions of \$29 million.

Table 18. Economic and Fiscal Impacts of Setback Ordinances Imposed By Los Angeles City - Direct and Multiplier Effects (Annual Average Reductions - 2020 to 2025); CMC Report

Loss In:	Setback Distance		
	500 foot	1,500 Foot	2,500 Foot
Oil production (%)	63%	86%	87%
Economic Output (\$ Millions)	\$255	\$340	\$344
Employment	890	1,210	1,221
Labor Income (\$ Millions)	\$88	\$120	\$122
State/Local Taxes (\$ Millions)	\$22	\$28	\$29

Los Angeles City oil and gas operations: The CMC report showed that there were 541 workers oil and gas industry establishments operating in the City in 2016. These employees were paid a combined total of \$77 million, which works out to an average annual wage of \$143,000. The high rate partly reflects the presence of the California Resources Corporation and Breitburn Energy Partners headquarters within the City. An additional 112 employees were employed in pipeline construction industries in the City. In the City average wages in the oil production industry are quite high compared to other private sector jobs.

Table 19. Economic and Fiscal Impacts of Setback Ordinances Imposed By Los Angeles City - Direct and Multiplier Effects (Annual Average Reductions - 2020 to 2025); CMC report

Type of Impact	Economic Output	Gross Regional Product	Number of Jobs	Labor Income
Direct	\$175	\$110	530	\$76
Indirect	29	18	122	14
Induced	71	43	471	25
Total	\$275	\$171	1,123	\$115
Multiplier	1.6	1.6	2.1	1.5

The combined countywide average for all oil and gas-related jobs is over \$100,000, and the oil and gas extraction segment has an average wage of over \$160,000. The high average wage in this segment partly reflects high wages paid by oil producers generally, but also is due to the significant number of well-paid jobs in headquarter, centralized purchasing, and logistical operations in the County (See Figure 19).

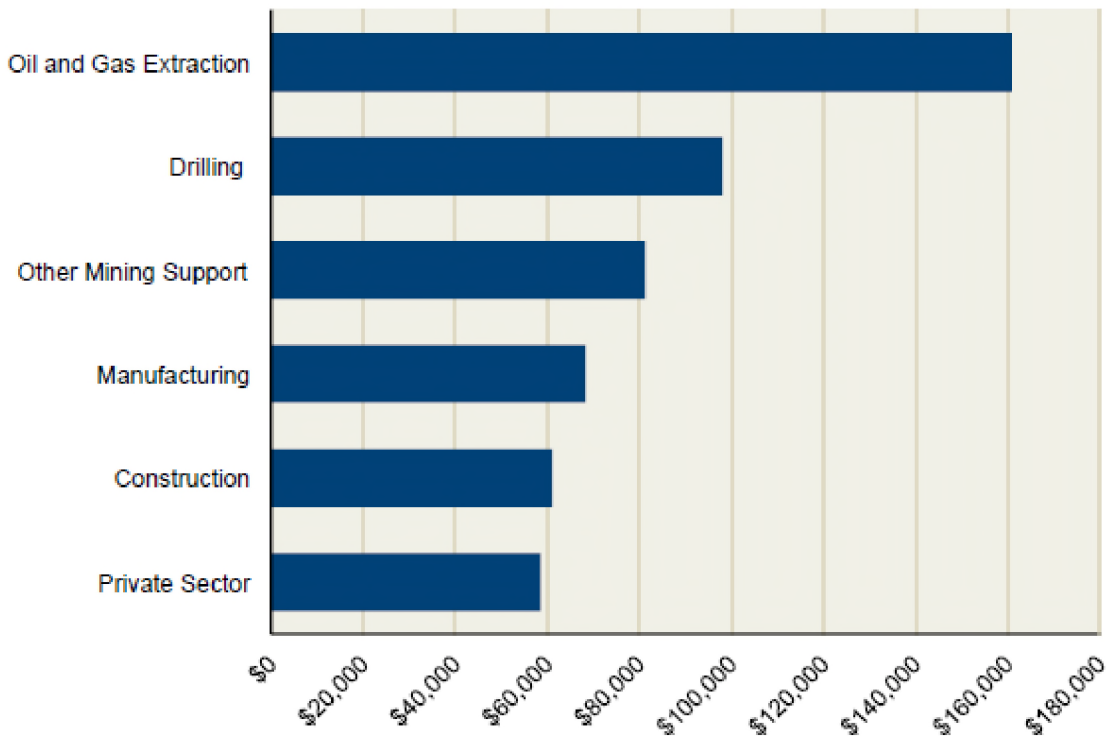


Figure 19. Los Angeles County Average Annual Wage by Industry in 2016, CMC report

Potential City Tax Impacts

State and local taxes generated by oil and gas production within City boundaries total \$25.9 million, of which \$15 million is state taxes and \$10.8 million is local taxes. Most of the local taxes are from sales and property taxes. The City does not have a barrel tax, but Table 20 shows the County has a 40 cents per barrel tax that generates approximately \$8.7 million per year.

The CMC report also evaluated tax revenues from: property taxes on oil reserves and equipment; state corporate taxes on company profits; personal income taxes on wages and royalties; state and local sales taxes on oil producers’ purchases of materials, fuels, and equipment; severance taxes imposed by about a dozen cities; and the DOGGR administrative fee used to support a variety of its regulatory activities. The multiplier effects include (1) personal income taxes paid on employees’ wages, and (2) state and local taxes paid on subsequent rounds of income and expenditures generated by supplying businesses and their employees.

Table 20. State and Local Taxes Generated by Oil and Gas Production in Los Angeles County and Los Angeles City in 2018 (Dollars in Thousands), CMC report

Tax Source	Los Angeles County		Los Angeles City	
	Total Amount	Per Barrel Amount	Total Amount	Per Barrel Amount
On producers & royalty owners:				
State:				
Corporation Tax	\$25,000	\$1.15	\$3,200	\$1.15
Personal income	10,270	0.47	1,320	0.47
Sales	14,110	0.65	2,010	0.72
DOGGR	12,550	0.58	1,610	0.58
Total, state	\$61,930	\$2.85	\$8,140	\$2.91
Local:				
Property	\$44,140	\$2.03	\$5,880	\$2.11
Sales	9,140	0.42	\$1,170	0.42
Severance	8,710	0.40	0	-
Other	3,270	0.15	420	0.15
Total, local	\$65,260	\$3.00	\$7,470	\$2.81
Multiplier impacts:				
State	\$54,500	\$2.50	\$6,920	\$2.48
Local	23,600	1.09	3,400	1.21
Total, multiplier impacts	\$72,970	\$3.59	\$8,680	\$3.69
Combined, Direct and Multiplier:				
State	\$116,430	\$5.36	\$15,060	\$4.94
Local	88,860	4.09	10,870	3.61
Total, combined	\$205,290	\$9.45	\$25,930	\$8.55

Separate from the income, jobs, and tax revenue, there is additional financial value identified by the CMC report. The economic value of the oil and gas reserves can be measured by estimating the present discounted value of after-tax cash flows (i.e. annual revenues minus operational and investment costs) generated from all future extraction of oil from these reserves. The actual value depends on several factors, one of the most important of which is the future price of crude oil. They projected a valuation based on low, moderate, and high assumptions, they estimate that the economic value of the oil reserves in LA County would be worth \$1.2 billion under the lower-end oil price forecast, \$2.3 billion under the moderate price forecast, and \$3.4 billion under the high-end price forecast. The lost value could also result in a major liability if mineral rights

property owners and producers were to prevail in “takings” lawsuits under the United States and California Constitutions.

At a minimum, it would cost millions of dollars in litigation expenses to defend against such lawsuits. If the plaintiffs were to prevail, the City would be required to pay the present value of the lost profits from the oil and gas that would no longer be recovered in these fields to the oil companies and owners of the mineral rights affected by the ordinance.

C. Setback Implementation Potential Fiscal Impact to the City

Oil and natural gas production values within the City are not publically available for six months to year. The most recent full year production data is from 2017. The average daily crude oil production rate for the City has ranged from approximately 7,600 - 8,000 barrels of oil per day (BOPD). The annual total cumulative oil and gas production in the City for 2017 was 2.5 million barrels (bbl) of oil and more than 4.9 million cubic feet (MCF) of natural gas.

Local governments and industry typically use the Midway Sunset Oil Field in Central California as a proxy for a State oil price. The American Petroleum Institute gravity (API gravity) is a measure of crude oil by density which dictates the price per barrel. Midway Sunset crude oil is set at 13 API gravity which is similar to most types of crude oil produced in California. In 2017, the Midway Sunset Oil Price ranged from \$44.33/bbl to \$59.24/bbl, with an annual average oil price of \$48.19/bbl. While in 2018, its daily price fluctuated higher from \$53.03/bbl to \$71.58/bbl, with an average annual oil price of \$68.02/bbl. The December 2018 Deloitte Advisory Firm Resource Evaluation Report projected the 2019 Average Midway Sunset crude oil price at \$59.00.

The present value of the current oil production (2.5 million barrels) within the City at the Midway Sunset oil price of \$59/barrel is conservatively estimated at least \$148 million per year. However, any change in oil price can significantly increase or decrease this value. The United State Energy Information Administration (US EIA) estimates oil price will be \$72/barrel in 2020, which would increase the value at \$185 million.

This estimate does not reflect the higher API gravity crude oil produced within the City or a valuation of the produced natural gas that would increase the net present value of the city wide petroleum production. The actual current value of oil and gas production will be greater due to expected higher oil prices in the future and the additional value of the natural gas produced. The following is the City’s Petroleum Administrator’s cost estimate for each potential fiscal impact.

