



ENTHALPY

A N A L Y T I C A L

Will Rice
Business Development Manager
Impacts of 2020 Region 2 Order

The “Acceptability” Process Defined

STANDARD REQUIREMENTS FOR REVIEW OF MATERIAL FOR IMPORT TO RE-USE FACILITIES

Submit General Information Required to Begin Review:

1. Site Address
2. Name of Project Owner, General Contractor, and who your company is working for
3. Total volume of source in cubic yards (CY)
4. Site map, grading plan, or cut/fill map, if available
5. Geotechnical report, if available
6. Project schedule
7. Estimated loads per day and truck type

Submit Phase I and Phase II Environmental Assessments

Information contained in the Phase I and Phase II will be used to determine the chemicals of concern and whether any past uses of the site prevent the material from being acceptable. Public Works projects will need to submit an Engineers or Consultants report describing the property and past uses.

Submit SF Bay Regional Water Quality Control Board/EPA/DTSC Closure Letters

If the property has been part of a San Francisco Bay Regional Water Quality Control Board, EPA, or DTSC site investigation, a closure letter must be submitted proving the investigation has been closed. Any contaminated or hazardous soils must be removed from the property prior to acceptance at the designated facility.



Submit Soil Analytical Results with the following:

1. CAM 17 Metals – EPA method 6010/7471 or 6020/7471
2. Total Petroleum Hydrocarbons-Gasoline/Diesel/Motor Oil (TPH-g/d/mo) – EPA Method 8015
 - 8260 for gasoline typically acceptable
3. Volatile Organic Compounds (VOCs) – EPA Method 8260
 - Sample using EPA method 5035 (Encore or Terra Core sampler)
 - Include methyl ethyl ketone (MEK, 2-butanone) and acetone in analyte list
 - Maximum RL or MDL of 8.6 ug/kg for acetone
4. Semi-Volatile Organic Compounds, SIM (SVOCs) – EPA Method 8270 SIM
 - **Include pyridine & hexachlorobenzene in analyte list**
 - Limit dilution factor as much as possible
 - If reporting limits (RLs) are not ≤ 20 ug/kg, report results to method detection limits (MDLs)
5. Pesticides – EPA Method 8081
 - Maximum RL of 2 $\mu\text{g}/\text{kg}$ for Dieldrin & Endrin
 - Limit dilution factor as much as possible
 - If RLs do not meet 2019 ESLs, report results to MDLs
6. Polychlorinated Biphenyls (PCBs) – EPA Method 8082
 - Maximum RL of 22.7 $\mu\text{g}/\text{kg}$
7. Asbestos - CARB 435
 - Recommend testing one third to one half of total number of samples collected
8. **Percent Moisture**
 - Report results of all other tests by dry weight
9. Soluble Threshold Limit Concentration (STLC)
 - Run on any constituents that are 10x or more over their Title 22 STLC limit
 - May not be necessary for all constituents (e.g. chromium)
10. Toxicity Characteristic Leaching Procedure (TCLP)
 - Run on any constituents that are 20x or more over their TCLP limit
 - May not be necessary for all constituents (e.g. chromium)



- Samples should be collected by an environmental consultant, professional engineer, or professional soil sampling service
- Report **must include map** with sample locations and depths relative to the corresponding excavation.
- Report all results by dry weight
- Must be discrete samples – NO composites
- Reporting of all results to MDLs preferred
- Always include EDDs
- Some sites may require additional testing (e.g. dioxins/furans, herbicides).
- Test all samples for the same suite of tests. Having partial testing on some samples may require new samples or cause delays.

MINIMUM MATERIAL SAMPLING SCHEDULE REQUIREMENTS:

<u>Area of Individual Borrow Area</u>	<u>Sampling Requirements</u>
2 acres or less	Minimum of 4 discrete samples
2 to 4 acres	Minimum of 1 discrete sample every ½ acre
4 to 10 acres	Minimum of 8 discrete samples
>10 acres	Minimum of 8 locations with 4 discrete samples per location

- The sample frequency above assumes the site is native, undisturbed, undeveloped land. For sites with existing structures and/or prior use, the minimum number of samples is multiplied by each geologic layer. If no clear layering is present, one sample near the surface and one additional sample for each 5' of excavation depth in each location is a good rule of thumb. EXAMPLE: 1.5-acre site with excavation 10' deep = 4 locations with samples at 1', 5', & 10' in each for a total of 12 samples.
- If site has artificial/undocumented fill, the fill must be tested using the stockpile frequency below.
- For pipelines or trenches, use the stockpile frequency below and base sample quantity on total volume of excavated material.

<u>Volume of Borrow Area/Stockpile</u>	<u>Stockpile Samples per Volume</u>
Up to 1,000 cubic yards	1 discrete sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 discrete samples for first 1,000 cubic yards plus 1 discrete sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 discrete samples for first 5,000 cubic yards, plus 1 discrete sample per each additional 1,000 cubic yards



Who deals with acceptability criteria?

