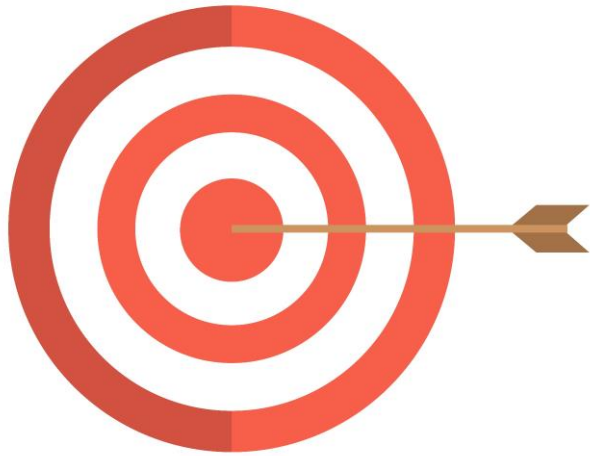




Soil sampling for PCB screening



The main goal is to get representative samples of soil for the assessment of PCB contamination.



One soil sample should be approximately 500 g.



Definition of composite sampling:

“A technique that combines a number of discrete subsamples collected from a body of material into a single homogenised sample for the purpose of analysis. The objective of composite soil sampling is to represent the average conditions in the sampled body of material.”



Composite methodology

- Discrete subsamples must be of equal size, from immediately adjacent sampling points, evenly spaced, and composited laterally.
- Lines connecting the discrete subsampling locations must not intersect with those of other composites. Each composite area must be of similar size and shape, except where not geographically possible.
- A maximum of four discrete constituents should be included in a composite sample.
- Each discrete subsample must be thoroughly homogenised in the laboratory, rather than in the field before drawing the composite.
- Each discrete subsample must contribute an equal amount of material to the composite.



Soil/fill type

- Discrete subsamples that are to be composited must be collected from the same soil horizon and depth interval.
- Discrete subsamples must be of similar characteristics, for example particle size and soil type, and from fill of similar origins.



For the collection of subsamples plastic bags can be used and then combined into a composite sample in a glass vial to get the final sample (200 – 250 mL).



Digging Tools (commonly choose 1 or 2)

1. Bucket Auger
2. Sharp Shooter
3. Montana Sharp Shooter (for rocky soils)
4. Tile Spade (only for well cultivated or loose material)
5. Spade (standard shovel)
6. Push Probe (e.g., Backsaver®, Oakfield®)—include a clean-out tool
7. Pulaski

| Digging Tools/Shovel Types | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| Pulaski | Standard shovel | Tile spade | Sharp-shooter | Montana sharp-shooter |
| | | (all steel) | | |
| <i>Primary use:</i> | <i>most materials</i> | <i>loose material</i> | <i>most materials</i> | <i>rocky soil</i> |



Sampling materials and tools

1. Camera
2. Sample bags (for grab samples)
3. Soil Description Sheet (indicate the use of the soil)
4. Sticky labels
5. Permanent marker
6. Scotch tape
7. Pens



