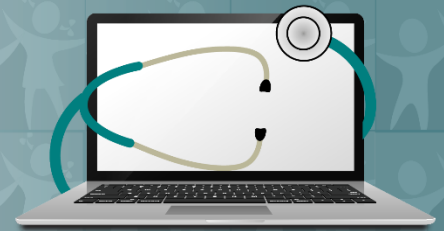




PEHSU NATIONAL CLASSROOM

Pediatric Environmental
Health Specialty Units



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Webinars

Series of scientific webinars that provide a forum for discourse on scientific issues.

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Case Conferences
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Online Courses

Evidence-based online courses on a variety of children's environmental health topics.

Interactive and Self-Paced

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Resource Catalog

Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals

Topics included:
Air Quality, Pesticides,
Natural Disasters, BPA,
Mold, Lead, Mercury



The Aliso Canyon Gas Leak

Public Health Roles and Responses

Acknowledgements

Los Angeles County Department of Public Health Staff

- Mandi Bane –Staff Analyst
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Objectives

- Learn the health impacts of the Aliso Canyon gas leak on the adjacent communities
- Understand how local and state agencies interact to evaluate air contaminants and other environmental hazards
- Learn the role of a local Public Health department in mitigating during and after an environmental threat

Aliso Canyon Gas Leak Background

Aliso Canyon Natural Gas Storage Facility - Background

- Operated by Southern California Gas Company since 1972
- In the Santa Susana Mountains – 3k ft from homes of Porter Ranch, CA.
- Petroleum drilled from this site, until field was “spent”, resulting in empty natural underground caverns
- Geologists determined caverns could be used for natural gas storage.

Aliso Canyon Natural Gas Storage Facility - Background

- Natural gas trucked into the facility, peaking in Summer when demand is relatively low.
- 100+ injection/withdrawal wells allow gas storage in caverns under pressure
- Gas extracted and distributed to a network of customers (e.g. residences and electric gas generators)
- Wells are long pipes with metal and, in some cases, cement casings, depending on size.
- No mining, fracking, or drilling

Aliso Canyon Natural Gas Storage Facility - Background

- October 23, 2015:
 - Personnel (engineers, safety officials, and agency representatives, including County Fire and HazMat) discovered a leak associated with one of the wells (“SS-25”). This is one of the smaller wells on the field.

What is the most significant risk associated with a natural gas leak at a gas storage field?

- Asphyxiation
- Ignition/combustion
- No significant risk

Answer

- Asphyxiation
- **Ignition/combustion**
- No significant risk

Aliso Canyon Gas Leak

Characterizing the Exposure

Characterizing the leak and the exposure

- Primary component of natural gas is methane
- Sulfur compounds are added before storage and distribution. These compounds give natural gas its characteristic odor.
- This facility adds Scentinel® T-50, a mixture of 2 compounds: tert-butyl mercaptan and tetrahydrothiophene (THT)

Characterizing the leak and the exposure

● Methane

- Asphyxiant gas, may cause the displacement of oxygen in closed spaces.
- Absorption of methane does not lead to systemic toxicity.
- Safety risk secondary to flammability (lower explosive limit 50,000ppm)

Characterizing the leak and the exposure

- Sulfur odorants:
 - Short term: “headache, dizziness, staggered gait, nausea, vomiting, pulmonary mucous membrane irritation, wheezing, tachycardia, limb rigidity, cyanosis” (CDC, 1988)
 - Long-term: “dermatitis”... “no long-term studies have been performed...” (CDC, 1988)

Characterizing the leak and the exposure

- *“...We do not know whether long-term exposure to low levels of mercaptan can result in harmful health effects. There is no information available about whether mercaptan causes cancer in people or animals. The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified mercaptan for carcinogenicity.” (CDC/ATSDR)*

Characterizing the leak and the exposure

- Difficulty with messaging, reconciling with overly generalized statements
- Public confusion regarding context and circumstances of exposure
- Lack of studies construed as positive confirmation of unknown, permanent effects