Value of Future Crude Oil Production:

In 2012, as the U.S. Geological Survey (USGS) estimated that between 1.4 and 5.6 billion barrels of recoverable oil remain in just ten (10) of the Los Angeles basin oil fields; three (3) of them (Inglewood, Torrance, and Wilmington/Belmont) lie partially within the City boundaries. In an updated 2018 geological evaluation, done by USGS geologist Don Gautier, concluded that approximately 1.6 billion barrels of additional volume of recoverable crude oil exist within the City that could be produced using existing technology. Applying the Midway-Sunset projected oil

price of \$59/bbl to the 1.6 billion barrels of remaining recoverable reserves provides \$94.4 billion in present value. Price Water House Cooper (PWC) projects a 6% rate of return for the oil industry in 2019. The projected future value of the remaining oil reserves belonging to mineral rights owners in the City calculated for a 20 year period at 6% interest rate is \$97.6 billion.

Estimated future value of recoverable petroleum reserves is \$97.6 billion.

Land Value:

Land values in the City vary by location according to a 2017 study of metropolitan land values across the United States. Economists David Albouy and Minchul Shin of the University of Illinois, and Gabriel Ehrlich of the University of Michigan, relied on data from CoStar, a national real-estate database, covering land transactions from 2005 through 2010. The study estimated the total land value of the Los Angeles-Long Beach, CA area at \$2.3 trillion. The average land value per acre city wide was estimated at \$2.6 million and the value of central downtown land was \$16 million per acre.

The sixteen remaining oil drilling sites are spread across the City of Los Angeles equate to 24 acres of surface land. The drill sites in non-central areas are estimated land value of \$85 million. The drill sites in central areas are estimated land value of \$15 million. The costs vary from location to location and would likely be higher than this estimate due to the regional housing crisis. In an imminent domain proceeding or litigation over the deprivation a surface owner's property rights, then the land owner would need to be compensated at a fair market price.

The estimated current surface land value of the drill sites in the City is \$100 million.

Well Abandonment:

Oil and gas well abandonments must meet standards required by CA DOGGR to be abandoned when operators end operations. There are approximately 1,100 active and idle oil wells within the City. As of 2018, there are 819 active wells and 296 idle wells, of which, the inactive wells can be reactivated at any time.

The abandonment of an oil well in the Los Angeles Region can cost anywhere from \$50,000 to \$500,000 per well according to news reports from CIPA. The two (2) wells recently abandoned on Firmin Street in the Echo Park area of the City cost the state about \$375,000. Sixty-Five percent (65%) of active and idle wells are located within drill sites which should be on the lower end of the cost scale. The remaining wells will likely require higher abandonment costs due to their locations in difficult to access urban settings. Drill site well abandonments are estimated to cost \$250,000 per well for seven hundred twenty-five (725) wells at a projected cost of \$181 million. Non-drill site wells are estimated to cost \$375,000 per well for the three hundred seventy-five (375) wells, which would total approximately \$140 million. The cost would likely be greater than this amount because many of the wells have old broken equipment inside them and damaged

casing which takes longer and is more expensive to abandon. In a property taking's litigation, these costs would be an item of dispute or if a company declared bankruptcy the City would need to identify the funding to abandon the wells.

Total Well Abandonment Cost Estimate - \$321 million

Environmental Remediation and Cleanup:

After each drill site's wells are abandoned, the environmental cleanup process must begin to restore the site to its prior natural state to allow for an alternative land use. The site cleanup is typically regulated by DTSC or the LARWQCB. Drill site cleanup will likely include tank removal, pipeline abandonment, building demolition, concrete removal, soil testing, soil removal, health risk assessments, and both Phase 1 & 2 environmental site assessments. Depending on the desired level of cleanup, residential or industrial levels, the costs can vary significantly.

In 2011, the Beverly Hills City Council voted to ban all oil drilling within the city limits by December 31, 2016. After implementation of this law and cancellation of the oil operating lease, the operator of the one active drill site within the City of Beverly Hills, Venoco Incorporated, declared bankruptcy. Venoco was discharged of its well abandonment and environmental remediation responsibilities in Federal Court, even though they were listed in their lease agreement. The City of Beverly Hills is now managing the project on behalf of the Beverly Hills Unified School District (BHUSD) to properly secure and plug nineteen (19) oil wells located on School District property (0.73 acres) adjacent to the Beverly Hills High School. Prior to bankruptcy, Venoco said the task would be "expensive and complicated" and that it could take "several years" at an estimated cost of \$10 - \$15 million to cleanup. Well abandonment was estimated to be half of the total project cost. In December 5, 2017, the City of Beverly Hills and the Beverly Hills School District entered into an agreement whereby the City of Beverly Hills would take on project management responsibilities to monitor and plug the wells. The City of Beverly Hills advanced \$8 million in costs for site monitoring and plugging. This amount is subject to 50% reimbursement by the Beverly Hills School District. The city and school district only received \$760,000 from the bankruptcy court proceedings. The Beverly Hills example is the basis of an anticipated estimated environmental remediation and cleanup cost estimate of \$6.25 million per acre. The City of Los Angeles has twenty-four (24) acres of active oil and gas drill sites that will eventually need to be abandoned and remediated.

Total Environmental Remediation and Cleanup Cost Estimate - \$ 150 million

Expected Litigation Costs:

In 2019, Assemblymember Muratsuchi introduced Assembly Bill 345 (See Appendix A2-19) to establish a statewide 2,500 foot setback from oil and gas wells. The Assembly Appropriations Committee summarized the fiscal effects of expanded setbacks proposed under Assembly Bill 345. The Committee's analysis (Appendices A2-20 & A2-A21), noted total lost revenues from oil production of up to \$3.5 billion, annual lost production revenue of up to \$350 million per year,

annual lost tax revenue in the range of \$100 million per year, and additional state regulatory costs of \$4 million per year. These cost burdens would be felt most acutely in the Los Angeles area because it would have impacted 87% of oil production in the City. The analysis concluded that the bill would give rise to litigation over takings “at significant cost to the state.” The bill analysis indicated implementation of the law would require at least \$1 million per year in litigation costs. The City Attorney’s Office agrees that the City can expect to spend a similar amount per year to defend the implementation of a setback distance within the City.

Estimated Annual Litigation Cost = \$1 million per year

Total Potential Fiscal Impact to the City of Setback Implementation:

- Current Oil Production - **\$148 - \$185 million**
- Future Oil Production - **\$97.6 billion**
- Land Value - **\$100 million**
- Well Abandonment - **\$321 million**
- Environmental Clean Up - **\$150 million**
- Litigation - **\$1 million per year**

The estimated potential cost to the City of establishing a setback distance on existing operation is \$724 million, which includes the minimum value of the current oil production, land value costs, well abandonment costs, environmental clean-up costs, and five years of litigation expenses. It may be lower if the sites are not cleaned up, wells stay unplugged, and the City is successful in the court systems. The estimated potential cost to the City of establishing a future setback distance could be as high as \$97.6 billion in compensation for the future value of mineral rights owed from takings litigation.

D. Establishment of Oil and Gas Restricted Funds

In 2018, Los Angeles City Controller Ron Galperin published a report titled, “Review of the City of Los Angeles’ Oil and Gas Drilling Sites” (Appendix A2-2). The review was initiated for several reasons, but two (2) that are directly related to this report. First, the review wanted to determine if appropriate coverage existed to protect the City and its residents from financial risks associated with oil and gas wells. Secondly, it sought to implement effective processes to collect revenues and recover costs. In order to successfully implement the recommendations in his report, he confirmed that it will require additional financial resources. The report also noted that as the City enhances its local oil and gas oversight framework, it should prioritize cost recovery.

The report highlighted the City’s large real estate portfolio (almost 9,000 distinct parcels) that includes parks, libraries, municipal facilities, buildings, and vacant land. The value of the City’s properties are not limited to surface structures, but it also has recoverable deposits of oil and gas may be found in subsurface locations beneath these parcels. The City’s ability to generate revenue by using its real estate assets for oil and gas extraction activity depends on the extent to

which it owns the mineral rights associated with subsurface parcels of land. The Controller found that Council-controlled and Proprietary Departments provided information that showed oil and gas operators paid approximately \$390,000 in oil and gas royalty revenue to the City in FY2017.

However, the City does not currently know the locations of all subsurface parcels where it owns mineral rights. This prevents the ability to identify pooling or unit agreements that include the properties that should generate royalty revenue for the City based on the amount of oil or gas that is being extracted. According to the Petroleum Administrator, there may also be opportunities to recover additional revenues from former well operators who may not have paid royalties to the City for decades. Any potential recovery of these funds is not possible without extensive title research of City land records, to identify subsurface locations of oil deposits along with parcels owned by the City. Once identified, these parcel numbers can be compared to existing pooling and unit agreements, as well as historical extraction data, which is maintained by CA DOGGR.

During the Controller's review, staff from some of the City Departments acknowledged that they did not have effective processes in place to ensure that the City was receiving all of the revenue it was owed. These examples demonstrate that City Departments are not exercising sufficient control to ensure that the City receive the appropriate revenue for a defined use of the City's property assets. Like any other property owner, the City needs to ensure that its business partners make accurate payments in a timely manner. The LAAC outlines a centralized role for the Board of Public Works and Petroleum Administrator to oversee oil and gas extraction from City-owned property. However, the historical nature of drilling activity in the City combined with a decentralized approach created information gaps that prevented effective oversight.

The Controller called on the City to consider reintroducing a barrel tax for voter approval. Many neighboring local jurisdictions assess a per barrel tax on oil and gas that is extracted by local operators. The City previously had a barrel tax in place, however, the tax was repealed in 1996. The City put forth a special ballot measure in 2011 that would have imposed a tax of \$1.44 per barrel of oil extracted within the City. The proposed tax rate was significantly higher than barrel taxes imposed by neighboring jurisdictions. The proposed ballot measure was narrowly rejected by voters 51.07% to 48.93%. Although the March 2011 ballot measure was rejected, increased awareness about the impacts of oil and gas extraction in densely populated environment combined with high profile public health incidents such as Aliso Canyon may have shifted voter opinion.

To begin the process, the City must perform a cost-benefit analysis for implementing a barrel tax that considers factors such as:

- Projected extraction volume based on historical records and the likelihood of future production activity;
- Cost of placing the measure on the ballot;
- Ongoing administrative costs associated with imposing and collecting the tax; and
- Set an appropriate tax rate.

