GeoDayz - 2018

Management of Environmental Projects, Procedures, and Case Histories

by

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Management of Environmental Projects

❖ Projects Driven by Federal and State Laws and Regulations Leading to the Creation of the U.S. Environmental Protection Agency (U.S. EPA), followed by counterpart State agencies since 1970s.

Deep History:

- 1965 – U.S. Congress passed the Solid Waste Disposal Act.
- 1970 –U.S. Congress amended the SWDA the Resource Recovery Act, and leading to creation of EPA (with **10 Regional EPA Offices**)
- 1976 – U.S. Congress amended the SWDA with the Resource Conservation and Recovery Act (known as RCRA).
- 1984 – U.S. Congress amended RCRA with the Hazardous and Solid Waste Amendments (HSWA).

Environmental Projects

- **Are not only driven by Federal and State laws and regulations, They are also driven by litigation, or the threat of litigation (more):**
  - ✓ Alleged exposure of contaminants of humans living around industrial facilities,
  - ✓ Alleged exposure of employees of industry against company,
  - ✓ Dominant alleged exposure from groundwater (via water wells), but also exposure by air, surface water, food, and other exposures.
  - ✓ The principal media of concern for exposure is via groundwater, beginning with the creation of EPA in the 1970s to the present, although in the 1990s, air exposures also became important to EPA which stimulated air quality monitoring and associated regulations, and
  - ✓ The role of Professional Hydrogeologists and Geologists was and remains the key professional involved in environmental projects, although surface concerns (for wetlands, GIS, etc.,) have emerged for Geoscientists (with a broad range of training), along with Regulatory Specialists.

Project Management

Stated Goals of RCRA

- To protect human health and the environment from the potential hazards of waste management,
- To conserve energy and natural resources,
- To reduce the amount of waste generated, including hazardous waste, and
- To ensure that wastes are managed in an environmentally sound manner.

Stated Action Items

- After 1984 (HSWA): Operating Industry Permitted Treatment, Storage, Disposal (TSD) Facilities seeking a permit are required to institute corrective action as necessary to protect HH&E from releases from SWMUs, regardless of when the waste was placed in the unit. Hence a series regulations regarding investigations and associated Health & Safety still matters today.

Project Management

Stated Goals of CERCLA (Superfund Projects)

- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) defines the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants in the United States.
- The NCP was developed by the EPA in response to the congressional enactment of The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of December 11, 1980,
- As amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and by section 311(d) of the Clean Water Act (CWA) (more).
- Today, "most" sites have been identified, but clean-up (remediation) continues:
  - Federal Superfund Sites in Texas (more)
  - State Superfund Site in Texas (more)
  - State-Driven Clean-up Projects in Texas (more), including:
    - Gasoline/Diesel Stations (more)
    - Dry Cleaners (more)
    - Texas Landfill Projects (more)
    - Others (more)

Project Management

Management Functions/Responsibilities:

- Monitoring of State & Federal Regulations …. Because changes can occur rapidly that have an impact on activities, and on project protocols (e.g., sampling of volatile organic compounds (VOCs).

- Monitoring of company personnel by professionals with specialized training (CIHs) either in-house or by contract for regular inspections.

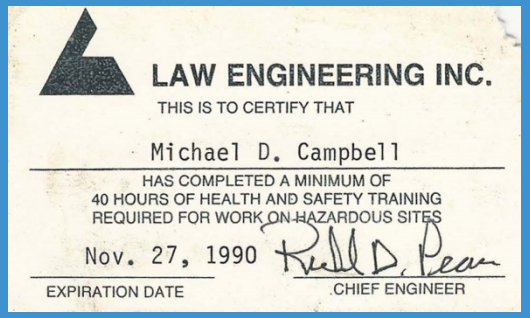
- Monitoring and adaptation of new technology (GIS, drones, etc.)

- Charged with responsibility for protecting company liability:
    1. Technical protocol training & implementation, e.g. **IET** & **Activities**
    2. Health & Safety, including possible drug testing, and
    3. Management expectations (behaviors in meetings and in public).
    4. Comparison of Business & Environmental Project Management (**more**)

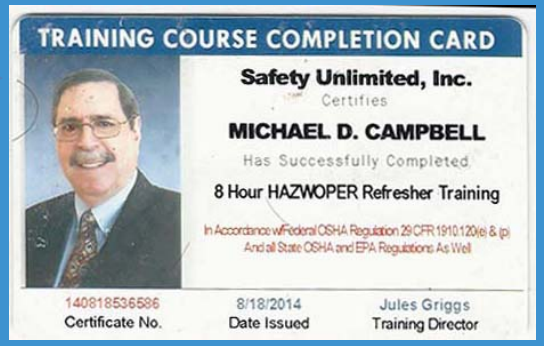
Health & Safety

(from FR 1910.120)

- 40-hour OSHA training
- 8-hour annual OSHA refresher
- Additional training:



➢ Industry/Society Training:



First Aid (CPR, etc.)

Confined Space

TCEQ CAPM –See **Application**)

➢ In-House Client-Required H&S Training

➢ Awareness of Field Health & Safety Issues (**more**)

Health & Safety

- Call 811 for subsurface “line locates” (gas, electrical, etc.). 48 hours to 2 weeks notice, good for 2 weeks.
- Call city for establishing locations of city sewers and water lines.
- Determine if any city, county, or state permits or notifications are required.

Health & Safety

- Each site must have its own H&S plan.
  - Scope of work
  - Responsible persons
  - Potential hazards
  - Location of nearest hospital
  - Personal Protection Equipment
  - Evacuation routes and meeting locations
- Daily tailgate safety meetings

Laboratory Selection

- For investigations involving permitting and remediation, use National Environmental Laboratory Accreditation Program (NELAP) approved labs only

- For RCRA or CERLA investigations, must use labs approved by state or federal agencies, so-called EPA-approved labs.

Accuracy vs. Precision

- "Accuracy" - how close a measured value is to the actual (true) value.
  - Measured as %R (% Recovery of a known concentration added to the sample)

- "Precision" - how close the measured values are to each other.
  - Measured as % RPD (Relative Percent Difference between two analyses of the same sample).

Accuracy vs. Precision
Laboratory Data

High Accuracy
Low Precision

Low Accuracy
High Precision

High Accuracy
High Precision

BS / BSD Recoveries

Project Name: [redacted]

Work Order #: [redacted]

Project ID: [redacted]

Analyst: JTR

Date Prepared: 01/16/2018

Date Analyzed: 01/16/2018

Lab Batch ID: [redacted]

Sample: [redacted]

Batch #: 1

Matrix: Solid

Units: mg/kg

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

BTEX-MTBE by SW 8260B Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
MTBE	<0.00250	0.500	0.520	104	0.500	0.553	111	6	68-138	25	
Benzene	<0.000500	0.100	0.108	108	0.100	0.115	115	6	62-132	25	
Toluene	<0.000500	0.100	0.100	100	0.100	0.108	108	8	66-124	25	
Ethylbenzene	<0.000500	0.100	0.103	103	0.100	0.110	110	7	71-134	25	
m,p-Xylenes	<0.00100	0.200	0.205	103	0.200	0.216	108	5	69-128	25	
o-Xylene	<0.000500	0.100	0.106	106	0.100	0.114	114	7	72-131	25	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Detection Limits

- Method Quantitation Limit (MQL)
  - 99% confidence
- Sample Detection Limit (SDL)
  - MQL adjusted to reflect sample (dilution, sample size, etc.)

XENCO LABORATORIES

Certificate of Analytical Results

[redacted]

Sample Id: [redacted] Matrix: Soil Sample Depth:

Lab Sample Id: [redacted] Date Collected: 01.08.18 14.45 Date Received: 01.09.18 15.20

Analytical Method: TPH by Texas1005 Prep Method: 1005

Analyst: ISU % Moist: 23.12 Tech: ISU

Seq Number: [redacted] Date Prep: 01.11.18 17.38

Prep seq: 7637353

Parameter	CAS Number	Result	MQL	SDL	Units	Analysis Date	Flag	Dil Factor
C6-C12 Range Hydrocarbons	PHC612	**37.4**	56.0	2.65	mg/kg	01.14.18 23:26	J	1
C12-C28 Range Hydrocarbons	PHCG1228	**10.7**	56.0	1.81	mg/kg	01.14.18 23:26	J	1
C28-C35 Range Hydrocarbons	PHCG2835	<0.759	56.0	0.759	mg/kg	01.14.18 23:26	U	1
Total TPH	PHC635	**48.1**		0.759	mg/kg	01.14.18 23:26	J	

Surrogate	% Recovery	Limits	Units	Analysis Date	Flag
o-Terphenyl	85	70 - 130	%		
1-Chlorooctane	80	70 - 130	%		

