



Successful Large-Scale Vapor Intrusion Investigation

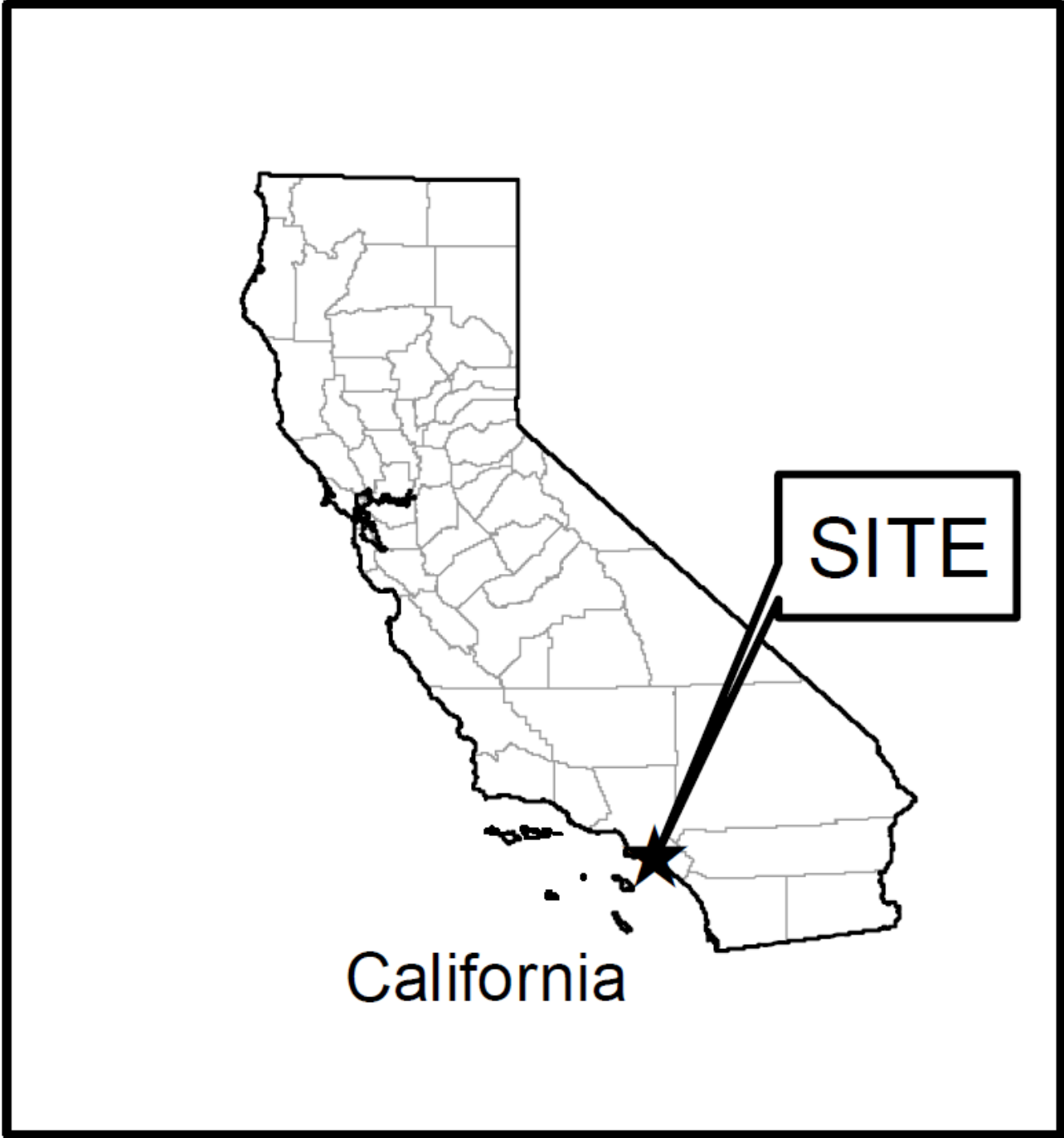
2020 CUPA Conference

Jessica Law, P.G.
Engineering Geologist
Santa Ana Regional Water Quality Control Board

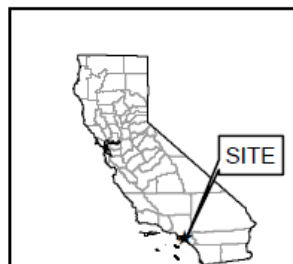
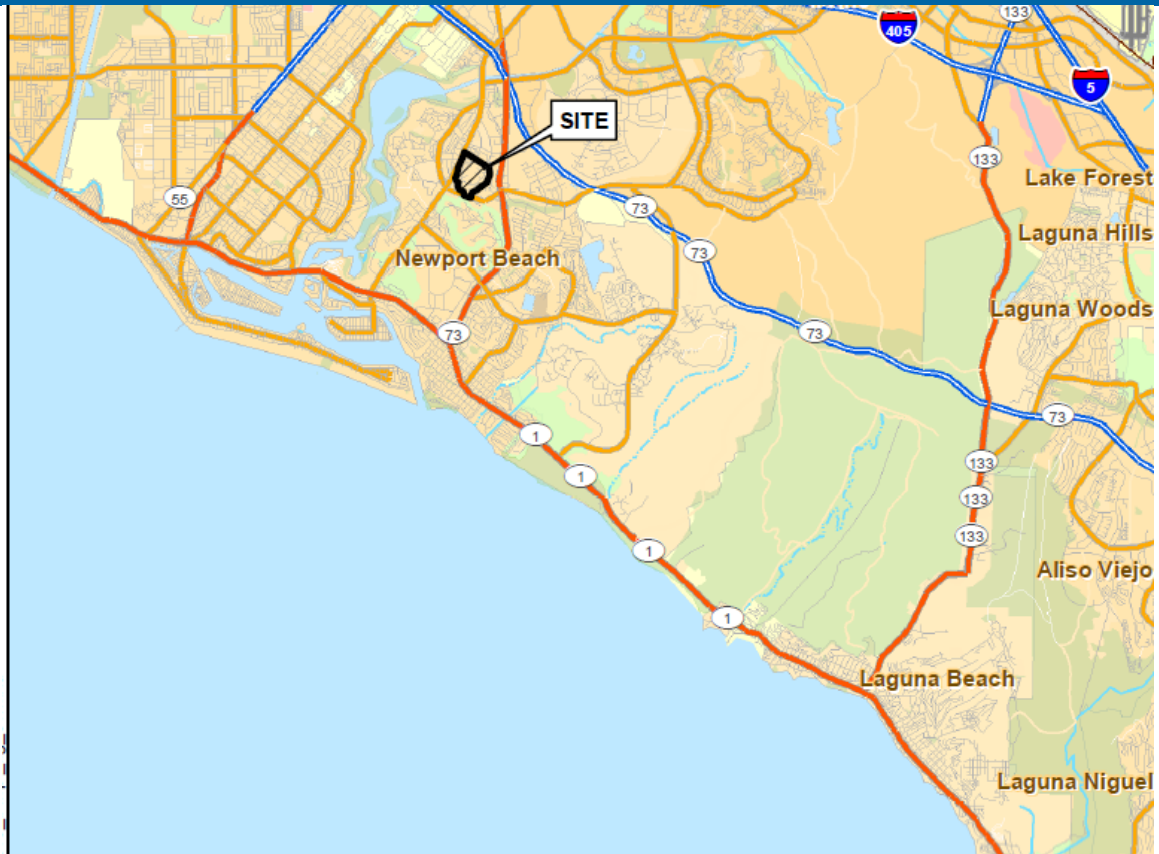
February 6, 2020

Presentation Outline

- Project History
- Vapor Intrusion Investigation
- Key Components For The Ongoing Successful Investigation