In an effort to protect groundwater and public health The State of California and the State of California Water Board created strict rules around soil disposal (CCR Title 27, division 2, and CCR Title 23, division 3). A soil report signed by a California-registered Professional Geologist or Professional Engineer is typically required by waste disposal sites prior to accepting contaminated soil.

In order to characterize soil as waste, representative samples must be collected and analyzed by a state-certified laboratory. The number of samples and sampling methodology vary pending the depth and volume of soil proposed for off-haul. In order to adhere to State and Federal regulations, accepting facilities typically require a wide array of laboratory analyses for purposes of waste profiling.

Haulers
Contractors
Construction Companies
Landscapers
Developers

Estimators
Engineering Contractors
Import/Export Facilities
Landfills
Public Trusts
Waste Management

TYPICAL SOIL WASTE CLASSIFICATIONS AND MINIMUM CONTAINMENT

- Waste Classification, Class I:
Hazardous Waste (per CCR Title 22, Chapter 11), Significant amounts of Hazardous Materials have been found in the soil and pose a water quality threat.
- Waste Classification, Class II:
Contaminants found in the soil but demonstrate a lower risk to ground water quality than Hazardous Waste
- Waste Classification, Class III:
Soil does not pose a significant threat to ground water quality so normal disposal steps may be taken

Class I, impacts and costs

- Cost for disposal is much higher.
- There are only two Class I Waste Disposal Sites in California so it's important to plan ahead, notify the disposal site (they fill up) and prepare for appropriate and safe transportation.
- There are potential scenarios in which soil waste is considered hazardous by the State of California but non-hazardous in accordance with Federal regulations.
- In some situations it may be more cost-effective to haul hazardous soil out of state by rail.

Class II, impacts and costs

Cost for disposal is still higher but significantly less than Hazardous Waste. Proper disposal methods still must be followed and landfill must have a Class II designation.

Import facility requirements may be unique and will still need to be compared to lab results.

Depending on local agencies the processes and requirements in handling may vary. The presence of Class II material is an immediate cost issue and must be assessed for optimal approach.

Class III (“acceptable”) impacts and costs

Ideal situation. While transportation of soil still must be arranged Non-hazardous Waste is accepted at a reasonable cost and there are variety of Class III landfills within the state. Some Class III soils can be reused off-site, however additional sampling is typically recommended in order to fully assess the usability of the soil and to minimize liability to the generator.

Title 27 : Why groundwater and potential use matter

- Title 27 §20705(e) establishes water quality protection requirements for cover materials at MSW landfills as follows: Except for reusable covers (such as tarps) that do not get buried with waste in the landfill, daily and intermediate cover materials shall: a. Meet the classification criteria for wastes that can be discharged to that landfill. For example, any material that would be classified as a Class II designated waste cannot be utilized for daily or intermediate cover at an MSW landfill unless that landfill's WDRs specifically allow disposal of Class II designated wastes; and b. Contain chemical constituents and foreseeable breakdown byproducts that, under the chemical and temperature conditions which it is likely to encounter within the landfill, would be mobilized at concentrations that, if released from the landfill, would not adversely affect beneficial uses of receiving waters (for disposal units lacking composite base liners); or c. Contain chemical constituents and foreseeable breakdown products that are listed as constituents of concern (COCs) in the landfills water quality protection standard (for disposal units with composite base liners).

R2-2020-0023 update, in summary

Adoption of this Order would:

- a. Set forth the requirements for disposal and onsite use of contaminated soils at MSW landfills by establishing waste acceptance criteria and uniform procedures for assessing the threat to water quality associated with soil disposal;
- b. Protect groundwater and surface waters of the State from pollution that could be caused by improper placement or discharge of contaminated soils and other materials that meet the requirements for use as alternative daily cover (see Findings 10-12 and 15-16 below);
- c. Specify monitoring and reporting requirements for groundwater and stormwater that account for the types of contaminants typically present in contaminated soils and related wastes; and
- d. Reduce the amount of time spent by the Regional Water Board updating individual WDRs to address issues related to the disposal of contaminated soils and related wastes.**

R2-2020-0023 purpose

“Routinely, landfill operators implement “load-checking programs” to limit unacceptable wastes from being accepted and disposed. However, due to the nature of contaminated soils, waste constituents in the soils cannot readily be detected through load-checking programs. Thus, routine load-checking programs are not adequate to regulate the discharge of contaminated soils.”

The Consequence?

In some cases weeks go by without resolve as to what compounds, limits and methods to apply.

At this point I am contacted and brought in to understand and negotiate analytical solutions based on missing requirements.