Analytical Method: BTEX-MTBE by SW 8260B Prep Method: 5035

Analyst: JTR % Moist: 23.12 Tech: JTR

Seq Number: [redacted] Date Prep: 01.16.18 12.40

Prep seq: 7637586

Parameter	CAS Number	Result	MQL	SDL	Units	Analysis Date	Flag	Dil Factor
MTBE	1634-04-4	<0.0791	0.158	0.0791	mg/kg	01.16.18 15:35	U	24
Benzene	71-43-2	**0.0193**	0.0316	0.0158	mg/kg	01.16.18 15:35	J	24
Toluene	108-88-3	**0.135**	0.0316	0.0158	mg/kg	01.16.18 15:35		24
Ethylbenzene	100-41-4	**0.0699**	0.0316	0.0158	mg/kg	01.16.18 15:35		24
m,p-Xylenes	179601-23-1	**0.262**	0.0633	0.0316	mg/kg	01.16.18 15:35		24
o-Xylene	95-47-6	**0.110**	0.0316	0.0158	mg/kg	01.16.18 15:35		24
Total Xylenes	1330-20-7	**0.372**		0.0158	mg/kg	01.16.18 15:35		
Total BTEX		**0.596**		0.0158	mg/kg	01.16.18 15:35		

Surrogate	% Recovery	Limits	Units	Analysis Date	Flag
Dibromofluoromethane	88	74 - 126	%		
1,2-Dichloroethane-D4	92	80 - 120	%		
Toluene-D8	106	73 - 132	%		

Quality Assurance

- Trip Blank
  - 1 per cooler
- Temperature Blank
  - 1 per cooler
- Field Blank
  - 1 per 10 samples
- Equipment Blank
  - 1 per day per equipment type

Quality Assurance

- **Field Duplicates**
  - 1 per 10 samples
  - Soil samples RPD <50%, unless other DL stipulated.
  - Water samples RPD <30%, unless other DL stipulated.

- **Assessment of Data Quality**

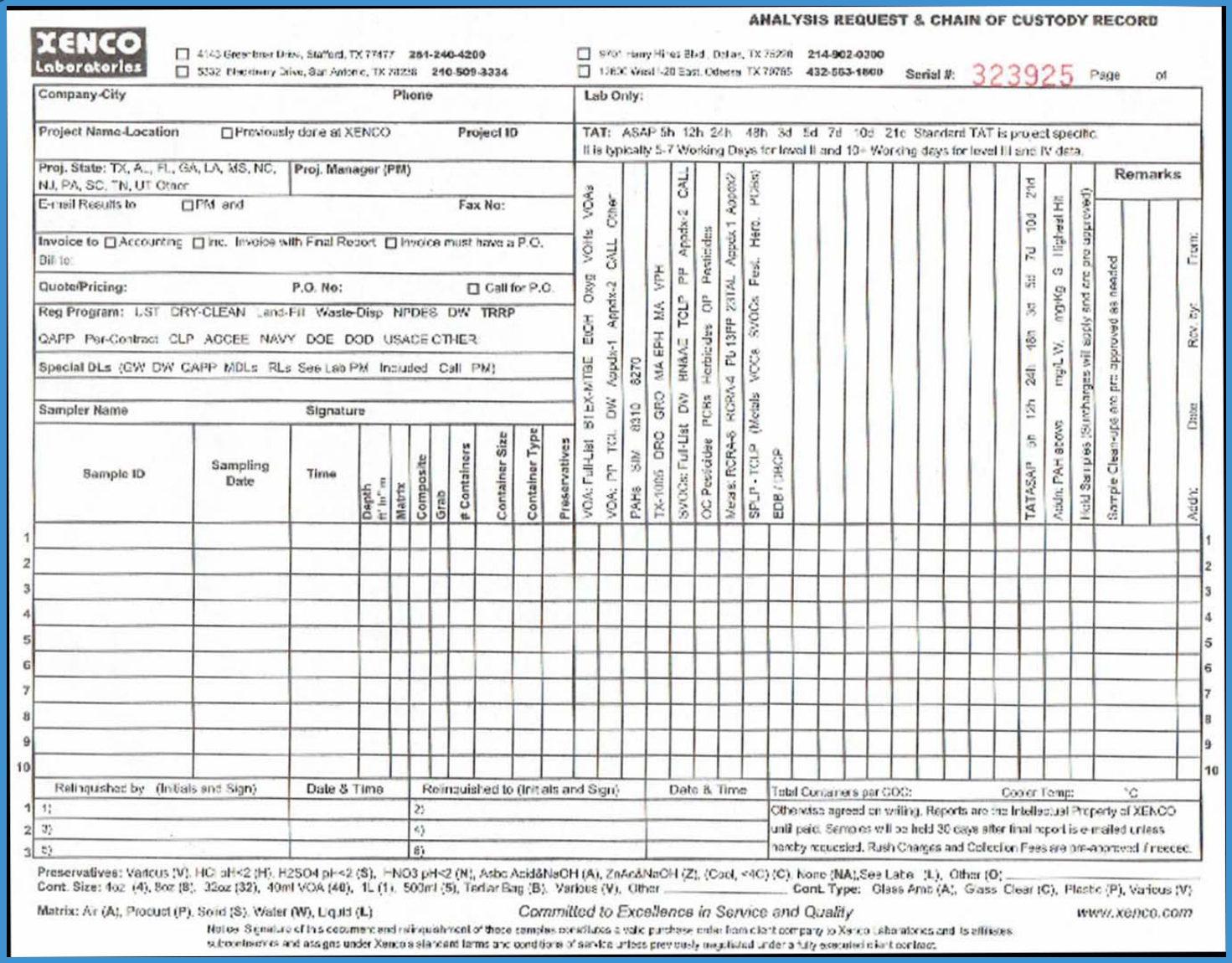
❑ Often conducted by geochemist in-house or independent consulting chemist.

❑ Data must be Defensible!

Sample Holding Times

- 48 hours to get samples to lab.
- Different analyses have different holding times.
  Some:
  - 24 hours to 6 months
  - VOCs
    - Water – 14 days
    - Soil – 48 hours (method 5035)

Chain of Custody of Sample Transport to Labs



XENCO Laboratories

☐ 4143 Greenbriar Drive, Stafford, TX 77477 281-240-4200
☐ 5332 Blackberry Drive, San Antonio, TX 78238 210-509-3334
☐ 9701 Harry Hines Blvd., Dallas, TX 75220 214-902-0300
☐ 12600 West I-20 East, Odessa TX 79765 432-563-1800

ANALYSIS REQUEST & CHAIN OF CUSTODY RECORD

Serial #: 323925 Page of

Company-City | Phone | Lab Only:

Project Name-Location ☐ Previously done at XENCO | Project ID

TAT: ASAP 5h 12h 24h 48h 3d 5d 7d 10d 21d Standard TAT is project specific.
It is typically 5-7 Working Days for level II and 10+ Working days for level III and IV data.

Proj. State: TX, AL, FL, GA, LA, MS, NC, NJ, PA, SC, TN, UT Other | Proj. Manager (PM)

E-mail Results to ☐ PM and | Fax No:

Invoice to ☐ Accounting ☐ Inc. Invoice with Final Report ☐ Invoice must have a P.O.
Bill to:

Quote/Pricing: | P.O. No: | ☐ Call for P.O.

Reg Program: LST CRY-CLEAN Land-Fill Waste-Disp NPDES DW TRRP
QAPP Per-Contract CLP ACCEE NAVY DOE DOD USACE OTHER

Special DLs (CW DW QAPP MDLs RLs See Lab PM Included Call PM)

Sampler Name | Signature

	Sample ID	Sampling Date	Time	Depth (ft in m)	Matrix	Composite	Grab	# Containers	Container Size	Container Type	Preservatives	VOAs	VOAs: Full-List 8260	VOAs: PP TCL DW Appdix-1	PAHs SIM 8310	TX-1005 DRO GRO MA EPH MA VPH	SVOCs: Full-List DW RNAs TCLP PP Appdix-2 CALL	OC Pesticides PCBs Herbicides OP Pesticides	Metals: RCRA-8 RCRA-4 Fe 13PP 2xTAL Appdix 1 Appdix2	SPLP - TCLP (Metals VOCs SVOCs Pest. Herb. PCBs)	EDB / DBCP	TAT ASAP 3h 12h 24h 48h 3d 5d 7d 10d 21d	Addn. PAH above mg/L Wt. mg/Kg G Higher Hit	Hold Samples (Surcharges will apply and are pre approved)	Sample Clean-ups are pre approved as needed	Remarks
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										

	Relinquished by (Initials and Sign)	Date & Time	Relinquished to (Initials and Sign)	Date & Time
1	1)		2)	
2	3)		4)	
3	5)		6)	

Total Containers per COC: Cooler Temp: °C

Otherwise agreed on writing, Reports are the Intellectual Property of XENCO until paid. Samples will be held 30 days after final report is e-mailed unless hereby requested. Rush Charges and Collection Fees are pre-approved if needed.