Site Location Map

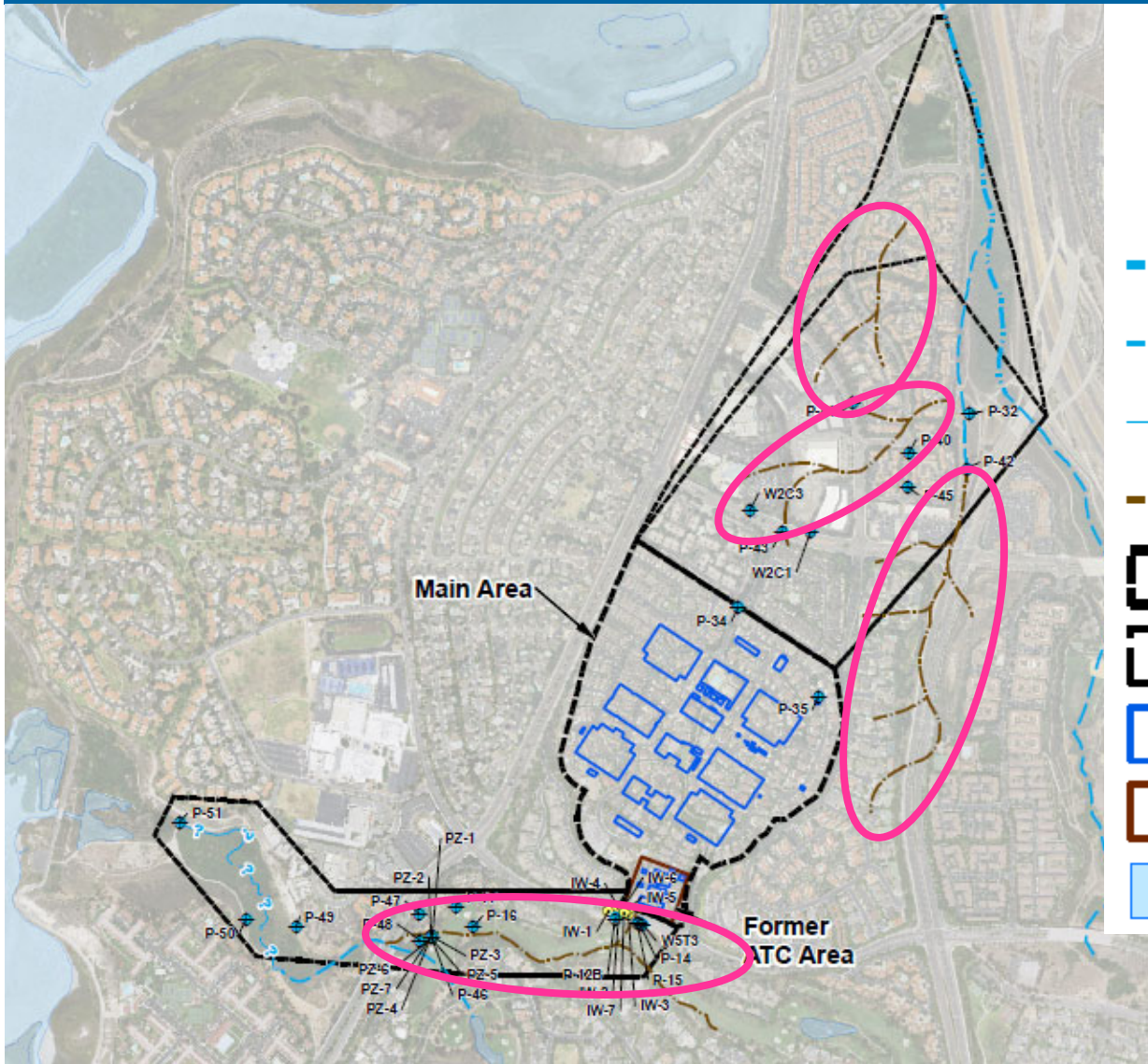













0 2 4 Miles

SITE LOCATION MAP
Newport Beach, California

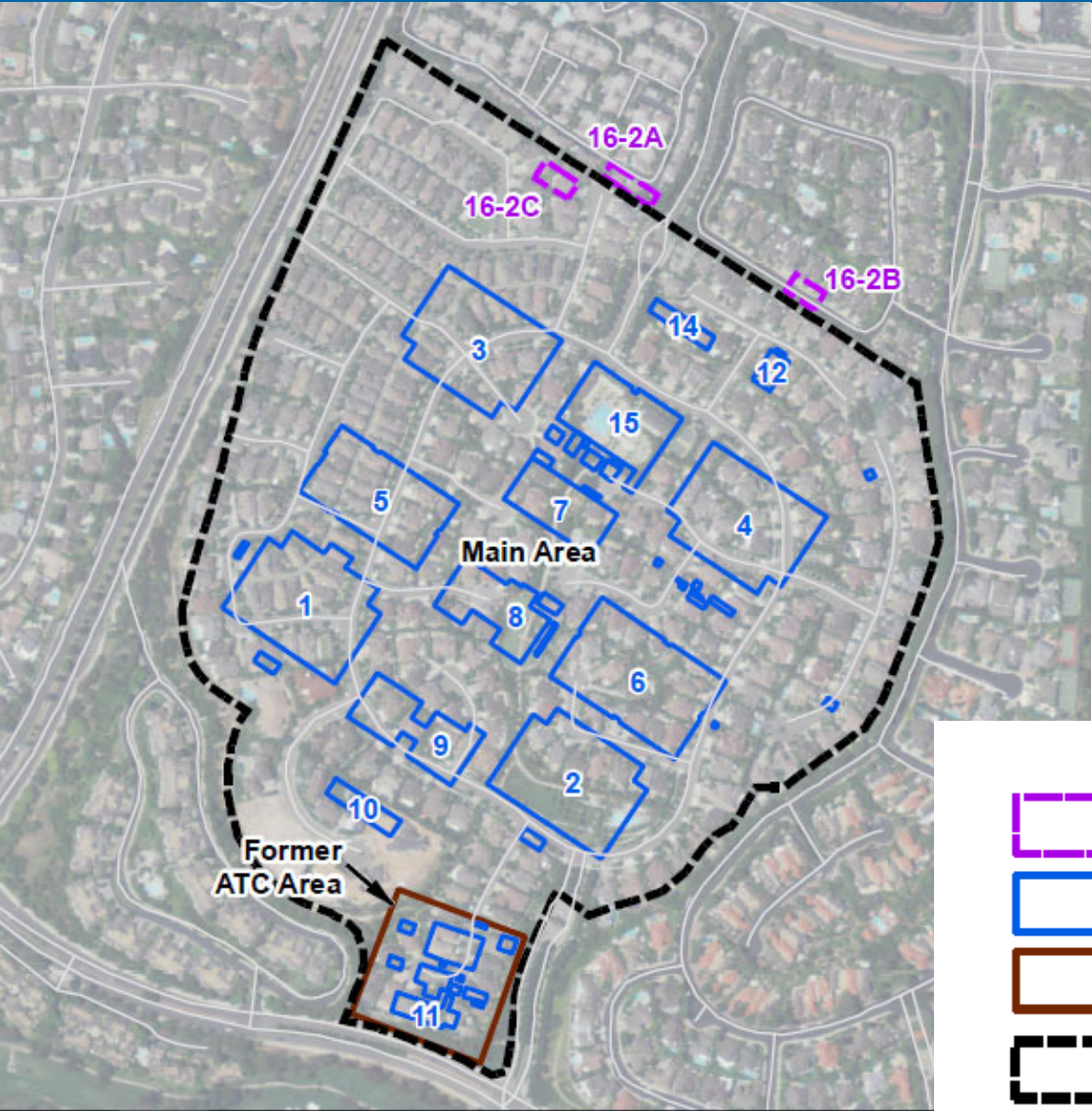






Site Vicinity Map



- Explanation
-  Monitoring well or piezometer
 -  Former IRZ injection piezometer
 -  Creek (current)
 -  Creek (former)
 -  Creek dashed with queries where inferred
 -  Former Arroyo (1931 USGS topographic map)
 -  Former facility boundary
 -  Approximate investigation areas
 -  Location of former facility buildings
 -  Former ATC area
 -  Water Features

Former Facility

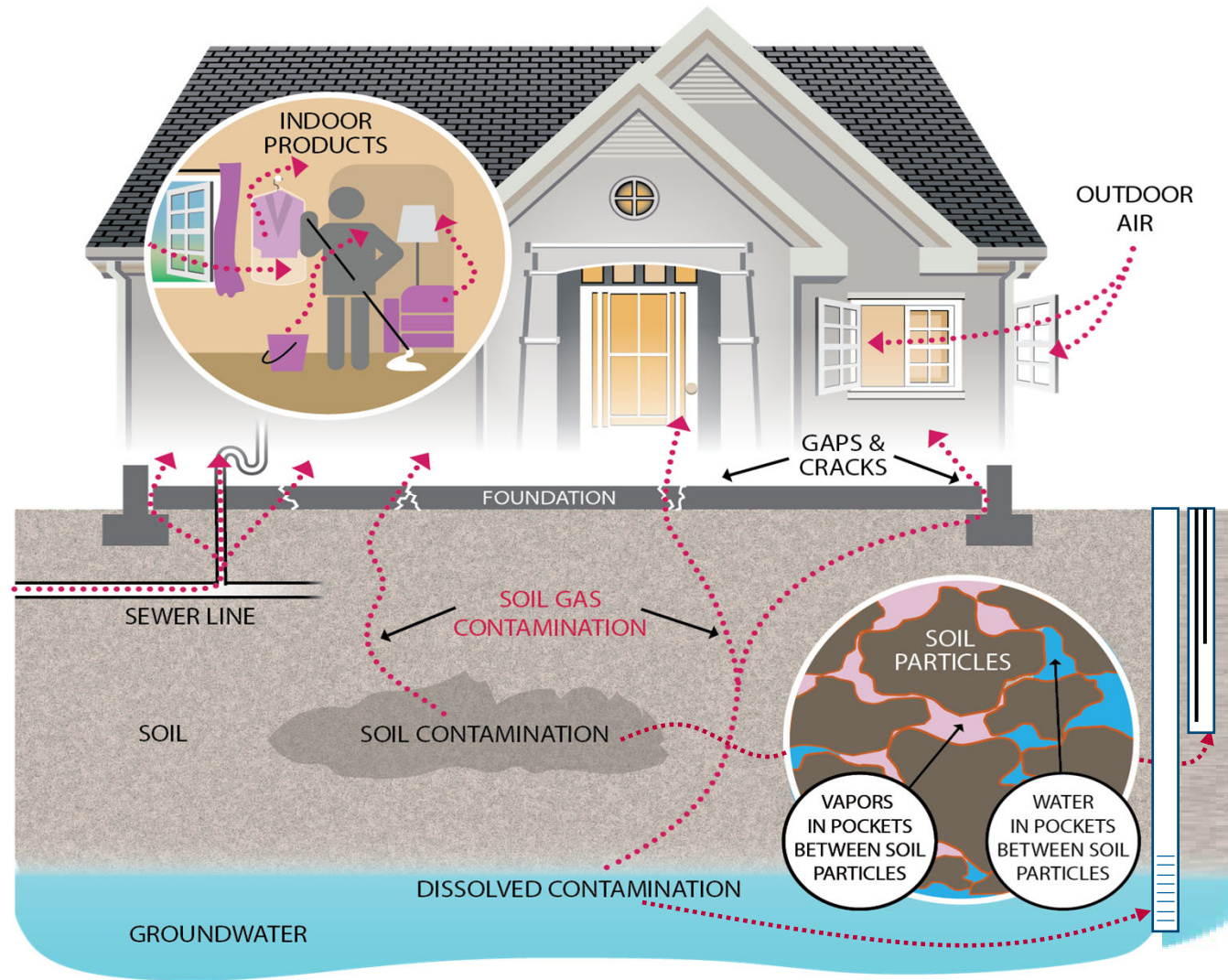


- Explanation
-  Generalized drum storage areas (16-2A, 16-2B, and 16-2C)
 -  Location of former facility buildings
 -  Former ATC area
 -  Former facility boundary

