SDMS Document ID
2007051

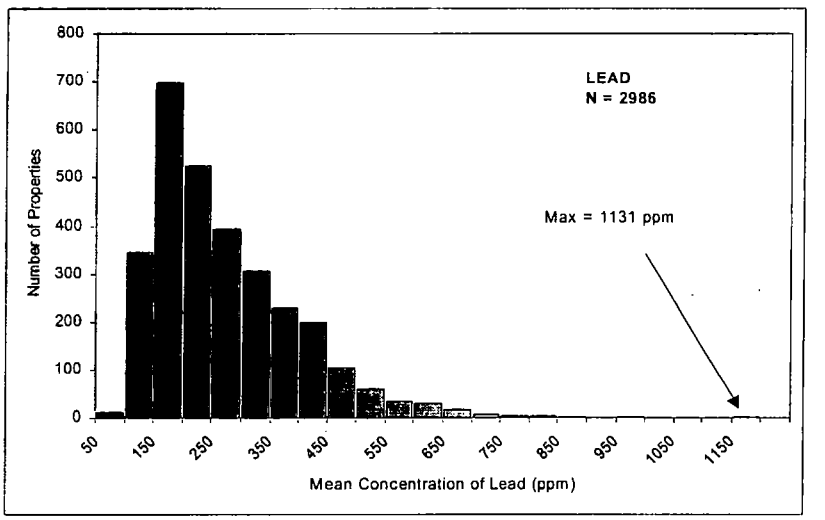
VBI70 WORKING GROUP

DRAFT FINAL
RISK ASSESSMENT RESULTS

03/29/01

EXPOSURE AND RISK FROM LEAD

DISTRIBUTION OF PROPERTY MEAN LEAD VALUES IN PHASE 3 SOILS



Site Specific Relationship Between Outdoor Soil and Indoor Dust

- Lead: Dust = 0.33 Soil + 150

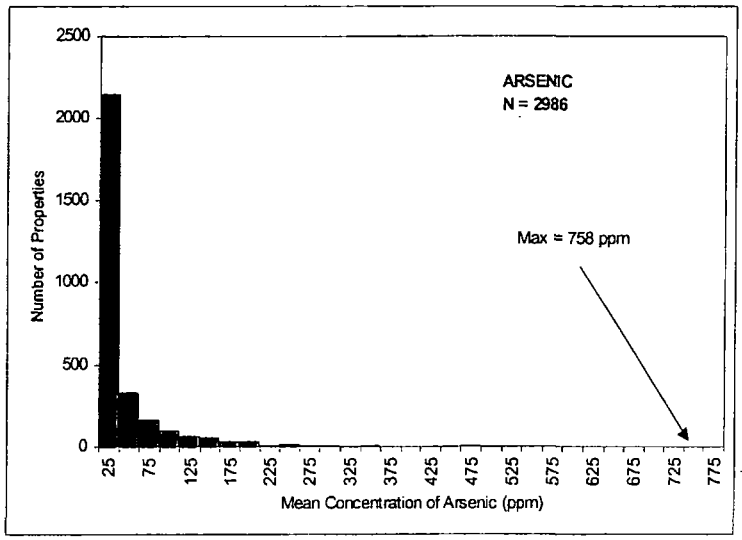
Main Changes

- Site-specific RBA = 0.84
  (Default = 0.6)
- Site-specific GSD not available

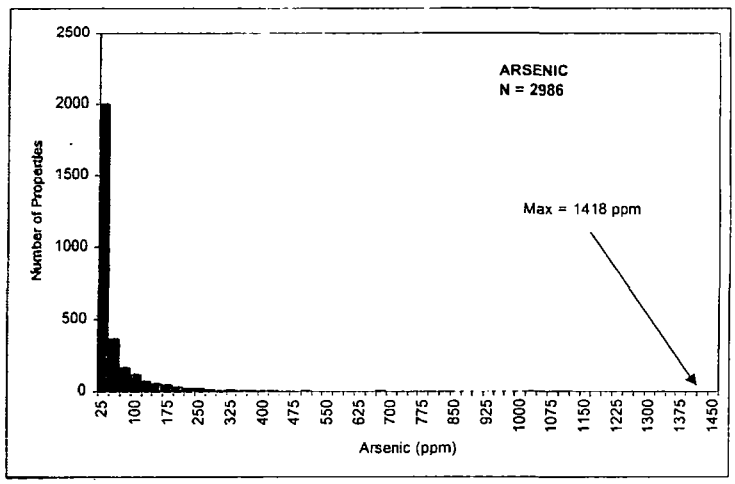
RISKS FROM ARSENIC

- Cancer Risk from Chronic Exposure
  1. Soil plus Dust
  2. Garden vegetables
  3. Total Risk
- Non-cancer Risk from Short-term Exposure to Soil