Preservatives: Various (V), HCl pH<2 (H), H2SO4 pH<2 (S), HNO3 pH<2 (N), Asbc Acid&NaOH (A), ZnAc&NaOH (Z), (Cool, <4C) (C), None (NA),See Labs (L), Other (O): _____
Cont. Size: 4oz (4), 8oz (8), 32oz (32), 40ml VOA (40), 1L (1), 500ml (5), Ziploc Bag (B), Various (V), Other _____ Cont. Type: Glass Amb (A), Glass Clear (C), Plastic (P), Various (V)

Matrix: Air (A), Product (P), Solid (S), Water (W), Liquid (L)

Committed to Excellence in Service and Quality

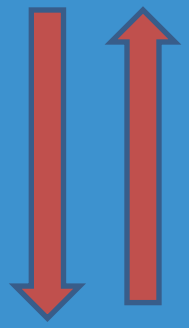
www.xenco.com

Notice: Signature of this document and relinquishment of these samples constitutes a valid purchase order from client company to Xenco Laboratories and its affiliates subcontractors and assigns under Xenco's standard terms and conditions of service unless previously negotiated under a fully executed client contract.

Project Management

- Phase I Environmental Site Assessments

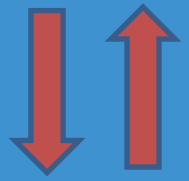
- Phase II Environmental Site Assessments



Texas Risk-Based Corrective Action (here)

Texas Risk Reduction Program (here)

- Phase III Remediation Assessments
- Phase IV Remediation Design & Implementation



Texas Closure Waste Management Units Program (here)

- Phase V Long-Term Monitoring or Site Closure

Project Management

- In the event the Phase I ESA finds evidence for possible/likely surface and/or subsurface contamination of soil, underlying sediments, and groundwater, a Phase II ESA investigation is generally undertaken, via soil sampling, drilling to obtain groundwater samples, associated well logging of core, geophysical logging (natural gamma, caliper, resistivity, etc. (to distinguish the characteristics of subsurface clay-silt-sand unit boundaries). Use of produced Phase II Data:

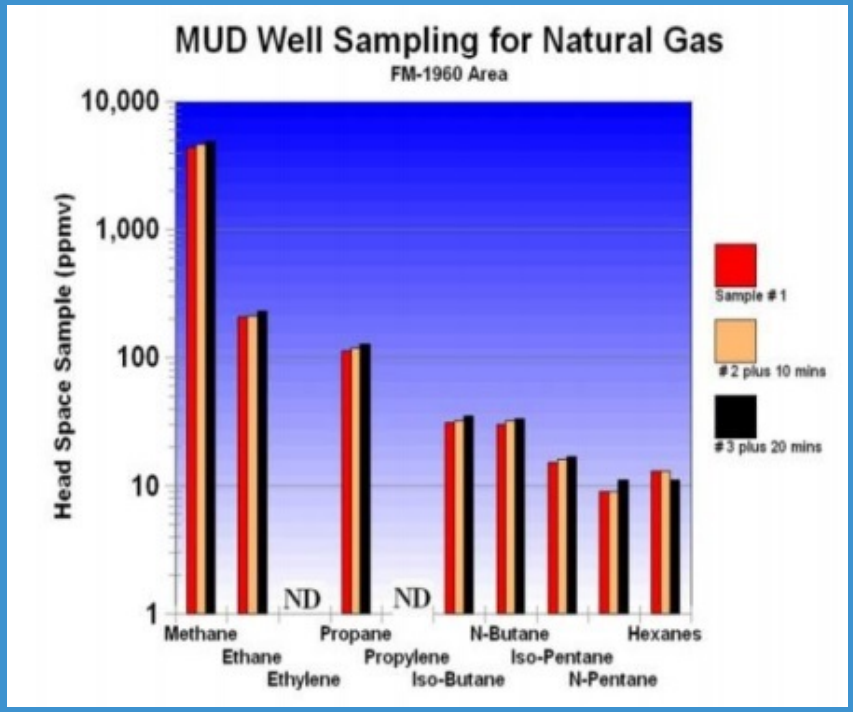
  - ✓ Determine contaminant type and horizontal and vertical extent of contaminants of concern in the subsurface,
  - ✓ Determine direction of groundwater flow,
  - ✓ Rate of groundwater flow,
  - ✓ All accomplished by groundwater modeling, modified by characteristics of contaminant flow or migration in groundwater.

Project Management

- Texas Risk-Based Corrective Action (RBCA) (here)
  - For releases from Petroleum Storage Tanks (PSTs) containing petroleum substances
  - PSTs are used for refueling vehicles and equipment
  - Typically are gasoline stations, farm and ranch PSTs used for refueling trucks, etc.
- Texas Risk Reduction Program (TRRP) (here)
  - For petroleum and hazardous material releases from RCRA, CERCLA, waste management units, landfills, etc. sites
  - For petroleum and hazardous material releases spills from vehicles and bulk facilities
- Texas Closure Waste Management Units Program (CWMP) (here)
  - Closure re categories of RCRA waste-management units subject to TRRP at time of closure,
  - Unless the RCRA unit has a PST that falls under the PST rules (RBCA).

Project Management

Data for Input to Phase I Site Assessments

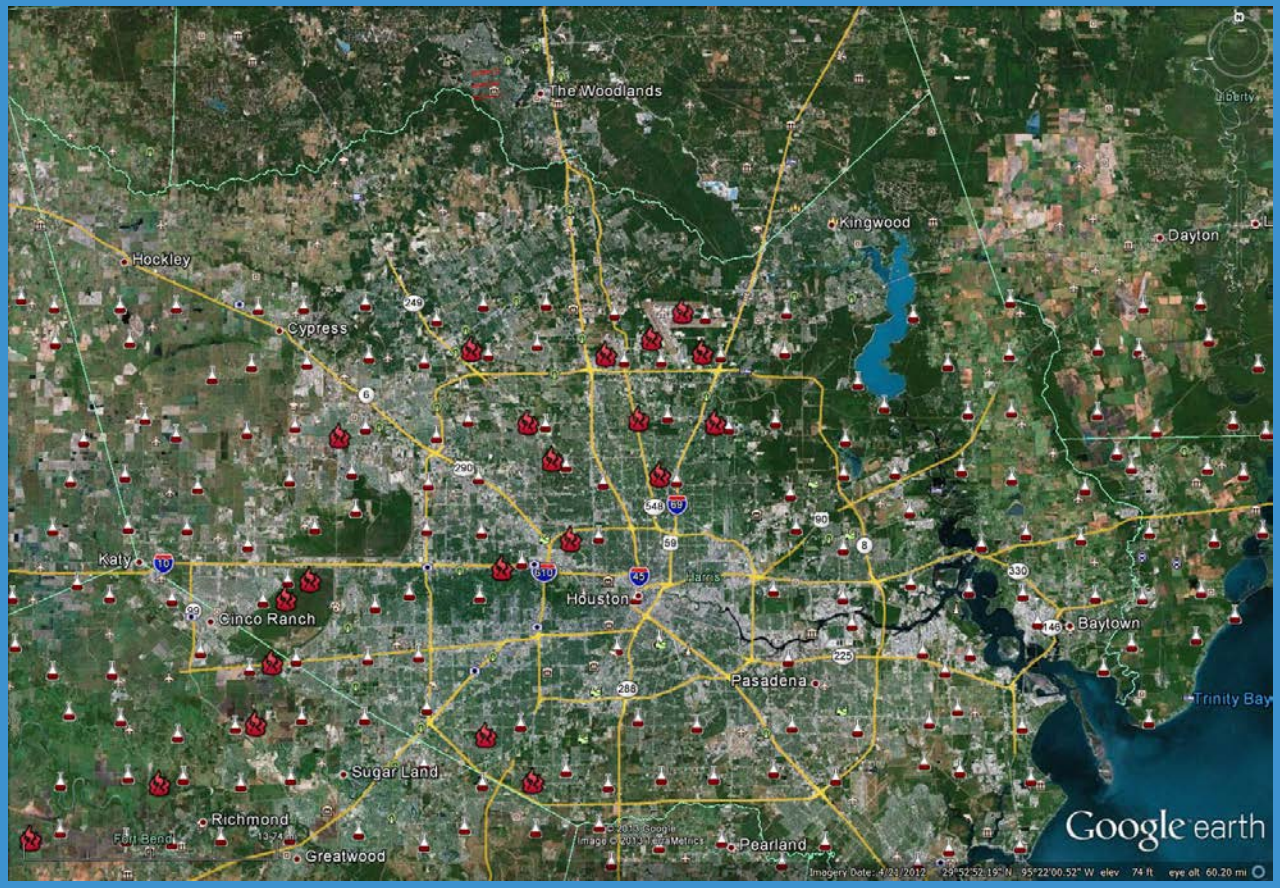


Natural Gas in Groundwater of Houston, Texas Area
MUD water wells.