Key Dates

- 1996-1997: Site received soil closure from LOP, allowing the property to be re-zoned for residential use. Offsite groundwater assessment required.
- 1998: Former facility redeveloped with residential homes.
- 2001-2004: Remediation in the BCA Area
- 2006, 2008, & 2012: Limited soil gas assessment conducted, concluded health risks were not present.
- 2014 USEPA Memo re: acute TCE exposure
- 2016 SF Bay Region updated ESLs
- 2017: Conceptual Site Model (CSM) submitted
 - CSM triggered the current vapor intrusion assessment
- 2018: Vapor intrusion assessment began

Vapor Intrusion Conceptual Model

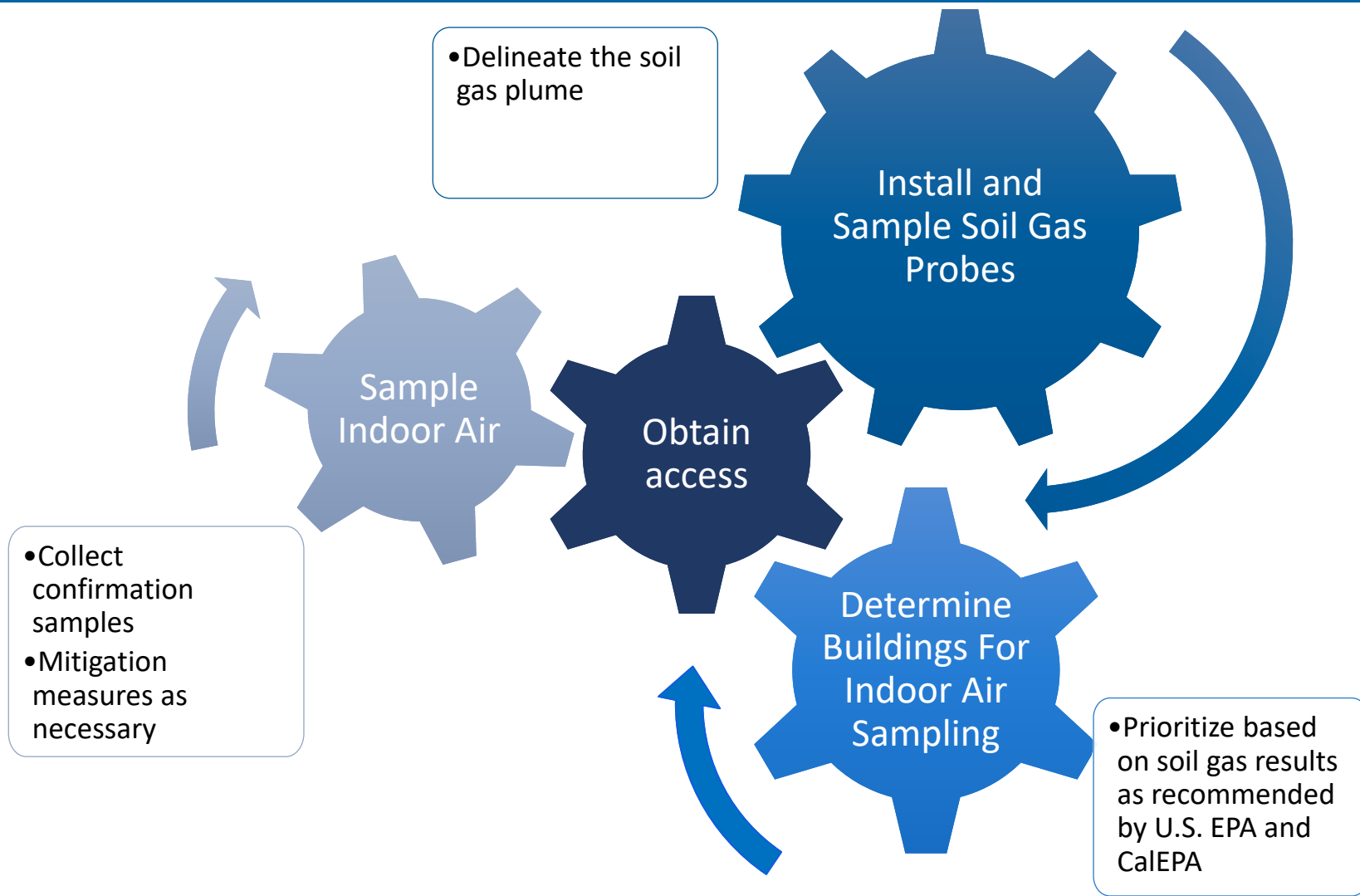


Source: CalEPA

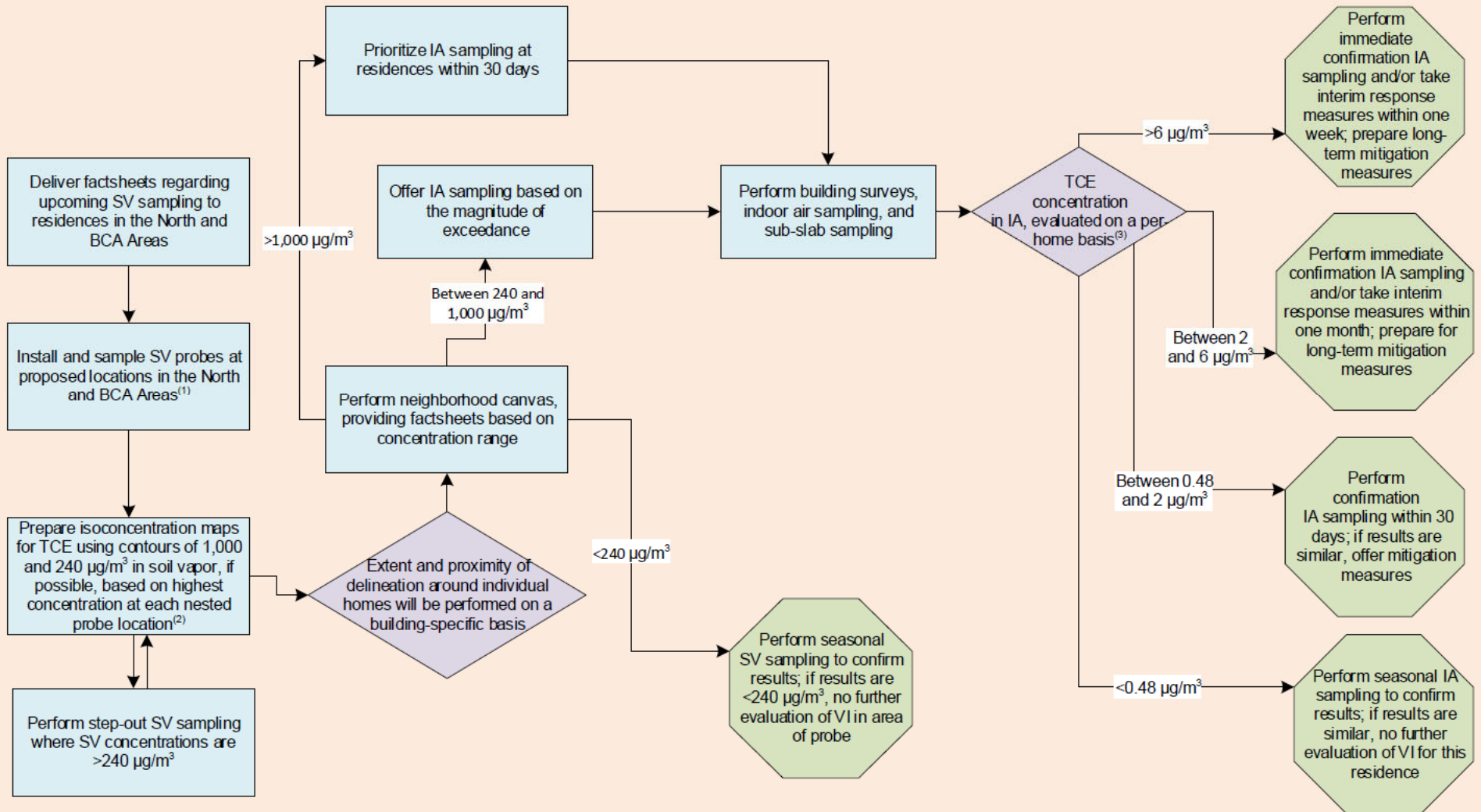
Vapor Intrusion Investigation

- January 2018 Initial Soil Gas Work Plan submitted
 - 14 soil gas probes installed in May 2018 and sampled June 2018
- July 2018 Indoor Air Sampling Work Plan submitted
 - Included a decision flow chart which established a clear path forward for the entire vapor intrusion investigation

