



NATURAL GAS STORAGE FACILITIES

in the South Coast Basin
(REVISED)

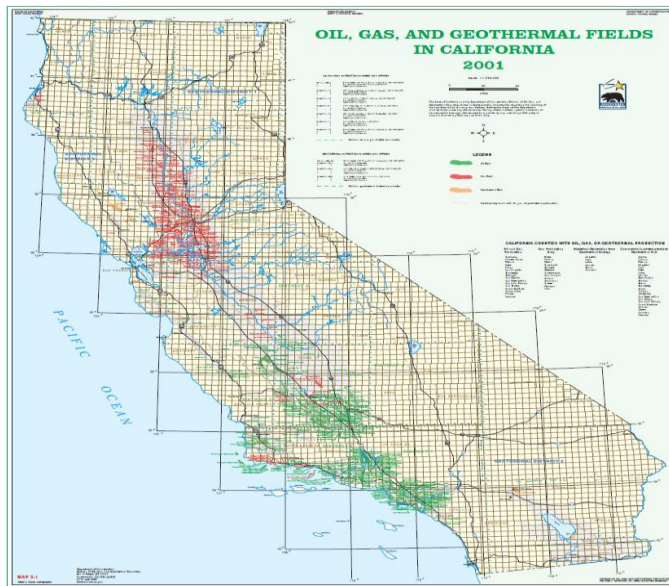
Stationary Source Committee Meeting
May 20, 2016

Mohsen Nazemi, P.E.
Deputy Executive Officer
Engineering & Compliance

Natural Gas Storage Facilities in the South Coast Basin



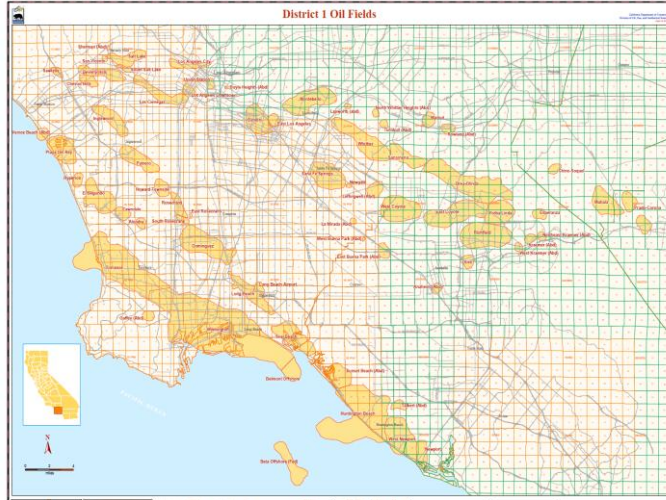
Oil, Gas and
Geothermal Fields
in California



Natural Gas Storage Facilities in the South Coast Basin



Los Angeles County Urban Oil Fields

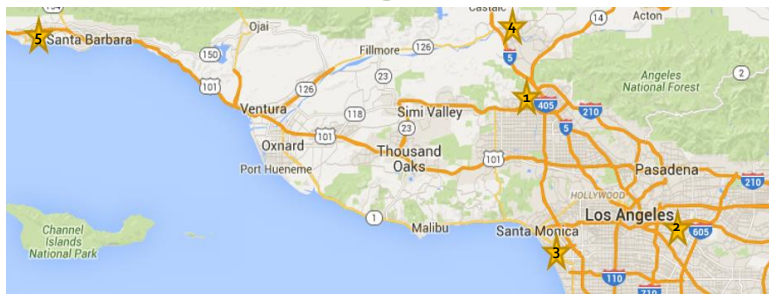


3

Natural Gas Storage Facilities in the South Coast Basin



SoCalGas Natural Gas Storage Facilities in Southern California



Facility	Location	Air District	Total Storage Capacity (BCF)	Number of Active Wells	Number of Injection/Withdrawal Wells
(1) Aliso Canyon	12801 Tampa Ave, Northridge	SCAQMD	88	129	116
(2) Montebello	831 Howard Ave, Montebello	SCAQMD	14	51	0*
(3) Playa del Rey	8141 Gulana, Playa del Rey	SCAQMD	7.06	54	24
(4) Honor Rancho	25205 Rye Canyon Rd, Valencia	SCAQMD	24.2	46	38
(5) La Goleta	1171 More Ranch Road, Goleta	SBCAPCD	21.5		18