Currently, barrel taxes in neighboring jurisdictions such as Long Beach, Santa Fe Springs, and Seal Beach range from \$0.41 to \$0.49 per barrel. Based on estimated current production levels (7,500 barrels per day), a barrel tax of \$0.50 would generate approximately \$1.4 million each year. Additionally, if the City decides to move forward with a ballot initiative, City Policymakers should determine whether revenue generated from these taxes should be deposited in the City's general fund or restricted funds to assist with well abandonment costs, environmental remediation, repurpose of oil and gas sites, oversight of current oil and gas operations, worker training, and/or another specific purpose.

The City should establish restricted petroleum trust funds for oil and gas revenues derived from its mineral rights. The funds should be located within the Board of Public Works under the oversight of the Director of Petroleum Administration and Board. The fund should have a large percent of it placed into an investment tool to generate interest for the betterment of all Angelinos. The County of Norway and the State of Alaska have successfully instituted these types of funds for the majority of their petroleum revenues. Oil and gas mitigation or abandonment funds are common in other local jurisdictions, like the State Lands Commission and the City of Long Beach Oil Properties Division. While the \$390,000 in annual revenue is very small relative to the City's annual total budget, it can quickly grow if treated as an endowment. Eighty percent (80%) of the petroleum revenue derived from the City should be placed into a restricted investment fund, while the other twenty percent (20%) should be directed to a separate restricted fund to be spent on oversight of oil and gas operational costs. Additional revenue could be generated through the re-institution of the City's oil barrel or severance tax. Currently, the County of Los Angeles, City of Signal Hill, and other local jurisdictions have passed these types of ballot measures.

The recent experiences of the City of Beverly Hills and Beverly Hills Unified School District should be a warning sign for the City of Los Angeles. After years of receiving millions of dollars in oil and gas royalties, the City of Beverly Hills voted in 2016 to end petroleum operations within their city. However, both public entities spent all of their respective petroleum revenues each year and saved nothing for clean up or abandonment costs. It should be noted that it may have appeared to be the prudent approach at the time, since they did have language in their oil and gas lease agreements that the company would restore and clean up the drill site. However, the clean up or well abandonment costs were quickly discharged in bankruptcy court leaving the City and School District scrambling to find funding from their general fund, limited reserves, or external public agencies.

The City of Los Angeles has the same liability, but much larger with our seventeen (17) oil and gas drill sites. This report estimates at least \$150 million in environmental remediation and clean-up costs for all sites city wide. The City should not spend all of its petroleum revenue every year without saving any of it in a rainy day fund. It's a fiscally irresponsible approach and does a disservice to our residents.

Section 12. Human Rights and Environmental Standards of Oil Exporting Nations

California has the largest economy in the United States and fifth largest in the World with a GDP of \$2.9 trillion according to Forbes. In 2018, the energy demand for the state required approximately 642,000 barrels of crude oil per day (BOPD) for refineries across the state. The state imports nearly 60% of the crude oil used at refineries in San Francisco Bay and Los Angeles/Long Beach Port Complex. The California Energy Commission reported that in 2018 California refineries received 31% of their crude oil from domestic California production, 11% from domestic Alaska Production, and 58% from foreign countries. The overall crude oil demand has held steady the past 20 years, but the percent of domestic production has declined dramatically. Foreign crude oil imports have offset the decline of both Alaska and California production over the last two decades (see Figure 20).

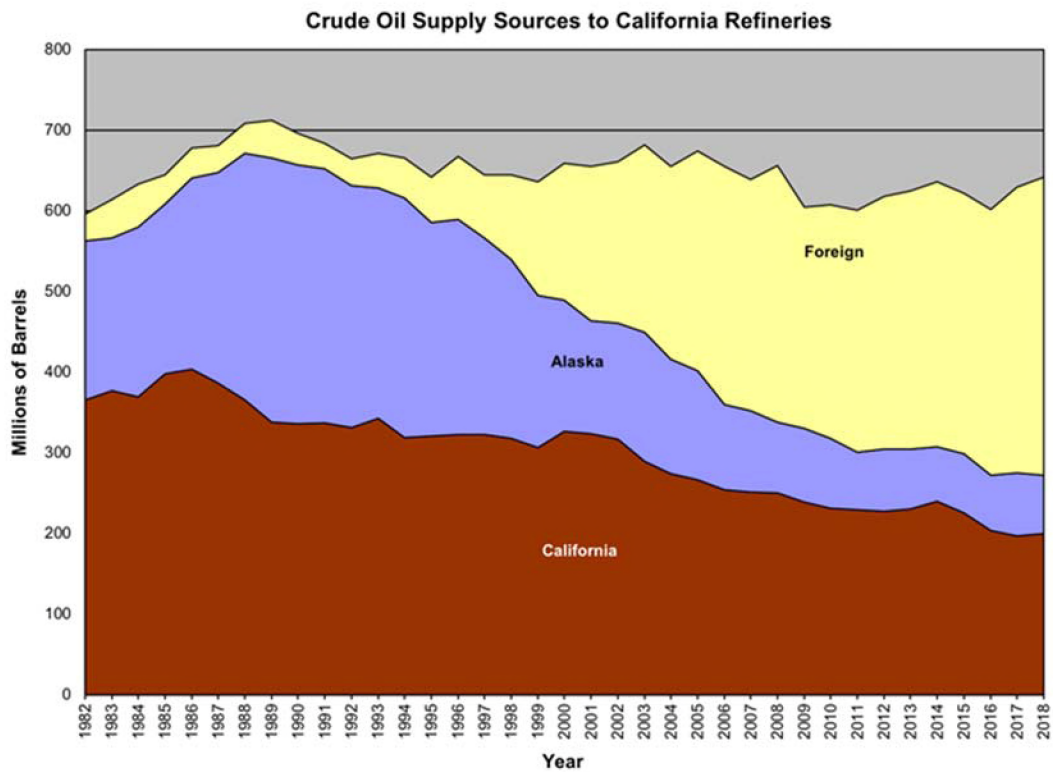


Figure 20. 1982 - 2018 Crude Oil Import Supply Sources to California Refineries

A. Foreign Oil Imports to California

The California Energy Commission and U.S. Energy Information Administration report that foreign sources of crude oil imported to California totaled 364 million barrels in 2018. Those mainly come here from North America, Latin America, Africa, and the Middle East. Saudi Arabia,

Ecuador and Columbia are the countries that provide the majority of the foreign imported crude oil to the state (see Table 21 and Figure 21).

Table 21. 2018 Foreign Sources of Crude Oil Imports to California by County

2018 Foreign Sources of Crude Oil Imports to California		
Source	Barrels of Crude Oil	Percentage
Saudi Arabia	134,818,000	37.00%
Ecuador	51,799,000	14.22%
Colombia	44,648,000	12.25%
Iraq	29,828,000	8.19%
Kuwait	22,548,000	6.19%
Brazil	17,688,000	4.85%
Mexico	15,064,000	4.13%
Canada	10,989,000	3.02%
Angola	10,691,000	2.93%
Other	26,294,000	7.22%
Total	364,367,000	100.00%

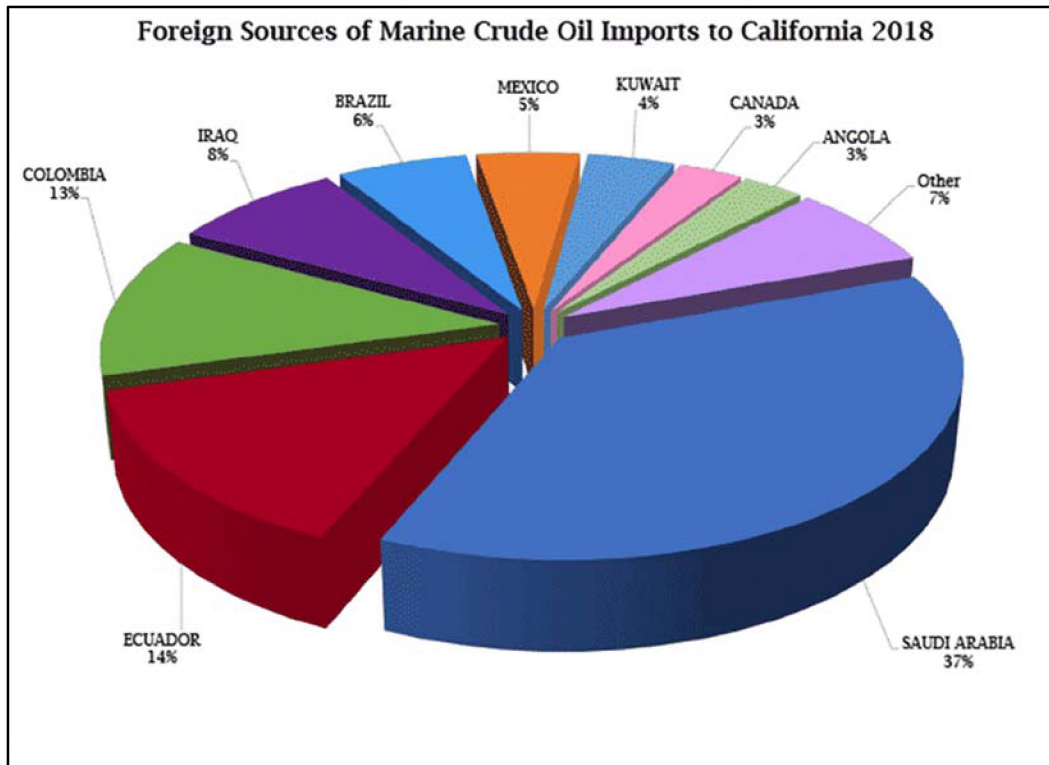


Figure 21. 2018 Percentage of Foreign Sources of Crude Oil Imports to California

B. Foreign Oil Imports to Ports of Long Beach and Los Angeles

Crude oil is transported to Los Angeles area refineries by pipelines, rail cars, and maritime tanker ships. Imported crudes from foreign countries arrive via the twin Ports of Long Beach and Los Angeles. In 2017, the Port of Long Beach (POLB) reported importing a 125.3 million barrels, while the Port of Los Angeles (POLA) reported 5.2 million barrels. Combined, a total of 76.1 million of barrels of crude oil comes into the ports from foreign counties and processed by local Los Angeles area refineries. Below is a listing of annual exported crude oil into the POLA & POLB ports by “Last Port” data supplied by Marine Exchange Database:

Table 22. 2017 Port of Long Beach Crude Oil Imports

Source Country	Barrels of Crude Oil	Percentage
USA (Alaska)	51,829,882	29.8%
Singapore	15,086,950	8.7%
Panama	12,364,054	7.1%
Iraq	11,836,046	6.8%
Ecuador	8,878,924	5.1%
Saudi Arabia	7,826,740	4.5%
Angola	5,661,879	3.3%
Mexico	4,362,457	2.5%
Columbia	3,776,875	2.2%
Canada	2,893,430	1.7%
Uruguay	877,680	0.5%
Total	125,394,917	

Table 23. 2017 Port of Los Angeles Crude Oil Imports

Source Country	Barrels of Crude Oil	Percentage
USA (Alaska)	2,655,881	50.4%
Colombia	1,845,234	35.0%
Panama	266,584	5.1%
Ecuador	258,477	4.9%
South Korea	247,479	4.7%
Total:	5,273,655	

C. Foreign Countries Exporting Oil to Los Angeles Refineries

The top foreign countries that export crude oil into Los Angeles area refineries include the following:

1. Angola
2. Canada
3. Columbia
4. Ecuador
5. Iraq
6. Mexico
7. Panama
8. Saudi Arabia
9. Singapore
10. South Korea
11. Uruguay

D. Human Rights Standards of Oil Exporting Countries

The United Nations defines human rights as rights inherent to all human beings, regardless of race, sex, nationality, ethnicity, language, religion, or any other status. Human rights include the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, and the right to work and education.

Freedom House is an independent watchdog organization dedicated to the expansion of freedom and democracy around the world. They produce an annual global report, titled "*Freedom in the World.*" The report (Appendix A2-24) analyzes countries political rights and civil liberties. It is composed of numerical ratings and descriptive texts for each country and a select group of territories. It uses a three-tiered system consisting of scores, ratings, and status. The 2018 edition covers developments in 195 countries and 14 territories from January 1, 2017, through December

31, 2017. The report’s methodology is derived in large measure from the Universal Declaration of Human Rights, adopted by the United Nations General Assembly in 1948.

Table 24. 2018 Freedom House Human Rights Ranking for Countries Export Oil into Los Angeles

2018 Freedom House Human Rights Ranking				
Country	Freedom Rating	Political Rights	Civil Liberties	Freedom Status
Saudi Arabia	7	7	7	Not Free
Ecuador	3	3	3	Partly Free
Colombia	3	3	3	Partly Free
Iraq	5.5	5	6	Not Free
Kuwait	5	5	5	Partly Free
Brazil	2	2	2	Free
Mexico	3	3	3	Partly Free
Canada	1	1	1	Free
Angola	6	6	6	Not Free

**CL, PR, Freedom Rating Explanation: 1 = most free and 7 = least free*

2018 Freedom House Human Rights Ranking Explanation:

- **Scores** – A country or territory is awarded 0 to 4 points for each of 10 political rights indicators and 15 civil liberties indicators; a score of 4 represents the smallest degree of freedom and 0 the greatest degree of freedom.
- **Political Rights and Civil Liberties Ratings** – A country or territory is assigned two ratings—one for political rights and one for civil liberties—based on its total scores for the political rights and civil liberties questions. Each rating of 1 to 7, with 1 representing the greatest degree of freedom and 7 the smallest degree of freedom.
- **Free, Partly Free, Not Free Status** – The average of a country or territory’s political rights and civil liberties ratings is called the Freedom Rating, and it is this figure that determines the status of Free (1.0 to 2.5), Partly Free (3.0 to 5.0), or Not Free (5.5 to 7.0).

In 2018, Freedom in the World recorded the 13th consecutive year of decline in global freedom. For comparison the United States in 2019 has a Freedom Rating Ranking of 1.5, Political Rights Ranking of 2 and a Civil Liberties Ranking of 1. The United States has been identified as struggling with assailing the rule of law, demonizing the press, self-dealing, conflicts of interest by officials, attacking the legitimacy of elections, and threats to the American Ideal abroad.

The United States' State Department is responsible for carrying out U.S. foreign policy, operating the nation's diplomatic missions abroad, negotiating treaties and agreements with foreign entities, and representing the United States at the United Nations. The Foreign Assistance Act of 1961 and the Trade Act of 1974, requires the State Department to release an annual report to the U.S. Congress on human rights practices for all countries receiving assistance and all United Nations member nations. The 2018 Country Reports on Human Rights Practices for each country can be accessed online here: <https://www.state.gov/reports/2018-country-reports-on-human-rights-practices/>

Below are excerpts from the executive summaries from the 2018 Country Reports on Human Rights Practices for each country that exports crude oil into Los Angeles:

1. Angola:

“Human rights issues included reports of unlawful or arbitrary killings by government security forces; arbitrary detention by security forces; harsh and life-threatening prison and detention conditions; restrictions on free expression and the press, including criminal libel and slander; refoulement of refugees to a country where they had a well-founded fear of persecution; corruption, although the government took significant steps to end impunity for senior officials; trafficking in persons; and crimes involving societal violence targeting lesbian, gay, bisexual, transgender, and intersex (LGBTI) persons.”

2. Canada:

“Human rights issues included reports of deadly violence against women, especially indigenous women, which authorities investigated and prosecuted.”

3. Columbia:

“Human rights issues included reports of unlawful or arbitrary killings; reports of torture and arbitrary detention by both government security forces and illegal armed groups; corruption; rape and abuse of women and children by illegal armed groups; criminalization of libel; violence and threats of violence against human rights defenders and social leaders; violence against and forced displacement of Afro-Colombian and indigenous persons; violence against lesbian, gay, bisexual, transgender, and intersex persons; forced child labor; and killings and other violence against trade unionists.”

4. Ecuador:

“Human rights issues included reports of torture and abuse by police officers and prison guards; harsh prison conditions; official corruption at high levels of government; criminalization of libel, although there were no reported cases during the year; violence against women; and the use of child labor.”

5. Iraq:

“Human rights issues included reports of unlawful or arbitrary killings by some members of the Iraq Security Forces (ISF), particularly Iran-aligned elements of the Popular Mobilization Forces (PMF); forced disappearances; torture; arbitrary detention; harsh and life-threatening prison and detention center conditions; arbitrary or unlawful interference with privacy; restrictions on free expression, the press, and the internet, including censorship, site blocking, and criminal libel; legal restrictions on freedom of movement of women; widespread official corruption; unlawful recruitment or use of child soldiers by Iran-aligned elements of the PMF that operate outside government control; trafficking in persons; criminalization of lesbian, gay, bisexual, transgender, and intersex (LGBTI) status or conduct; violence targeting LGBTI persons; threats of violence against internally displaced persons (IDPs) and returnee populations perceived to have been affiliated with ISIS; and restrictions on worker rights, including restrictions on formation of independent unions and reports of child labor.”

6. Mexico:

“Human rights issues included reports of the involvement by police, military, and other state officials, sometimes in coordination with criminal organizations, in unlawful or arbitrary killings, forced disappearance, torture, and arbitrary detention by both government and illegal armed groups; harsh and life-threatening prison conditions in some prisons; impunity for violence against journalists and state and local censorship and criminal libel; and violence targeting lesbian, gay, bisexual, transgender, and intersex (LGBTI) persons.”

7. Panama:

“Human rights issues included undue restrictions on free expression, the press, and the internet, including censorship, site blocking, and criminal libel; and widespread corruption.”

8. Saudi Arabia:

“Human rights issues included unlawful killings; executions for nonviolent offenses; forced renditions; forced disappearances; and torture of prisoners and detainees by government agents. There were also reports of arbitrary arrest and detention; political prisoners; arbitrary interference with privacy; criminalization of libel, censorship, and site blocking; restrictions on freedoms of peaceful assembly, association, and movement; severe restrictions of religious freedom; citizens’ lack of ability and legal means to choose their government through free and fair elections; trafficking in persons; violence and official discrimination against women, although new women’s rights initiatives were implemented; criminalization of consensual same-sex sexual activity; and prohibition of trade unions.”

9. Singapore:

“Human rights issues included: preventive detention by government authorities under various laws that dispense with regular judicial due process; monitoring private electronic or telephone communications without a warrant; significant restrictions on the press and online, including the use of defamation laws to discourage criticism; laws and regulations significantly limiting the right of peaceful assembly and freedom of association; and discrimination based on sexual orientation and gender identity as well as criminalization of sexual activities between men, although the law on this was not enforced.

10. Republic of Korea (South Korea):

“Human rights issues included detention of conscientious objectors to military service, including those with religious objections; the use of the National Security Law and other security legislation, abuse of criminal libel law, blocking of internet sites; and corruption.”

11. Uruguay:

“Human rights issues included harsh conditions in some prisons.”

The Organization of the Petroleum Exporting Countries (OPEC) was established in 1960, with five (5) member countries, and has expanded to seventeen (17) member countries. The organization’s stated primary objective is to secure fair and stable prices for OPEC member countries. The original countries focused on efficient, economic and stable supply of petroleum to consuming nations, and they sought a fair return on capital to those investing in the industry. In the 1968 OPEC Declaratory Statement of Petroleum Policy, the member countries declared that they would hold sovereignty over their natural resources (petroleum & natural gas) in the interest of their national development. In October of 1973, during the Arab-Israeli War, Arab members of the OPEC, including Saudi Arabia and Iraq, imposed an embargo against the United States in retaliation for its decision to re-supply the Israeli military in order to gain leverage in the post-war peace negotiations. The six month embargo led to a quadrupling of oil prices, wide spread shortages of gasoline across the county, and many believe led to the 1973-1975 economic recession. According to the Council on Foreign Relations, combined, the group controls close to forty percent (40%) of world oil production. Their dominant market positions has allowed OPEC to act as a cartel, coordinating production levels among members to manipulate global oil prices.