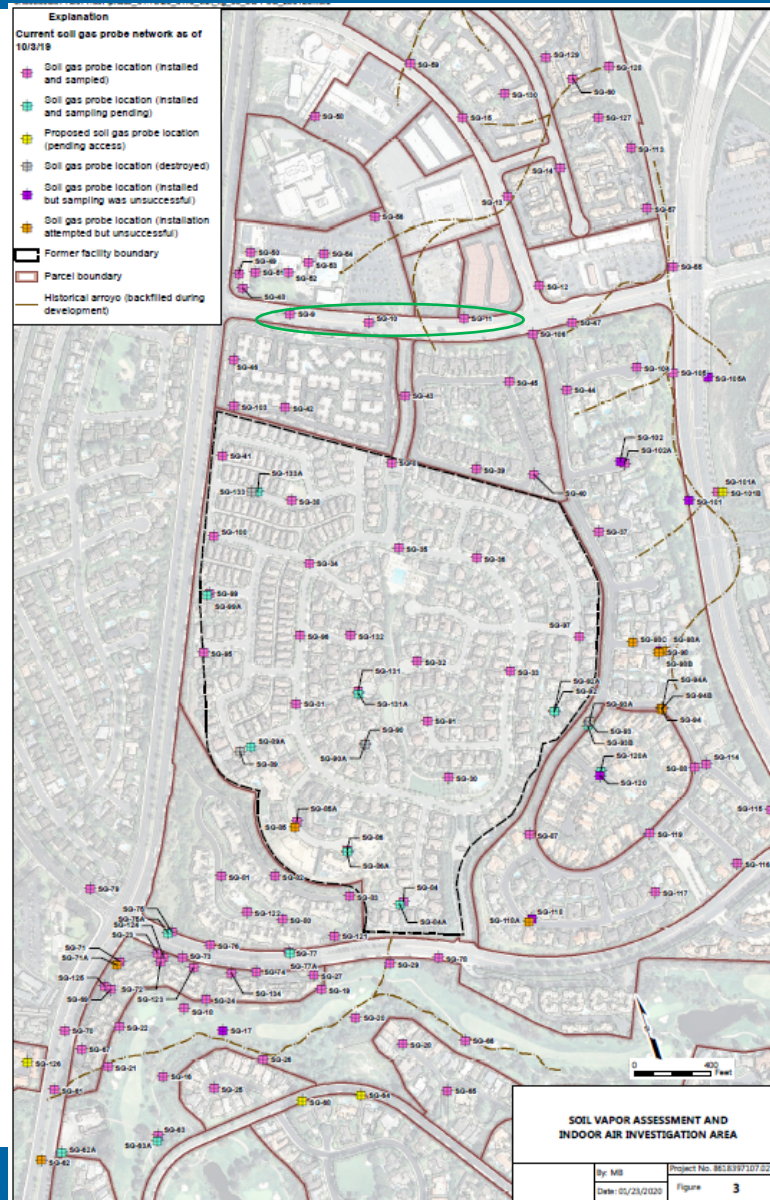
Decision Flow Chart for Vapor Intrusion Assessment



Decision Flow Chart for Vapor Intrusion Assessment at Residential Properties



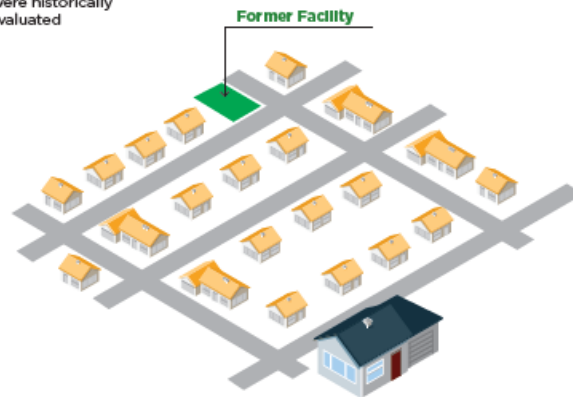
Roadblocks for Conducting Investigation



Vapor Intrusion Investigation Process

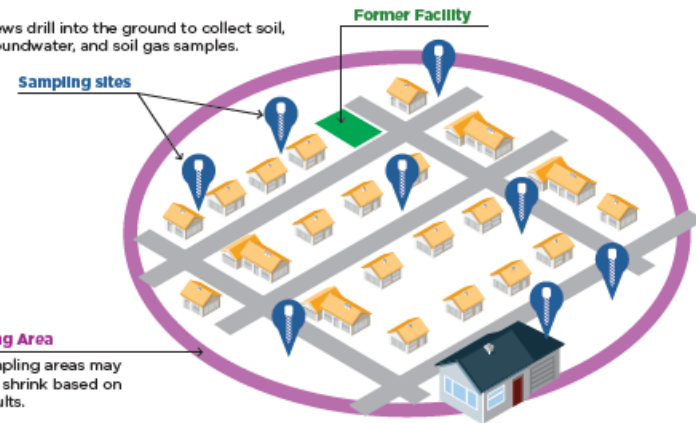
1. Volatile chemicals are identified in the soil, groundwater, or vapors coming from the soil.

Sites where VOCs were historically used are being re-evaluated

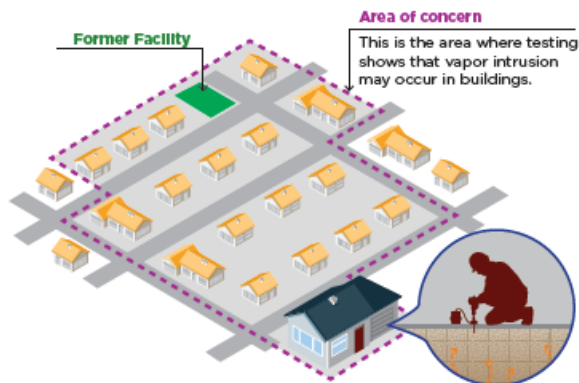


2. Sample for vapors underground to determine area of concern.

Crews drill into the ground to collect soil, groundwater, and soil gas samples.



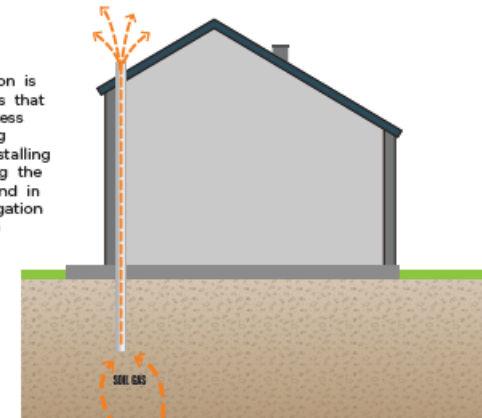
3. Test for vapor intrusion inside homes and buildings within the area of concern.



Testing beneath the home for vapors is called sub-slab soil gas sampling. It involves drilling small holes in your garage floor to collect soil gas samples from under the building. Indoor air samples are collected as well.

4. Take steps to mitigate for vapor intrusion.

If testing finds vapor intrusion is a problem, there are actions that can be taken to quickly address the situation such as sealing cracks in the foundation, installing mobile air purifiers, adjusting the heating/ventilation system and in some cases installing a mitigation system to vent vapors from beneath the home.