Growth Fault at Surface near
San Jacinto Monument, near Houston

Project Management

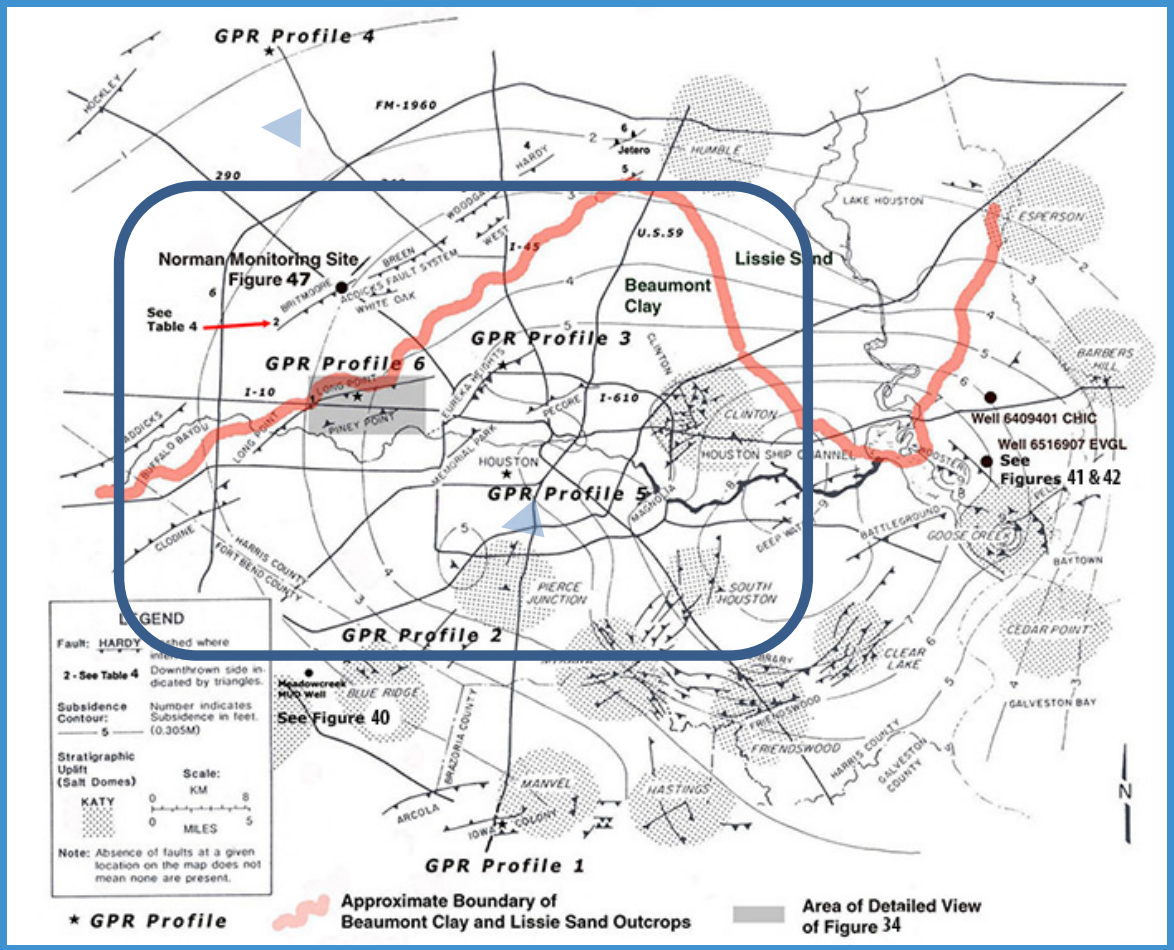
Data for Input to Phase I Site Assessments

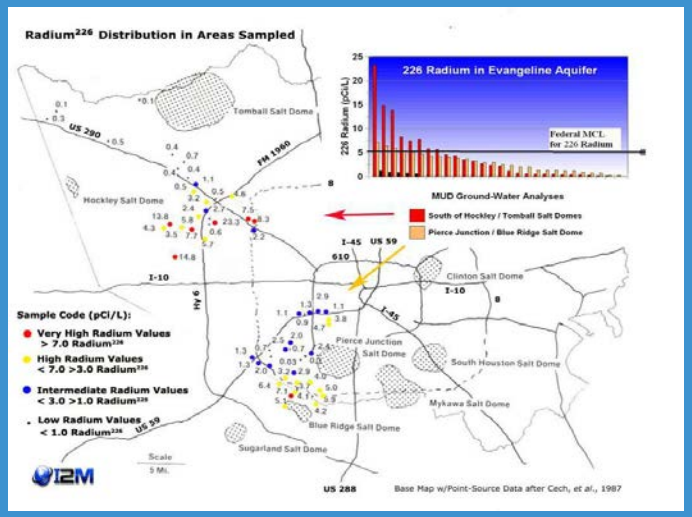


Red Flame Symbol = > 5 µg/L Uranium as Anomalous (MCL 5 ppb?) Houston Area Water Wells, MUD and Private Wells

Project Management

Data Input for Phase I Site Assessments



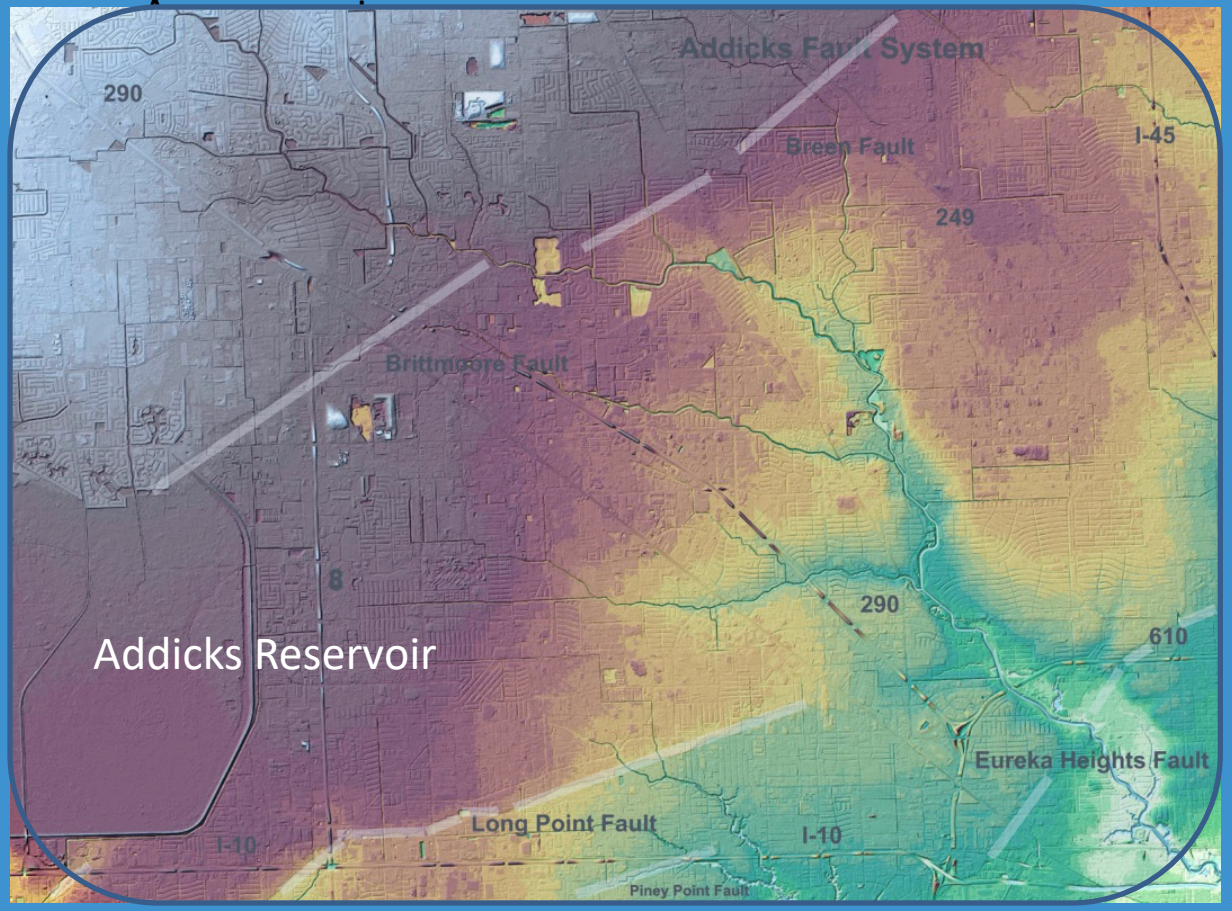


Reported Uranium, Radium, etc. in Groundwater, Houston, Texas Area (in mid-1960s).

