# LANL Cost Estimate Review

June 26-28, 1990

*Response to Comments*

A cost estimate, budget planning tool

Not a sampling plan - most comments relate to an actual work plan

Too early in the game to develop a sampling plan for each site - this will be done over the next four years and cost estimates will be modified as the RFI/CMS process proceeds

Each Work Plan will be tailored for individual tasks with phased sampling - no shotgun approach

Sites visited representative of strategy types - not work plans

Active sites will require site characterization to defer corrective action and some interim action may be required

Canyon walls must be sampled and potentially remediated - e.g., TA-45

Sampling will be phased to provide cost effective results

Environmental characterization - geology, background already included

Resource planning will be done for currently identified sites; contingency will be applied at DOE-AL or -HQ, not at LANL

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# LANL ER Program

## Data Quality Objectives

risk assessment

evaluation of alternatives

engineering design

proof of negative contamination

Level 4 analytical data used for final decision making

*If you don't know where you're going,*
*any road will take you there!*

# Compositing of Samples

It should be pointed out that the composite samples provide only an estimate of the mean of the population from which the samples forming the composite are drawn. No estimate of the variance of the mean, and hence, the precision with which the mean is estimated can be obtained from a composite of samples. It is not sufficient to analyze two or more subsamples from the same composite to obtain an estimate of the variation within the population. Such a procedure would permit the estimation of variation among subsamples within the composite, but not the variation among samples in the field. Similarly, if composites are formed from samples within different parts of a population, the variability among the parts, but not the variability within the parts, can be estimated. If an estimate of the variability among sampling units within the population is required, two or more samples taken at random within the population must be analyzed separately. (Peterson and Calvin, 1965)

*taken from "Soil Sampling Quality Assurance User's Guide" EMSL-LV 1984, EPA 600/4-84-043, and*

*"Sediment Sampling Quality Assurance User's Guide" EMSL-LV, PB85-233542.*

# Compositing

May be appropriate for first phase of sampling

Will not meet LANL data quality objectives

Adequate for mean and trend estimation - not risk assessment

Loss of spatial resolution - useless for engineering design

Loss of variability and extremes - inadequate for site characterization

Disallowed in the past by regulatory communities

Cannot be used for samples analyzed for volatiles which are a significant concern at most LANL sites

Bandelier tuff is not a soil but a rock, and must be ground to composite cores

Dilutes samples such that analytical methods must be more sensitive to achieve useful detection limits

# Screening Issues

Utilizing state-of-the-art technology produces DQO Levels 1 and 2

Useful for preliminary site characterization, scoping, reconnaissance

LANL plans to use screening in the first phase of characterization

Must define what parameters are field measurable and what data level is obtained

Not a substitute for risk assessment, design quality, or alternative selection data - Level 4

Level 1 quality data generated with most available field screening methods

Some emerging technology - slow EPA acceptance

# Screening Technologies

Volatiles - LANL fieldable GC-MS may provide Level 3 & 4 data (in development)

- other available units provide Level 1 & 2

Semi-volatiles - are you kidding?

Metals - fieldable XRF, inadequate detection limits; Level 2 data

Explosives - LANL field colorimetric screen for H&S purposes; Level 1 data

Radionuclides - gross alpha, beta, gamma; Level 1 data only

- inadequate for isotopic analysis (required for risk)
- insensitive to weak emitters

# LANL Analytical Issues

*Most of LANL's samples will be mixed waste*

*LANL's analytical costs are essentially identical to external costs for complete mixed waste analyses - especially when herbicides and pesticides are removed (we believe that these will not be a concern at LANL)*

*TCLP requirements are expected to be minimal and the Lab expects to contract these samples out*

*LANL anticipates doing as much of the analytical work in-house as possible, to minimize quality problems and potential liability of shipping mixed wastes off-site*