TCE Screening Levels

Long-Term Exposure Screening Levels

TCE	Sub-slab/Soil Gas Vapor Intrusion ₁	Indoor Air Direct Exposure ₁
Residential	240 µg/m ³	0.48 µg/m ³
Commercial	3,000 µg/m ³	3 µg/m ³

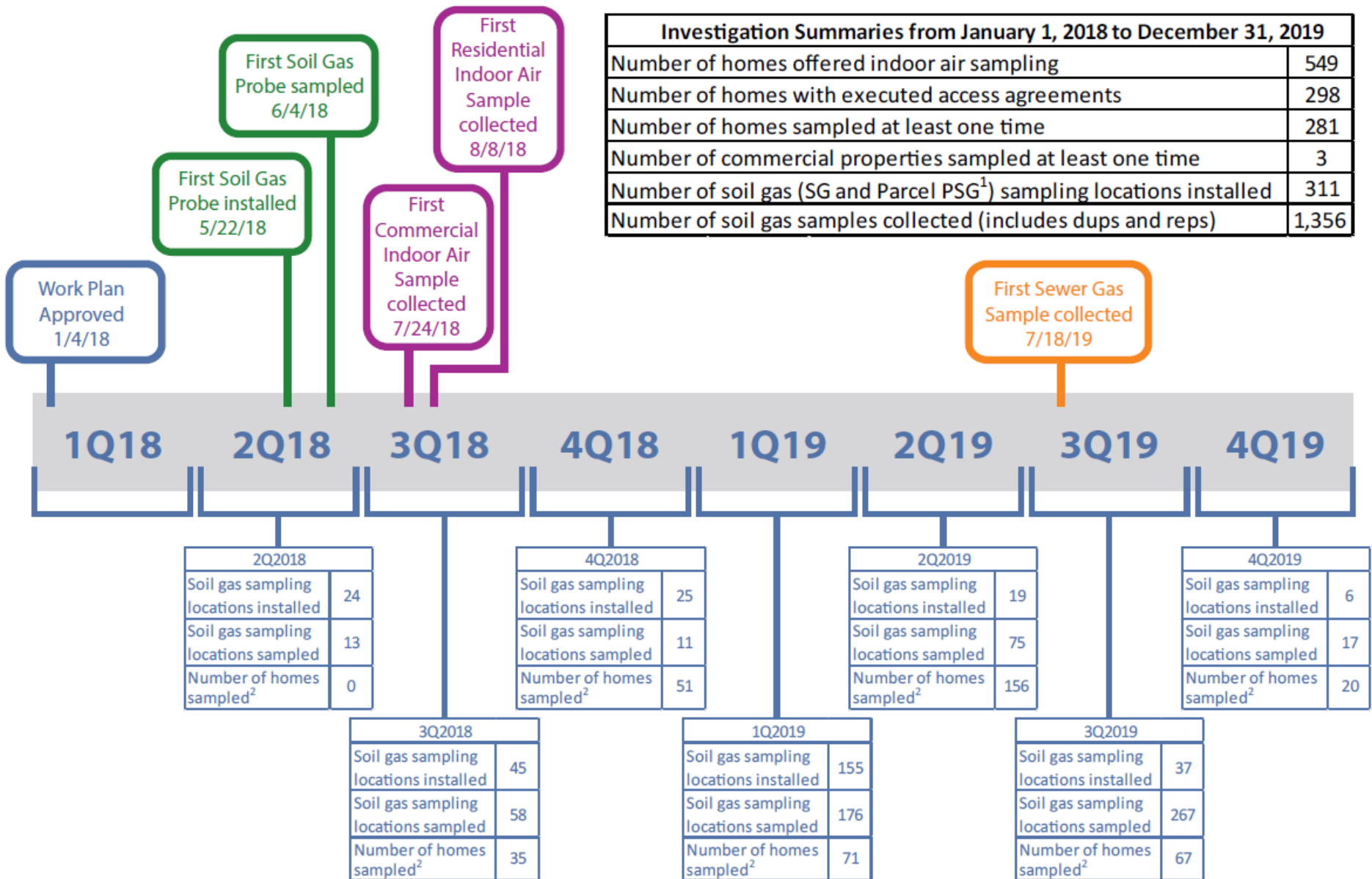
Short-Term Exposure Screening Levels

TCE	Sub-slab/Soil Gas Vapor Intrusion ₁	Indoor Air Direct Exposure—Accelerated ₂	Indoor Air Direct Exposure—Urgent ₂
Residential	1,000 µg/m ³	2 µg/m ³	6 µg/m ³
Commercial (8-hour workday)	8,000 µg/m ³	8 µg/m ³	24 µg/m ³
Commercial (10-hour workday)	8,000 µg/m ³	7 µg/m ³	21 µg/m ³

Environmental Screening Levels (ESLs)

- 2016 vs. 2019 ESLs?
- ESLs updated January 24, 2019.
 - Indoor air screening levels stayed the same.
 - Primary updates to soil gas screening levels.
 - Based on the current US EPA default attenuation factors.
- Same approach.
 - Still delineating the soil gas plume to non-detect.
 - Still utilizing the 2016 ESLs for triggering indoor air evaluation.
 - Still a phased approach.
- Potential changes
 - TBD based on indoor air results

Investigation Summaries from January 1, 2018 to December 31, 2019	
Number of homes offered indoor air sampling	549
Number of homes with executed access agreements	298
Number of homes sampled at least one time	281
Number of commercial properties sampled at least one time	3
Number of soil gas (SG and Parcel PSG ¹) sampling locations installed	311
Number of soil gas samples collected (includes dups and reps)	1,356



NOTES:

1. Parcel PSGs from Parcels 1, 10, 11, and 16.
2. Number of homes sampled each quarter includes homes sampled for the first time, confirmation sampling and seasonal sampling.

VAPOR INTRUSION INVESTIGATION TIMELINE		
Newport Beach, California		
By: KLU	Proj. No. 8618397107.01.1B	
Date: 01/22/2020	Figure	1

Environmental Investigation Vapor Intrusion Assessment – Soil Gas

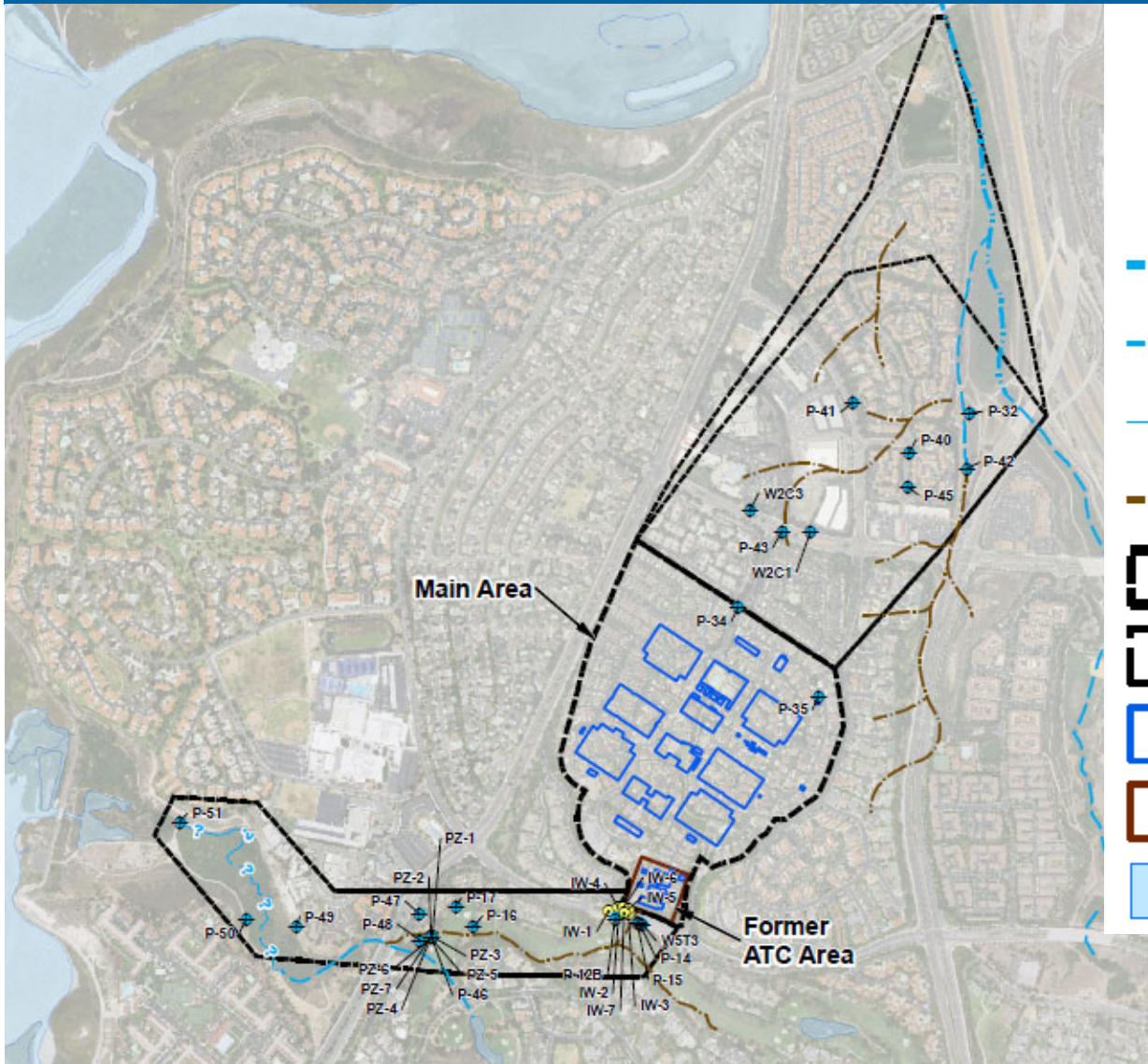
Determine Extent of Soil Gas Plume

- Samples being evaluated for all volatile organic compounds.
- PCE and TCE are the primary two contaminants detected in soil gas that exceed screening levels.
- 138 sampling locations for evaluating the extent of soil gas plume; plus an additional 173 perimeter soil gas locations.
- Good understanding on the lateral extent of the soil gas plume and close to fully defining the outer edges.
- Good understanding of which buildings should be evaluated.