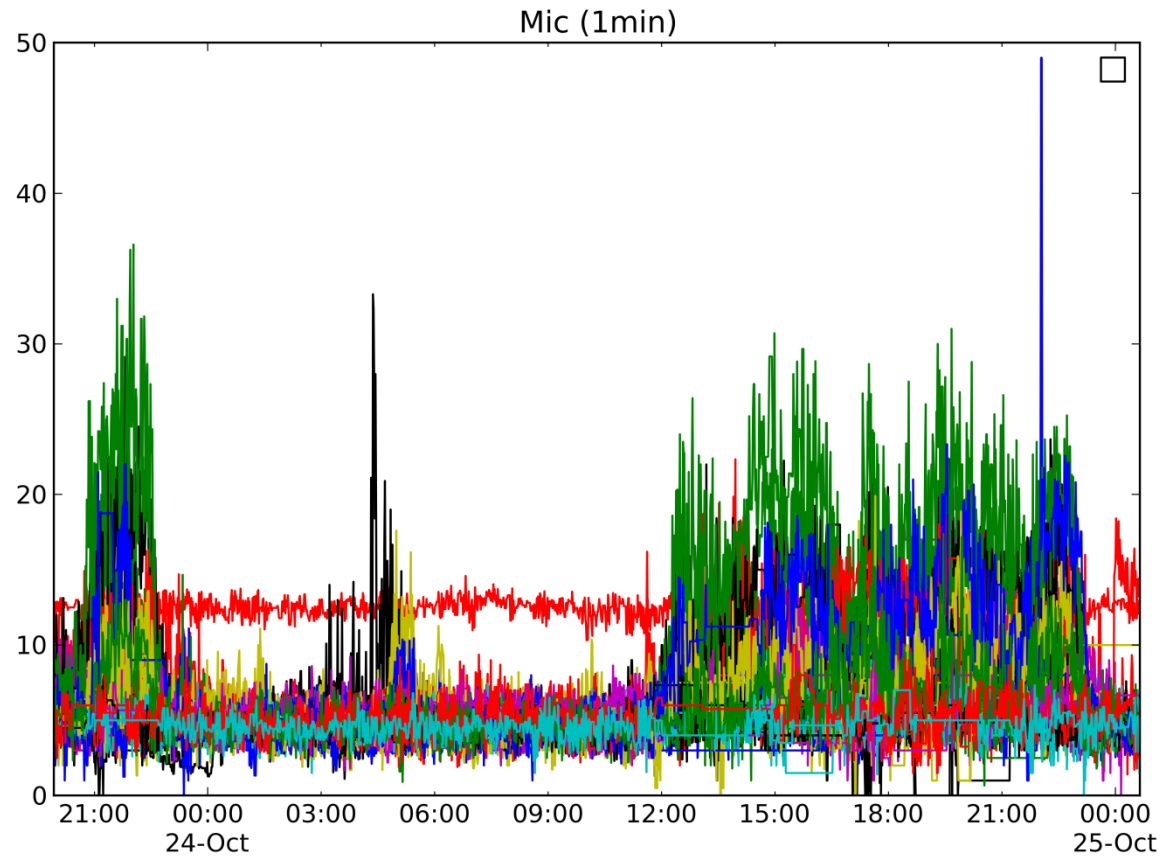
All the while involved parties are unable to come to agreement on whom is responsible for the time and materials lost.

How did a lab get involved?

In the goal of expediting project plans missing characterization requirements in sample quantity and testing had halted multi-acre development projects to a standstill. This occurred frequently enough for the lab to be contacted and then become a routine option for evaluating if bottleneck has an analytical solution.



Separate the signal from the noise



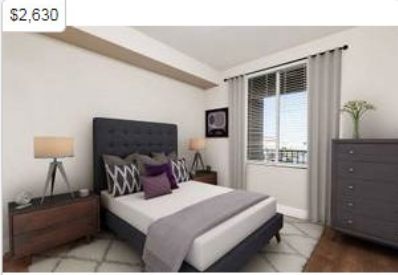
Why Dirt Is Big Business


When dealing with environmental safety regulations, health always comes first. Evaluating the regulations deeper for optimization of field work is not a play at profit through negligence. Developers in California want to clean up brownfield sites to a truly safe level. In most cases, it's the only way they'll ever be cleaned.


Without commercial interests attached, whatever environmental issues are associated with these contaminated sites will continue to fester. More testing requirements won't make the sites or the environment any safer, in fact, it's more likely to lead responsible parties to seek short cuts rather than remediation efforts.


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Acceptable import material is how we get from point A to point B



So what changed?

The regulatory updates were initially intended by region 2 waterboard landfill division to broaden the options for oversight of protocol. As time has gone on however this freedom of discretion has led to the opposite, which is a privatizing and complicating of the acceptance process by creating a grey area in which class II material is acceptable as if it were class III.

Without a policy to reference, and with the procedure around site protocol so open ended, this essentially has privatized screening requirements beyond what is called by current law.

Limits orders of magnitude lower for totals than years past due to 2019 interim esls, for many sites they were not testing that low.

To some this may sound trivial, but imagine spending 5 years on a site remediation and transfer only to find out your intended haul destinations now require tests you had not been performing all along.

The circumstance of historical data not being enough is trending on the rise.

For sites with >100k CY and a complete EIR, are they truly intended to retest it all in order to dispose?