*3 idle wells 4

Natural Gas Storage Facilities in the South Coast Basin

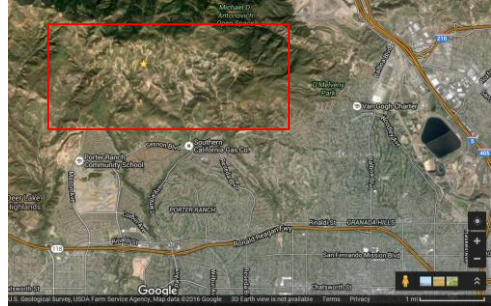


Aliso Canyon (Fac ID 800128)

History

- Oil & gas drilling began in 1930s
- Gas Storage began ~ 1972
- Total Storage Capacity: 88 Billion CF
- 129 Active Wells
 - 116 injection/withdrawal, 5 observation, 8 water injection
- Number of Active SCAQMD Permits: 49

• Heater/Furnace/Boiler	• Flare
• Gas Turbines	• Activated Carbon
• Internal Combustion Engines	• Vapor Recovery
• Nat Gas Odorizing	• Vapor Balance
• Storage Tanks	• Waste Water Treatment System
• Bulk Loading/Unloading	• Oil Water Separator



5

Natural Gas Storage Facilities in the South Coast Basin



Aliso Canyon Natural Gas Well Leak – Key Events

- Oct 23, 2015 : Natural gas leak from well SS-25 discovered by SoCalGas.
- Oct 24, 2015: SCAQMD received and investigated the first of more than 2,300 air quality complaints due to the leak.
- Oct 26, 2015: SCAQMD began ongoing air sampling and monitoring activities in the local community.
- Nov 5, 2015: SCAQMD issued Notice to Comply to SoCalGas to abate the release of mercaptan odors from the natural gas leak that were impacting the local community.
- Nov 23, 2015: SCAQMD issued Notice of Violation to SoCalGas for creating a public nuisance.

6

Natural Gas Storage Facilities in the South Coast Basin



Aliso Canyon Natural Gas Well Leak – Key Events

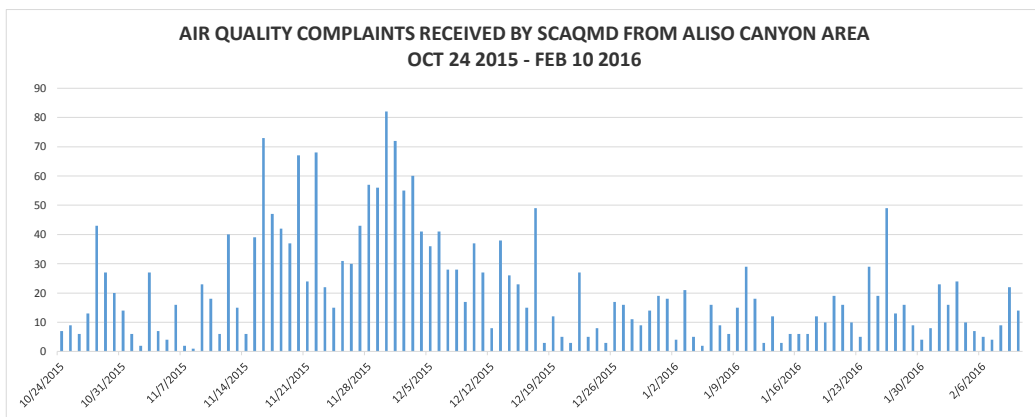
- Dec 10, 2015: SCAQMD petitioned the SCAQMD Hearing Board for an Order for Abatement requiring SoCalGas to abate the natural gas leak, monitor the leaking gas, and reduce its nuisance impacts on the local community.
- Jan 9, 16, 20, & 23, 2016: The SCAQMD Hearing Board heard public testimony from local community members about the impacts of the natural gas leak. Following deliberation on January 23, 2016, the Hearing Board issued the Order for Abatement.
- Jan 26, 2016: SCAQMD filed a civil penalty lawsuit against SoCalGas in LA Superior Court for creating a public nuisance.