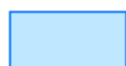
Prior to Making Decisions

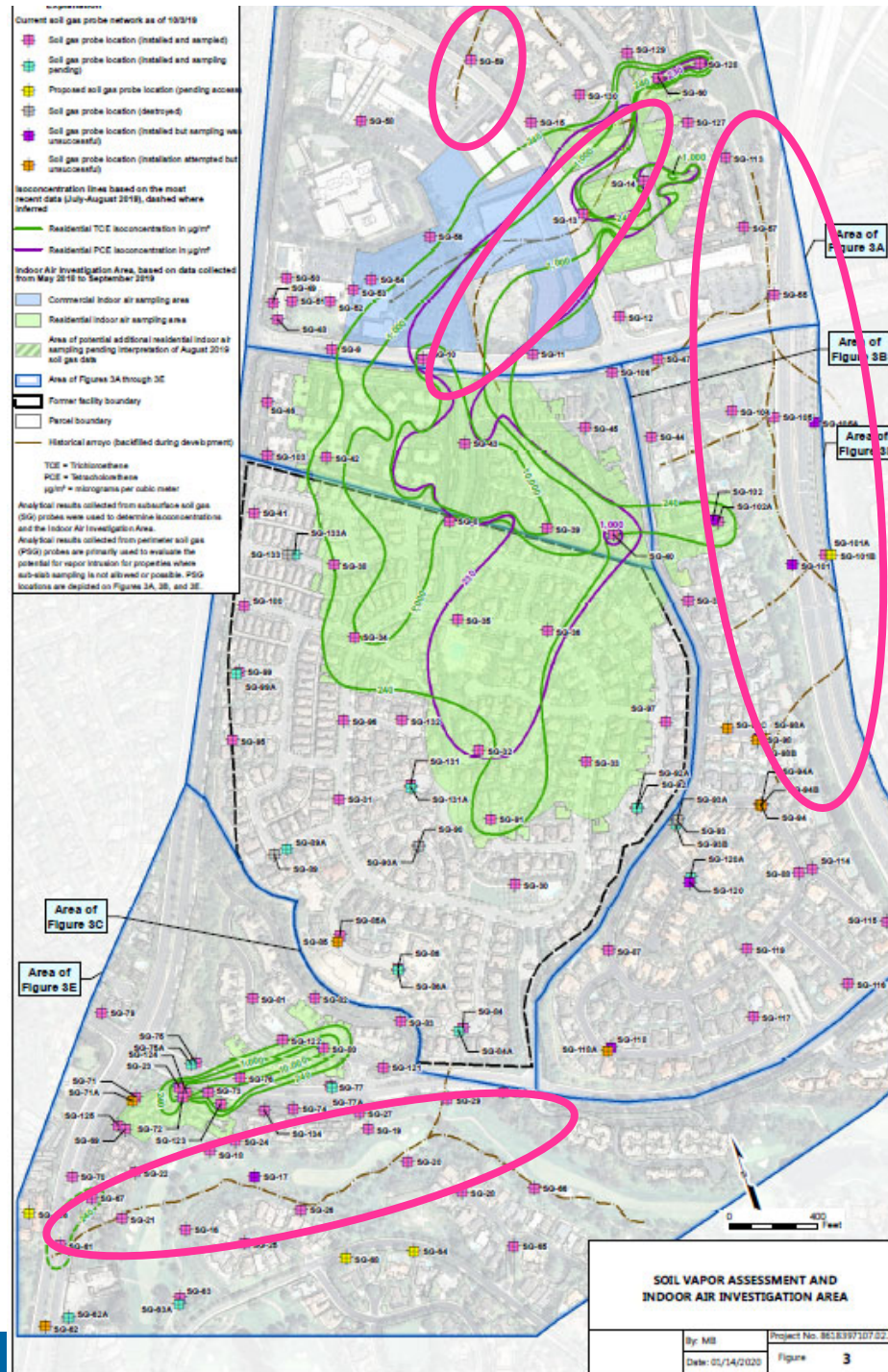
- A minimum of two sampling events in different seasons is necessary.
- Recommended by U.S. EPA and CalEPA guidance.