Characterizing the leak and the exposure

- The gas leak was coming from below the surface of the field, but the depth of the breach was not initially known.
- Personnel at the facility detected an odor and notified the Los Angeles County Fire Department on October 26.
- Public Health was notified around October 29.
- SoCalGas informed the Fire Dept that the leak would likely be fixed in about 3-7 days via after a “well kill”

Characterizing the leak and the exposure

- SoCalGas attempted to drive down well pressure, initiated well kill
- Well kill was unsuccessful, resulted in emission of an oily mist, manifested in a dried oily residue on some outdoor surfaces in the community.
- Residue was found to be composed of crude oil.
- Geological engineers determined well could not be killed from above, would require a 3-4 month solution to kill the well at depth

Characterizing the leak and the exposure

- Public Health determined it would be appropriate to establish a daily air monitoring program to monitor for all chemical constituents that may be associated with the gas leak
- Methane, sulfur odorants, BTEX gases, PAH's, metals, hydrogen sulfide

Aliso Canyon Gas Leak Health Effects

Community complaints and evolution of the leak

- The Public Health department began receiving complaints of odors from the community.
- Most complaints were mild in nature, and involved the homes closest to the facility.
- A few days later, reports of symptoms began to emerge, and increased daily.

Community complaints and evolution of the leak

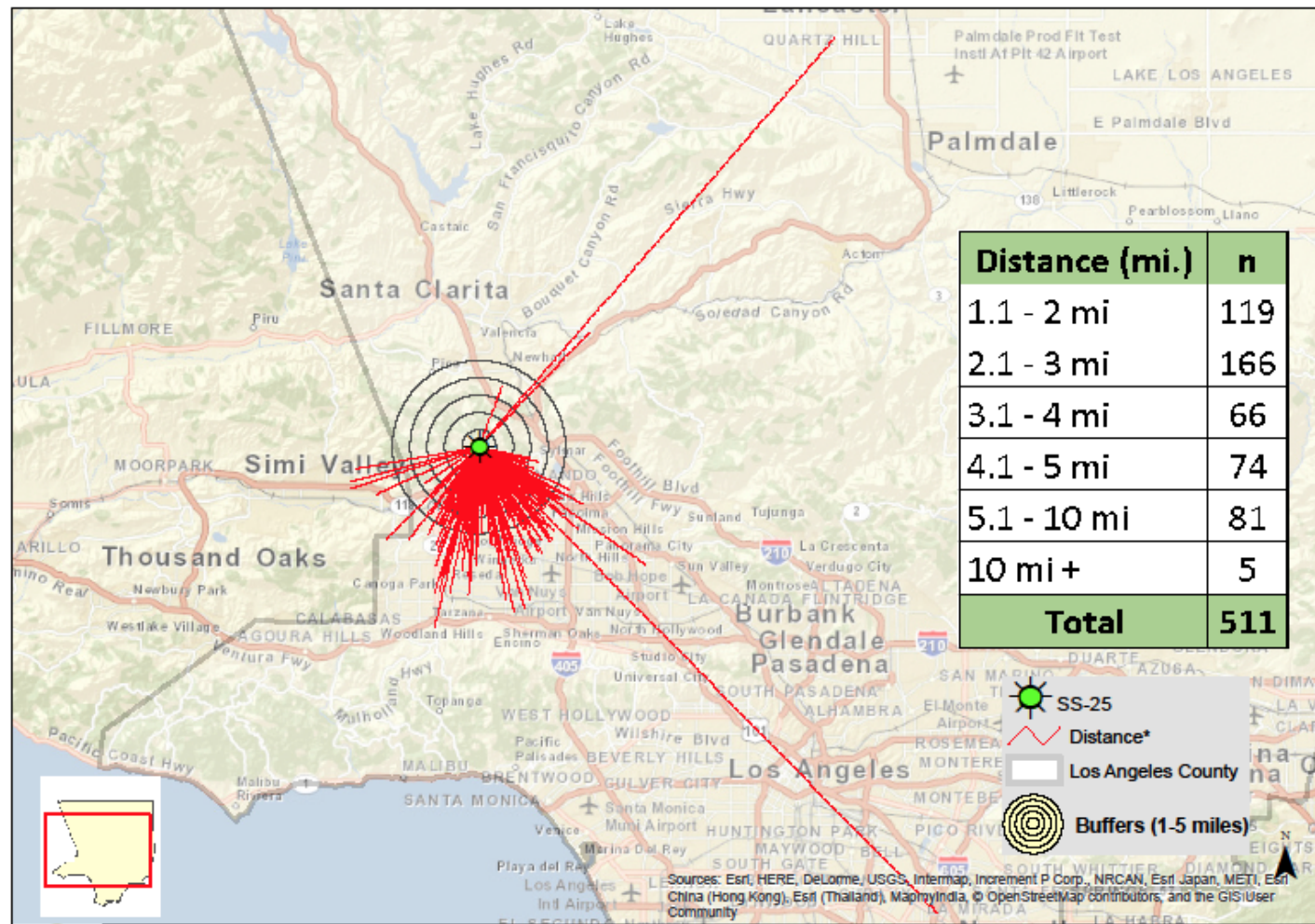
- Symptoms included nausea, abdominal discomfort, headaches, dizziness, sino-pulmonary irritation
- Public Health issued a directive, enabling any household to relocate temporarily secondary to symptoms
- Directive was extended to 2 areas public schools