7

Natural Gas Storage Facilities in the South Coast Basin



Aliso Canyon Complaints



Date Range	Complaints Received by SCAQMD
Jan 1 – Oct 23 2015	8 complaints received alleging Aliso Canyon facility as source of air contaminants.
Feb 11 – May 13 2016	175 complaints received alleging Aliso Canyon facility as source of air contaminants (45 received on 4/13/16).

8

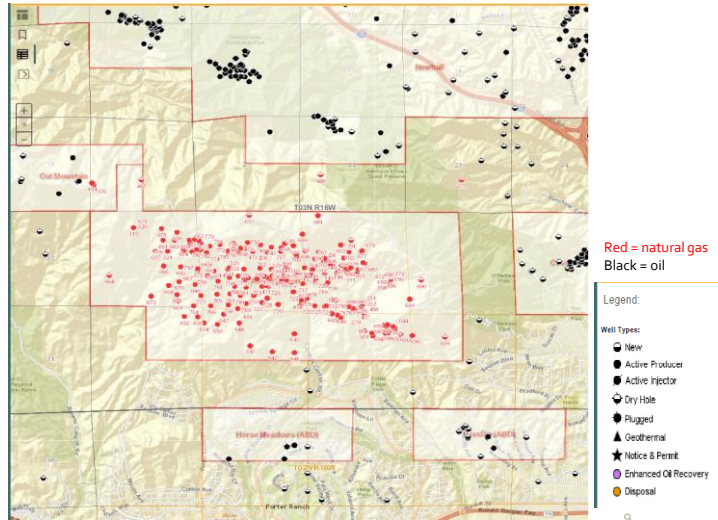
Natural Gas Storage Facilities in the South Coast Basin



Aliso Canyon Facility Wells

Adjacent/co-located operations:

R222 Registered Oil & Gas Wells	Termo Del Aliso Lease	Termo Oat Mountain	Crimson
Fac ID	83508	97081	174815
Production well cellars	7	10	4
Well heads	7	10	4
Annual gas production	21,264 MCF	2,770 MCF	6,349 MCF
Annual oil production	20,771 BBL	65,288 BBL	8,232 BBL



Natural Gas Storage Facilities in the South Coast Basin



Aliso Canyon Facility Wells

- All wells have been inspected numerous times since February 13, 2016.
- Inspections have included TOC (Total Organic Compound) monitoring with vapor analyzers and infrared imaging with FLIR camera.
- Numerous minor leaking components have been identified and reported to SoCalGas for repair.
- Most common leaking components included:
 - Instrument safety measurement devices
 - Wing valves
- Follow-up inspections found some, but not all, leaks repaired; new leaks identified.
- Ongoing communication with SoCalGas personnel regarding well leak status.

Natural Gas Storage Facilities in the South Coast Basin



Montebello (Fac ID 800127)

History

- Standard Oil began drilling in Montebello oil field in 1917; by 1920 Montebello oil fields were producing 1/8th of the state's crude oil.
- Natural gas storage began in 1965 in 487 acre facility.
- In 2000, SoCalGas filed with the California Public Utilities Commission (CPUC) to decommission the facility.
- In 2001, the CPUC approved the request to decommission the facility, and 280 wells at the site have already been permanently sealed (per SoCal Gas).
- Most of the active wells at Montebello are depleted and the gas must be extracted from liquids (oil and water)



11

Natural Gas Storage Facilities in the South Coast Basin



Montebello Facility

Site Details

- Total Storage Capacity: 14 Billion CF
- 31 wells onsite
 - 4 active production (oil, gas, and water)
 - 23 production (idle)
 - 3 gas injection (idle)
 - 1 water injection
- 20 wells located in community
 - 4 active production
 - 3 waste water
 - 13 observation
- Pumping out 1 MCF of natural gas & 100 barrels of oil as part of decommissioning process
- Number of Active SCAQMD Permits: 4
 - Wastewater Treating
 - Afterburner
 - Bulk Loading Rack
 - Storage Tank

