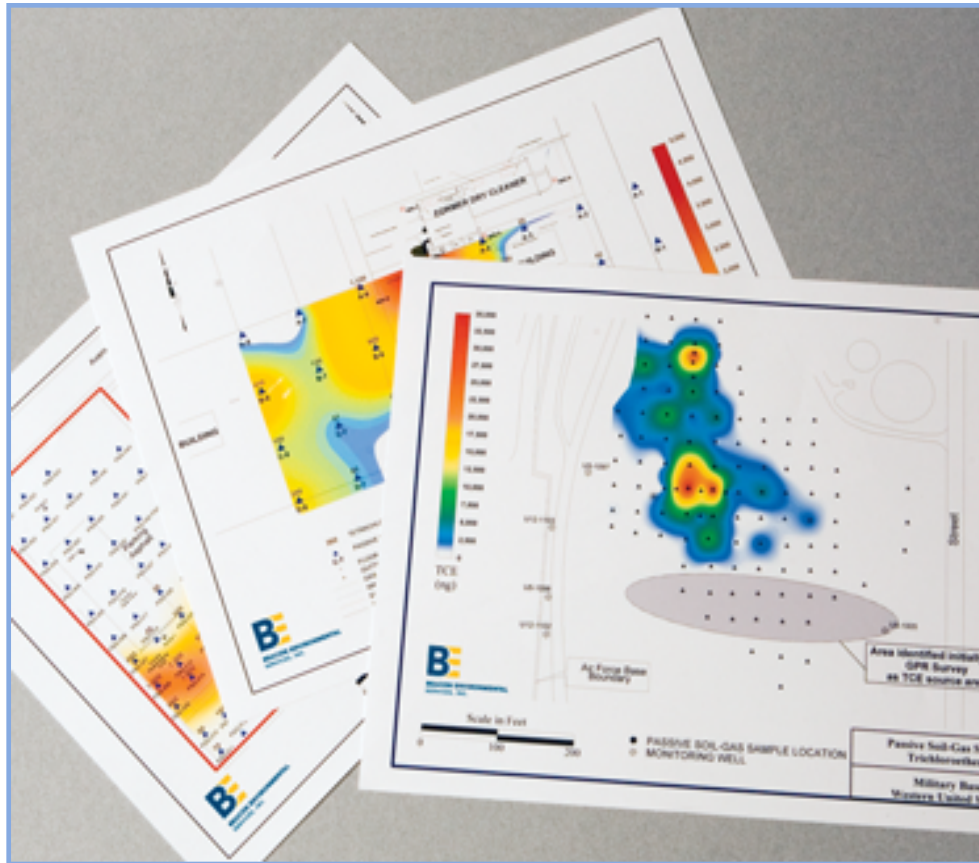


# Advanced Site Characterization Design & Technology Review



The short course will be presented in three components: Review and introduction of state-of-the-art site characterization approaches and technologies commercially available; a review of the objectives for data collection including indoor vapor intrusion, impact to soil and groundwater assessment, natural resources protection, and remediation data collection; and most importantly “Site Conceptual Model Development” which is critical for remediation pilot testing design, full scale design considerations and life cycle costing.

## Part I: Review and Introduction of Advanced Site Characterization Approaches and Technologies

Common approaches to Site Characterization Include:

### Vapor Testing

- Passive Soil Gas (sources and spatial variability)
- Active Soil Gas (Temporary and permanent probes)
- Indoor air (Passive and active sampling)

### Soil Testing

- Surface soil testing
- Subsurface soil testing (hand auger, soil boring, geoprobe)
  - Discrete sampling
  - Continuous Core
  - Membrane Interface Probe (MIP)

### Groundwater Testing

- Temporary or discrete wells
- Permanent monitoring wells
  - Multi-nested wells
  - Single well multi port wells
- Sampling Approaches and Technologies
  - Three or more volume purge sampling
  - Low flow sampling
  - Passive (no flow) sampling
  - Vertical delineation sampling (within single screened wells)
    - Passive diffusion bags
    - Snap samplers
    - Point Collection bags

### Subsurface Characterization

- Electrical resistance geophysics
- Down hole instrumentation geophysics
- Groundwater penetrating radar (GPR)

## Part II: Objectives for Data Collection (Indoor air vapor intrusion, Risk Assessment, Remediation Feasibility Analysis, Site Conceptual Model Development)