Environmental Screening Levels

San Francisco Bay Regional Water Quality Control Board



GAVIN NEWSOM
GOVERNOR



JARED BLUMENFELD
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Tier 1 ESLs ¹

2019 (Rev. 2)

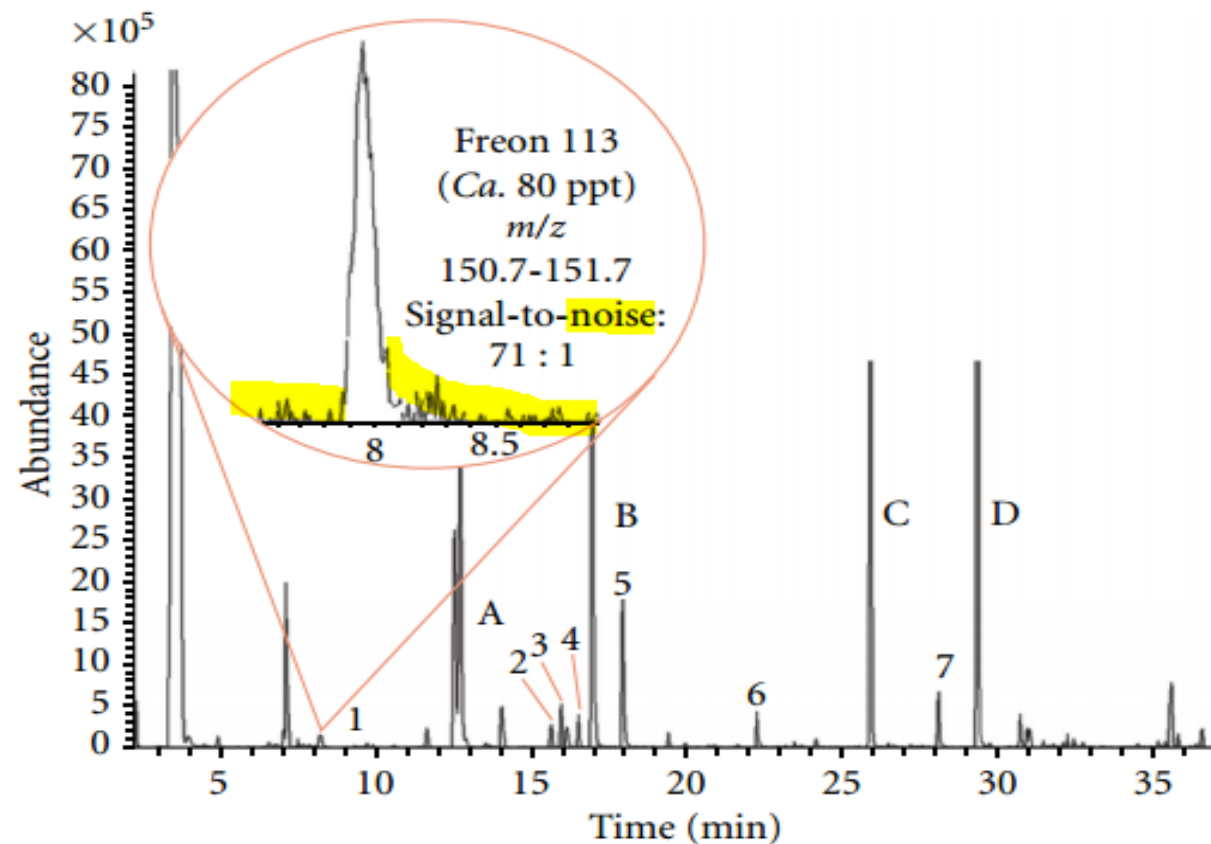
Based on a generic conceptual site model designed for use at most sites²

Chemicals	CAS No.	Groundwater (µg/L)	Soil (mg/kg)	Subslab / Soil Gas (µg/m ³)	Indoor Air (µg/m ³)
Acenaphthene [PAH]	83-32-9	1.5E+01	1.2E+01	1.7E+04	5.1E+02
Acenaphthylene [PAH]	208-96-8	1.5E+01	6.4E+00	--	--
Acetone	67-64-1	1.5E+03	9.2E-01	1.0E+06	3.1E+04
Aldrin	309-00-2	1.4E-04	2.4E-03	1.9E-02	5.7E-04
Anthracene [PAH]	120-12-7	7.3E-01	1.9E+00	--	--
Antimony	7440-36-0	6.0E+00	1.1E+01	--	--
Arsenic	7440-38-2	1.0E+01	6.7E-02	--	--
Barium	7440-39-3	1.0E+03	3.9E+02	--	--
Benzene	71-43-2	4.2E-01	2.5E-02	3.2E+00	9.7E-02
Benzo[a]anthracene [PAH]	56-55-3	1.7E-02	6.3E-01	3.1E-01	9.2E-03
Benzo[b]fluoranthene [PAH]	205-99-2	4.9E-02	1.1E+00	--	--
Benzo[k]fluoranthene [PAH]	207-08-9	4.9E-02	2.8E+00	--	--
Benzo[g,h,i]perylene [PAH]	191-24-2	1.0E-01	2.5E+00	--	--
Benzo[a]pyrene [PAH]	50-32-8	1.4E-02	1.1E-01	--	--