*LANL is ultimately responsible for sample disposal at external labs*

*LANL will do special analyses, quick turn-around*

*Concern over level of rad that can be accepted by external labs*

*Routine samples will be sent to contractors*

# RFI/CMS Document Costs

RFI LANL TA-21, 68 SWMUs; cost FY89, 90 - **$1.1M**, estimated total cost at completion - **$2.2M**

RI Work Plan Mound Area B, 3 SWMUs; cost FY88, 89, 90 - **$1.1M**

RFI Work Plan Kansas City Plant South Lagoon, 1 SWMU; cost FY89, 90 - **$500K**

RFI Work Plan Pantex Gasoline Leaks, 2 SWMUs; cost FY89, 90 - **$600K**

RFI Work Plan Sandia-Livermore Fuel Oil Spill, 1 SWMU; FY88 - **$50K**

***"Peer, and regulatory review and comment can double document costs"***

—

RFI Work Plan LANL Generic, 10 SWMUs - **$500K**

# LANL Estimated Cost per sample

| | | |
|---|---|---|
| Field Labor | | 250 |
| Sampling Equipment | | 150 |
| Drilling | | 700 |
| Location Surveying | | 300 |
| Sample Archiving (Five Years) | | 50 |
| Geophysics (Surface and Borehole) | | 100 |
| H&S Screening (Rad, Volatiles, explosives) | 300 | |
| Packing/Shipping | | 50 |
| TAL Volatiles (not App. IX) | | 750 |
| TAL Semi-volatiles (not App. IX) | | 1500 |
| Explosives | | 1000 |
| Radionuclides (Pu-238/9, U-234/5/8, Cs-137, H-3, Am-241) | 1800 | |
| TAL Metals | | 500 |
| Total* | | $7500K |

**If Appendix IX or TCLP required, add $2-3K.*

# LANL Cost per Average Sample

| | |
|---|---|
| ~~Assume 20% of estimated samples are not taken~~ | ~~$0~~ |
| Assume ~~30~~ 20% of estimated samples require partial analysis | $3750 |
| Assume the remaining ~~50~~ 80% of samples require full analysis | $7500 |

Therefore, cost of an "average" sample is =$~~5000~~ 6,750

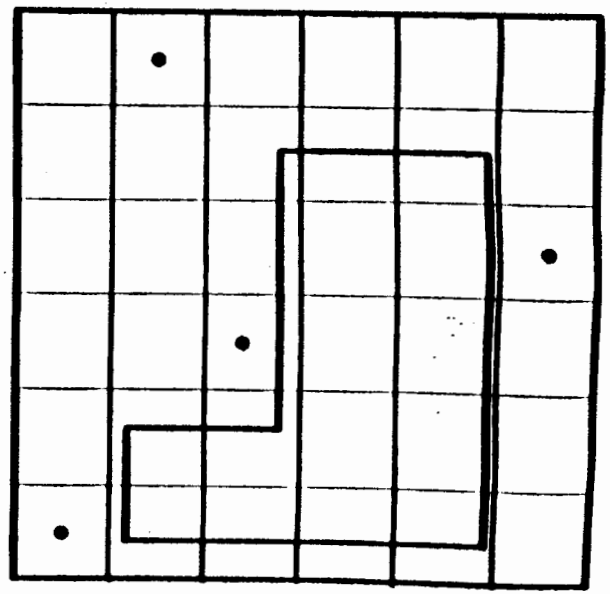
This accounts for unique site conditions and for the obvious need for tailoring of the sampling plan to each individual site.

*LANL believes this is a better cost estimating method than doing Phase 1 - Level 1 screening, and attaching large contingencies to produce adequate data for risk/design/no further action. We believe that is will be faster and more efficient to produce data of sufficient quality up-front, as opposed to excessive verification of poor data.*