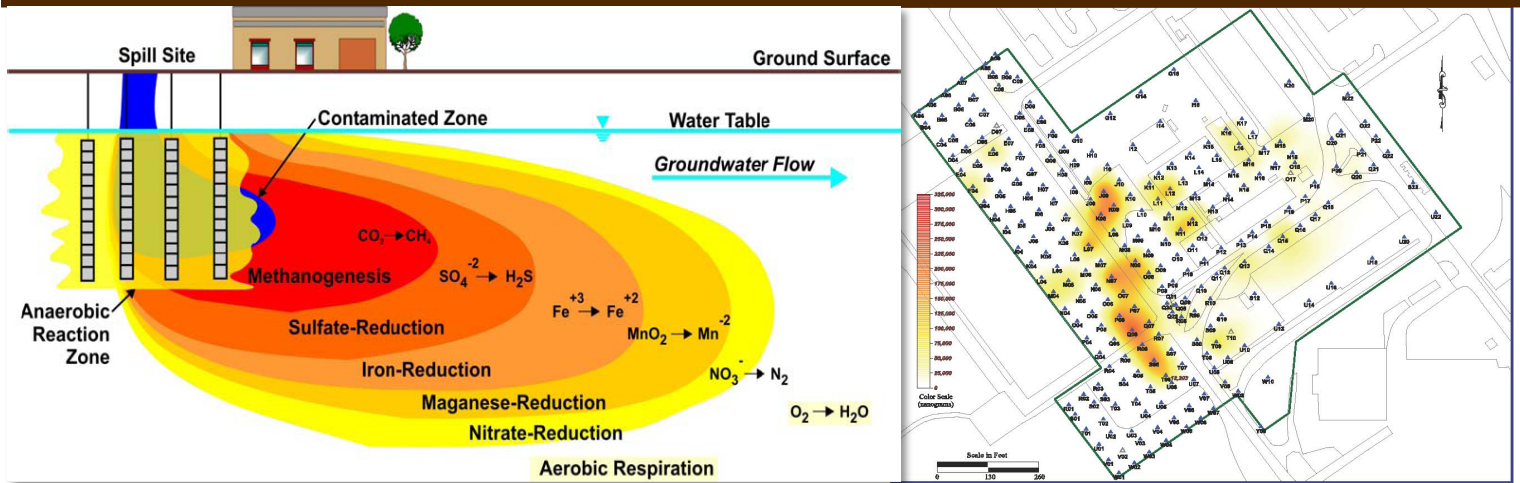
The objectives for characterizing an impacted site are many but almost all are important at different stages of a particular site. Part II of the short course will review the various criteria and objectives property owners and consultants have for initiating or continuing site characterization activities in order to understand and appreciate the key elements of each. This is critically important when determining the most appropriate site testing and characterization approach that can be leveraged across goals and applications. This is where the value of strategy comes in.

Most sites start with assessing a potential leak or activity by previous owner / operator of the property / plant, respectively, while other sites begin by assessing a potential impact to groundwater or an impact to neighboring properties' soil and/or groundwater, which may also result in vapor intrusion concerns.

The following site investigation and contaminant characterization goals and criteria will be reviewed:

- Liability Assessment for property transfer – Phase I and II assessments
- Vapor Intrusion risk assessment (preliminary or complete)
- Leaking equipment (above or below ground)
- Airborne or ingestion risk of surface impacts
- Risk assessment for real-estate development or other projects
- Remediation design and optimization





Ultimately site assessment investigations may lead to remediation but most of the above goals and criteria for initial or continued site characterization activities require the assessment of the following site-specific conditions and information and rely on multiple lines of evidence to identify the appropriate strategy.

- Site specific information
  - Soil type and air permeability
  - Depth to groundwater
  - Local applicable regulations, such as VOC emissions limits
  - Cleanup criteria (if established or known)
  - Extent of contamination
  - Presence of dense or light NAPL
- Physical limitations of remediation technology
- Contaminant characteristics (individually, as well as combined)
- Availability of utilities (i.e., water, gas, electrical, storm/sewer discharge)
- Estimated time to achieve cleanup goals
- Cost to manage with and without remedy
- Environmental sustainability of both characterization and remediation options