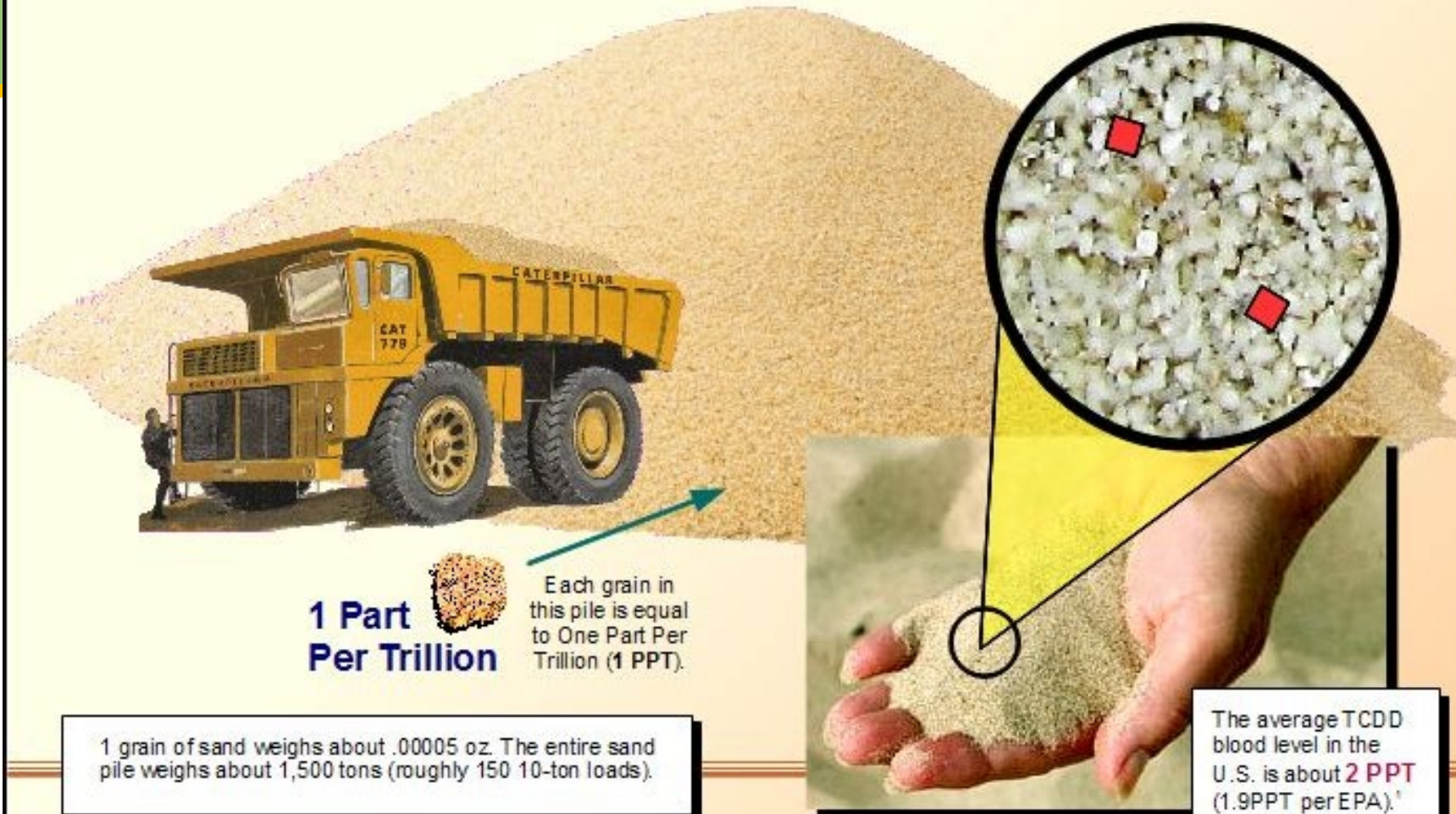
More Confounding, Protocols Are Citing Lower Thresholds Within the ESLs