# COST ESTIMATING ASSUMPTIONS

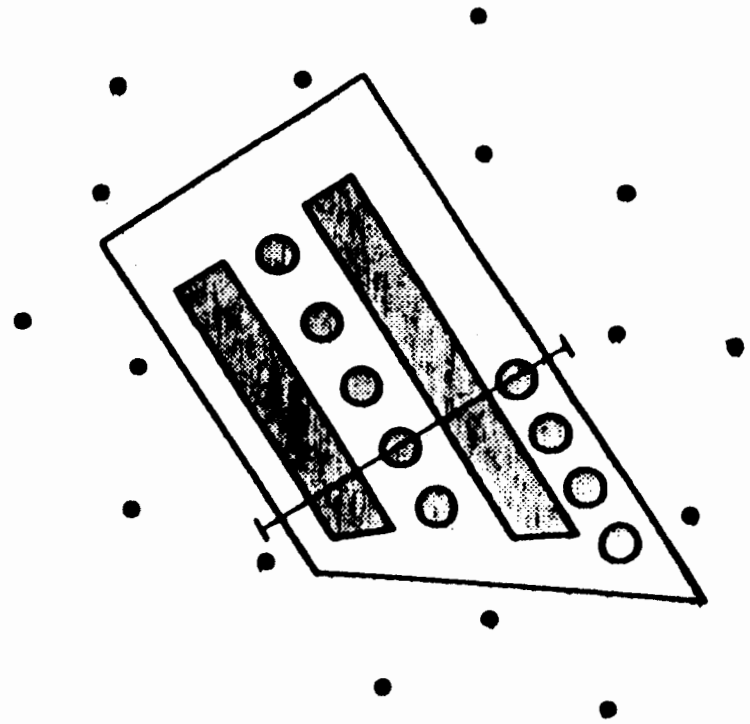
# RANDOMLY SAMPLED AREAS

- **Assumed for sites where the planned remedial action is clean to acceptable risk-based criteria**
- **Sample a percentage of an area with a 5 x 5 ft grid**; grid size can be increased up to 100' x 100', depending on size of the site
- **Percentage of the grid sampled based on:**
  - **Heterogeneity of waste**
  - **Distribution of waste**
- **Stratified random sampling assumed for sites with known structures and expected waste distribution**
- **Simple random sampling assumed for sites where waste is evenly distributed at site**
- **Sampling points will be sampled from surface to total depth**; limited to near-surface sampling as appropriate
  - **5-ft intervals from surface to 30 ft**
  - **10-ft intervals from 30 ft to total depth**
- **Total depth of sampling points based on waste form, geology, hydrology, and period of use**
- Screening techniques as appropriate