### Part III: Site Conceptual Model Development

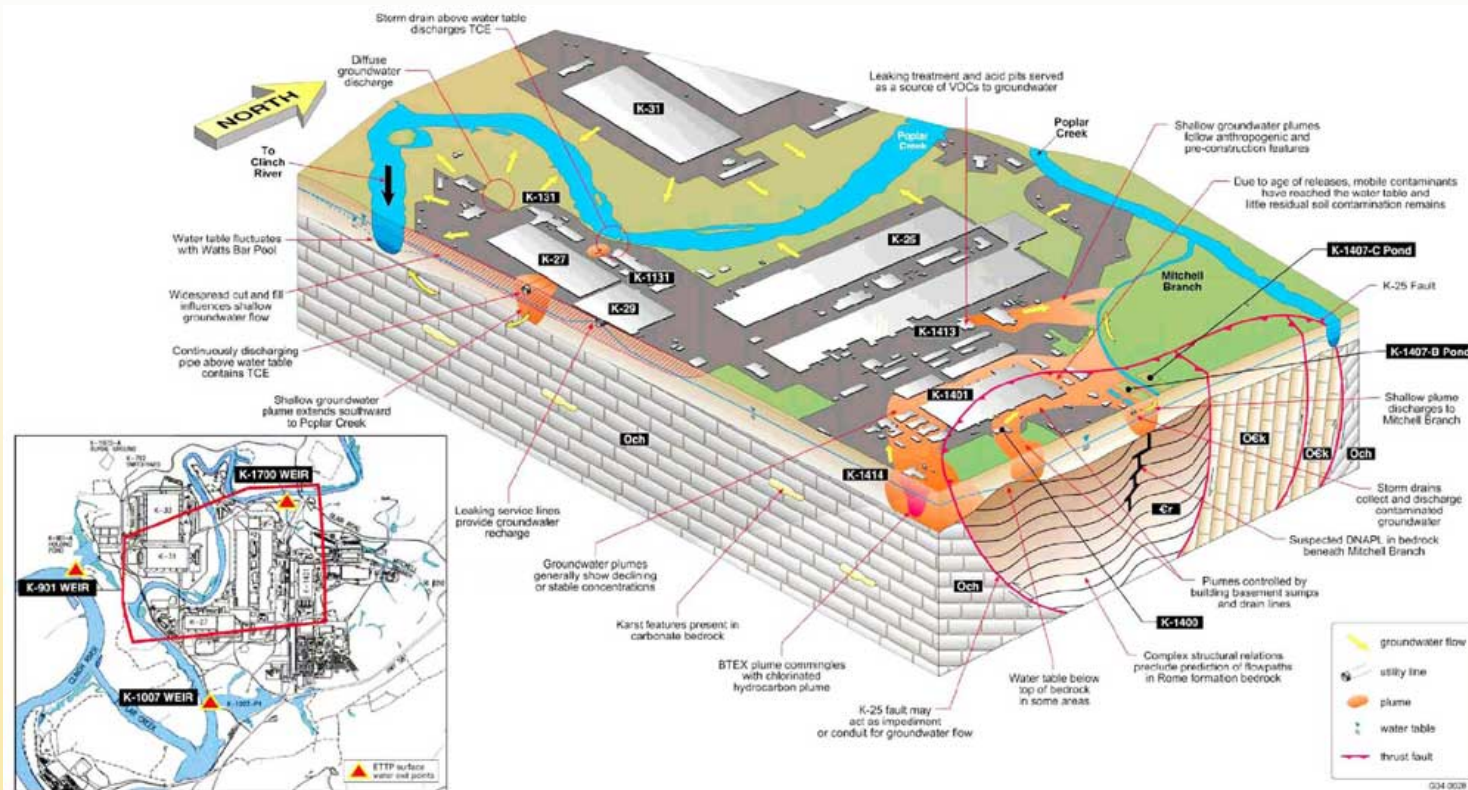
The importance and process for developing a site conceptual model is presented. Site conceptual models are required for understanding the life cycle management aspects for a contaminated property from a risk to human and environment aspect as well as a remedial design perspective. The components of site conceptual model development will include the following:

- Vapor migration (subsurface)
- Soil Impact (vertical and lateral extent)
- Impact to groundwater
- Presence of Dense and Light Non-Aqueous Phase Liquids (DNAPL & LNAPL)
- Fate and transport of contaminants

A review of site characterization screening tools and technologies along with case studies will be presented that illustrate cost effective and timely approaches for meeting most or all of the goals and criteria for site characterization while also providing the following additional benefits:

- Assessment of contaminant vapors and potential risk for migration
- Assessment of source of contamination and fate and transport fingerprint
- Assessment of potential impacts and migration in groundwater
- Increasing the number of data points and reducing data gaps
- Value of doing less with more! Using screening techniques to reduce the total cost of site investigation activities and need for repeat and redundant tests and investigations by the same or other consultants on the same site.

The above information will be used to quickly summarize the potential life cycle cost savings in site characterization technologies and approaches, with the added benefit of time savings.



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Mr. Kessel is the Principal at EnviroLogek, specializing in marketing and business strategy for emerging technology and engineering companies and operating in North and South America and Australia. He has over 10 years practice experience in the environmental engineering and remediation, petroleum, and real estate development industries, having worked with companies including Benton Oil and Gas Co., IT/Shaw Group, Haley & Aldrich, ARCO/BP, and G.E.O. Inc. He is a registered professional geologist (PG), registered environmental assessor (REA) in the U.S. and has managed projects on five continents.

Mr. Kessel holds an MBA in Finance and Strategy from University of California and a BS and MS in Geological Sciences from University of California with research experience in hydrogeochemistry and geophysics. He is an active member of the sustainable remediation forum (SURF), a non-profit organization dedicated to helping the environmental industry prepare and apply sustainable practices to environmental engineering and remediation which are founded on benefits to the Environment, Society and Local Economy.