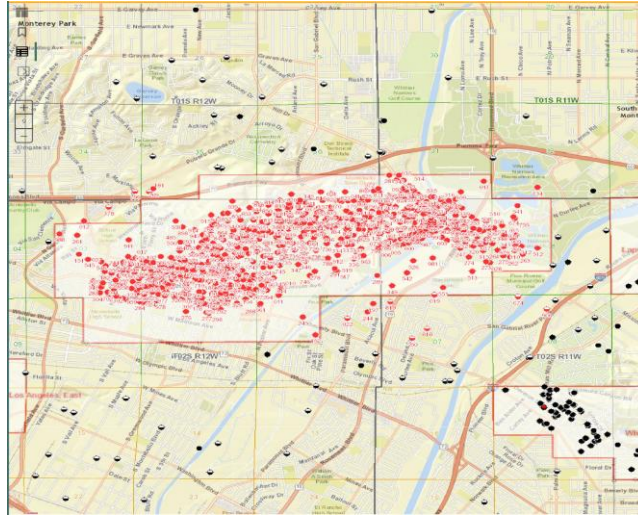


12

Natural Gas Storage Facilities in the South Coast Basin



Montebello Facility Wells



Red = natural gas
Black = oil

Legend:

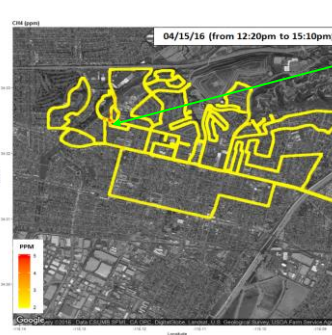
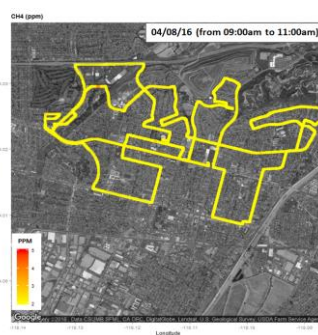
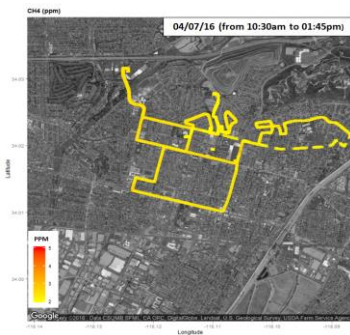
- Well Types:
- New
 - Active Producer
 - Active Injector
 - Dry Hole
 - Plugged
 - ▲ Geothermal
 - ★ Notice & Permit
 - Enhanced Oil Recovery
 - Disposal

Natural Gas Storage Facilities in the South Coast Basin



Montebello Facility Nearby Community Methane Survey

- Mobile methane surveys using a Li-COR 7700 methane analyzer were conducted April 07, April 08, and April 15, 2016
- Overall, measured methane levels were close to background (min: 1.95 ppm; max: 4.95 ppm; average: 2.03 ppm).



Highest reading near metal enclosure (probably sewer vent) at the intersection of Morris Place and Lincoln Ave

Natural Gas Storage Facilities in the South Coast Basin



Montebello Facility Wells

Total facility wells inspected: 51
Total facility isolation valves inspected: 28

Well Leak Summary Table							
Date	TOC Leaks (≥500<3,000 ppm)	TOC Leaks (≥3,000 <10,000 ppm)	TOC Leaks (≥10,000 ppm)	Total TOC Leaks Detected	Emissions Recorded with FLIR	Average Component Leak(s) per Well Site	Total Wells Inspected
4/07/2016	1	0	1	2	0	0.25	8
4/12/2016	0	0	4	4	4	0.33	12
4/13/2016	0	1	2	3	10*	0.11	28
4/14/2016	0	0	0	0	0	0	3
Total	1	1	7	9	14		
Average						0.18	51

*Seven (7) FLIR videos recorded for emissions observed but components unable to be reached with TVA
Note: Average = Total TOC leaks detected/total wells inspected

Isolation Valve Site Leak Summary Table							
Date	TOC Leaks (≥500<3,000 ppm)	TOC Leaks (≥3,000 <10,000 ppm)	TOC Leaks (≥10,000 ppm)	Total TOC Leaks Detected	Emissions Recorded with FLIR	Average Component Leak(s) per Isolation Valve Site	Total Isolation Valve Sites Inspected
4/14/2016	2	1	6	9	5	0.5	18
4/15/2016	1	0	4	5	4	0.5	10
Total	3	1	10	14	9		28
Average						0.5	

Note: Average = Total TOC leaks detected/total wells inspected

Other than during public comment period at March Governing Board meeting, no complaints received January 1, 2015 – present alleging Montebello facility as source of air contaminants.

