DERP Forum

Strengthening Relationships with our Regulatory Partners

St. Louis, Missouri

May 8-9, 2019

Comparison of Vapor Intrusion Investigations: Case Studies with a Range of Findings and Response

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09 May 2019

Agenda

- **Identification of Case Studies**
  - Naval Base Coronado, Operable Unit 20
  - Naval Base San Diego, IR Site 22
- **Presentation and Contrast**
  - Conceptual Site Model/Site Conditions – Pre VI Sampling
  - Planning and Investigative Approach
  - Results
  - Mitigation
- **Summary and Lessons Learned**

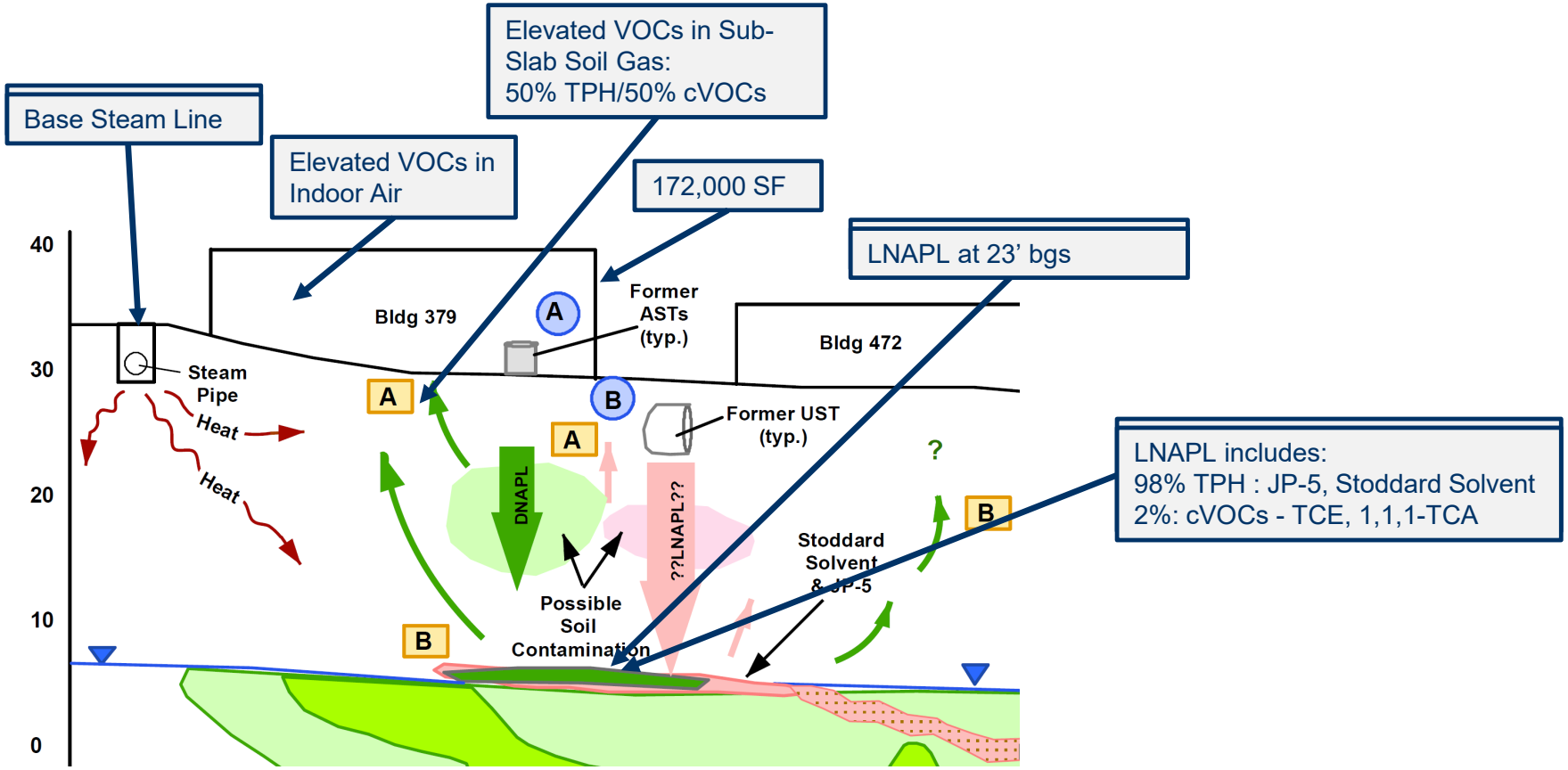
Case Study 1: NAS North Island, OU20 Building 379