Summary of Symptoms/Actions Reported by Household (N=600)

61%	Headache / Migraine
40%	Nausea/Vomiting/Stomach ache/GI/Diarrhea
32%	Bloody Nose
27%	Respiratory / Breathing Symptoms
24%	Chest Tightness / Coughing / Palpitations
22%	Dizzy / Lightheaded
18%	Eye Irritation / Vision Complaints
17%	Smell / Odor
16%	Sore Throat
13%	Went to MD / ER
9%	Pet Affected
10%	Relocated or Requested Relocation

Aliso Canyon Symptom Reports

Respondent's Address: Distance to Leak

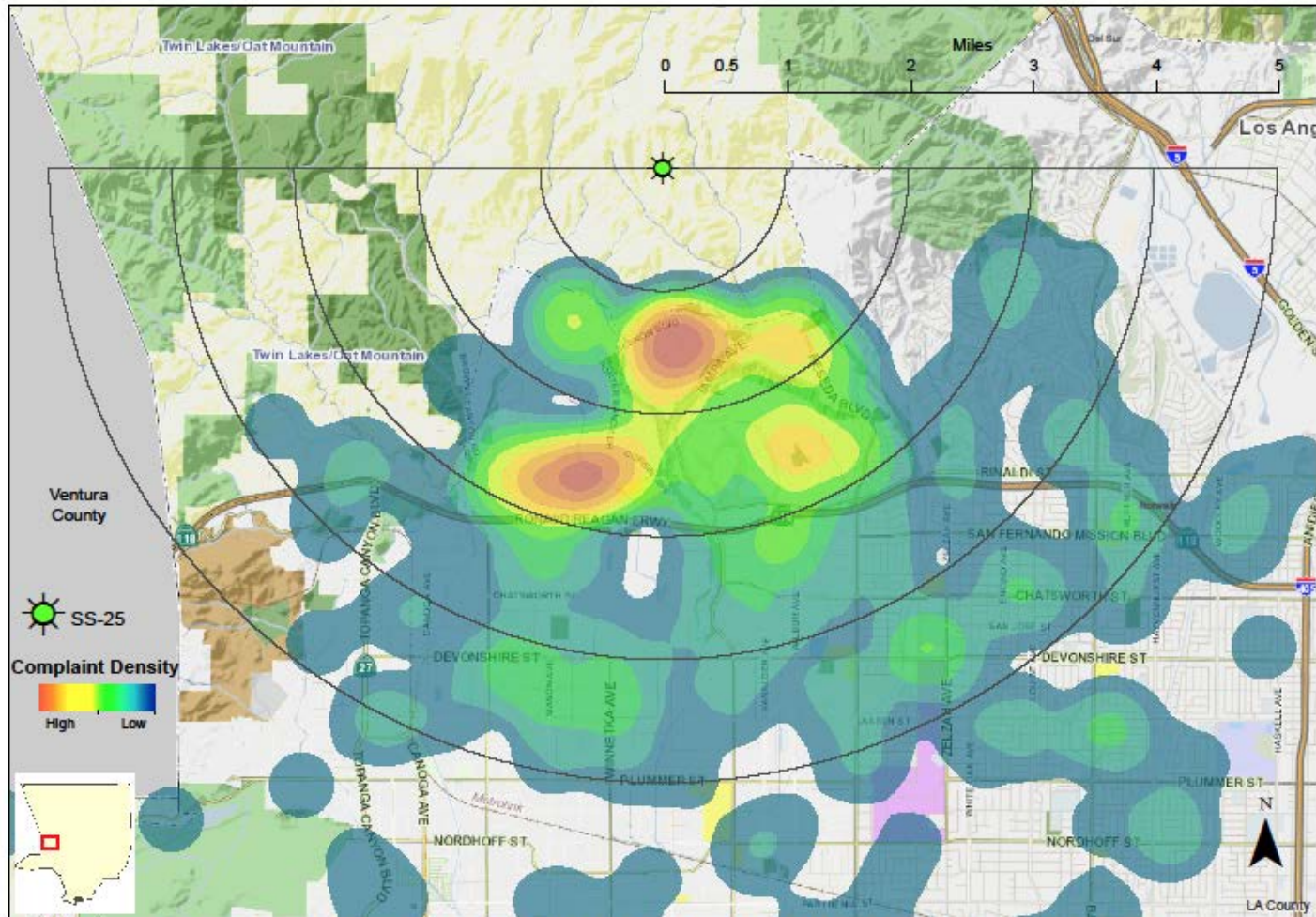


Aliso Canyon Symptom Survey Respondent's Address*

Created by: Office of Health Assessment and Epidemiology, Epidemiology Unit. 02/3/16. Map shows the density of Symptom Survey respondent's addresses. 511 of 687 addresses were located (the rest were excluded due to incorrect or missing addresses). *Euclidean Distance from SS-25.



Aliso Canyon Symptom Survey Complaint Density



Aliso Canyon Symptom Survey Respondent's Address

Created by: Office of Health Assessment and Epidemiology, Epidemiology Unit. 02/3/16. Map shows the density of Symptom Survey respondent's addresses. 511 of 687 addresses were located (the rest were excluded due to incorrect or missing addresses).