Project Management

Data Input for Phase I Site

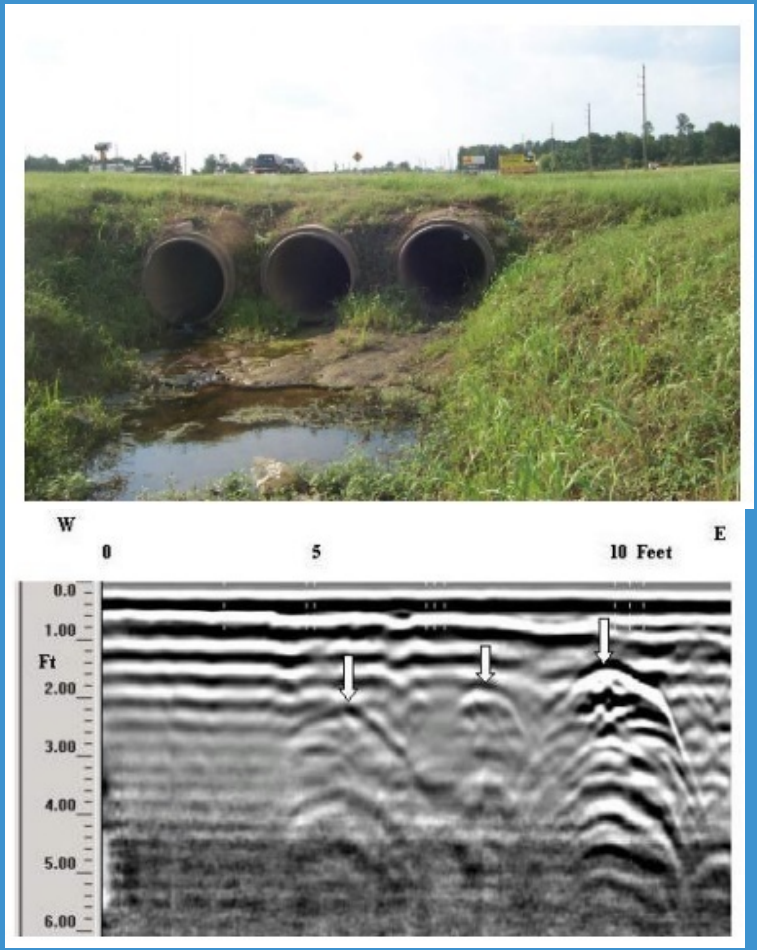
LiDAR Imaging: "Light Detection and Ranging), is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the surface of the Earth.



Vertical accuracy is increasing with time: 17 cms (over pavement, grassy areas and evergreen forests) to 26 cms (deciduous forests) (more).

Project Management

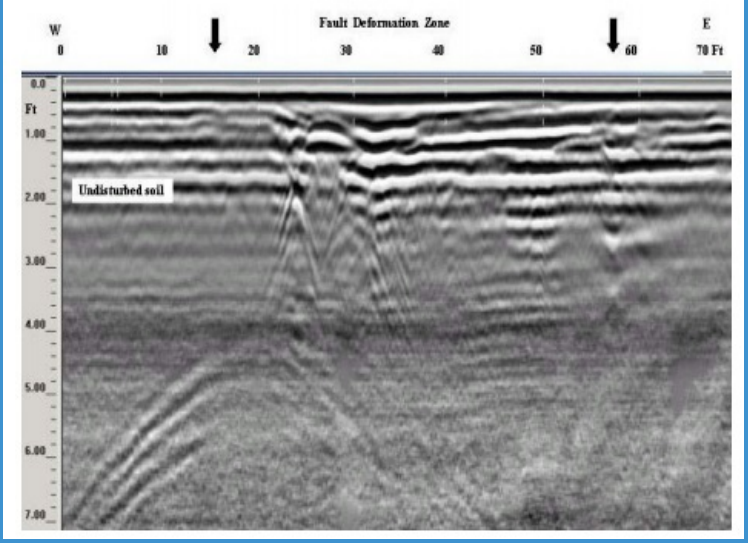
Input to Phase I Site Assessments



Ground-Penetrating Radar Testing

Project Management

Input to Phase I Site Assessments

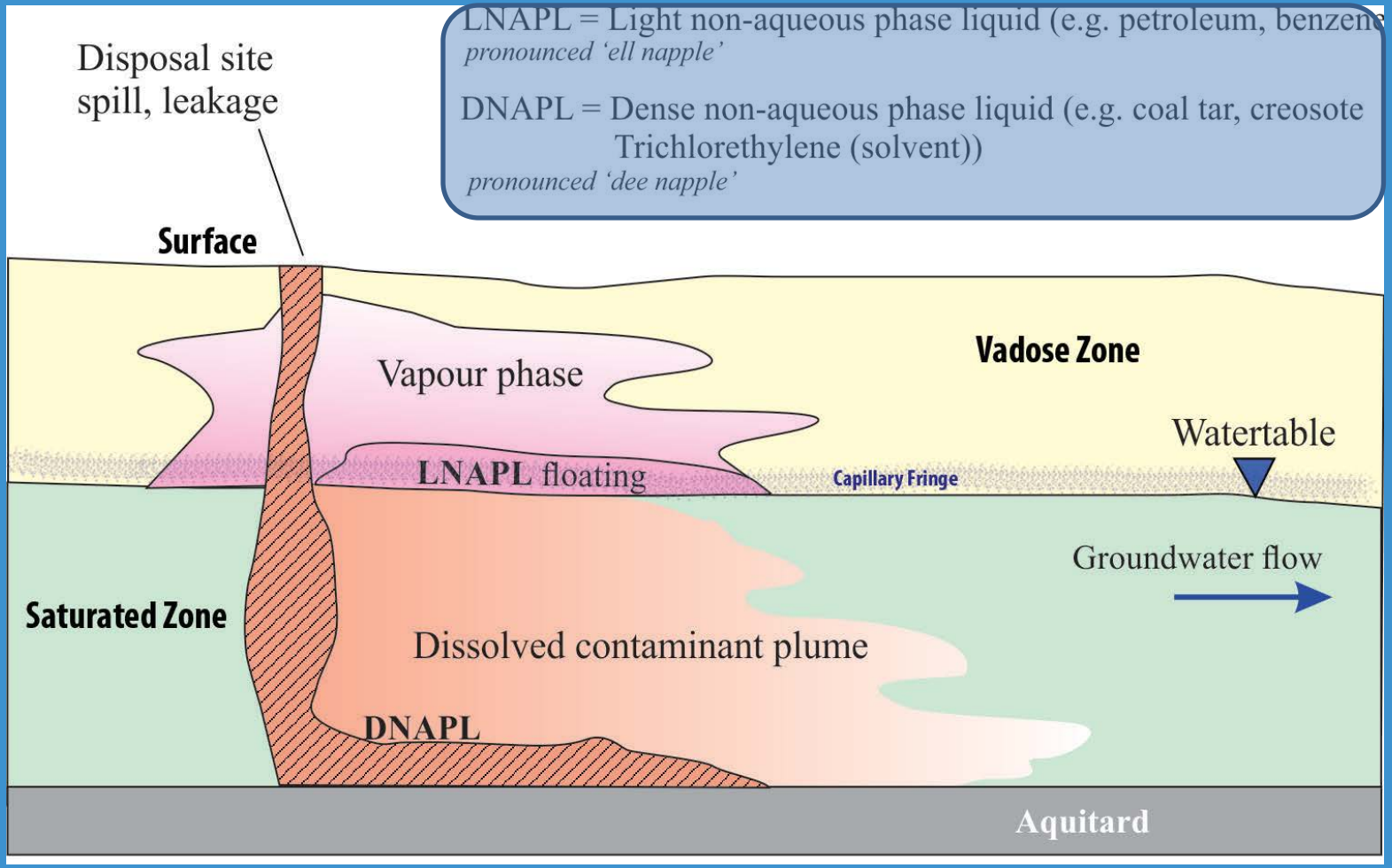


Long Point Fault, Western Houston, Tex.