- **Site Conditions/Situation – Pre VI Sampling**
  - Building 379 – 172,000 square foot footprint
  - Overlies LNAPL 25 feet deep, which includes cVOCs and heated to 130 ºF from base steam line
  - cVOCs in soil gas/sub-slab in places >10M ug/m^3
  - Initial indoor air concentrations exceed the USEPA Region 9 ARAL

LNAPL – light non-aqueous phase liquid
cVOCs – chlorinated volatile organic compound
ARAL – Accelerated Response Action Level

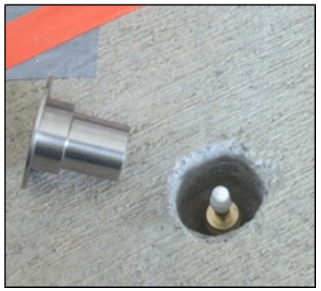
Case Study 1: NAS North Island, OU20 Building 379

- **Site Conceptual Model**



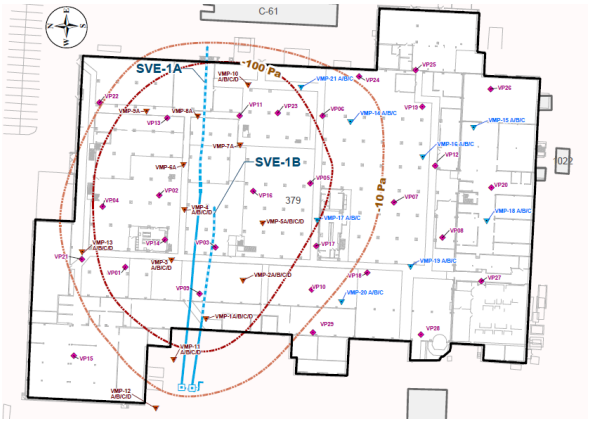
Case Study 1: NAS North Island, OU20 Building 379

- **Planning & Investigative Approach Taken**
  - Initial Planning
    - Communications Plan; Commanding Officer - personnel meetings
    - Building Surveys
      - Potential source evaluations
      - Evaluate HVAC system
  - Measurements
    - Sub-slab/vapor pin installation
    - Initial Indoor air screening
      - HAPSITE/Electron capture detection
    - Contemporaneous indoor/outdoor and sub-slab sampling
    - Regular ongoing monitoring of indoor air (49 events since 2016)
      - SUMMA canisters - before and after mitigation efforts
  - Results
    - Initial screening
      - Indoor Air Concentrations > USEPA Region 9 ALARs
    - Contemporaneous measurements
      - Indoor air TCE concentrations reduced after initial mitigation
      - Result in building-specific attenuation factor (**0.000001**)
    - Ongoing monitoring of indoor air
      - Verifies that concentrations after mitigation remain below USEPA Region 9 ARALs