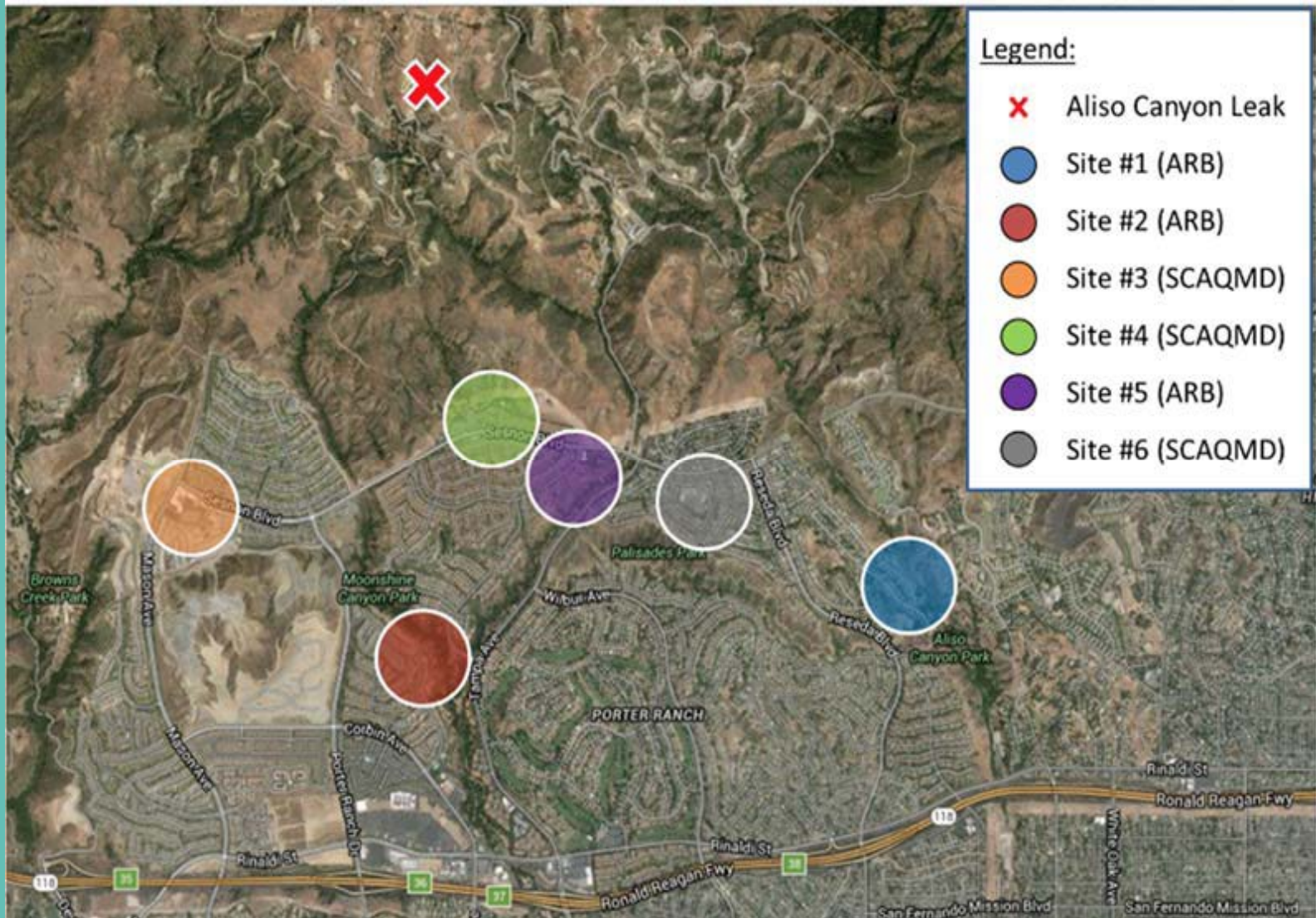


Aliso Canyon Gas Leak Air Monitoring

Air Sampling Locations



SCAQMD and CARB Real-time Methane Monitoring



Community Cumulative “Grab” Sample Summary

Source Southern California Gas Company
Type “Grab” (10-minute) Samples
Dates October 30 - January 28
Chemicals Tested Methane, Other Hydrocarbons, BTEX, Sulfur Compounds

Chemical	Community							
	Number Detected	Total / Samples	% Detects	Range (Min-Max)	Average*	Health Protective Level	Background Levels	Units
Methane	1702	/ 1702	100%	1.2 - 231	8.0	50,000**	NA	ppm
Benzene	766	/ 1699	45%	0.1 - 5.6	0.38	8.0***	NA	ppb
tert-Butyl Mercaptan	0	/ 1623	0%	ND -	NA	NA	NA	ppb
Tetra- hydrothiophene	0	/ 1623	0%	ND -	NA	NA	NA	ppb

ppm = parts per million; ppb = parts per billion; ND = non-detectable; NA = not available

*Average of detected concentrations.