Compound	Units	RL	MDL	Previous Criterias	Limit	Difference to MDL	An Example of a Recent update	Limit	Difference to MDL
bis(2-Chloroethyl)ether	mg/Kg	1.2	0.057	Bis(2-chloroethyl)ether	0.13	0.073	Bis(2-chloroethyl)ether	0.03	-0.043
bis(2-Chloroisopropyl) ether	mg/Kg	0.25	0.045	Bis(2-chloroisopropyl)ether	0.87	0.825	Bis(2-chloroisopropyl)ether	0.0051	-0.8199
bis(2-Ethylhexyl)phthalate	mg/Kg	0.25	0.072	Bis(2-ethylhexyl)phthalate	160	159.928	Bis(2-ethylhexyl)phthalate	160	0.072
Chloroaniline, 4-	mg/Kg	0.25	0.059	Chloroaniline, p-	0.091	0.032	Chloroaniline, p-	0.0067	-0.0253
Chlorophenol, 2-	mg/Kg	0.25	0.04	Chlorophenol, 2-	0.12	0.08	Chlorophenol, 2-	0.012	-0.068
Chrysene	mg/Kg	0.25	0.083	Chrysene	2.2	2.117	Chrysene	2.2	0.083
Dibenz(a,h)anthracene	mg/Kg	0.25	0.052	Dibenz(a,h)anthracene	2.1	2.048	Dibenz(a,h)anthracene	2.1	0.052
Dichlorobenzene, 1,2-	mg/Kg	0.25	0.045	Dichlorobenzene, 1,2-	1	0.955	Dichlorobenzene, 1,2-	1	0.045
Dichlorobenzene, 1,3-	mg/Kg	0.25	0.052	Dichlorobenzene, 1,3-	7.4	7.348	Dichlorobenzene, 1,3-	7.4	0.052
Dichlorobenzene, 1,4-	mg/Kg	0.25	0.032	Dichlorobenzene, 1,4-	0.2	0.168	Dichlorobenzene, 1,4-	0.2	0.032
Dimethylphenol, 2,4-	mg/Kg	0.25	0.077	Dimethylphenol, 2,4-	8.1	8.023	Dimethylphenol, 2,4-	8.1	0.077
Dinitrophenol, 2,4-	mg/Kg	1.2	0.051	Dinitrophenol, 2,4-	3	2.949	Dinitrophenol, 2,4-	3	0.051
Fluoranthene	mg/Kg	0.25	0.081	Fluoranthene	86	85.919	Fluoranthene	86	0.081
Indeno(1,2,3-cd)pyrene	mg/Kg	0.25	0.086	Indeno(1,2,3-c,d)pyrene	2.3	2.214	Indeno(1,2,3-c,d)pyrene	2.3	0.086
Methylnaphthalene, 1-	mg/Kg	0.25	0.046	Methylnaphthalene, 2-	0.88	0.834	Methylnaphthalene, 2-	0.88	0.046
Methylnaphthalene, 2-	mg/Kg	0.25	0.037	Methylpentanone, 4-, 2-	0.36	0.323	Methylpentanone, 4-, 2-	0.36	0.037
Pentachlorophenol	mg/Kg	1.2	0.048	Pentachlorophenol	0.098	0.05	Pentachlorophenol	0.098	0.048
Phenanthrene	mg/Kg	0.25	0.07	Phenanthrene	11	10.93	Phenanthrene	11	0.07
Phenol	mg/Kg	0.25	0.049	Phenol	0.16	0.111	Phenol	0.16	0.049
Pyrene	mg/Kg	0.25	0.081	Pyrene	45	44.919	Pyrene	45	0.081

Signal vs Noise



The estimated U.S. blood lipid background for 2,3,7,8-TCDD is about 2 parts per trillion (PPT). This trillion-grain sand pile demonstrates how small 2 PPT really is – about the equivalent of **2 grains of sand**.



1. Extrapolated from Patterson et al., 2008 using $[LOD / \sqrt{2}]$

How we end up with a 136 page protocol vs a 2 page

From the permit:

Soils with an average, contaminant-specific concentration that does not exceed a Regional Screening Level (RSL)¹ for residential sites established by the U.S. Environmental Protection Agency (USEPA). ¹ USEPA Region 9 RSL tables are located at:

<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016>.

RSLs with target cancer risk (TR) of 1E-06 and target hazard quotients (THQ) of 1.0 should be used to establish threshold levels. 9 ii. In the absence of RSL limits, soils with an average, contaminant-specific concentration that does not exceed an Environmental Screening Level (ESL)² for “Soil Tier 1” compiled by the San Francisco Bay Regional Water Quality Control Board. iii. For soils for which a RSL or ESL has not been established, an average contaminant specific concentration shall not exceed, on a per weight basis 10 times the maximum contaminant level (MCL) for drinking water, established by the USEPA or the State Water Board’s Division of Drinking Water, whichever is more stringent.

Reporting and Detection Limits

(in the presence of high non target organics)

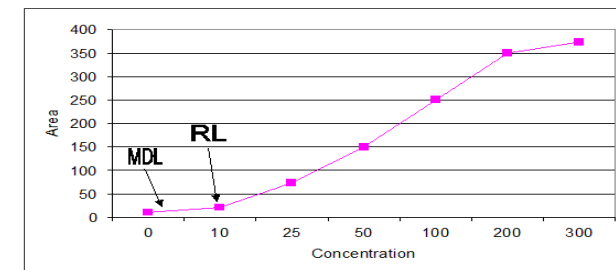
The laboratory generally reports two types of detection limits for each analyte.

Method Detection Limit (MDL) – May not be requested on report

- Determined by statistical analysis (10 replicates) and is the lowest theoretical level of detection, and an estimated value (not as legally defensible) - 99.9% sure of compound detection
- Concentration that is sufficiently above the background “noise” of the method to be certain that a compound is present
- Typically 2x to 5x lower than RL

Reporting Limit (RL)

- The minimum concentration that can be consistently quantified.
- Lowest calibration point



Dilutions . . . why?