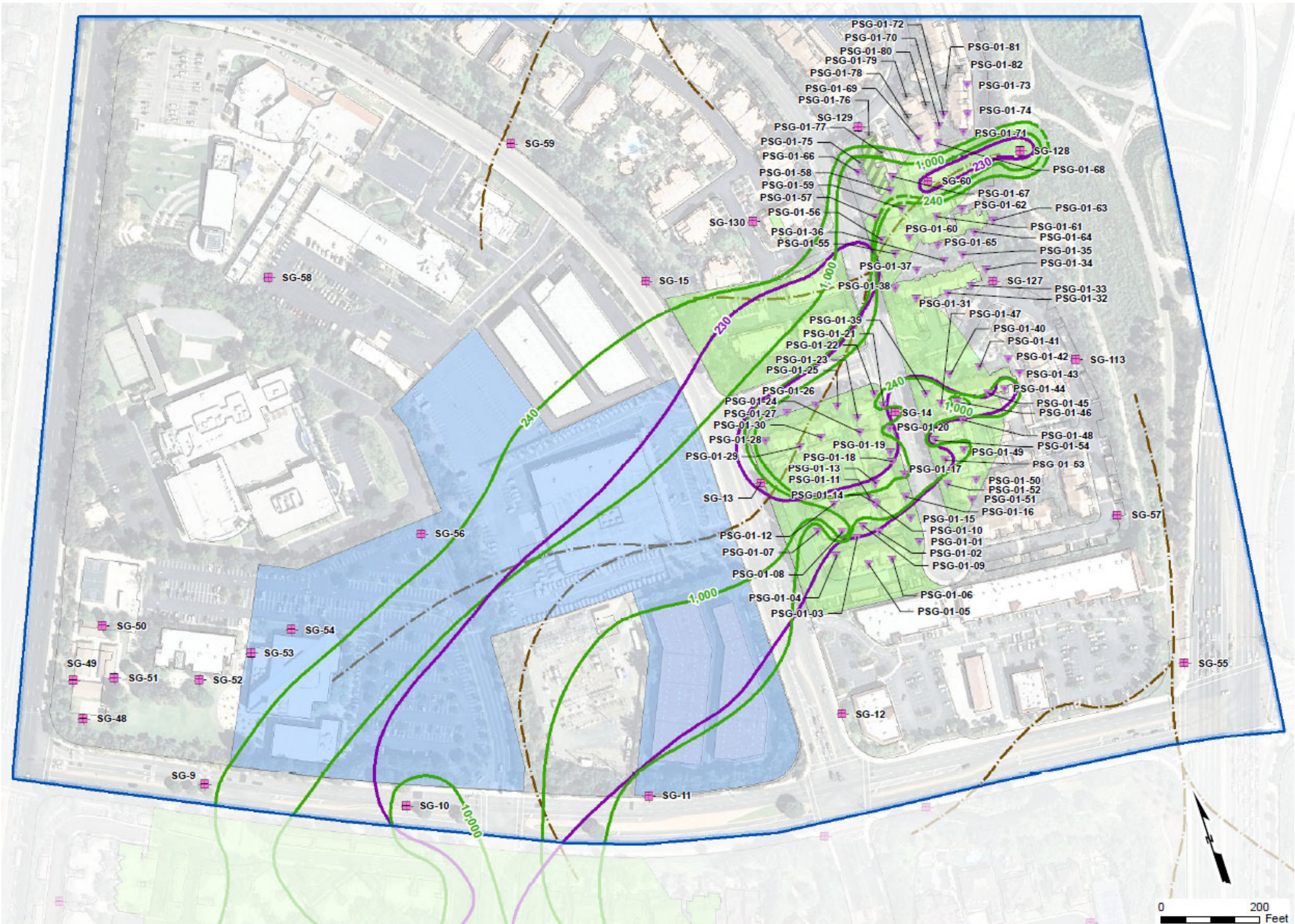
Site Vicinity Map



Explanation

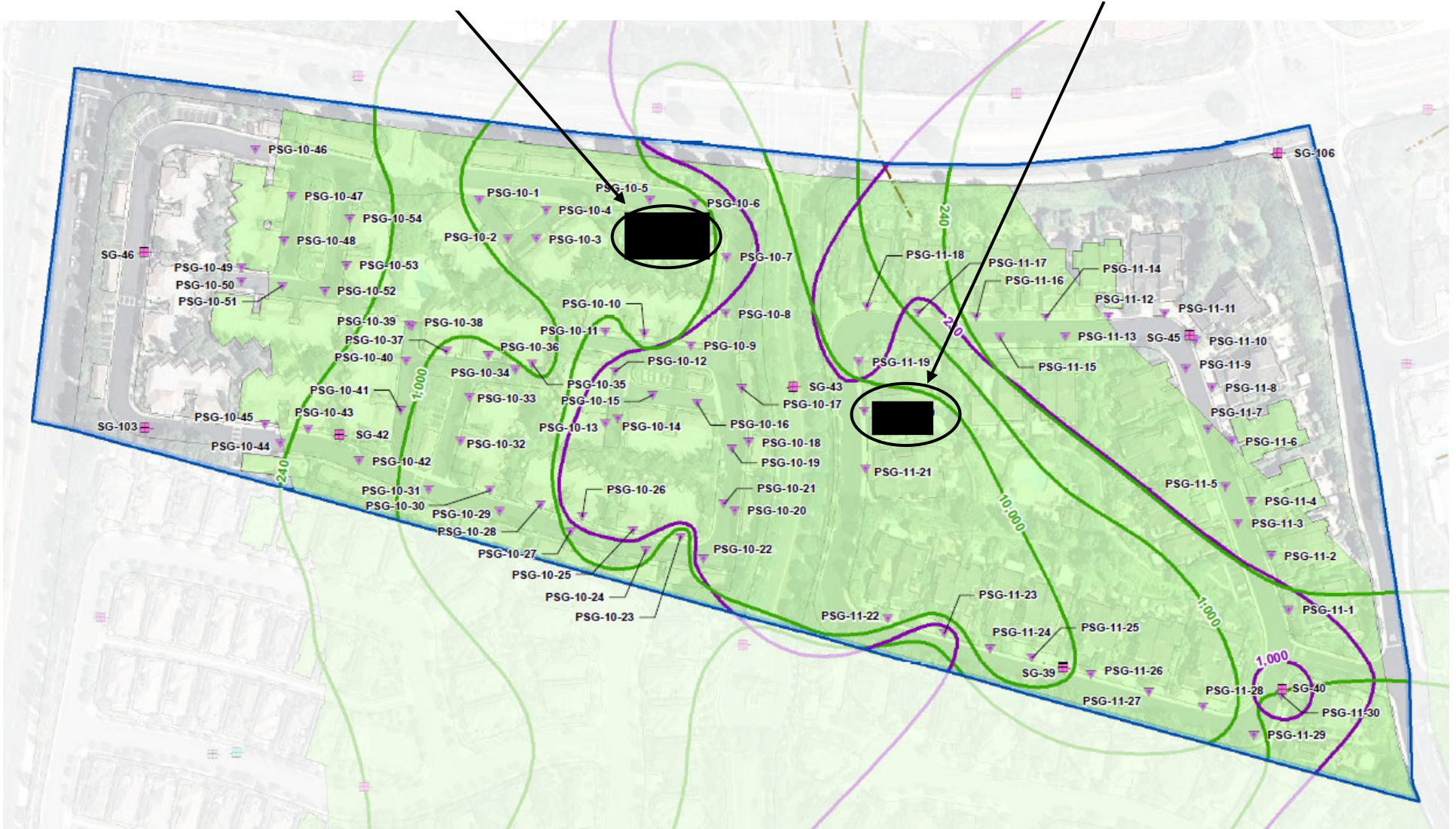
-  Monitoring well or piezometer
-  Former IRZ injection piezometer
-  Creek (current)
-  Creek (former)
-  Creek dashed with queries where inferred
-  Former Arroyo (1931 USGS topographic map)
-  Former facility boundary
-  Approximate investigation areas
-  Location of former facility buildings
-  Former ATC area
-  Water Features



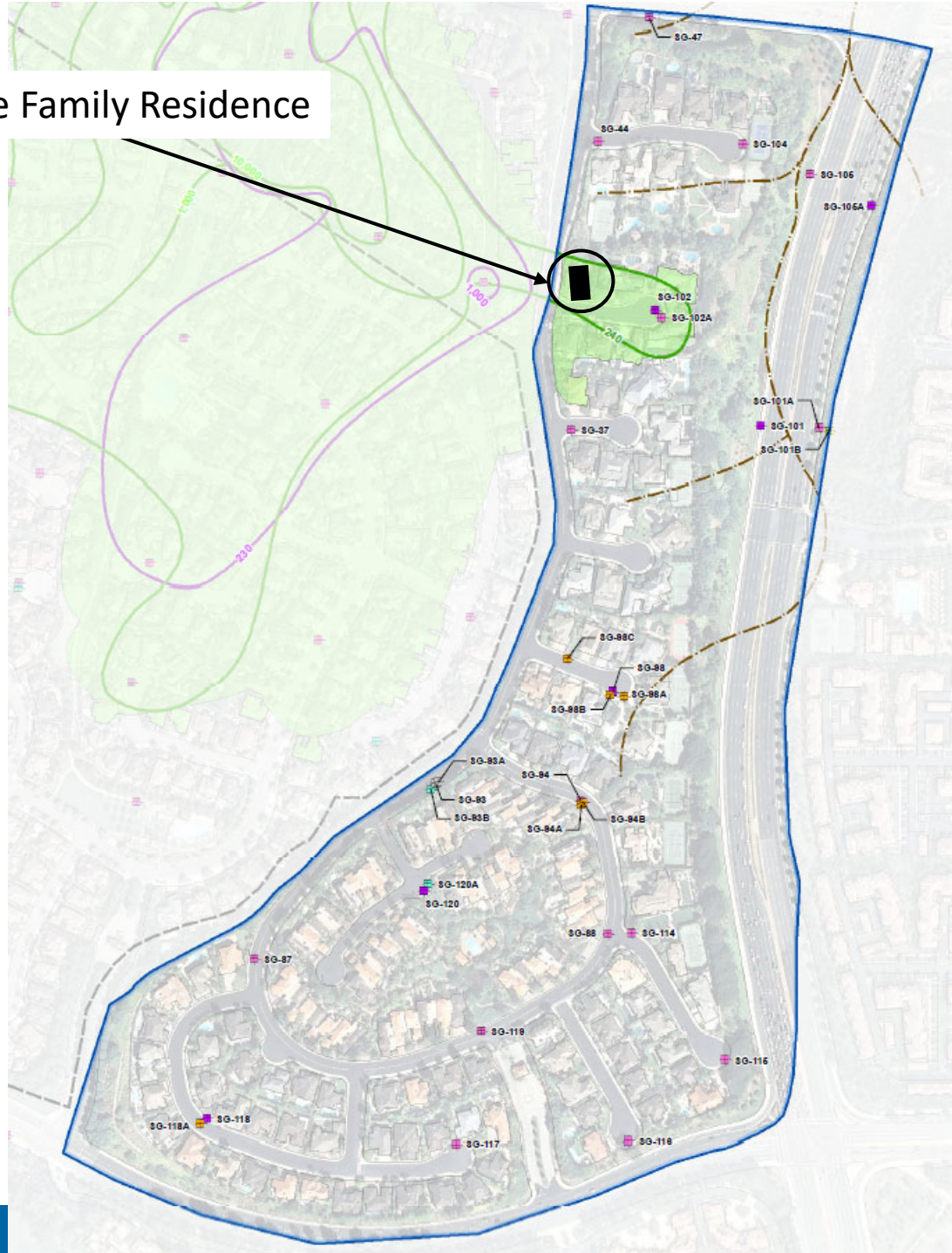


8 RESIDENTIAL UNITS
IN THIS BUILDING

2 RESIDENTIAL UNITS
IN THIS BUILDING

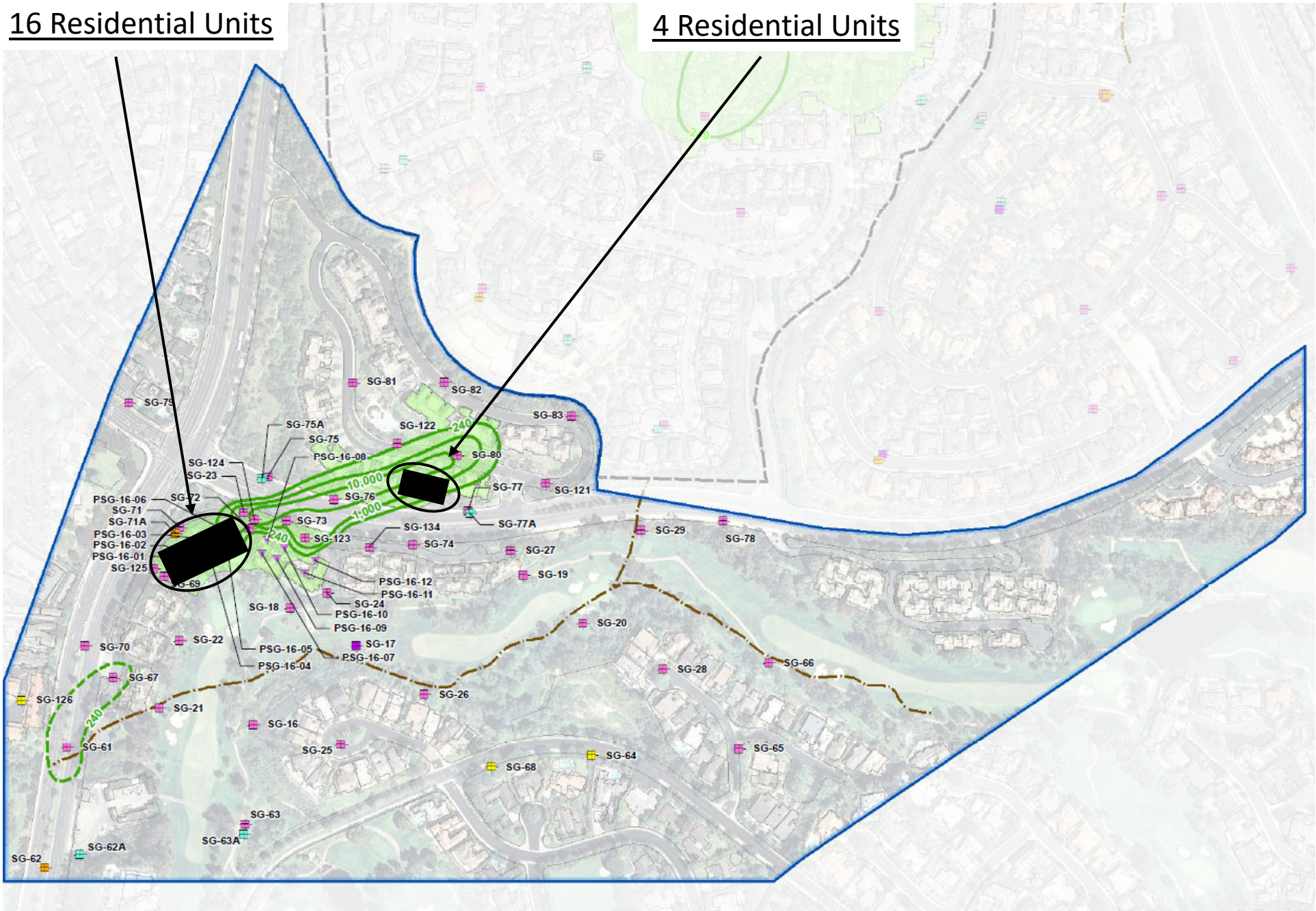


1 Single Family Residence



16 Residential Units

4 Residential Units



Environmental Investigation

Vapor Intrusion Assessment – Indoor Air

Why Evaluate Buildings

- When there is soil gas that exceeds screening levels, vapor intrusion may be occurring.