DISTRIBUTION OF PROPERTY MEAN ARSENIC VALUES IN PHASE 3 SOILS



DISTRIBUTION OF PROPERTY ARSENIC EXPOSURE POINT CONCENTRATIONS (EPCs) IN PHASE 3 SOILS



CANCER RISKS FROM SOIL INGESTION

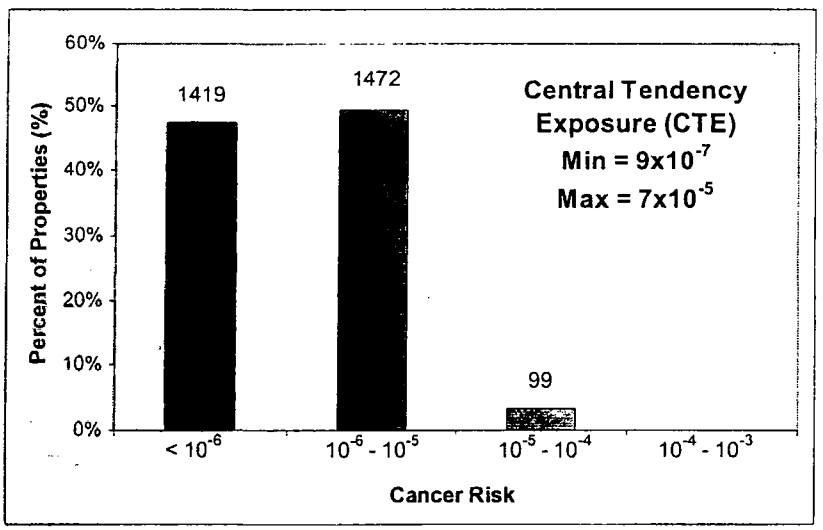
REVISED RBA DATA FOR ARSENIC

Test material	OLD	NEW
TM-1	0.37	0.35
TM-2	0.43	0.45
TM-3	0.37	0.36
TM-4	0.58	0.21
TM-5	0.18	0.18
Mean	0.39	0.31
95% UCL	0.52	0.42

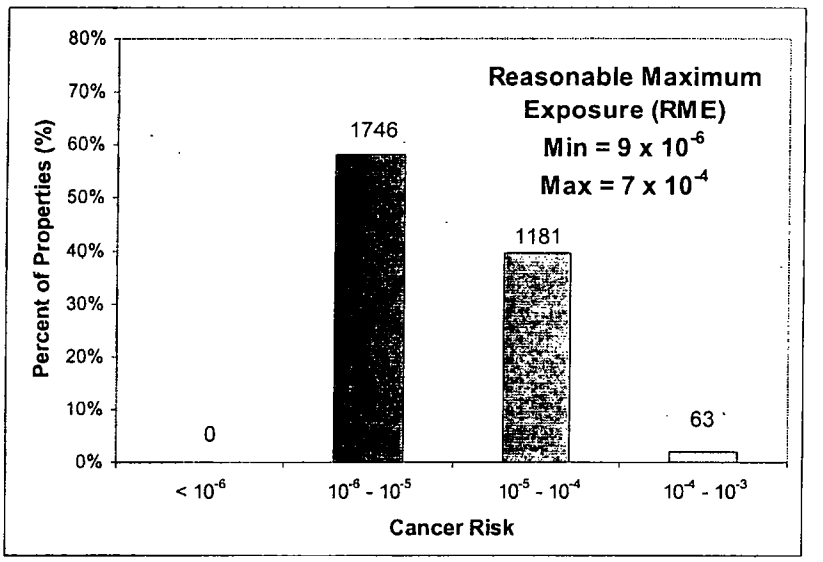
Site Specific Relationship Between Outdoor Soil and Indoor Dust