**Lower explosive limit.

*** Acute reference exposure limit.

Boundary Cumulative Summary

Source Southern California Gas Company
Type 12-Hour Samples
Dates January 12 - January 27
Chemicals Tested Methane, BTEX, Sulfur Compounds

Chemical	Boundary						
	Number Detected	Total / Samples	% Detects	Range (Min-Max)	Average*	Health Protective Levels	Units
Methane	196	/ 196	100%	1.9 - 24	5.3	50,000**	ppm
Benzene	197	/ 197	100%	0.08 - 0.42	0.18	1.0***	ppb
tert-Butyl Mercaptan	0	/ 197	0%	ND	NA	NA	ppb
Tetrahydrothiophene	0	/ 197	0%	ND	NA	NA	ppb

ppm = parts per million; ppb = parts per billion; ND = non-detectable; NA = not available

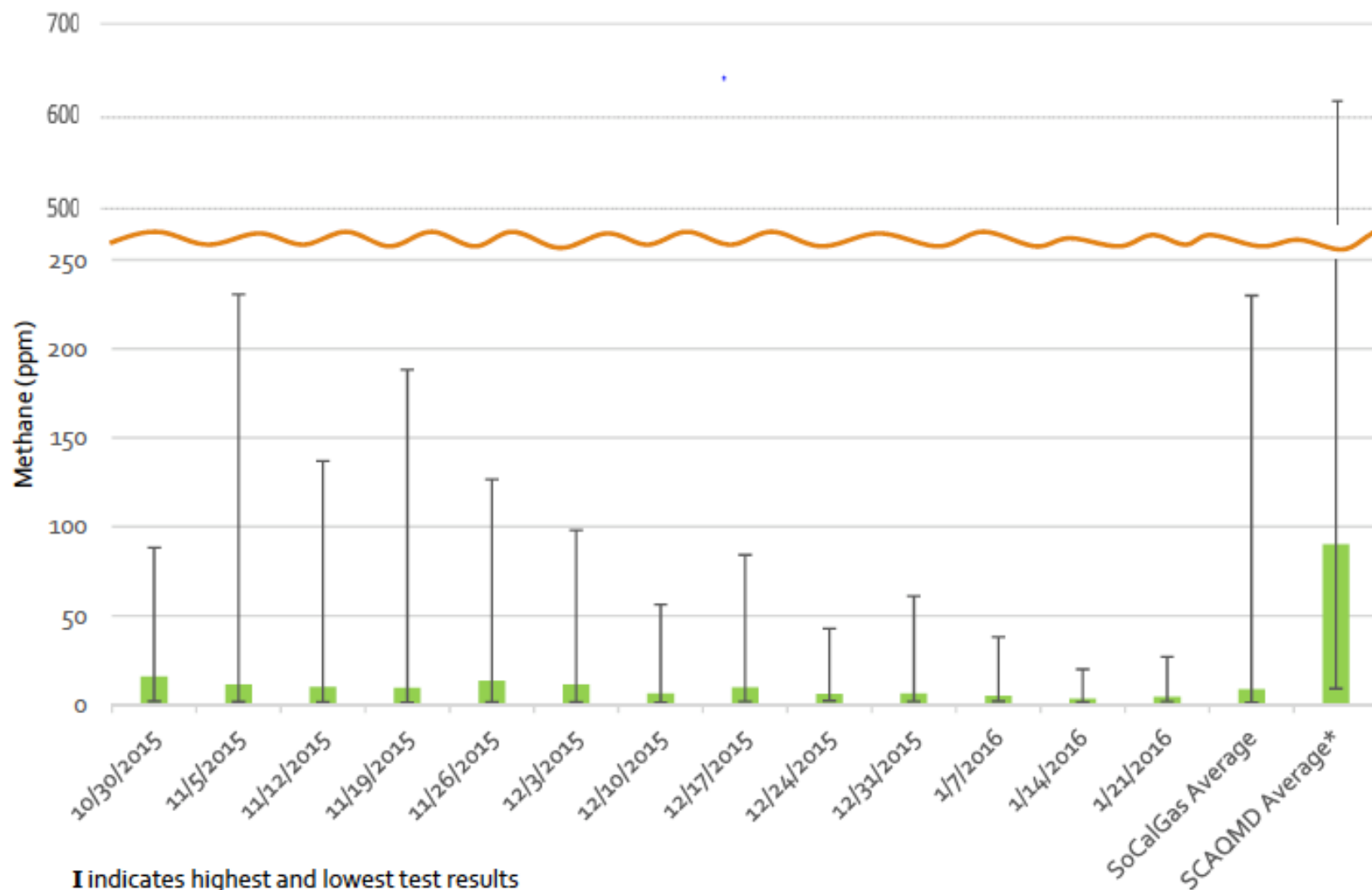
*Average of detected concentrations.