15

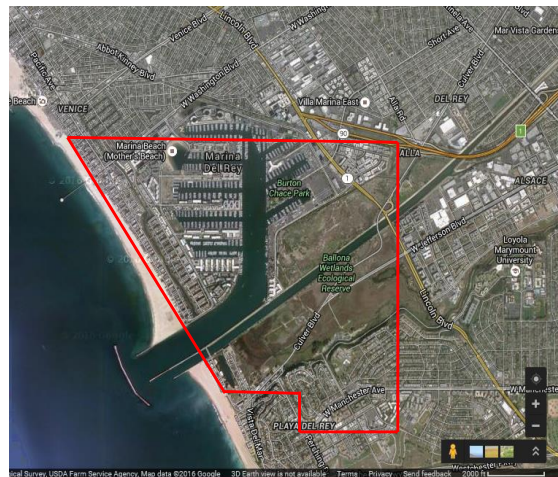
Natural Gas Storage Facilities in the South Coast Basin



Playa del Rey (Fac ID 8582)

History

- Oil & gas drilling began in 1930s
- Natural gas storage began ~ 1942
- CPUC approved settlement agreement of complaint against SoCalGas in 2007 for leaking gas into water table, requiring SoCal Gas to :
 - Monitor for soil gas & subsidence
 - Test withdrawn gas & liquids
 - Limit pressure in some areas to no more than 2400 psi
- SoCalGas adopted odor minimization program:
 - Routine odor patrols
 - Planned natural gas venting – community notification
 - Minimizing fugitive emissions & engine & exhaust odors
 - Operation of meteorological station



16

Natural Gas Storage Facilities in the South Coast Basin



Playa del Rey Facility

Site Details

- Total Storage Capacity: 7.06 Billion CF
- 54 Active Wells:
 - 34 onsite (3 production, 24 injection/withdrawal, 2 gas lift, 2 observation & 3 water wells)
 - 20 within community (1 production, 2 gas lift and 17 observation)
- Number of Active SCAQMD Permits: 26
 - Heater/Furnace
 - Afterburner
 - Internal Combustion Engines
 - Activated Carbon
 - Natural Gas Odorizing
 - Vapor Recovery
 - Natural Gas Dehydration
 - Storage Tanks
 - Oil Water Separator

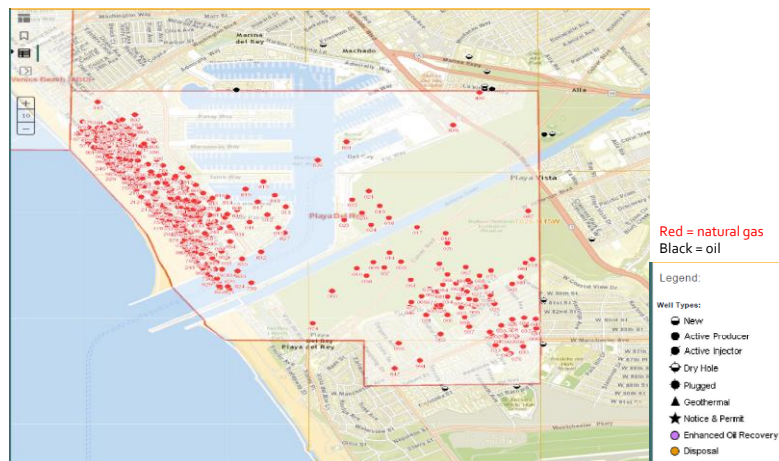


17

Natural Gas Storage Facilities in the South Coast Basin



Playa del Rey Facility Wells



18

Natural Gas Storage Facilities in the South Coast Basin



Playa del Rey Facility Wells

Total facility wells inspected: 54

Well Leak Summary Table							
Date	TOC Leaks (≥500<3000 ppm)	TOC Leaks (≥3,000 <10,000 ppm)	TOC Leaks (≥10,000 ppm)	Total TOC Leaks Detected	Emissions Recorded with FLIR	Average Component Leak(s) per Well Site	Total Wells Inspected
4/26/2016	0	3	4	7	4	0.47	15
4/27/2016	1	1	13	15	9	0.88	17
4/28/2016	3	5	16	24	11	1.09	22
Total	4	9	33	46	44		54
Average						0.85	