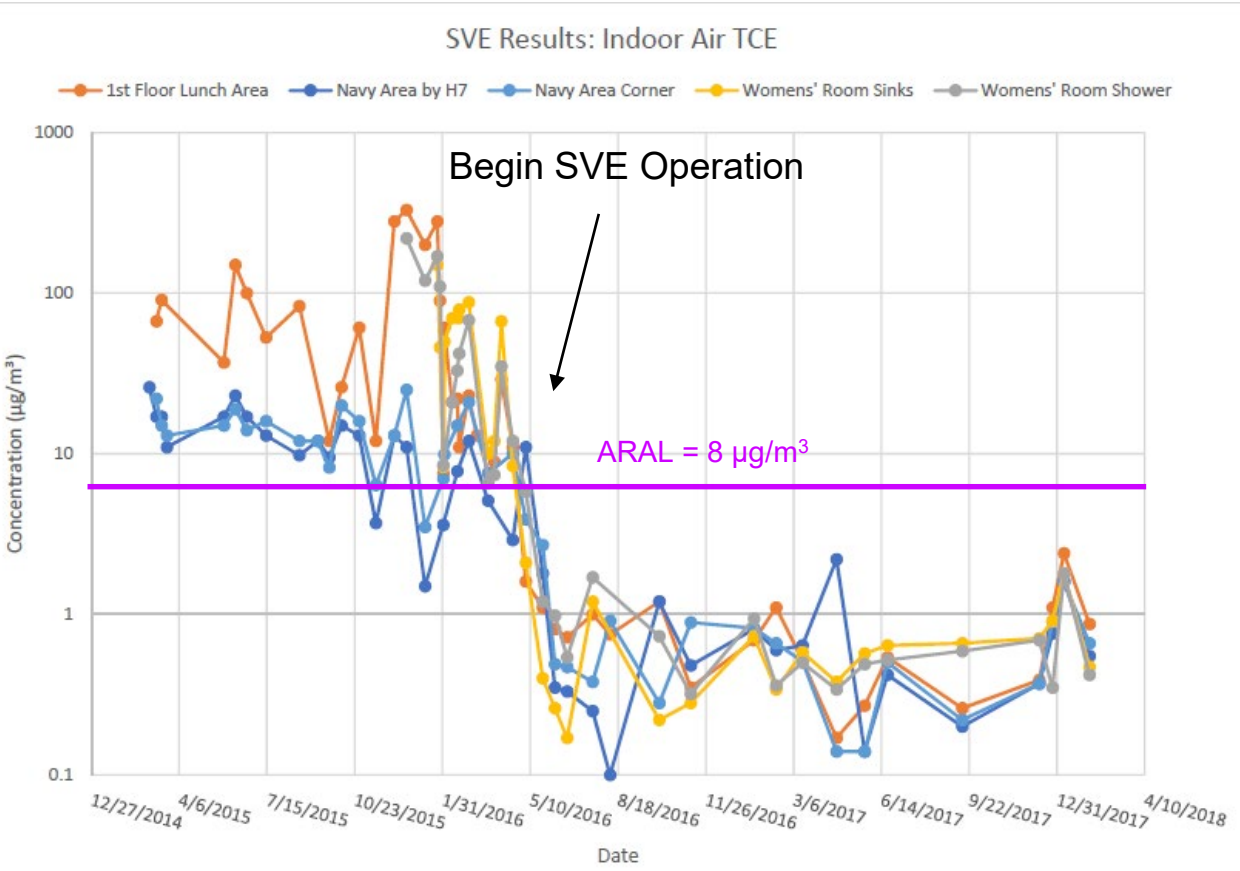
Case Study 1: NAS North Island, OU20 Building 379

- **Mitigation Steps**
  - Initial Response
    - Offered relocation to sensitive receptors, modified HVAC operation
  - Time critical removal action
    - Sealed 15,000 linear feet of cracks and joints
    - Sealed pathways identified in restroom, floor of lunch room
    - Deployed air purification units in selected rooms
    - Two horizontal soil vapor extraction (SVE) wells installed below Building 379 slab