Evaluating Vapor Intrusion

- Collect indoor air sample over a 24-hour period in various rooms.
- Collect concurrent soil gas sample from either a sub-slab soil gas probe or perimeter soil gas probe.
- Collect samples in different seasons (i.e. summer and winter months)
- Prepare a risk assessment report

Indoor Air Testing Results Project Totals to Date

549 homes that need sampling



298 signed access agreements (54%)



281 homes sampled (51%)

Indoor Air Testing Results Project Totals

281 homes
sampled

- Low levels of PCE and TCE have been detected in indoor air in some homes.
- Additional contaminants detected in indoor air but not in the subsurface.

7 homes with
TCE levels over
short-term
action level

- 5 homes offered air purifying units
- 3 home concluded to be an indoor air source

91 homes with
PCE and/or TCE
over ESLs

- ~26 homes appear to have VI occurring
- Short-term mitigation measures being offered

Resulting Actions

- Interim Remedial Action Plan was submitted November 2019 and approved January 2020
- Short-Term Mitigation Measures Work Plan submitted December 2019 and approved December 2019
- Sharing the data with two of the three major ongoing studies on attenuation factor and providing feedback:
 - DTSC Southern California Division
 - Robbie Ettinger of Geosyntec.

What's Next

- Continue vapor intrusion investigation, then transition to vapor intrusion monitoring.
- Conduct SVE pilot test at three locations.
- Additional soil, soil gas, and groundwater assessment in select areas.
- Begin preparing risk assessment reports per community.

Key Components for Successful Investigation

- Collaborative communication.
 - Public outreach and providing multiple outlets for additional information.
- Adaptive approach.
 - Accepting and incorporating feedback.
 - Willingness to “course correct” along the way as appropriate
- Transparency


Public Outreach and Additional Information

- Public Meetings – 5 events to date
- Community Fact Sheets – 3 distributions
- Lyris List for email notification
 - Next public event – May 2020
- GeoTracker
- Water Board webpage
- RP set up a site-specific website and 800 number
- Local information repository - library

Community Meetings - Planning

- 90/10 Rule
- Understanding the public's key concerns.
- Establish key message points.
- Involving the “right” people.
- Discuss potential questions, especially the difficult ones.
- Provide handouts

Community Meetings - Planning



Trichloroethylene (TCE) in Indoor Air

What is Trichloroethylene (TCE)?

- Trichloroethylene (TCE or trichloroethene) is a toxic, clear, colorless liquid. Liquid TCE evaporates quickly into the air. It is not flammable.
- TCE is primarily used in industry to remove grease from metal parts and to make refrigerants.
- TCE can also be found in consumer products such as automotive degreasers, stain removers, paint removers, and adhesives.

How can I be exposed to TCE?
Common ways people may be exposed to TCE include:

- Living or working in a building that is above soil or groundwater contaminated with TCE;
- Working in industries that produce or use TCE;
- Using TCE-containing products at home.


How can TCE affect my health?

- Short-term exposure to TCE in the first trimester of pregnancy may increase the risk of heart defects in the baby.
- Long-term exposure to TCE can impact the immune system, kidney, male reproductive system, and liver. Long-term exposures also increase the risk of kidney cancer and possibly other types of cancer.
- The health effects of TCE depend on many factors, such as:
 - The amount of TCE in air,
 - How long people breathe it, and
 - Individual sensitivity to the chemical.

What can I do to reduce my exposure to TCE in my home?

- Avoid using products containing TCE, and follow directions when using them.
- Ventilate your home frequently by opening the windows and doors.
- For more information reducing your exposure to chlorinated chemicals, such as TCE, see the Air Resources Board factsheet on *Chlorinated Chemicals in Your Home* (<https://www.arb.ca.gov/research/indoor/clguide.pdf>).

Office of Environmental Health Hazard Assessment (OEHH), California Environmental Protection Agency
Sacramento | California | November 2018



VAPOR INTRUSION

Frequently Asked Questions

ROLE OF THE REGULATORY AGENCY

What is the role of the Santa Ana Regional Water Quality Control Board?
The Santa Ana Regional Water Quality Control Board (Regional Board) is a state regulatory agency under the umbrella of the California Environmental Protection Agency (CalEPA). The Regional Board makes critical water quality decisions for the region, including setting water quality standards, issuing permits (waste discharge requirements), determining compliance with those requirements, and taking appropriate enforcement actions. In the case of the Former Ford Aeronautics Facility Site, the Regional Board oversees the Responsible Party that caused the contamination, Ford Motor Company (Ford), to ensure that Ford conducts the appropriate assessment and remediation of the Site.

TERMINOLOGY


What is vapor intrusion?
Vapor intrusion is the movement of vapor-forming chemicals (e.g., radon, volatile organic compounds, or semi-volatile organic compounds), from an underground source such as contaminated soil and/or groundwater, into the indoor air of an overlying building. An example of vapor intrusion is the seepage of radon gas into homes in the Midwest and on the east coast as well as some locations in California.

What are VOCs?
Volatile Organic Compounds (VOCs) are chemicals that are contained in products commonly used in industry as well as in the home. Products containing VOCs include paints, paint strippers, cleaning supplies, and markers. VOCs are also found in car exhaust, cigarette smoke, air fresheners and other scented materials, dry cleaned clothes, gardening chemicals, and fuel.

What is TCE?
Trichloroethylene (referred to as trichloroethene or TCE) is a VOC that is used as a solvent for degreasing metal parts during the manufacture of a variety of products. It can be found in consumer products, including some wood finishes, adhesives, paint removers, and stain removers. Due to its widespread use, very low levels of TCE are common in the air of homes and businesses and in outdoor air in urban areas.

What is PCE?
Tetrachloroethylene (referred to as tetrachloroethene or PCE) is a VOC that is commonly used in dry cleaning and metal degreasing. It is also used to make other chemicals and can be found in some consumer products. Similar to TCE, PCE is also volatile, highly stable, and nonflammable at room temperature.

Former Ford Aeronautics Facility | Newport Beach, California
February 2019 | 1



How to interpret your INDOOR AIR RESULTS

```

    graph TD
      Q1[Was a VOC* detected in Indoor air?] -- NO --> A1[No vapor intrusion identified. Retest in 6 months to confirm.**]
      Q1 -- YES --> Q2[Was the VOC detected above the Indoor air screening level?]
      Q2 -- NO --> A2[No unacceptable vapor intrusion risk identified. Resample in 6 months to confirm.**]
      Q2 -- YES --> Q3[Was the VOC detected in the subsurface?]
      Q3 -- NO --> A3[Vapor intrusion unlikely. The VOC is likely from an indoor air source.**]
      Q3 -- YES --> Q4[Was the VOC detected above the soil gas screening level?]
      Q4 -- NO --> A4[Vapor intrusion may be occurring. Additional sampling necessary.**]
      Q4 -- YES --> A5[Further evaluation necessary to determine vapor intrusion or indoor air source.**]
  
```

*VOC = VOLATILE ORGANIC COMPOUND
**Resample as outlined in the vapor intrusion evaluation strategy.

Former Ford Aeronautics Facility | Newport Beach, California
February 2019

Community Meetings – Presenting Information

- Utilize public participation and/or communication specialist.
- Understand your audience.
- Utilize visuals and recap key points.
- Ensure established key message items are adequately addressed.

Community Meetings – Answering Questions

- Utilize subject matter experts.
- Discuss the “hard” questions ahead of time.
- Follow up on questions that can not be answered during the meeting.

Adaptive Approach

- Modifying public outreach approach.
- Revising investigation approach.
 - Adding sewer gas sampling.
 - Modifying probe construction.

Sewer Gas Sampling



Adaptive Approach



Transparency

- ESL update discussion.
- Answering the “hard” questions.

Frequently Asked Questions

- How is this going to affect my property value?
- Why is this happening now?
- What are the risks?
- How long is this going to take?
- My home is going to be sampled, what can I expect and is there anything I need to do to prepare?
- How long until I receive my indoor air results?
- How can I reduce or get rid of the contaminants found in my home?
- How is this going to get cleaned up?