- Arsenic: Dust = 0.06 Soil + 11

CANCER RISKS FROM CHRONIC ARSENIC EXPOSURE



CANCER RISKS FROM CHRONIC ARSENIC EXPOSURE



CANCER RISK FROM GARDEN VEGETABLES

REVISIONS IN RISK ESTIMATION METHOD

- Adjust for fraction of total arsenic that is inorganic

  C(inorganic) = C(total) * 0.6

- Adjust for preparation loss

  IR(adjusted) = IR(raw) * 0.84

REVISED RISK ESTIMATES FOR GARDEN VEGETABLES FROM 19 SAMPLED PROPERTIES

Property Number	Neighborhood	DF	EPC (based on inorganic arsenic) (a)	Chronic Noncancer Risk		Lifetime Cancer Risk	
				CTE	RME	CTE	RME
1	CLAYTON	1/10	3.2E-03	4E-03	4E-02	2E-07	8E-06
2	CLAYTON	0/1	2.5E-03	3E-03	3E-02	2E-07	7E-06
3	CLAYTON	0/1	2.6E-02	4E-02	4E-01	2E-06	7E-05
4	CLAYTON	3/6	3.3E-02	4E-02	5E-01	3E-06	9E-05
5	CLAYTON	1/2	1.2E-02	2E-02	2E-01	9E-07	3E-05
6	CLAYTON	12/12	3.3E-01	4E-01	5E+00	3E-05	9E-04
		11/11 (b)	1.3E-01	2E-01	2E+00	1E-05	3E-04
7	CLAYTON	0/2	9.6E-03	1E-02	1E-01	7E-07	3E-05
8	COLE	1/2	4.0E-02	5E-02	6E-01	3E-06	1E-04
9	COLE	1/2	1.1E-03	1E-03	1E-02	8E-08	3E-06
10	COLE	1/1	1.2E-03	2E-03	2E-02	9E-08	3E-06
11	COLE	4/6	1.2E-01	2E-01	2E+00	1E-05	3E-04
12	COLE	4/4	4.4E-02	6E-02	6E-01	3E-06	1E-04
13	COLE	3/9	2.0E-02	3E-02	3E-01	2E-06	5E-05
14	COLE	3/3	1.2E-02	2E-02	2E-01	9E-07	3E-05
15	COLE	0/4	1.9E-02	3E-02	3E-01	1E-06	5E-05
16	COLE	1/1	1.2E-02	2E-02	2E-01	9E-07	3E-05
17	SWANSEA/ELYRIA	0/2	2.0E-03	3E-03	3E-02	2E-07	5E-06
18	SWANSEA/ELYRIA	1/1	8.7E-04	1E-03	1E-02	7E-08	2E-06
19	SWANSEA/ELYRIA	1/3	2.9E-03	4E-03	4E-02	2E-07	8E-06

Combining Risks from Garden Vegetables and Soil

APPROACH

Perform calculations at all 2986 properties

Use site-specific data (concentration in yard soil) to estimate concentrations in garden soil and in garden vegetables

Site-Specific Relationships

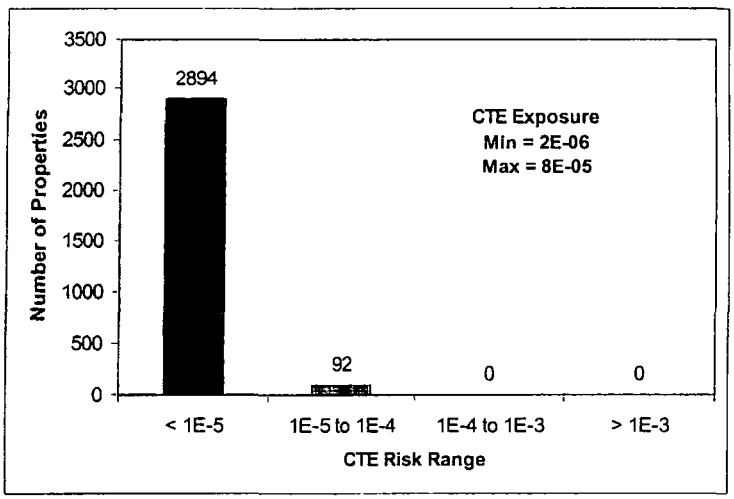
- Garden soil-Garden Vegetable Relationship