Above based on Campbell, *et al.*, 2018 (more)

Project Management

Types of Contaminants to be Managed

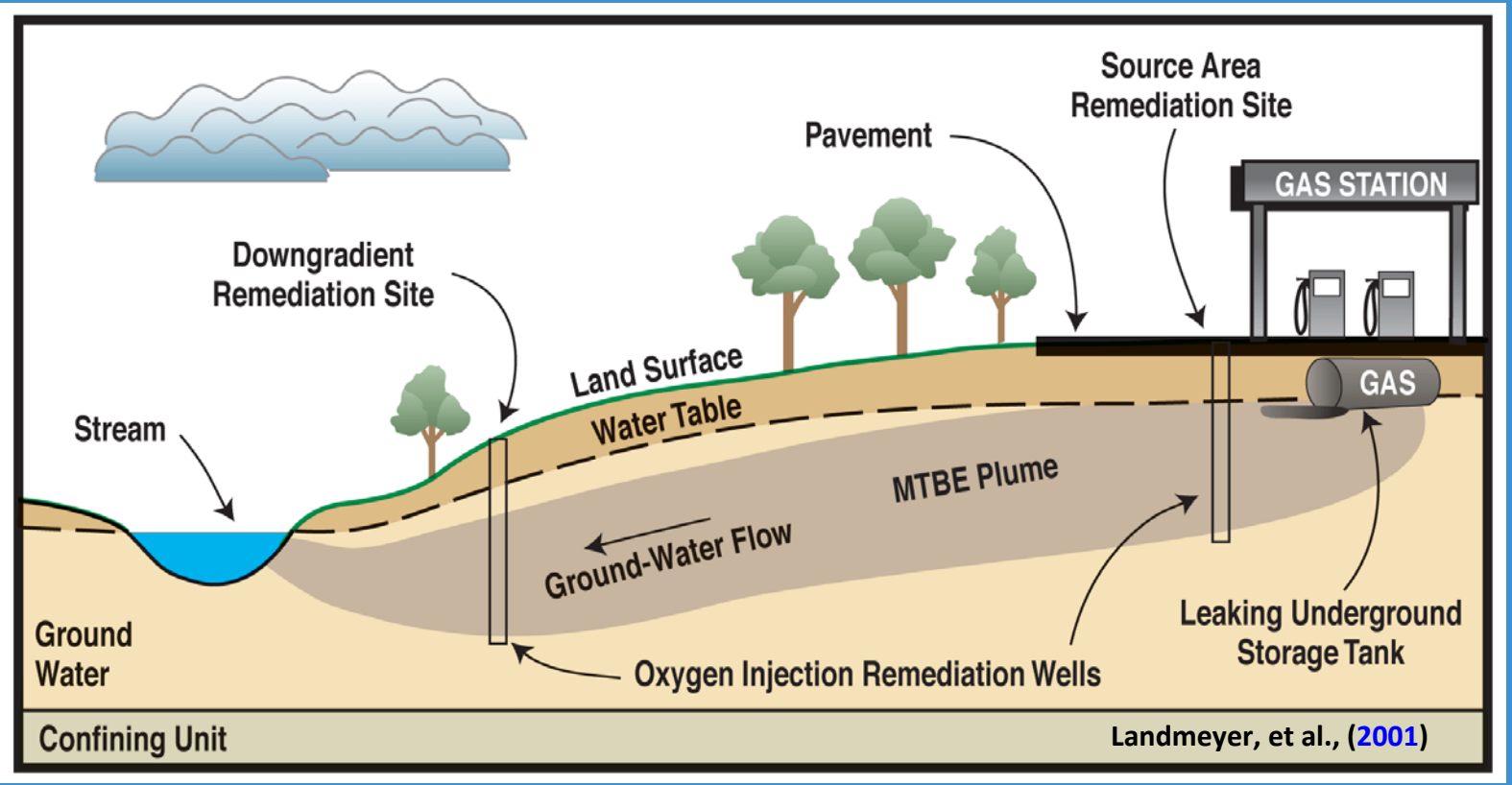


(After Heron Instruments Inc.(2017))

Project Management

Types of Contaminants to be Managed

LNAPLs



Typically BTEX + MTBE + Other Hydrocarbons and Additives

Gasoline • Kerosene • Fuel oil • Jet fuel • Diesel fuel

Project Management

Types of Contaminants to be Managed

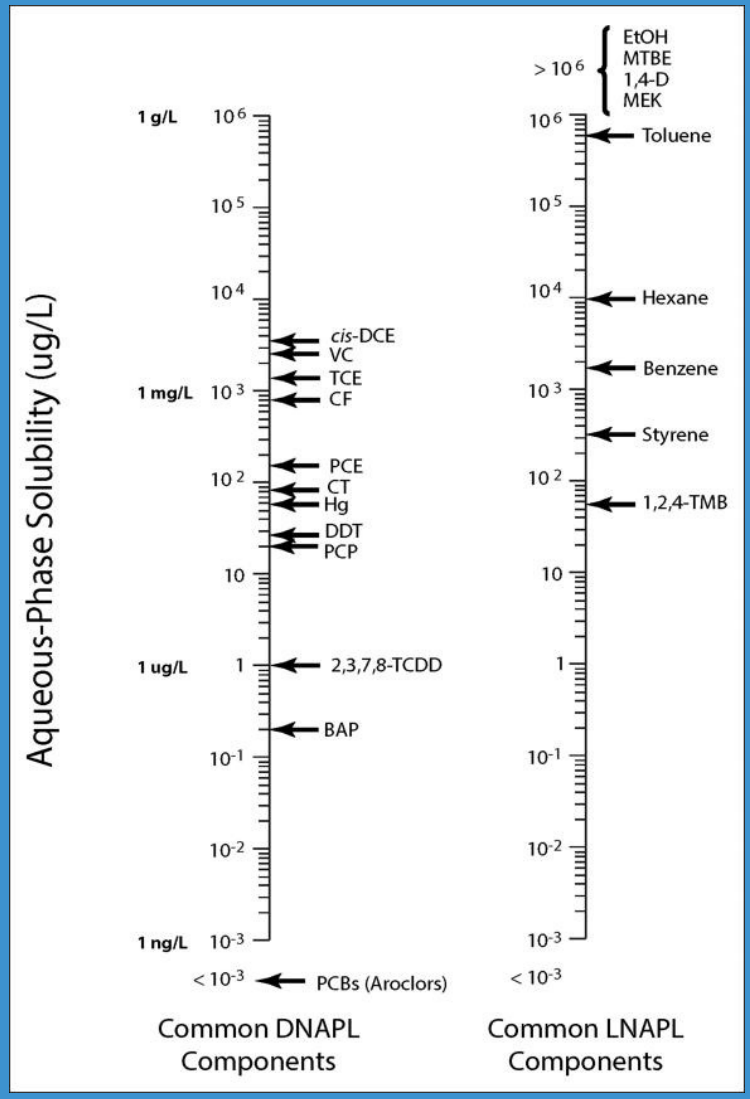
DNAPL and LNAPL Aqueous Solubility

Some of the Chlorinated Solvents:

Tetrachloroethene, aka Perchloroethylene (PERC),
Trichloroethylene & Tetrachloroethene (TCE),
1,1,1-trichloroethane (Chlorothene),
Carbon tetrachloride,
Coal Tars, (Polycyclic Aromatic Hydrocarbons),
Various types of Creosote (more), and
Polychlorinated biphenyl (PCBs),

One example of many approaches to remediation of DNAPls: Aerobic TCE biodegradation

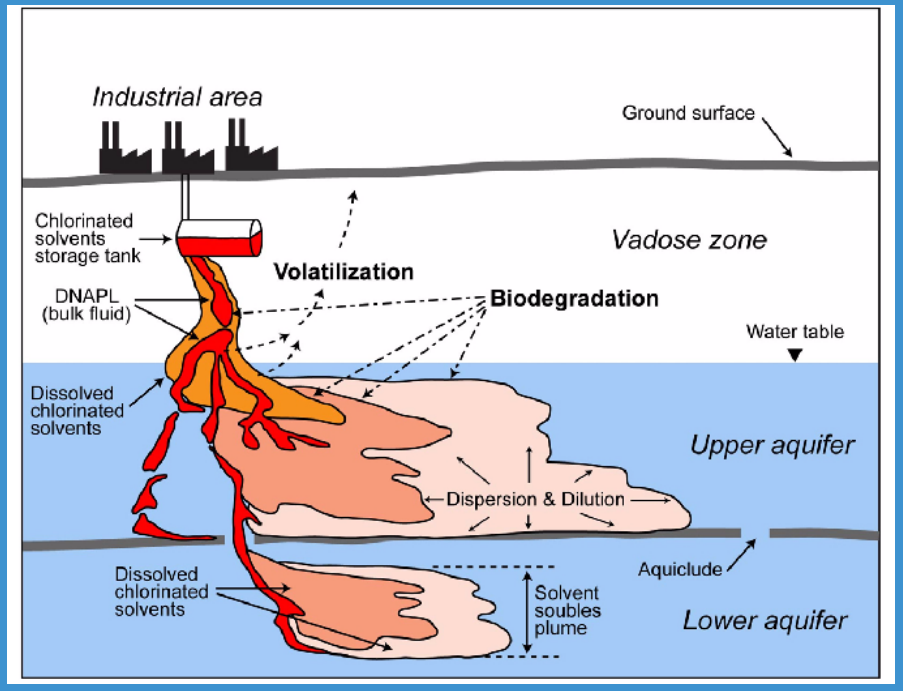
(After ITRC (2015))