**Lower explosive limit.

*** Chronic reference exposure limit.

Average Weekly Methane Concentrations in the Community

(10/30/2015 - 1/27/2016); Source: SoCalGas Grab Samples



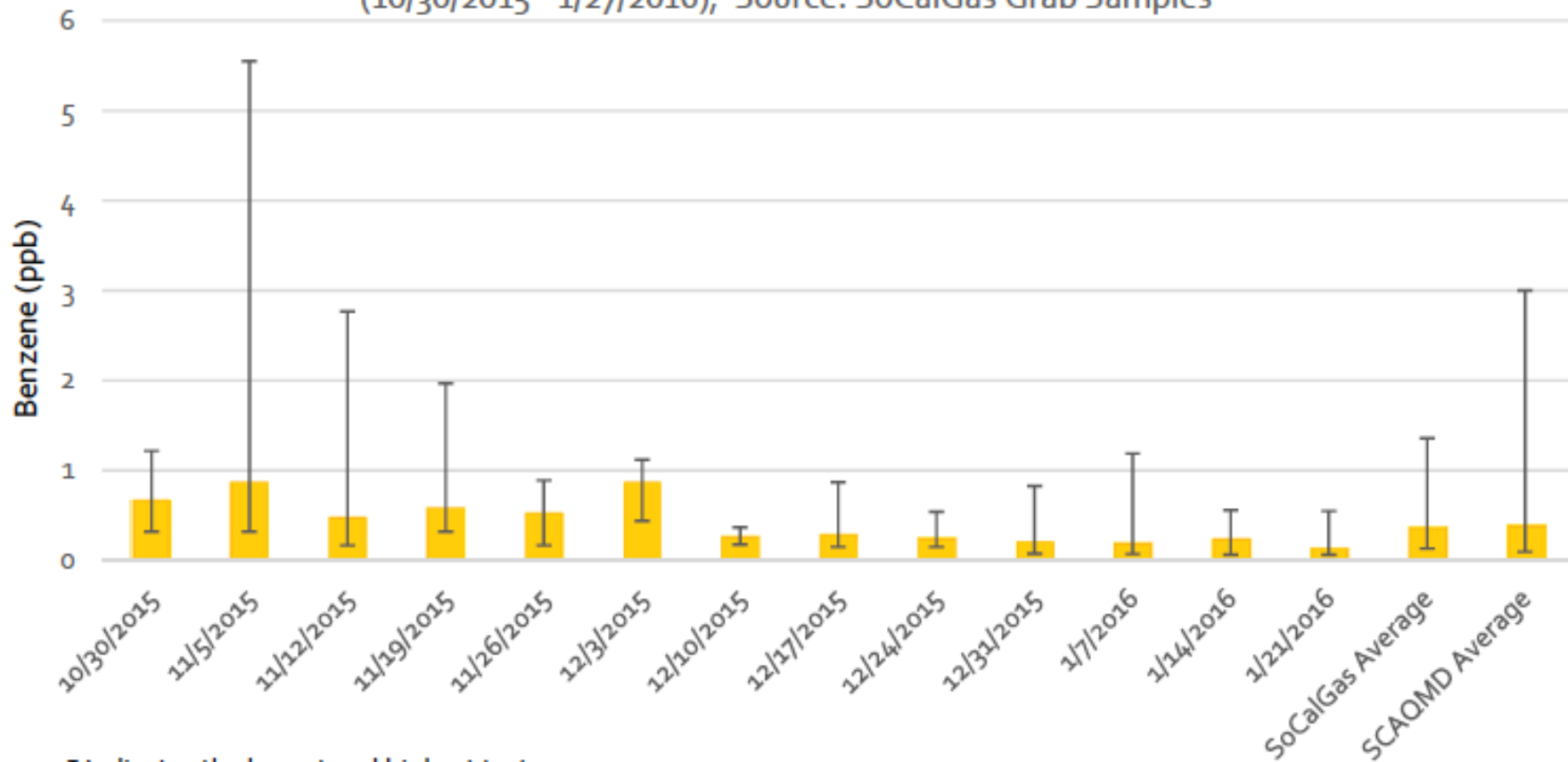
I indicates highest and lowest test results