  C(veg) = C(veg)0 + Ksv*C(garden)

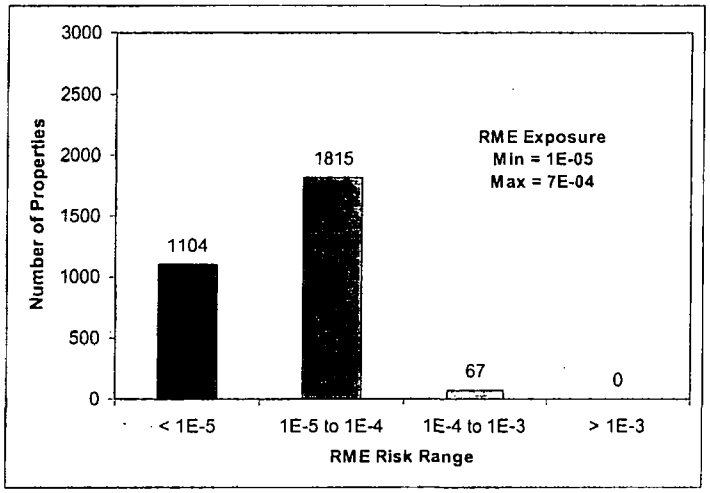
- Yard Soil-Garden Soil Relationship

  C(garden) = C(garden(0) + Ksg*C(yard soil)

CTE TOTAL CANCER RISKS FROM ARSENIC IN SOIL AND VEGETABLES



RME TOTAL CANCER RISKS FROM ARSENIC IN SOIL AND VEGETABLES



EVALUATION OF SHORT-TERM NONCANCER RISK

EVALUATION OF SHORT-TERM NONCANCER RISKS TO RESIDENTS FROM ARSENIC IN SOIL

Sub-chronic	(e.g., several months to several years)
Sub-acute	(e.g., several weeks)
Acute	(e.g., 1-2 doses)
Acute-Pica	(1 dose, high soil intake)

HQ = Site Dose compared to Safe Dose (RfD)
Site Dose = C * IR/BW *RBA
Safe Dose = RfD

Parameter	Case 1	Case 2
BW (kg)	12.3	12.3
IR (grams)	10	5
RfD (mg/kg-d)	0.005	0.015
RBA	0.4	0.4

NOTE: The concentration term is the maximum in the yard, not the mean or UCL

CALCULATION OF MTHC

MTHC = "MAXIMUM THEORETICAL HOTSPOT CONCENTRATION"

Each Phase 3 sample is a 10-point composite

Worst Case Scenario:

9 samples at background are mixed with one sample from a hotspot

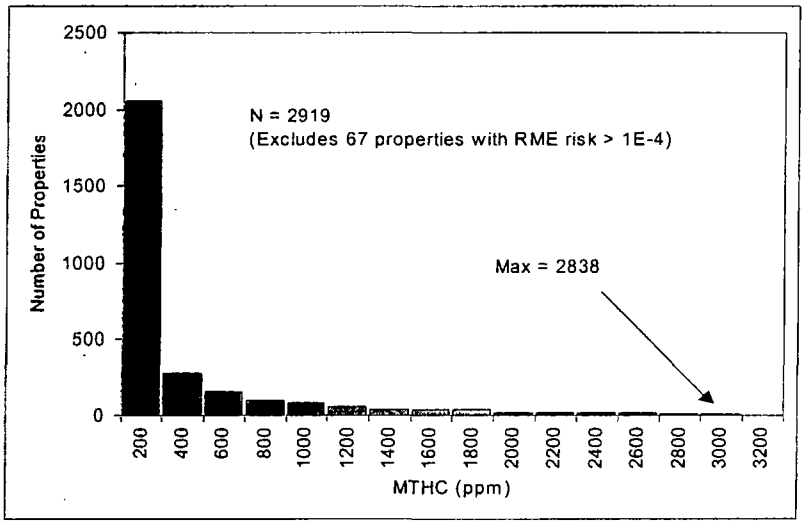
Then

Composite = (9*Background + 1*Hot spot) / 10

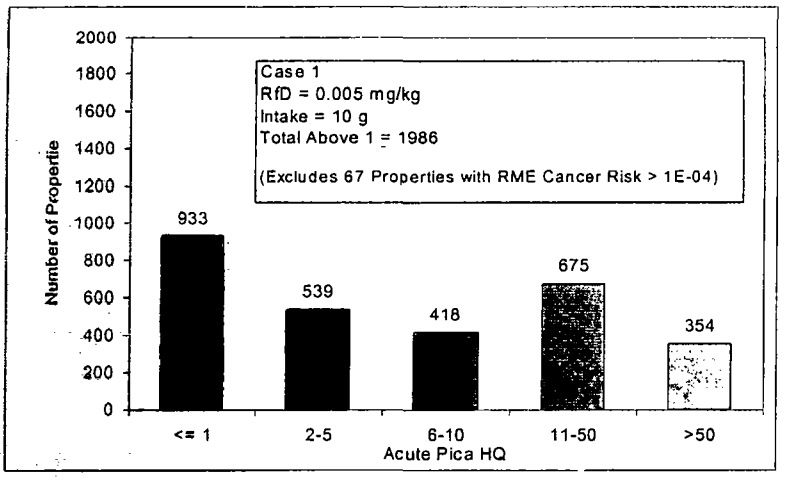
Thus, the MTHC is:

MTHC = 10*Composite - 9*Background

DISTRIBUTION OF ARSENIC MTHC VALUES



ACUTE ARSENIC NON-CANCER RISKS FROM SOIL PICA BEHAVIOR



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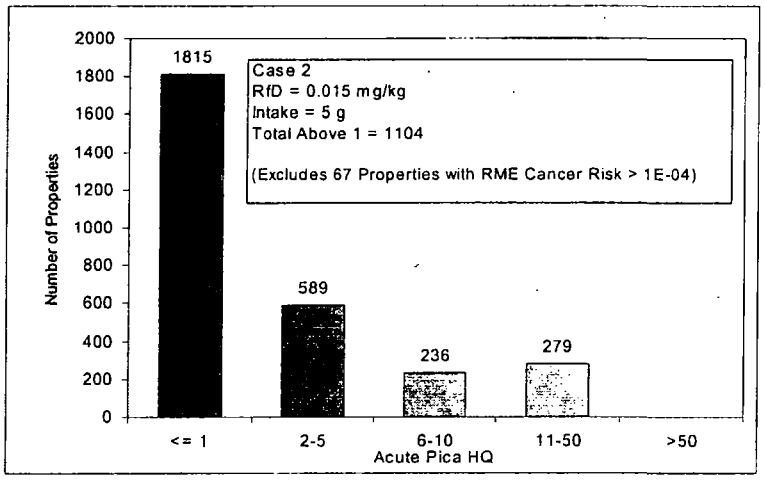

Physicochemical Soil Characterization Study Objectives

- Develop a method to characterize the physical and chemical attributes of residential and candidate source soils/materials.
- Use this method as a weight-of-evidence approach to establish a fingerprint for investigative soils.

Proposed Analytical Measurements

- Physical Characteristics
  - Bulk Soil Characterization
  - Presence of Perlite
- Chemical Characteristics
  - Metals (23 metals)
  - Geochemical Speciation (Arsenic, Lead, Trace Metals)
  - Stable Lead Isotope Ratios
  - *In Vitro* Bioaccessibility

Soil Comparisons

- Compare "High *Adjacent*", "Intermediate *Adjacent*", and "Low *Adjacent*"
- Compare "High *Focal*" to "High *Adj*"; "Intermediate *Focal*" to "Intermediate *Adj*"; and "Low *Focal*" to "Low *Adj*"
- Compare "High *Focal*" to "Intermediate *Focal*" and "Low *Focal*"

Data Use and Interpretation

- Compare the "fingerprint" developed for each characterization parameter to assess its diagnostic value.
- Using the appropriate combination of parameters, define a "handprint" that characterizes residential yard soils and potential source materials.
- Use the "handprints" to attribute source(s) responsible for contamination at the VBI70 site.