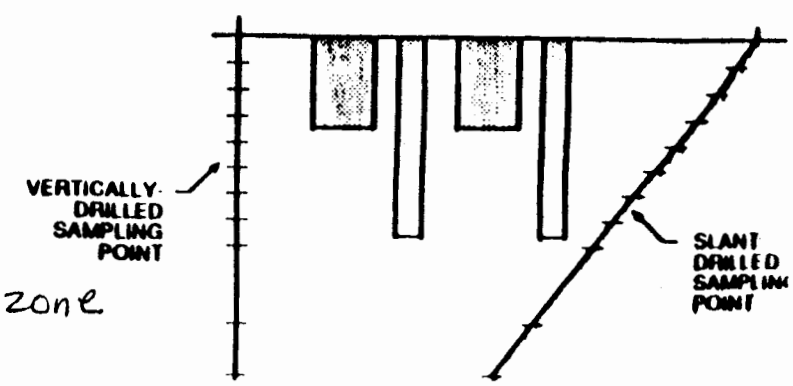


# COST ESTIMATING ASSUMPTIONS

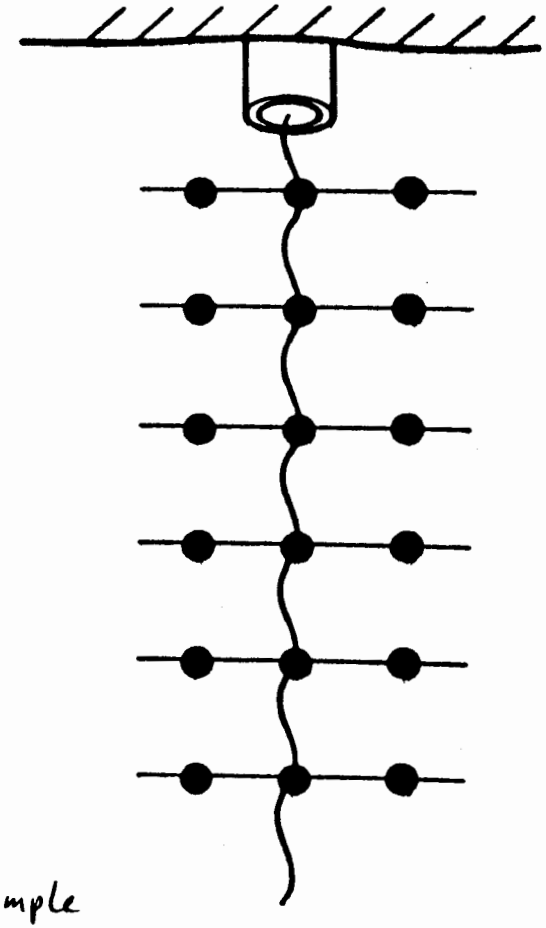
## PERIMETER SAMPLING



- Assumed for sites where the planned remedial action is in-place stabilization
- Sampling points placed at ~~50?~~ 100-ft spacing around perimeter of area
- Sampling points in unit as appropriate
- ~~Alternate vertical and slant-drilled sampling points to sample directly below unit~~
- Sample at 10 ft intervals from surface to total depth
- Total depth of sampling points based on waste form, geology, hydrology, and period of use
- Screening as appropriate
- 30% contingency
  - uncertainties relative to migration in vadose zone
  - uncertainties relative to perimeter spacing



# COST ESTIMATING ASSUMPTIONS
## OUTFALL AREAS



- **Sample on transects across outfall area**
- **Transects spaced ~~50~~ 200-ft apart along length of outfall to a maximum of 1,000 ft**
- **3 Sampling points per transect**
- ~~**3 Depths per sampling point: surface, 12 inches, 36 inches**~~
- Phase 1 sampling: composite samples from 3 sampling points across transect as follows:
  - Surface to 12 inches
  - 12 to 24 inches
  - 24 to 36 inches
  - Collect one discrete sample at each depth for VOC analysis

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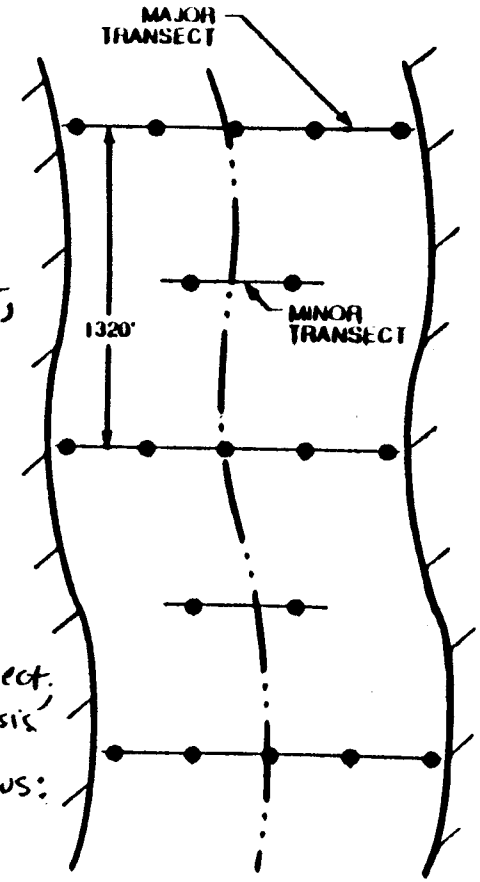
- Phase 2 sampling: one sample point on ~~each~~ per transect; 3 sample depths: surface, 12 inches, 36 inches
- ~~10~~ 30% contingency for uncertainties relative to transect spacing

~~Reser~~ Reservations on this!! (Most Important)