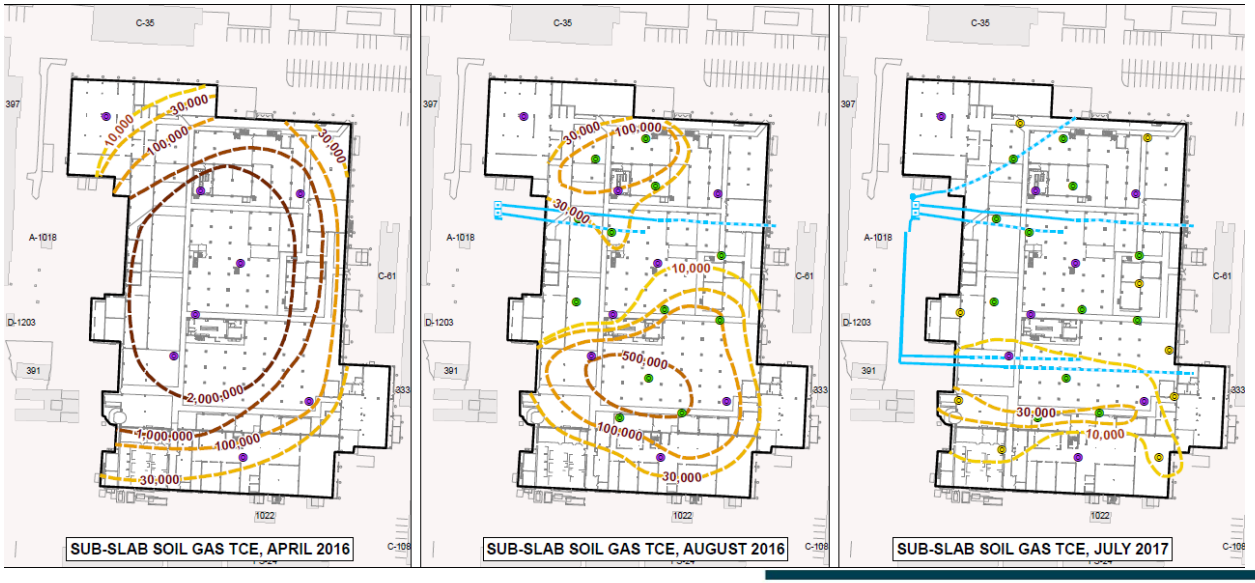
Case Study 1: NAS North Island, OU20 Building 379

- **Measurements/Results – Indoor Air Concentrations**



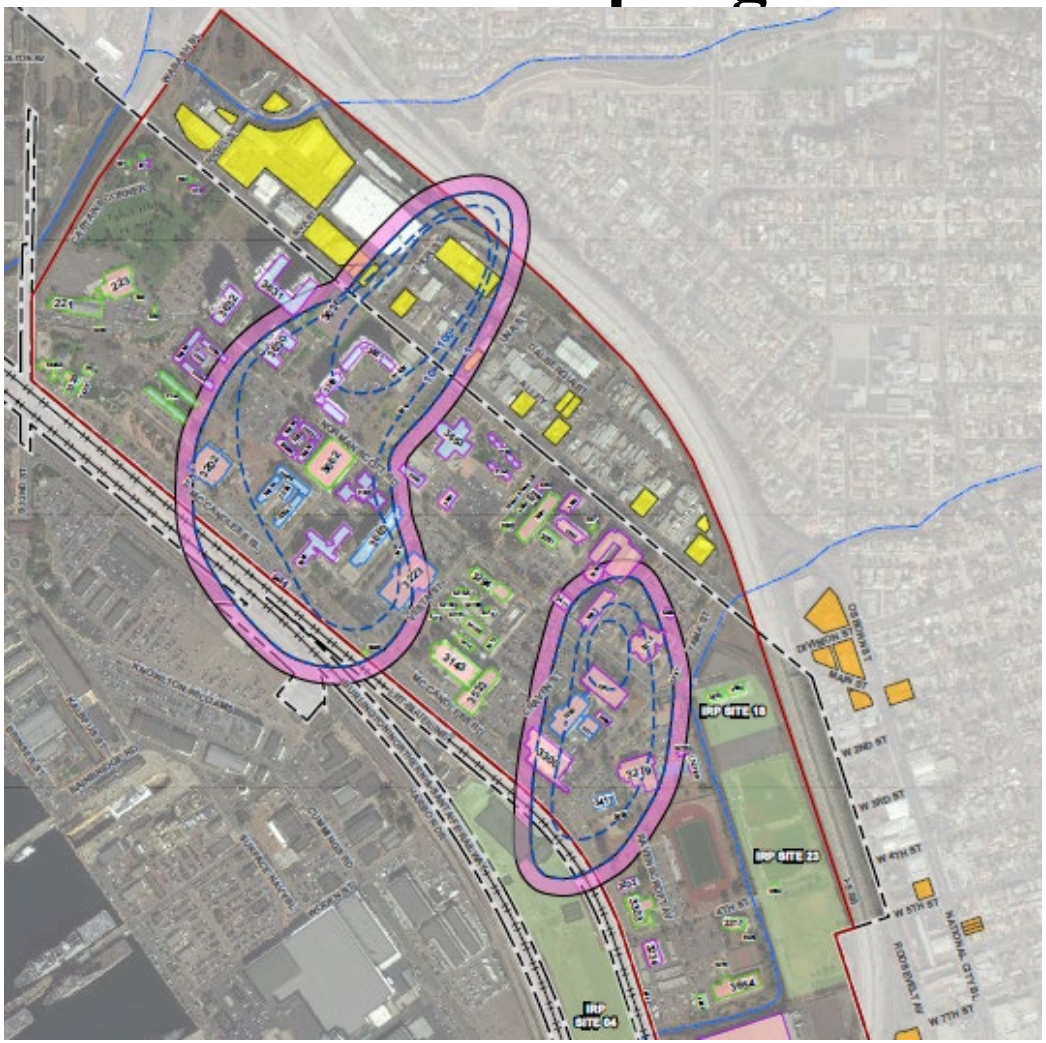
Case Study 1: NAS North Island, OU20 Building 379