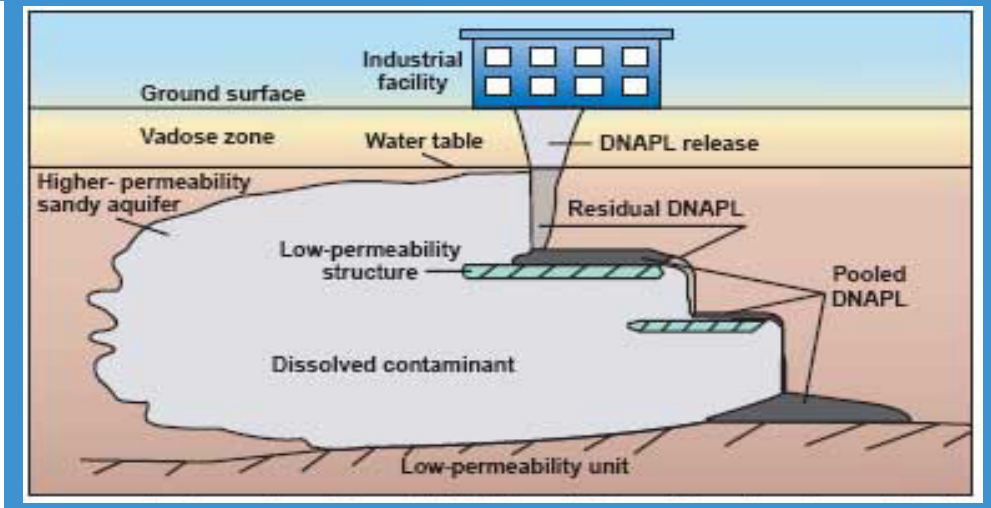
Project Management

Types of Contaminants to be Managed

DNAPLs



From U.S. EPA (1999)



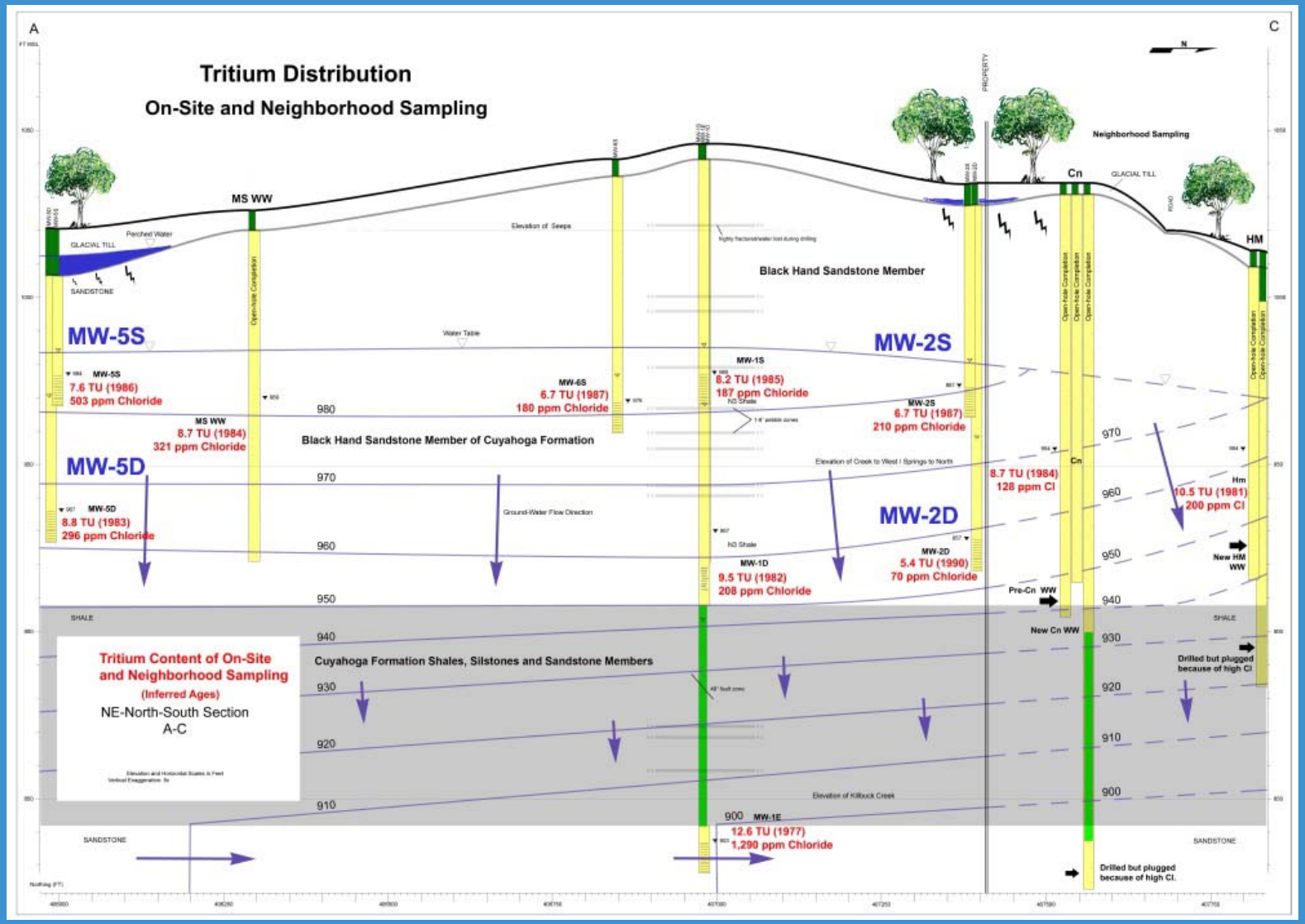
(Beal and Faircloth (2018)

Phase II Investigations for Geological and Hydrogeological Characterization: Vertical and Horizontal Extent

Any Effective Remediation of Contaminants Depends on it !

Project Management

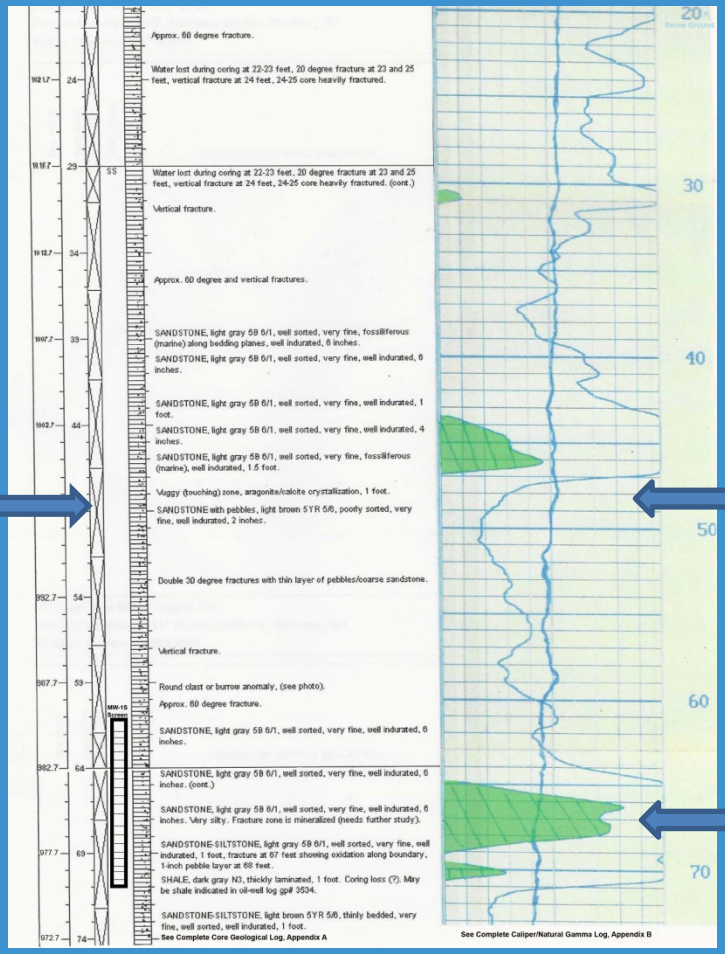
Unusual Phase II Projects



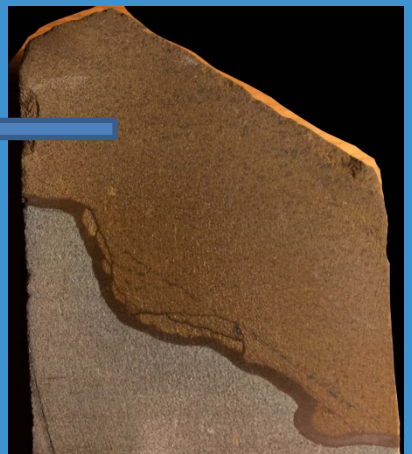
Project Management

Unusual Phase II Projects

Photomicrograph of thin section (showing crossed nicols polarization)