Note: Average = Total TOC leaks detected/total wells inspected

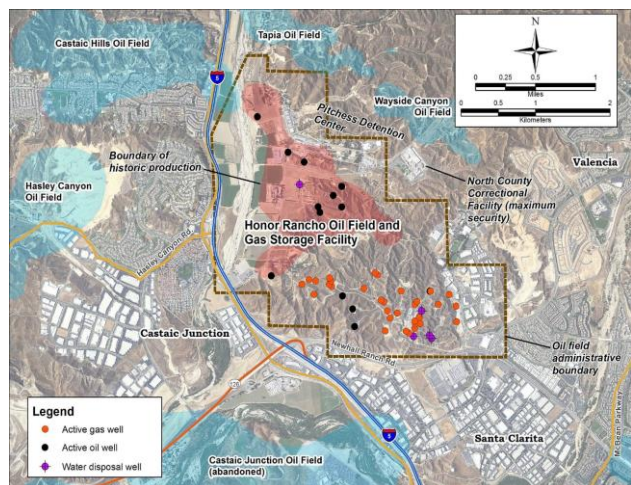
2 complaints received January 1, 2015 – present
alleging Playa del Rey facility as source of air contaminants (odor).

19

Natural Gas Storage Facilities in the South Coast Basin

Honor Rancho (Fac ID 5973, NO_x RECLAIM/Title V)History

- Oil & gas drilling began in 1950
- Natural gas storage began in 1975



20

Natural Gas Storage Facilities in the South Coast Basin



Honor Rancho Facility

Site Details

- Total Storage Capacity: 24.2 Billion CF
- Number of Active Wells: 46
 - 28 injection/withdrawal wells, 10 withdrawal only wells, 1 crude oil production well, 1 observation well, 2 brine production wells, and 4 brine disposal wells
- Number of Active SCAQMD Permits: 34

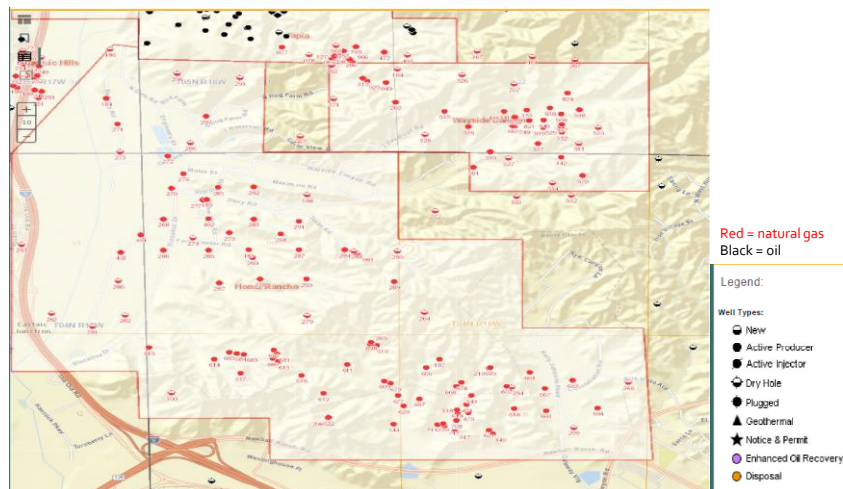
• Heater/Furnace	• Flare
• Internal Combustion Engines	• Non-Catalytic Reduction
• Natural Gas Drying	• Vapor Recovery
• Natural Gas Odorizing	• Vapor Balance
• Storage Tanks	• Crude Oil Treating
• Bulk Loading/Unloading	• Abrasive Blasting

21

Natural Gas Storage Facilities in the South Coast Basin



Honor Rancho Facility Wells



22

Natural Gas Storage Facilities in the South Coast Basin



Honor Rancho Facility Wells

Total facility wells inspected: 46

Well Leak Summary Table							
Date	TOC Leaks (≥500<3,000 ppm)	TOC Leaks (≥3,000 <10,000 ppm)	TOC Leaks (≥10,000 ppm)	Total TOC Leaks Detected	Emissions Recorded with FLIR	Average Component Leak(s) per Well Site	Total Wells Inspected
5/04/2016	6	4	8	18	5	3	6
5/05/2016	17	5	25	47	10	5.9	8
5/06/2016	7	9	39	55	30	3.1	18
5/10/2016	10	6	33	49	22	3.5	14
Total	40	24	105	169	67		46
Average						3.7	

Note: Average = total leaks detected/total wells inspected

No complaints received January 1, 2015 – present
alleging Honor Rancho facility as source of air contaminants.