# COST ESTIMATING ASSUMPTIONS
# CANYONS




- **Sample on "Major" and "Minor" transects across the canyon**

  **"Major" transects located every 1,320 ft along the length of the canyon**
  - Phase 1 sampling: 1 vertical and 1 horizontal composite sample at each transect, 30% additional samples for VOC analysis
    - **Average 5 ~~samples~~ sampling points per transect**
    - **Minimum of 2 ~~samples~~ sampling points on any transect**
  - Phase 2 sampling: 2 sampling points per transect, sample at depth as follows:
    - **5-ft intervals from surface to 30 ft**
    - **10-ft intervals from 30 ft to total depth**

  **"Minor" transects located midway between "Major" transects**
  - Phase 1 sampling: 1 vertical and 1 horizontal composite sample at each transect, 30% additional samples for VOC analysis
    - **2 ~~Samples~~ sampling points per transect**
  - Phase 2 sampling: 1 sampling point per transect, sample at depth as follows:
    - **5-ft intervals from surface to 30 ft**
    - **10-ft intervals from 30 ft to total depth**

- **Total depth of sampling points based on average depth of alluvium in the canyon**

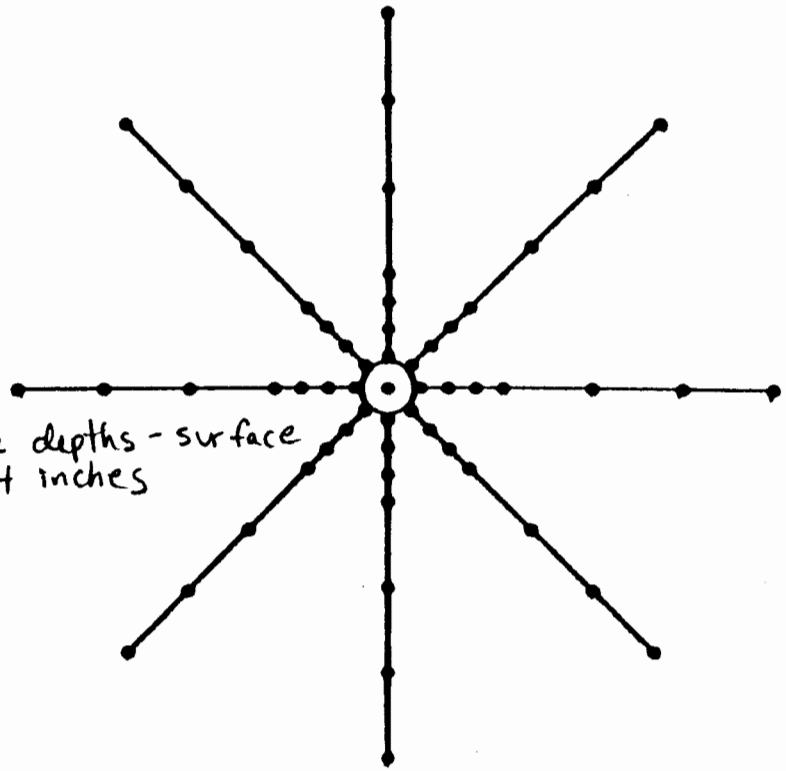
- Screening if appropriate
- 20% contingency

- uncertainties relative to composite sampling
- uncertainties relative to transect spacing

# COST ESTIMATING ASSUMPTIONS

## FIRING SITES

- **Sample on 8 lines radiating from site**
- **Length of lines estimated based on:**
  - **Historic shot sizes**
  - **Field investigation data**
  - **Configuration of site (open or contained)**
- **Sampling point spacing increases away from site center as follows:**
  - **50-ft spacing from site center to ~~200~~ 200 ft**; 2 sample depths - surface and 24 inches
  - **100-ft spacing from ~~200~~ 200 ft to end of line**;
  - 1 sample from the surface-to-1 ft interval
  - ~~**2 Sample depths: surface and 1 ft**~~
- **1 Sampling point in center of site**
- Screening as appropriate ?
- 10% contingency for uncertainty in spacing and sampling depth