Figure 22: 2019 OPEC Member Countries, Council on Foreign Relations

Four (4) countries that export crude oil to the Ports of Long Beach and Los Angeles are members of OPEC. They include Angola, Ecuador, Iraq, and Saudi Arabia. Here’s a brief summary of additional human rights concerns from the 2018 State Department Human Rights Practices Report:

Angola

“In August 2017 the ruling People’s Movement for the Liberation of Angola (MPLA) party won presidential and legislative elections with 61 percent of the vote. MPLA presidential candidate Joao Lourenco took the oath of office for a five-year term in September 2017, and the MPLA retained a supermajority in the National Assembly. Domestic and international observers reported polling throughout the country was peaceful and generally credible, although the ruling party enjoyed advantages due to state control of major media and other resources. The Constitutional Court rejected opposition parties’ legal petitions alleging irregularities during the provincial-level vote count and a lack of transparent decision-making by the National Electoral Commission.”

Ecuador

“Civilian authorities maintained effective control over the security forces. The government took steps to investigate and prosecute officials who committed human rights abuses, as it engaged in efforts to strengthen democratic governance and promote respect for human rights.”

Iraq

“In 2018 civilian authorities did not maintain effective control over some elements of the security forces, particularly certain units of the Popular Mobilization Forces (PMF) that were aligned with Iran.

Violence continued throughout the year, largely fueled by the actions of ISIS. The government declared victory over ISIS in December 2017 after drastically reducing the group’s ability to commit abuses and atrocities, but members of the group continued to carry out deadly attacks and kidnappings. The government’s reassertion of federal authority in disputed areas bordering the Iraqi Kurdistan Region (IKR), after the Kurdistan Region’s September 2017 independence referendum, resulted in reports of abuses and atrocities by the security forces, including those affiliated with the PMF.

The government, including the Office of the Prime Minister, investigated allegations of abuses and atrocities perpetrated by the ISF, but it rarely made the results of the investigations public or punished those responsible for human rights abuses. The Kurdistan Regional Government (KRG) High Committee to evaluate and respond to international reports reviewed charges of Peshmerga abuses, largely against IDPs, and exculpated them in public reports and commentaries, but human rights organizations questioned the credibility of those investigations. Impunity effectively existed for government officials and security force personnel, including the ISF, Federal Police, PMF, Peshmerga, and KRG Asayish internal security services.

ISIS continued to commit serious abuses and atrocities, including killings through suicide bombings and improvised explosive devices (IEDs). The government continued investigating and prosecuting allegations of ISIS abuses and atrocities and, in some instances, publicly noted the conviction of suspected ISIS members under the 2005 counterterrorism law.”

Saudi Arabia

“Government agents carried out the killing of Washington Post journalist Jamal Khashoggi inside the consulate of Saudi Arabia in Istanbul, Turkey, on October 2. Saudi Crown Prince Mohammed bin Salman (MBS) pledged to hold all individuals involved accountable, regardless of position or rank. Several officials were removed from their positions, and on November 15, the Public Prosecutor’s Office (PPO) announced the indictment of 11 suspects. The PPO announced it would seek the death penalty for five of the suspects charged with murder and added that an additional 10 suspects were under further investigation. At year’s end the PPO had not named the suspects nor the roles allegedly played by them in the killing, nor had they provided a detailed explanation of the direction and progress of the investigation. In other cases the government did not punish officials accused of committing human rights abuses, contributing to an environment of impunity.”

E. Environmental Standards of Oil Exporting Countries

Environmental standards are administrative regulations or law implemented for the treatment and maintenance of the natural environment. Environmental standards are set by local and national governments to prohibit specific activities, develop monitoring standards, and/or require permits for the use of land, water, or air. The standards can vary dramatically by country and by the type of environmental activity.

The Environmental Performance Index (EPI) is a joint project of the Yale Center for Environmental Law & Policy (YCELP) that measures global environmental standards. The 2018 report (Appendix A2-23) ranked 180 countries on 24 performance indicators across ten issue categories covering environmental health and ecosystem vitality. These metrics provide a gauge at a national scale of how close countries come to established environmental policy goals. The EPI is produced in collaboration with the World Economic Forum (WEF).

Table 25. 2018 EPI of the Top Oil Exporters to Los Angeles Refineries

2018 Environmental Performance Index				
Source	EPI Ranking	EPI Index	Environmental Health	Ecosystem Vitality
Angola	170	37.44	33.79	39.88
Canada	25	72.18	97.51	55.29
Colombia	42	65.22	71.05	61.33
Ecuador	87	57.42	72.58	47.31
Iraq	152	43.20	61.46	31.02
Mexico	72	59.69	66.04	55.46
Panama	56	62.71	66.96	59.87
Saudi Arabia	86	57.47	72.81	47.25
Singapore	49	64.23	72.14	58.96
South Korea	60	62.3	73.3	54.96
Uruguay	47	64.65	84.72	51.27

The lower the index score the better the relative environmental performance of a specific county. Environmental health is the branch of public health concerned with all aspects of the natural and built environment affecting human health. Environmental health is focused on the natural and built environments for the benefit of human health. Ecosystem vitality is aimed at reducing the loss or degradation of ecosystems and natural resources. These indicators are: air pollution effects on ecosystems, water effects on ecosystems, biodiversity and habitat, productive natural resources (forestry, fisheries and agriculture) and climate change.

According to the 2018 Environmental Performance Index (EPI) countries that export oil to the Ports of Long Beach and Los Angeles have lower environmental standards. For relative comparison, the United States ranked #27 out of 180 countries. Only Canada ranked higher than the United States, while the other ten countries were near the middle or bottom of global indexes.

Of the countries that export oil to the Ports of Long Beach and Los Angeles, the best countries to import oil from based on Freedom Ranking are Canada and Brazil (the only two that both meet

the definition of free countries). Of the countries that export oil to the Ports of Long Beach and Los Angeles, the best countries to import oil from based on the Environmental Performance Index are Canada, Columbia and Uruguay. Based on these rankings, Canada is the best country to import oil from.

Of the countries that export oil to the Ports of Long Beach and Los Angeles, the lowest ranked countries on Freedom Ranking are Saudi Arabia, Angola, Iraq and Kuwait. All four of these countries restrict one or more of the fundamental freedoms of religion or belief, expression, peaceful assembly and/or association or engage in gross violations of human rights such as extrajudicial killing, torture, and extended arbitrary detention. Of the countries that export oil to the Ports of Long Beach and Los Angeles, the lowest ranked countries to import oil according to the Environmental Performance Index are Angola, Iraq, Ecuador and Saudi Arabia. Based on these rankings, Angola and Saudi Arabia are the lowest ranking countries to import oil from based on human rights standards.

Section 13. Report Recommendations

Overall the review of the scientific literature on the health impacts of oil and gas operations relative to the City of Los Angeles was limited and inconclusive. The relevant studies identified by Physicians, Scientists, and Engineers for Healthy Energy found elevated risks and potential health impacts to sensitive receptors. The limited body of scientific research suggests association with a variety of potential health hazards and impacts related to the density of wells, proximity to sensitive receptors, and emissions of high concentrations of toxic air contaminants. The City of Los Angeles, Southern California Region, and the State of California have a dearth of local health studies to validate the findings in other states. The majority of the studies cited in research literature were from unconventional natural gas fields that have tight shale rock geologic formations enabled by high-volume hydraulic fracturing operations outside of California. However, the conventional oil and gas production in the City of Los Angeles is completely different from the field specific geochemistries, high pressure and high flow rate oil and natural gas production in other states like Colorado, New Mexico, Oklahoma and Texas. Production in those states are typically completed with unconventional natural gas development techniques, such as hydraulic or acid matrix fracturing that utilize large gas compressor stations. Oil and gas production in those states can often flow freely on primary production at much greater depths to the surface than in the mature oil fields within the City. Those states do not have the same level of emission control as required by CARB or SCAQMD in Southern California. It should be noted that since the 2013 enactment of State Senate Bill 4, there has been no permitted unconventional hydraulic fracturing oil and gas wells activity within the City of Los Angeles.

One peer reviewed study (Shamasunder et al. 2018) has been published to date in the City of Los Angeles related to respiratory health outcomes of asthma and oil and gas activities. It was based on self-reported household health surveys in the Adams and University Park neighborhoods. While this study compared localized asthma rates to state and county-level surveys, these

comparisons do not take into account competing sources of air pollution and other variables associated with asthma prevalence. The study was very weak as there was no source apportionment, consequently the source of the methane is difficult to ascertain and it relies on self-reported data, which can be difficult to interpret or replicate.

The Southern California comprehensive system of regulatory oversight, includes multiple reviews, permits, and inspections performed by subject matter experts in more than 15 different federal and state agencies, as well as multiple City Departments. These overlapping regulatory programs govern the siting of wells and facilities, drilling, well servicing, facility construction and maintenance, surface and subsurface operations, maintenance and mechanical integrity inspections, specific health, safety and environmental programs, workforce training, emergency response and plugging and abandonment, all of which include inspections, monitoring, reporting and public disclosure by operators and regulatory agencies. It's important to note, these regulatory requirements include a combination of engineering and operational controls, and monitoring that provide multiple, redundant layers of protection to safeguard neighbors, workers and the environment providing heightened regulations to those in Colorado, Texas, Ohio, Pennsylvania, or Maryland.

Both the County and our consultant identified the need for more local high quality health studies to better inform long term policy decisions. Our consultants (PSE) recommended to consider the implementation of a minimum surface setback, caps on oil and gas development density, and deployment of increased emission control strategies in the City of Los Angeles. A physical surface setback distance alone as a policy solution is not recommended by either the Los Angeles County Department of Public Health, or PSE. The County's report noted that a setback distance is not an absolute measure of health protection and additional mitigation measures must also be considered. Given the limitations of epidemiological studies, the County recommended comprehensive exposure monitoring of oil and gas activities and precautionary measures as appropriate to minimize exposures to substances that may adversely affect health. Our PSE consultants also identified setback distances from oil and gas development that can help mitigate proximal population exposures to air pollutants and other stressors associated with oil and gas activities that may be responsible for the observed human health risks and impacts in the peer-reviewed literature. The City should not establish setbacks without studying the results of the ongoing local oil and gas monitoring programs from SNAPS, AB 617, and MATES V. The City may want to consider contributing funding towards additional future studies. The City Council could add to the City's Legislative agenda an item to support the identification of additional funding for oil and gas health studies to be conducted by the State, SCAQMD, and the Los Angeles County Department of Public Health.