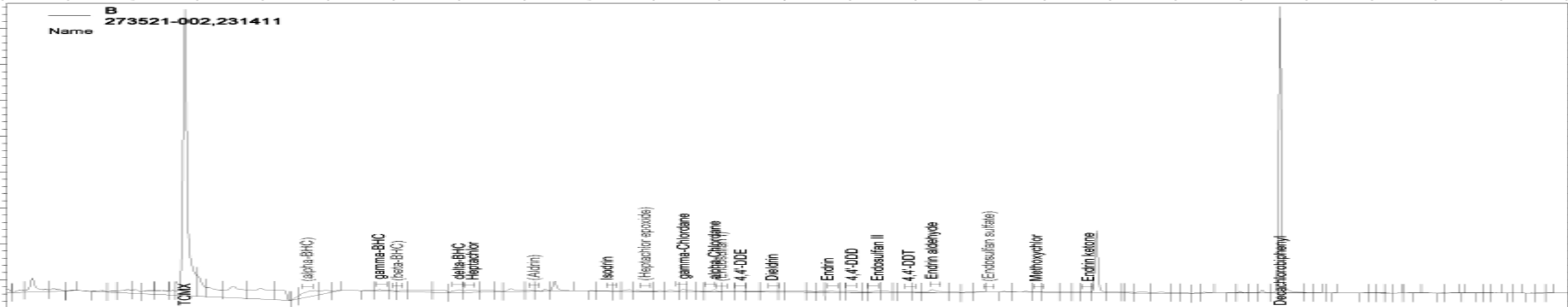
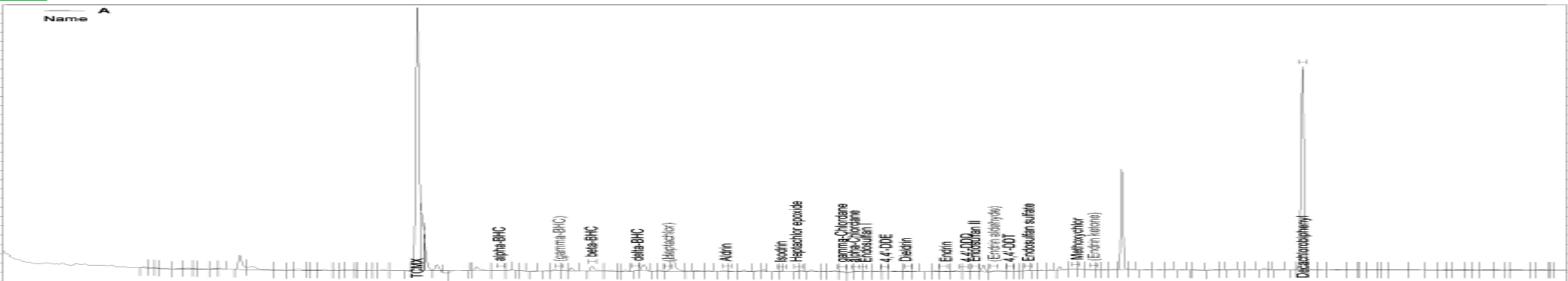
Sample results may have to be analyzed at a dilution for one or more of the following reasons:

- high target analyte concentration
- high non-target analyte concentration
- physically challenging matrix (dark, viscous, high solids, etc)