* SCAQMD samples taken 10/26/15 - 1/13/16

— Indicates break in y-axis scale

Average Weekly Benzene Concentrations in the Community

(10/30/2015 - 1/27/2016); Source: SoCalGas Grab Samples



I Indicates the lowest and highest test

* SCAQMD samples taken 10/26/15 - 1/23/16

Estimates about Lifetime Cancer Risk

- “The modeled additional cancer risks attributed to the gas leak are estimated to be less than 2-in-one million for a six-month exposure, almost exclusively due to benzene.” (AQMD)
- “Based on the limited available SoCal Gas monitoring data (January 12, 2016 to February 22, 2016), preliminary estimates of the long-term health risks from a six-month exposure to benzene and air toxics from all sources (including the gas leak) is less than one-third of the REL, and the estimated cancer risk from benzene is less than 4-in-one million.” (AQMD)

Activities to Assess Health Effects in Residents, Pets, and Other Animals

Assessing Effects on Human Health

- Department of Public Health Complaint Line
- Community Resource Center
- Outreach to Medical Providers

Assessing Effects on Animal Health

- Veterinary Clinic Outreach
- Outreach to Large Animal Veterinarians
- Outreach to Animal Shelters and CDFW
- Reports from Pet Owners

Aliso Canyon Gas Leak Brief Case Studies

Case #1

- Newborn male with no symptoms, feeding and sleeping normally
- Family reports no odors associated with the gas leak
- No symptoms reported in any family members

Question from parents:

Our baby was just born. Are the chemicals from the gas leak more harmful to our baby? Should we relocate even though we are not smelling the gas and have no symptoms?

Case #2

- 6-year-old female with history of asthma and allergies, hospitalized in the PICU with pneumonia and respiratory failure
- Past medical history of moderate asthma, controlled with inhaled beta-agonists and corticosteroids
- Symptoms occurred in early November the gas leak. Odors detected by the family. Other family members reported nausea.

Question from parents:

Will our child have permanent
health problems associated with
the gas leak?

Case #3

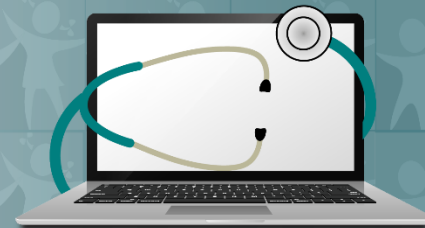
- 12-year-old male was diagnosed in with anemia and undergoing a workup for possible leukemia
- WBC 2.0, neutrophils “low”, Hgb 7, plt 90
- Bone marrow biopsy pending

Question from parents:
Did benzene cause leukemia in our
son?



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