The best available public data on materials used at Oil and Gas Drill Sites in the City of Los Angeles are from the South Coast Air Quality Management District. However, PSE identified major data gaps regarding the identities of chemicals and associated environmental and toxicological profiles of the chemical inventories reported by SCAQMD Rule 1148.2. A total of 327 chemicals reported in the SCAQMD dataset could not be definitively identified by Chemical Abstracts Service Registry Numbers (CASRN) and were labeled trade secret chemicals. Seventy-nine

percent (79%) and seventy-seven (77%) of chemicals identified by CASRN did not have available acute inhalation toxicity data or chronic inhalation toxicity data, respectively. Furthermore, chemical information that is submitted by operators includes errors, such as incorrect CASRNs, obvious misspellings, and inconsistent data entries. The SCAQMD dataset is maintained as separate event and chemical reporting datasets, which themselves are further divided into the periods before and after September 4, 2015.

There are many ways that we can improve health oversight within the City and enhance coordination with our external health agencies. Los Angeles County could deputize the Los Angeles City Fire Department with health officer authority for oversight and inspections of oil and gas facilities within the City. This action would be proactive for future incidents and move away from a reactive model of oversight while empowering our local emergency services agency, LAFD, to have more oversight related to oil and gas operations.

Exploring the transfer of the Hazardous Waste Generator element of the Unified Program from the Los Angeles County Fire Department Health Hazardous Materials Division to LAFD CUPA is another improvement in health coordination. It aligns with LAFD's Strategic Plan for the development of a program to regulate hazardous waste management within the City. Oil and gas drill sites are typically hazardous waste generators and this authority would strengthen the City's enforcement abilities in the event of an oil spill.

Beyond improved health coordination, mitigation measures can be effective in reducing potential health impacts depending on site specific operations and proximity to sensitive receptors. The combination of a setback distance with enhanced operation conditions can minimize or potentially eliminate the sources of noise, light, odors, vibrations, and toxic air emissions.

The City's zoning code could be updated to require enhanced air quality, noise, traffic and transportation operating conditions derived from local regional EIRs. Additional engineering and operational controls, beyond those required by other regulatory requirements, could add further layers of protection for the community and the environment. In particular, annual inspections, Tier 4 engines, automated monitoring and control systems that could enable monitoring of real-time conditions in wells, flow lines and tanks to detect anomalies, and respond promptly to prevent and/or mitigate releases to further safeguard neighbors and the environment. The County Oil and Gas Strike Team report recommended mitigations which are relevant to the City's conventional oil and gas operations. Both reports also supported the establishment of a continuous Fenceline air monitoring system at oil and gas sites. City Council has already taken action on establishing a city wide Fenceline air monitoring program (CF-18-0203), but further advisement from SCAQMD staff and inclusion of the results from current and future studies (SNAPS, AB 617, and MATES V) will better inform an appropriate program for the City. Updates to the City's zoning code should consider the adoption of these types of mitigations to protect public health and safety. Additionally, our consultant PSE, recommended alignment of regional public policy on the oversight of oil and gas operations within the LA Basin.

This report should not lead to any public panic or belief in a widespread public health crisis. There is a lack empirical evidence correlating oil and gas operations within the City of Los Angeles to widespread negative health impacts. The lack of evidence of public health impacts from oil and natural gas operations has been demonstrated locally in multiple studies by the Los Angeles County Department of Public Health, the Los Angeles County Oil & Gas Strike Team, the South Coast Air Quality Management District and the comprehensive Kern County Environmental Impact Report and Health Risk Assessment. Both CA DOGGR and SCAQMD – as well as the dozens of other regulatory agencies – have specific environmental legal authority, including the ability to order a shutdown of operations which constitute an imminent threat to public health and/or safety.

Establishing a Setback Distance on Existing Operations

If City policy makers decide to establish a setback distance, there are several options to consider. A physical surface setback can be established in the zoning code for existing oil and gas wells. The precise setback distance for the City of Los Angeles to adopt is unclear from the literature review or approaches by other jurisdictions. The Los Angeles County Department of Public Health recommended expanding the minimum setback distance beyond 300 feet for both the citing of new wells and the development of sensitive land uses near existing operations. CA DOGGR has a “critical wells” designation for wells that are 300 feet from the centerline of the well to any building intended for human occupancy or any airport runway. The CA DOGGR distance is not a physical setback distance, but the threshold for additional safety measures, such as additional requirements for well blowout prevention equipment, emergency backup systems, and additional control valves.

While the State of California has no established statewide setback for oil and gas development, some local jurisdictions have established setbacks for residences and sites of sensitive receptors. In 2018, the City of Arvin adopted an ordinance (Appendix A2-31) that establishes setback distances of 300 feet for new development and 600 feet for new drilling operations near sensitive sites, such as parks, hospitals, and schools. However, neither setback distance impacted any existing or future oil and gas development. The California Attorney General’s Office issued a letter (Appendix A2-32) prior to the adoption of their ordinance stating that the proposed prohibited zones and setbacks are within the City’s power to regulate land use and within the City’s police powers, as long as it does not contradict state law. The Attorney General’s letter stated the following, “the Ordinance will not prevent the operation of oil and gas wells currently existing within the prohibited zones and/or setbacks if these sites can demonstrate vested rights and will not eliminate future access to subsurface oil and gas resources located in the restricted areas.” In the Arvin setback ordinance, if the setbacks had impacted existing oil and gas operations, then the Attorney General’s Office believed the action to be pre-empted by state law as interfering with the state's goals to develop and utilize oil and gas resources.

Texas, Pennsylvania, Colorado, New Mexico and other major oil and gas producing states do have regulations that set a minimum surface setback requirement from sensitive receptors to where

oil and gas can be produced. Those surface setback requirements are larger than those that exist in the State of California more generally. Those states produce mainly natural gas from deep low permeability shale geological formations that are located in rural, typically unpopulated, areas. Oil fields in the City of Los Angeles and across Southern California are different, being they are high permeability, low pressure sandstone geological formations.

However, nearly all the setback distances were for future oil and gas development and did not impact existing oil and gas operations. For example the State of Maryland has a 2,000 foot setback distance, but they only have ten (10) active natural gas wells in the whole state. In Texas, the 1,500 foot setback distances in Dallas and Flower Mound are the only mitigation that is required for oil and gas sites.

The City's PSE consultants stated, "the science is relatively clear that the development of oil and gas immediately adjacent to places where people live, work and play poses hazards and risks to public health and that some minimum distance from sensitive receptors should be considered." As such, they advised that a setback greater than 500 feet and up to 5,290 feet should be considered. The studies that evaluated health impacts at 2,500 feet or greater were nearly all from unconventional natural gas operations outside of California. They evaluated noise, perinatal, cancer, and non-cancer health effects in Pennsylvania, Oklahoma, and Colorado.

Of all 131 events reported within the City of Los Angeles by the SCAQMD chemical database, eighty-one (81) events or sixty-two percent (62%) of all events were within 600 feet of the sensitive receptor. Of all chemicals reported to the SCAQMD dataset, 22 were identified as hazardous air pollutants (HAPs) under the Clean Air Act, half of which were reported as used in the City of Los Angeles. The chemical inventory assessment does show chemicals of concern and HAPs are present, but again the City does not have empirical evidence that they have become airborne above observable unhealthy thresholds. If a surface setback distance alone is established from sensitive receptors, it should be at least 600 feet due to the uncertainty of airborne chemicals of concern and at least 500 feet which was the minimum threshold evaluated in the multiple epidemiological literature studies. Kern County setback distances ranged from 210 to 367 feet for deeper wells than City of Los Angeles oil and gas wells. A setback distance of 600 feet would be further than both Kern County's and meet the LADPH recommendations.

The best available emission control technologies and operational management approaches should be deployed on all oil and gas wells and ancillary infrastructure to limit emissions of toxic air pollutants. The stronger the regulatory environment, the more enhanced operating conditions, required engineering controls, annual inspections, and utilization of the best available technology can significantly reduce the need for potential setback distances.

If a surface setback distance is established, it could conservatively cost the City of Los Angeles at least a \$148 million for existing oil and gas production and up to \$97.6 billion in lost property values by mineral rights owners from the remaining 1.6 billion of recoverable oil and gas reserves beneath the City boundaries.

Establishing a Setback Distance on Future Development

A physical surface setback for future oil and gas development can be established by ordinance. In the review of other jurisdictions, nearly all, except for the City of Arvin, established setback distances for future development. Our consultants did recommend limiting the density of wells and other oil and gas development infrastructure at oil and gas producing areas within and near the City of Los Angeles.

In one general health study (Lewis et al. 2018), a group of health care providers, public health practitioners, environmental advocates, and researchers were surveyed about the safe distances from unconventional oil and gas development from vulnerable groups. The group reached consensus (defined as agreement among 70% of participants) that the minimum safe distance from unconventional oil and gas development is ¼ mile (1,320 feet) and additional setbacks should be established near sensitive receptors. There was a lack of consensus by the group around setback distances between ¼ - 2 miles (1,320 – 10,560 feet), due to limited health and exposure studies. It should be noted that this study did not expressly assess health effects.

The furthest distance considered by the Los Angeles County Department of Public Health was 1,500 feet. The County noted that additional mitigation is not likely to be needed at this distance and that some uncertainty remains due to gaps in long term health and exposure data. Fires, Explosions, and Other Emergencies were listed, but no defined mitigations were itemized and there was no evaluation of the fire code requirements for drill sites, nor fire suppression systems. The two out-of-state examples of 1,500 feet are the cities of Dallas and Flower Mound. Both distances are the only mitigation associated with that setback requirement, and those regulations are still being litigated in the Texas state court system. Additionally, 1,500 feet is the furthest jurisdictional distance limit that the City could set before potentially conflicting with other jurisdictional authorities, like the Ports of Long Beach and Los Angeles, Los Angeles World Airports, Unincorporated Los Angeles County, and adjacent municipalities.