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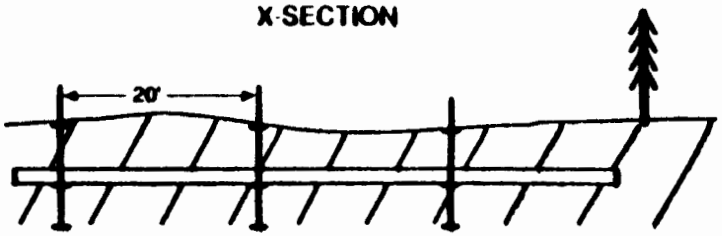
# COST ESTIMATING ASSUMPTIONS

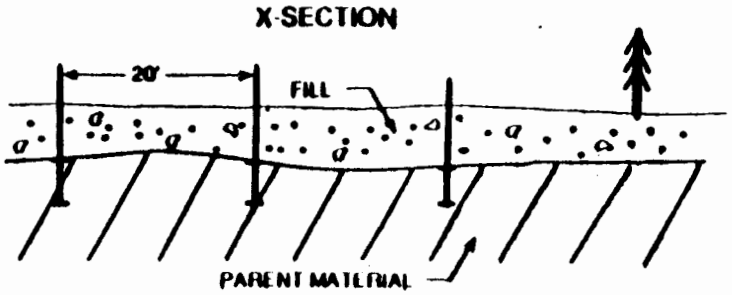
## DRAINLINES

- ~~Sampling points located 20 ft apart along the drainlines~~




IN-PLACE DRAINLINES

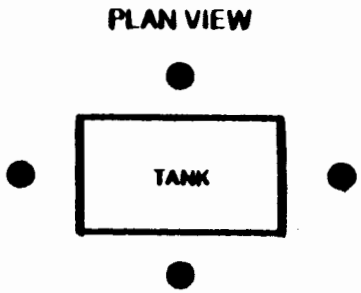
- **In-place drainlines**
  - ~~3 Sample depths based on depth of drainline~~
  - Clean-up at the time of removal; verification sampling prior to backfilling excavation; no cost estimate for RFI/CMS
- **Decommissioned drainlines**
  - **1 Sample depth at interface of fill and parent material**
  - Sampling point spacing as follows:
    - * 50-ft outside LANL boundaries (townsite areas)
    - * 100-ft within LANL boundaries
  - 30% contingency for spacing uncertainties
- Screening as appropriate

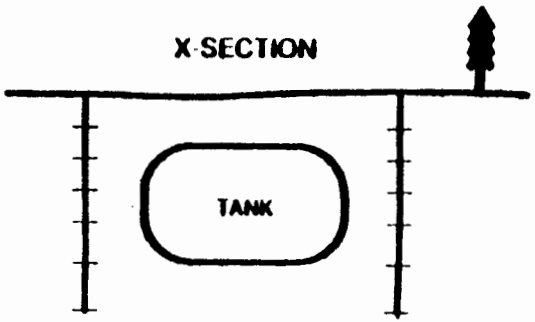



DECOMMISSIONED DRAINLINES

# COST ESTIMATING ASSUMPTIONS
# DISCRETE UNITS

- **Assumed for discrete underground structures such as tanks, sumps, and pits**
- **Sampling points placed adjacent to all sides of the structure**
- **Sample from surface to total depth as follows:**
  - **5-ft intervals from surface to 30 ft**
  - **10-ft intervals from 30 ft to total depth**
- **Total depth of sampling points based on waste form, geology, hydrology, and period of use**




- Groups of discrete units (e.g. tank farm) will be sampled around the perimeter of the group of structures at 20-ft spacing
- Screening as appropriate
- 10% contingency for uncertainties relative to migration in vadose zone

TOTAL PROGRAM CONTINGENCY

FOR NEW SITES

20%

~~10~~%

LANL ER COST VALIDATION REVIEW
JUNE 27, 1990

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