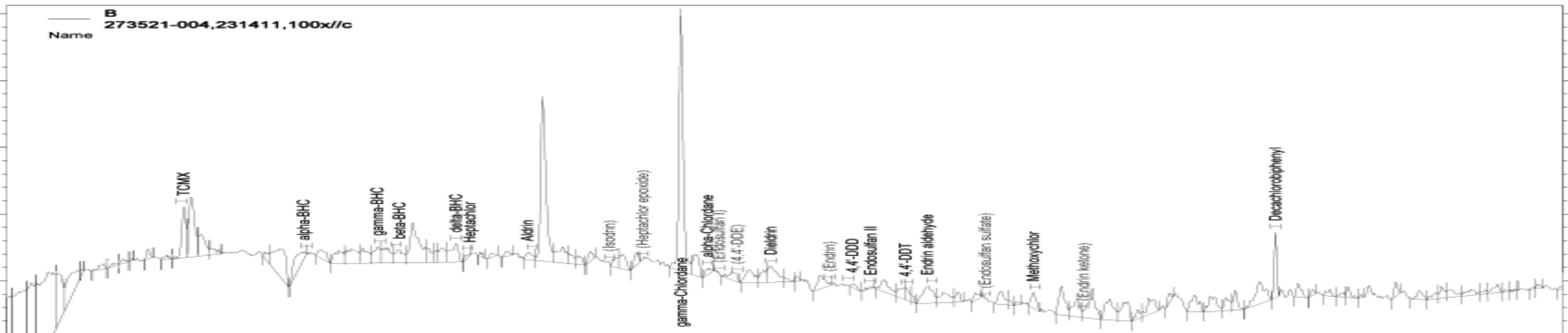
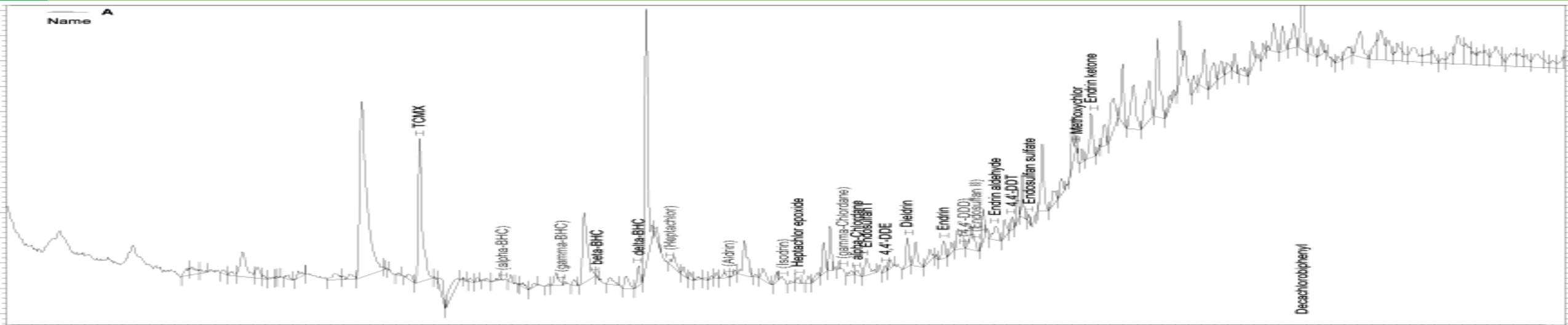
Clean Environmental Samples

No dilution required



Environmental Samples with high non-target organics

Required 100x dilution (had no hits)



What is in the permit vs what is being written into protocol

Methods defined, but lists and limits now are left open to interpretation inflating analytical costs by >80k for a recent stockpile characterization event.

Analysis	EPA Analytical Method	Origination Land Use			
		Land On/ Near Existing Freeway	Land On/ Near Mining Area or Quarry	Agricultural Land	Residential/ Acceptable Commercial Land
California Title 22 Metals (TTLC)	USEPA 6010B and/or USEPA 7471A	X	X	X	X
Modified WET (with DI Water)	6010B	X	X	X	X
Asbestos	PLM or OSHA 191		X (PLM)		X (OSHA 191)
pH	USEPA 9045D		X		
Polynuclear Aromatic Hydrocarbons (PAHs)	8310 or 8270 SIM	X			X
VOCs	USEPA 8260B with collection by USEPA 5035				X
SVOCs	USEPA 8270C SIM				X
Chlorinated Herbicides	8151A	X		X	X
TPH	8015M	X	X	X	X
Pesticides	8141A; and 8151A; and 8081A or 8080A	X	X	X	X
PCBs	USEPA 8082 or 8080A				X

Note: Modified waste extraction test (WET) using deionized water as the extractant can be used instead of the standard WET procedure.

The laboratory reporting limits for soil samples must be below the SFRWQCB's Tier 1 Environmental Screening Levels (ESLs) for soil. The reporting limits for Modified WET results must be below the Tier 1 ESLs for groundwater. The soil and groundwater ESLs are included as **Attachment A**.

Dilutions Impact

- Reporting limits (RLs) and Method Detection Limits (MDLs) are elevated by the dilution factor used.
- Samples may need to be reported as Non-Detect (ND) above the laboratories lowest RL.
- In some cases a clean-up procedure may be used to remove interferences.
- Multiple dilutions can be done, but a straight run is not guaranteed

Case study: How the lab got involved

An import facility received a violation for lack of oversight of metals levels imported to the location.

Unbeknownst to parties involved in a property transaction the facility had a unique requirement for metals analysis as a result.

The requirement was to run the samples for STLC DI Metals, which is to take DI water tumbled and leached in the material, and then analyze that and compare to drinking water environmental screening limits.

Case Study Continued

In this scenario the lab is imitating rainfall on to the facility, the rain going straight through to the water table, and that table then being pumped directly to tap. The logic here is flawed from a modeling standpoint, but more so this created an invisible requirement that no lab, contractor or consultant would anticipate.

All work done up to that point was stalled for 3 weeks, with over \$11k lost already due to standstill. No parties were able to interpret the protocol, and the facility was unable to explain to the earthwork team what needed to be done.

The lab was able to send a courier to the existing lab, pull the samples and run them for the metals. What was found was that naturally occurring levels of arsenic, vanadium, chromium and barium were all triggering their thresholds.

Conclusions

If we are to leave acceptability determination to the private sector than clearer standards are needed.

If new compounds and thresholds of concern are being added all parties should be notified so they may plan accordingly.

Further policy in order to clarify which thresholds are to be applied is needed.

Questions or problems? Call me and let's talk through it!

Will Rice, Business Development Manager

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510-439-7877