If a surface setback distance is established on future oil and gas development, it could potentially cost the City of Los Angeles between \$1.2 billion in present value to \$97.6 billion in future value in a constitutional takings claim by mineral rights owners of the remaining 1.6 billion barrels of recoverable oil and gas reserves beneath the City.

Oil and Gas Health Report Recommendations:

It is recommended that the Los Angeles City Council, subject to the Mayor's approval:

1. Instruct the City Planning Department with the assistance of the Petroleum Administrator and the City Attorney's Office to prepare a report outlining the feasibility of establishing in the zoning code a physical surface setback distance of 600 feet from sensitive receptors on existing oil and gas wells, associated production facilities, and drill sites. The report shall address the discontinuance of non-conforming land uses resulting from the new requirements. The report shall also address a requirement to provide relief and an administrative remedy to comply with state and federal due process and takings law for any oil and gas operators or stakeholders in an oil and gas production that are affected by the new zoning requirements. The estimated cost to the City is at least \$724 million in anticipated litigation, lost oil production, well abandonment, environmental remediation and cleanup, and surface land value;
2. Instruct the City Planning Department with the assistance of the Petroleum Administrator and the City Attorney's Office to prepare a report outlining the feasibility of establishing in the zoning code a physical surface setback distance of 1,500 feet from sensitive receptors on future oil and gas development. The report shall also address a requirement to provide relief and an administrative remedy to comply with state and federal due process and takings law for any oil and gas operators or stakeholders in an oil and gas production that are affected by the new zoning requirements. The potential cost to the City could range from \$1.2 billion to \$97.6 billion in constitutional taking by mineral rights owners of the remaining 1.6 billion barrels of recoverable oil and gas reserves. The estimated cost of litigation over the anticipated property takings claims to the City is expected to be at least \$1 million per year for several years to defend the City;
3. Request that the City Attorney report back with legal analysis on the possible implementation of changes to the City's Zoning Code relative to establishing new setback requirements, as well as pursuing takings compensation for oil and gas operators;
4. Instruct the City Planning Department, with the assistance of the City Attorney and Petroleum Administrator, to report back on options on how to amend the Zoning Code relative to oil and gas facilities (LAMC Section 13.01) to better reflect alignment with surrounding sensitive land uses, align with Los Angeles County's code, enhanced operating conditions, and regulatory best practices; include the required funding, staffing, and environmental consultants cost estimates;
5. Instruct the Petroleum Administrator and the Los Angeles County Department of Public Health to report back on costs and coordination on conducting Health Risk Assessments (HRA) at each oil and gas drill site adjacent to residential and industrial zoned areas within the City of Los Angeles;

6. Instruct the Petroleum Administrator and other relevant City Staff to report back on possible measures to establish Community Emergency Preparedness and Comprehensive Safety Plans at oil and gas drills sites across the City;
7. Instruct the Petroleum Administrator and other relevant City staff to participate in California Air Resources Board Study of Neighborhood Air Near Petroleum Sources (SNAPS) and the Assembly Bill 617 studies to incorporated the findings into the development of citywide continuous fenceline air monitoring and community notification program;
8. Instruct the LAFD with the assistance of the City Attorney to negotiate with Los Angeles County to designate Health Officer Authority to Los Angeles City Fire Department through an MOU for enhanced local oversight and improved health coordination;
9. Instruct LAFD and the City Attorney to negotiate with Los Angeles County to transfer the Hazardous Waste Generator Program to Los Angeles City Fire Department for enhanced local oversight and improved health coordination;
10. Instruct CLA to add to the City's Legislative Agenda the funding for additional oil and gas health studies to be conducted by State, SCAQMD, and Los Angeles County Department of Public Health; and
11. Instruct the Petroleum Administrator, Office of Finance, CAO, and other relevant City Staff to establish Oil and Gas Restricted Funds for drill site abandonment, environmental remediation, consultant studies, clean up assessment, strengthening current oversight, as outlined in this report. Additionally, explore re-establishing a barrel tax to support these new funds and provide revenue to support enhanced oil and gas oversight.

Disclaimer: If the scope of this request had been broader or additional items requested for evaluation, then the findings may have been different. There may also be additional records that were not accessible or available for consideration in this report.

If you have any questions about this report, please contact Uduak-Joe Ntuk at Uduak.Ntuk@lacity.org or via phone at (213) 978-1697.

Section 14. Appendices

- a. Appendix 1: Los Angeles City Health Commission Submitted Reports

- b. Appendix 2: Publicly Submitted Reports

- c. Appendix 3: Environmental Impact Reports (EIRs)

- d. Appendix 4: Physicians, Scientists, and Engineers for Healthy Energy (PSE) Reports

- e. Appendix 5: Maps

- f. Appendix 6: Tables

Appendix 1

LA City Health Commission Submitted Reports

1. "Inglewood Oil Field Communities Health Assessment", Bureau of Toxicology and Environmental Assessment, Los Angeles County Department of Public Health, February 2011
2. "Reissued Draft Health Impact Assessment, E&B Oil Drilling and Production Project", Intrinsic Inc., July 22, 2014
3. "Appendix M Health Risk Assessment Kern County DEIR –Proposed Drilling and Oil and Gas Operations" Environmental Compliance Solutions, Inc., June 5, 2015
4. "Appendix M-2 Cumulative Health Risk Assessment, Kern County Final EIR –Proposed Drilling and Oil and Gas Operations", Environmental Compliance Solutions, Inc., October 2015
5. Amended Revised Draft Kern County Zoning Ordinance as prepared by the Board of Supervisors Final 11/9/2015
6. "Evaluation of the Effects of Buffer Zone Setbacks on Los Angeles County Oil and Gas Production", California Independent Petroleum Association (CIPA), Catalyst Environmental Solutions, September 18, 2017
7. "Economic and Fiscal Impacts of Setbacks on Los Angeles County", California Independent Petroleum Association (CIPA) (Undated)
8. Setback Ordinance Infographic "Setback Ordinance Creates Costly Energy Shutdown in City of Los Angeles, Eliminates Jobs and Damages Local Economy", Californians for Energy Independence, November 9, 2017
9. Setback Ordinance Infographic "Setback Ordinance Will Create Costly Energy Shutdown in Los Angeles County, Eliminates Jobs and Damages Local Economy", Californians for Energy Independence, November 9, 2017
10. "Evaluation of the Effects of Buffer Zone Setbacks on City of Los Angeles Oil and Gas Production", California Independent Petroleum Association (CIPA), Catalyst Environmental Solutions, September 18, 2017
11. Nicole J. Wong, MPH "Existing scientific literature on setback distances from oil and gas development sites", June 2017
12. Liberty Hill, "Drilling Down: The Community Consequences of Expanded Oil Development in Los Angeles", Fall 2015

Appendix 2

Publically Submitted Reports

1. LACoDPH (Los Angeles County Department of Public Health). (2018). Public Health and Safety Risks of Oil and Gas Facilities in Los Angeles County. Retrieved from http://publichealth.lacounty.gov/eh/docs/PH_OilGasFacilitiesPHSafetyRisks.pdf
2. "Review of the City of Los Angeles' Oil and Gas Drilling Sites" Los Angeles City Controller Ron Galperin, June 27, 2018.
3. Shamasunder B et al. "Community-based health and exposure study around urban oil developments in South Los Angeles". International Journal of Environmental Research and Public Health. 2018;15(1):138. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5800237/>) (LACoDPH Reference Report)
4. David Rigby, Ph.D. and Michael Shin, Ph.D. "The Oil and Gas Extraction Sector in the City of Los Angeles" (From STANDLA, given to OPNGAS electronically on March 21, 2018)
5. Liberty Hill, "Transitioning to a Greener Los Angeles Report, The Potential for Repurposing Oil and Gas Drilling Sites", Spring 2018
6. "Evaluation of the Effects of Buffer Zone Setbacks on City of Los Angeles Oil and Gas Production" California Independent Petroleum Association (CIPA), Catalyst Environmental Solutions, September 18, 2017
7. "Evaluation of the Effects of Buffer Zone Setbacks on Los Angeles County Oil and Gas Production" California Independent Petroleum Association (CIPA), Catalyst Environmental Solutions, September 18, 2017
8. Los Angeles Fiscal and Employment Study "Economic and Fiscal Effects of Set-back Requirements on the Oil and Gas Industry in Los Angeles" for Californians for Energy Independence by Capital Matrix Consulting, March 2018
9. Los Angeles City Setback Study "Evaluation of the Effects of Buffer Zone Setbacks on City of Los Angeles Oil and Gas Production" for Californians for Energy Independence by Catalyst Environmental Solutions, March 9, 2018
10. "Would Green Jobs Offset Oil Industry Job Losses Due to an Oil and Gas Production Ban?" by Capitol Matrix Consulting, June 6, 2019
11. "Kern County Oil & Gas Permitting Handbook" prepared by the County of Kern Planning & Natural Resources Department, July 1, 2016
12. Kern County Oil and Gas Draft EIR, Environmental Compliance Solutions, Inc., June 5, 2015
13. Kern County Oil and Gas Final EIR, Environmental Compliance Solutions, Inc., October 2015(Accessible online at <https://kernplanning.com/environmental-doc/environmental-impact-report-revisions-kern-county-zoning-ordinance-2015-c-focused-oil-gas-local-permitting/>)
14. Amended Revised Draft Kern County Zoning Ordinance as prepared by the Board of Supervisors Final 11/9/2015
15. Health Assessment by County of LA for Inglewood Oil Field "Inglewood Oil Field Communities Health Assessment" February 2011 County of Los Angeles Public Health
16. "Baldwin Hills Air Quality Study" Final Report prepared for Los Angeles County by Sonoma Technology Inc, February 2015.