- **Mitigation Steps**
  - Enhancements – take advantage of installation steam piping
  - Three additional SVE wells, enhanced removal of NAPL with steam injection
  - TCE footprint decreased after 15 months of initial operation
  - Significant TPH/cVOC recovery (>6,300 gallons recovered)



Case Study 2: Naval Base San Diego, Installation Restoration Site 22

- **Site Conditions/Situation – Pre VI Sampling**
  - Two groundwater VOC Plumes
    - Offsite sources
    - cVOCs, BTEX
  - 99 buildings overlaying plume outline
    - Child Development Center
    - Residence Halls
    - Commercial/ Industrial/ Recreational



BTEX = benznene, toluene, ethylbenzene, xylenes

Case Study 2: Naval Base San Diego, Installation Restoration Site 22

- **Planning & Investigative Approach Taken**
  - Initial Planning
    - Communications Plan
      - Initial stakeholder meeting; Fact Sheets pre and post phases; Open house meetings; Rapid Response Plan
    - Building Prioritization
      - Existing data and Johnson and Ettinger Modeling; Quantitative Decision Framework; 100-foot boundary
  - Measurements - Phased Building Surveys
    - Phase 1 (99 buildings) – Gather existing data, evaluate building systems, walk through
    - Phase 2 – (44 buildings) Initial indoor air screening – HAPSITE; fixed SUMMA canister samples; pressure cycle sampling
    - Phase 3 - Concurrent indoor, outdoor air, sub-slab soil vapor, 8 to 24-hour SUMMA canister sampling – confirmation and data gap evaluation

Case Study 2: Naval Base San Diego, Installation Restoration Site 22

- **Survey Results**
  - In many buildings intermittent low concentrations of 1,2-DCA, chloroform steady during pressure cycling; suggests small inside sources
  - TCE concentrations below USEPA Region 9 accelerated response action level and DTSC response level
  - PCE concentrations slightly above screening thresholds in initial HAPSITE testing at two resident halls
    - Pressure cycling confirms vapor intrusion
    - Entry points: sewer cleanouts and ventilation hatches – washers/dryers
    - Phase 3: 8/24-hour SUMMA sampling and pressure monitoring implemented
- **Mitigation to Date**
  - Negative pressure observed with normal operating HVAC; adjustments made to positive pressure
  - Evaluation of sampling results after adjustments ongoing

Summary and Lessons Learned

- **Upfront planning for communication/mitigation alternatives is essential**
  - All installation stakeholders need to be briefed and understand possible implications and potential courses of action
- **Evaluate building ventilation systems & possible entry points before taking first sample**
  - Easily implemented options are fastest responses
- **Sampling approach/philosophy revised with time**
  - Have switched sequence of sub-slab and indoor air sampling
- **Program and negotiate mitigation options in advance**
  - If initial options do not work, nimble reaction is needed