23

Natural Gas Storage Facilities in the South Coast Basin



Air Quality Compliance Overview

Facility	NO _x RECLAIM (Annual RECLAIM Minimum Audit/Inspection)	Title V (Annual Title V Minimum Inspection)	Date of Title V Permit Expiration*	Date of Last Annual RECLAIM and/or Title V Inspection**	Date of Last Well & Component Inspection ***
Aliso Canyon	X	X	11/18/2018	07/09/2015	05/09/2016
Montebello	X		---	03/31/2015	04/15/2016
Playa del Rey	X	X	10/18/2016	08/14/2015	04/29/2016
Honor Rancho	X	X	01/08/2020	07/31/2015	05/10/2016

* Title V permits are required to be renewed every 5 years.

** RECLAIM and Title V inspections are conducted at minimum annually to verify NO_x emissions and determine compliance with rules and regulations and facility permit conditions

*** Well & component inspections included measurement of TOC emissions using vapor analyzers and infrared imaging of TOC emissions using FLIR camera.

24

Natural Gas Storage Facilities in the South Coast Basin



Emissions Requirements - Natural Gas Wells

- Natural gas (methane) emissions from natural gas wells at underground natural gas storage facilities are not presently subject to leak detection and repair (LDAR) / fugitive emissions requirements but are prohibited from creating a public nuisance under SCAQMD Rules & Regulations.
 - **SCAQMD Rule 1173** controls VOC (but not methane) leaks and releases from components at petroleum facilities and chemical plants, but specifically exempts natural gas storage facilities not located at a natural gas processing plant from its requirements.
 - **SCAQMD Rule 1148.1** controls emissions from oil and gas production wells, but specifically exempts natural gas distribution, transmission and associated storage operations from its requirements.
 - **SCAQMD Rule 222** requires registration of oil wells and other equipment identified by Rule 219 as exempt from permitting requirements, and does not apply to natural gas wells.

25

Natural Gas Storage Facilities in the South Coast Basin



CARB Proposed Regulation for Crude Oil & Natural Gas Facilities

- CARB developing proposed regulation to establish greenhouse gas emission standards for crude oil and natural gas facilities
 - Includes natural gas underground storage
 - Other natural gas sources include on and offshore natural gas production and well stimulation activities, natural gas gathering and boosting stations, processing plants, and transmission compression stations
 - Includes provisions for monitoring natural gas underground storage facilities, leak detection and repair
 - Requirement to develop a plan for continuous surface leak monitoring
 - Considering a leak emission reduction requirement for large or catastrophic leaks
- Board Meeting tentatively scheduled for July 2016

26

Natural Gas Storage Facilities in the South Coast Basin



DOGGR Proposed Regulation for Gas Storage Program

- Currently in preparation to make significant revisions to regulations governing the Division's Gas Storage Program
- Builds on requirements adopted by emergency rulemaking
- Immediate regulatory goals include clarifying:
 - Standards for gas storage project data requirements
 - Well construction standards for gas storage wells
 - Testing and monitoring standards and other risk mitigation protocols to ensure safe operations
 - Emergency response plans standards to ensure rapid and safe responses when emergency situations arise

27

Natural Gas Storage Facilities in the South Coast Basin



SCAQMD Proposed Rulemaking

- Considering requirements for natural gas underground storage facilities
 - Consider nuisance triggers similar to Rule 1148.1 that could require Root Cause Analysis and Mitigation Measures for natural gas storage facilities
- Considering additional provisions to compliment Proposed CARB and DOGGR Regulation
 - Possibly fence line monitoring and/or fixed methane monitors near groups of wells
 - Considering variety of tools for Leak Detection such as use of infrared cameras
 - Proposing to increase Leak Detection and Repair frequencies
 - Considering requirements for surface leaks monitoring
 - Considering public notification and communication requirements
- Schedule: Fall 2016

28