17. Hermosa Beach E&B Oil Drilling and Production Project Health Impact Assessment Intrinsic Report “Final Health Impact Assessment EB Oil Drilling and Production Project” September 3, 2014
18. Hermosa Beach E&B Oil Drilling and Production Project Health Impact Assessment Presentation “Reissued Draft Health Impact Assessment E&B Oil Drilling and Production Project” July 22, 2014
19. Assembly Bill 345 (2019) Oil and gas, February 4, 2019
20. Assembly Bill 345 (2019) Natural Resources Committee Analysis, April 22, 2019
21. Assembly Bill 345 (2019) Appropriations Committee Analysis, May 8, 2019
22. STANDLA “Danger Next Door, The Top 12 Air Toxics Used for Neighborhood Oil Drilling in Los Angeles”, December 2017
23. Yale Center for Environmental Law & Policy, Yale University “2018 Environmental Performance Index, Global metrics for the environment: Ranking country performance on high-priority environmental issues” 2018
24. Freedom House, “Freedom In the World 2018, Democracy in Crisis: Highlights from Freedom House’s annual report on political rights and civil liberties” 2018
25. FluxSense Report, Johan Mellqvist , Jerker Samuelsson, Pontus Andersson, Samuel Brohede, Oscar Isoz, Marianne Ericsson, “Using Solar Occultation Flux and other Optical Remote Sensing Methods to measure VOC emissions from a variety of stationary sources in the South Coast Air Basin.” September 14, 2017
26. National Physical Laboratory (NPL) Report ENV, F Innocenti, R A Robinson, T D Gardiner and A J Finlayson, Environment Division, “Differential Absorption Lidar (DIAL) Quantification of VOC Fugitive Emissions from Small Sources in Los Angeles Area, USA”, October 2015
27. The United States Environmental Protection Agency (U.S.EPA), “Exemption of Oil and Gas Exploration and Production Wastes from Federal Hazardous Waste Regulations” 2002
28. U.S. Geological Survey, “Geology of the Los Angeles Basin California-An Introduction Geological Survey Professional Paper 420-A” U.S. Department of the Interior, June 3, 1971
29. U.S. Geological Survey, “Remaining Recoverable Petroleum in Ten Giant Oil Fields of the Los Angeles Basin, Southern California” U.S. Department of the Interior, Revised February 2013
30. Donald L. Gautier Ph.D. “Large volumes of potentially recoverable petroleum in the City of Los Angeles”, 2018
31. City of Arvin Ordinance “Ordinance No. 451 Text Amendment No. 2017-04 An Oil and Gas Ordinance for Regulation of Petroleum Facilities and Operations” July 2018
32. Xavier Becerra, Attorney General State of California, Department of Justice Letter “Proposed Ordinance No. 18-XX to Adopt Text Amendment No. 2017-04 and Ordinance for Regulation of Petroleum Facilities and Operations by Repealing Chapter 17.46, Title 17, and Adding Chapter 17.46 to Title 17 of the Arvin Municipal Code” June 8, 2018
33. Superior Court of the State of California, County of Los Angeles, Central District, Final Judgement, AllenCo Energy, June 3, 2016
34. South Coast Air Quality Management District's (SCAQMD's) Annual Emissions Reporting (AER)- retrieved on 11-8-2018 and verified on 7-23-2019. (<https://xappprod.aqmd.gov/find/>)
35. Code of Federal Regulations-1910.1000 Air contaminants. Occupational Safety and Health Standards
36. Hazardous Substance Fact Sheet “Trimethyl Benzene”
37. Health and Safety Code” Authorities and Responsibilities of Local Health Officers In Disasters”

38. "Letter of Agreement by and Between the County of Los Angeles Department of Public Health and the Los Angeles World Airports" May 23, 2012
39. SNAPS Fact Sheet
40. AB617 Fact Sheet-Community Identification Process
41. AB617 Fact Sheet- Community Air Initiatives
42. CARB's Oil and Gas Methane Regulation
43. CalEnviroScreen 3.0 Factsheet

Appendix 3

Environmental Impact Reports (EIRs)

1. Summary of eight California oil and gas related Environmental Impact Reports (EIRs), Office of Petroleum and Natural Gas Administration and Safety
2. Marine Research Specialists. **Baldwin Hills** Community Standards District Final Environmental Impact Report. October 2008. Accessible online at <http://planning.lacounty.gov/baldwinhills/background>.
3. Aspen Environmental Group. Final Environmental Impact Report. **ERG Operating Company West Cat Canyon Revitalization Plan Project** County EIR No. 15EIR-00000-00004 and State Clearinghouse No. 2015081063, Prepared for the County of Santa Barbara Planning & Development, Energy & Minerals Division, February 2019. Accessible online at (<https://www.countyofsb.org/plndev/projects/projects.sbc>) (<https://cosantabarbara.app.box.com/s/pe8ttgohtdpc592zcg99nivsfu723m5x?page=1>)
4. Marine Research Specialists. E & B Oil Drilling & Production Project, Final Environmental Impact Report, State Clearinghouse No. 2013071038, Prepared For the City of **Hermosa Beach**, June 2014. Accessible online at (<http://www.hermosabch.org/index.aspx?page=755>)
5. Environmental Impact Report for Revisions to the **Kern County** Zoning Ordinance – 2015 C, focused on Oil and Gas Local Permitting Kern County Planning and Community Development Department, November 2015. Accessible online at (<https://kernplanning.com/environmental-doc/environmental-impact-report-revisions-kern-county-zoning-ordinance-2015-c-focused-oil-gas-local-permitting/>)
6. Environmental Audit, Inc., Draft Environmental Impact Report for **OXY USA Inc. Dominguez Oil Field Development**. Prepared for the City of Carson, January 2014. Accessible online at (<http://ci.carson.ca.us/Search.aspx?q=Dominguez+Oil+Field+Development>) (http://ci.carson.ca.us/content/files/pdfs/planning/oxyproject/Volume1-DEIR_part1.pdf)
7. County of Santa Barbara Planning & Development Department, FINAL Environmental Impact Report, **Santa Maria Energy Production Plan and Development Plan**, Laguna County Sanitation District Phase 3 Recycled Water Pipeline, Santa Barbara County EIR No. 12EIR-00000-00003, State Clearinghouse No. 2011091085 Santa Maria Energy Oil Drilling and Production Plan, September 2013. Accessible online at (<http://www.sbcountyplanning.org/energy/projects/SantaMariaEnergyOPP.asp#docs>) (<https://cosantabarbara.app.box.com/folder/81724042868>)
8. Aspen Environmental Group. Final Environmental Impact Report. **SB4 Analysis of Oil and Gas Well Stimulation Treatments in California**, State Clearinghouse No. 2013112046. Prepared for the California Department of Conservation, June 2015. Accessible online at (https://www.conservation.ca.gov/dog/Pages/SB4_Final_EIR_TOC.aspx)

9. Marine Research Specialists. **Whittier Main Oil Field Development Project** Final Environmental Impact Assessment, Final. Prepared for the City of Whittier, October 2011. Accessible online at (<https://www.cityofwhittier.org/government/community-development/mineral-extraction-information/final-environmental-impact-report>)

Appendix 4

Physicians, Scientists, and Engineers for Healthy Energy (PSE) Reports

1. Shonkoff, S. B. C., Domen, J. K., & Hill, L. A. L. (2019). Human health and oil and gas development: A review of the peer-reviewed literature and assessment of applicability to the City of Los Angeles
2. Shonkoff, S. B. C., Domen, J. K., & Hill, L. A. L. (2019). Human health and oil and gas development: An assessment of chemical usage in oil and gas activities in the Los Angeles Basin and the City of Los Angeles.
3. Shonkoff, S. B. C., Domen, J. K., & Hill, L. A. L. (2019). Human health and oil and gas development: An assessment of chemical usage in oil and gas activities in the Los Angeles Basin and the City of Los Angeles. Appendix A
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Appendix 5

Maps

1. 4th Ave
2. Allen Co
3. Broadway
4. Filipino Town Echo Park
5. Harbor City 1 & 2
6. Harbor Gateway 1 & 2
7. Hillcrest
8. Jefferson
9. Mission Visco
10. Murphy
11. Packard
12. Rancho Park
13. Sawtelle
14. Warren
15. West Pico

Appendix 6

Tables

1. Table 3. Chemicals used in routine oil and gas development that are classified by the United Nations Globally Harmonized System (GHS) Categories 1 and 2 for acute mammalian toxicity. *From “Comparison of chemical-use between hydraulic fracturing, acidizing, and routine oil and gas development”, William T. Stringfellow, Mary Kay Camarillo, Jeremy K. Domen, Seth B. C. Shonkoff, April 19, 2017, <https://doi.org/10.1371/journal.pone.0175344>*
2. Table 4. Chemicals used in routine oil and gas development that are classified by the United Nations Globally Harmonized System (GHS) in Categories 1 and 2 for ecotoxicity. *From “Comparison of chemical-use between hydraulic fracturing, acidizing, and routine oil and gas development”, William T. Stringfellow, Mary Kay Camarillo, Jeremy K. Domen, Seth B. C. Shonkoff, April 19, 2017, <https://doi.org/10.1371/journal.pone.0175344.t004>*
3. “Table 19. Potential chemicals of concern based on estimated hazard metric (EHM) and available air pollutant and carcinogenicity data. This list currently contains the top 10 for Acute and Chronic EHM rankings, along with most air pollutants and carcinogens within the entire SCAQMD dataset. Listed in alphabetical order starting with chemicals used in the City of LA.” *From Shonkoff, S. B. C., Domen, J. K., & Hill, L. A. L. (2019). Human health and oil and gas development: An assessment of chemical usage in oil and gas activities in the Los Angeles Basin and the City of Los Angeles*
4. “Table 20. Chemicals used in the City of LA identified as having the potential for travel by air and subsequent inhalation exposure.” *From Shonkoff, S. B. C., Domen, J. K., & Hill, L. A. L. (2019). Human health and oil and gas development: An assessment of chemical usage in oil and gas activities in the Los Angeles Basin and the City of Los Angeles*