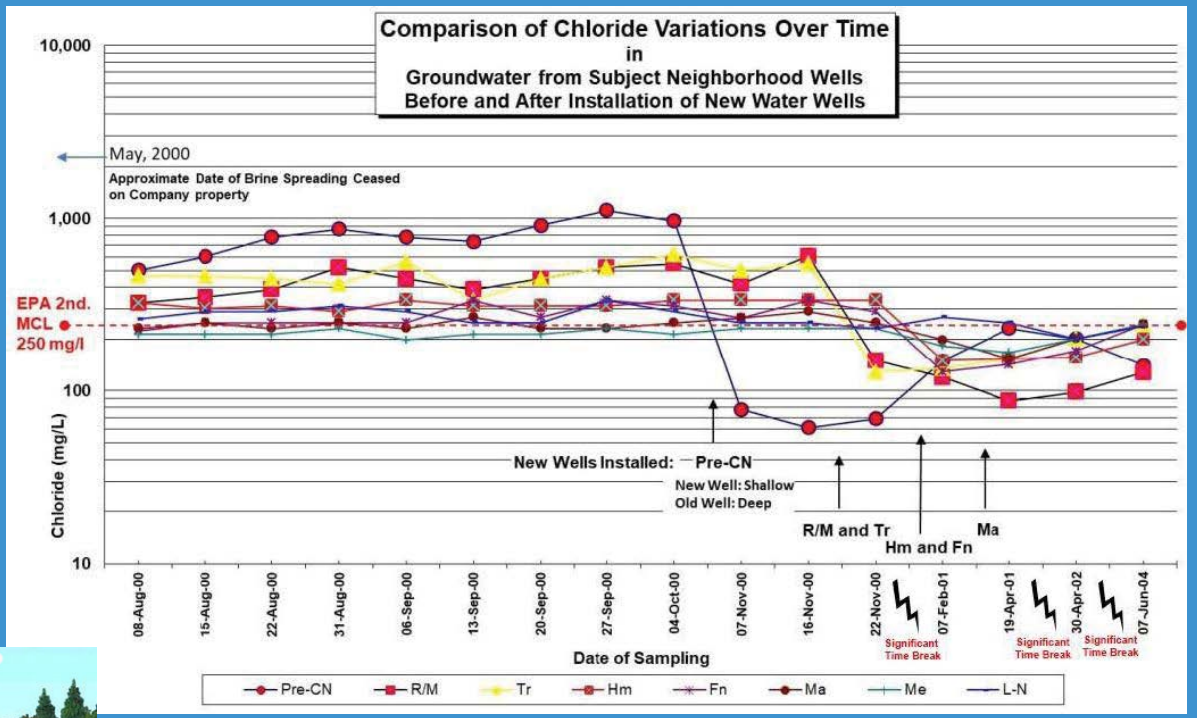
Halved 2-inch core samples

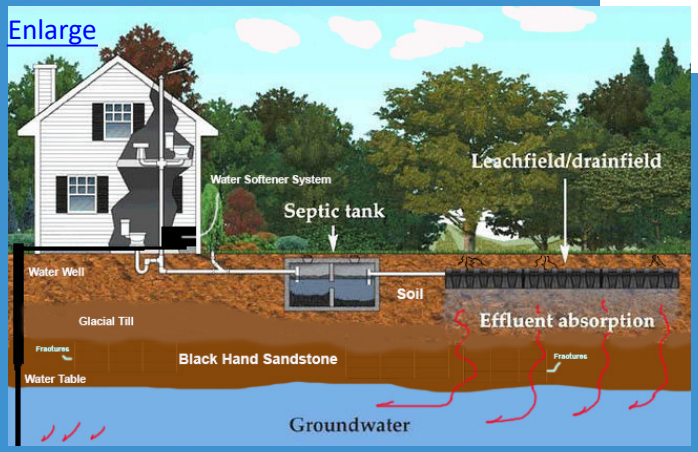


Project Management

Unusual Phase II Projects

Licensed Geologist logging core under winter conditions.





Model of likely cause of elevated chloride concentrations reported in neighborhood water wells.

Above based on Campbell, *et al.*, 2017 (more)

Project Management

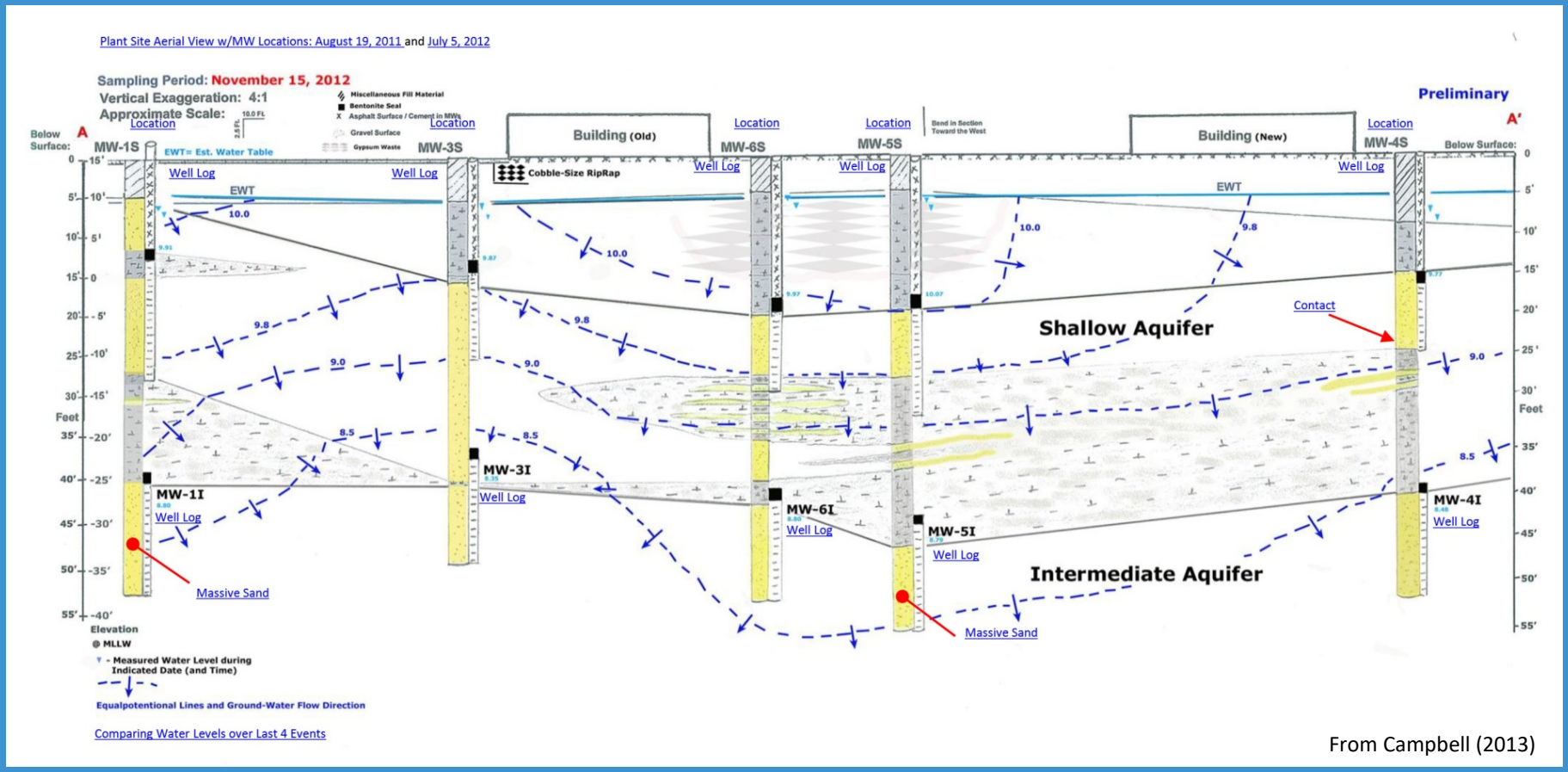
Data for Input to Phase II Investigations

Hydrogeologists Logging Station

Drilling by coring of sediments (GeoProbe (push-pull method)) and setting of PVC casing and well screen to construct a monitoring well for sampling and remote monitoring

Project Management

Data for Input to Phase II Investigations



From Campbell (2013)

To Active PDF (here)

To Remote Continuous Groundwater Monitoring (here)

To Arsenic Monitoring (2011-2015) (here)

Project Management

Final Note: For students who have produced a thesis or dissertation, we encourage you to publish your findings. Summaries (**TPG**) & (**more**).

To keep up-to-date on specific areas of the geosciences, monitor the I2M Web Portal (**more**).

After graduation, you should begin the process of obtaining your professional license (P.G.). See TBPG (here). Preparing for the first examination (Fundamentals), see (here) and (here).

If you would like to keep up on employment issues, see (**here**) and (**here**).

If time permits, Questions?

Should you have further questions after GeoDayz, feel free to contact either **Henry Wise** or **Michael Campbell** via the **AIPG-TX.org**

We trust you will find the rest of the GeoDayz program of interest and helpful.

xxx