Site location

1. Field Note Book
2. GPS Unit



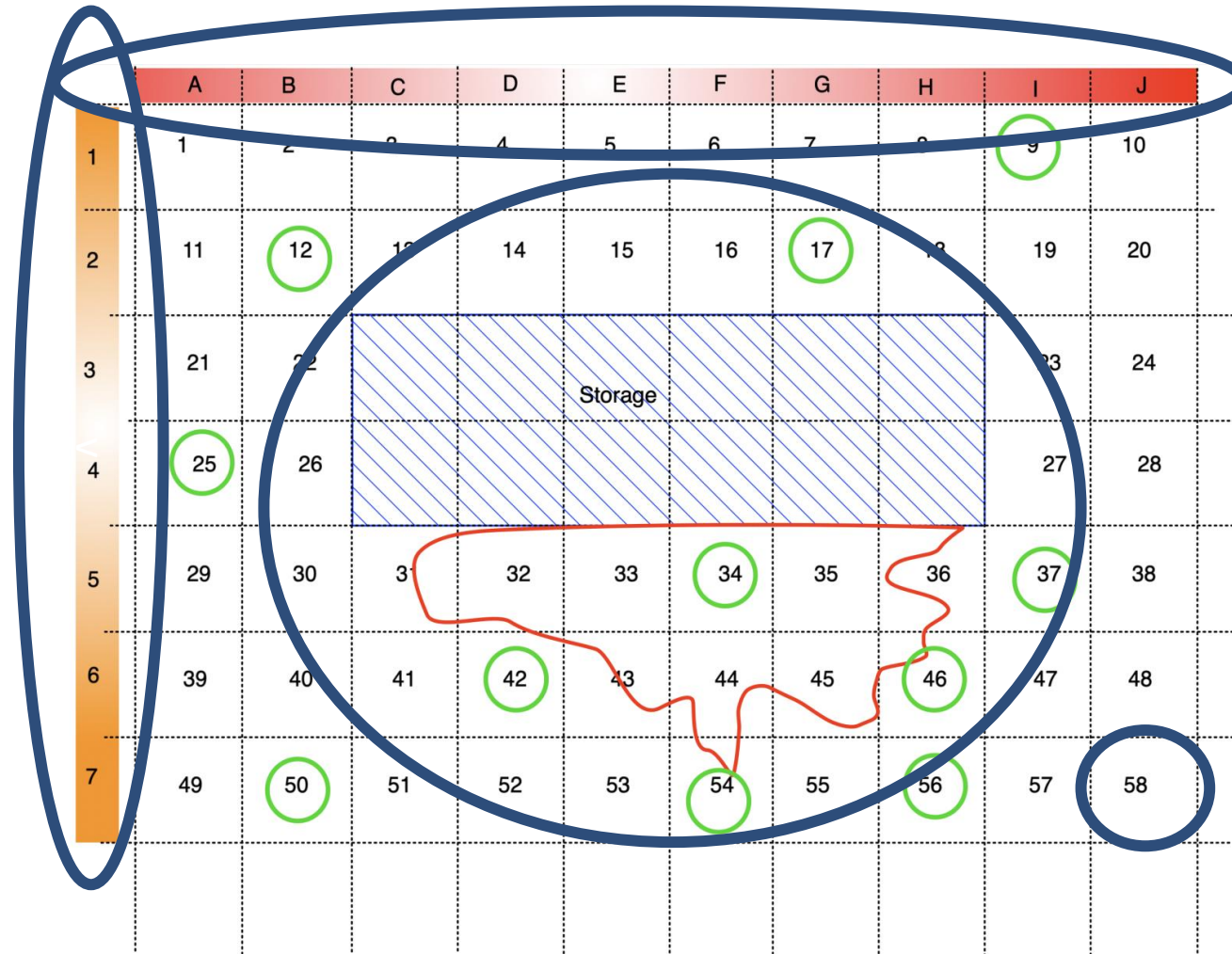
Personal Protective Equipment

1. Small First Aid Kit
2. Leather and nitril gloves
3. Sunglasses
4. Sunscreen
5. Hat



Sampling grid

- Using a floor plan of the site to be sampled, draw a 5 × 5 m grid across the entire site. Align, as far as possible, with its property boundaries.
- Assign a number to the rows and a letter to the columns to identify each of the squares on the grid.
- Number the squares consecutively obtaining the total number of grids (TN) that will relate them to their position on the grid.



Sampling grid

- Then, for random selection of the squares to be sampled use the following excel formula:

Excel formula = $\text{TRUNC}((\text{RAND}()) * (\text{TN}-1) + 1), 0)$

- Where TN = The total number of grids.
- In green you can see the randomly selected squares from the formular. These squares are the location to be sampled.
- In this example 11 squares were selected (20% of all squares)

| | A | B | C | D | E | F | G | H | I | J |
|---|----|----|---------|----|----|----|----|----|----|----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 3 | 21 | 22 | Storage | | | | | | 23 | 24 |
| 4 | 25 | 26 | Storage | | | | | | 27 | 28 |
| 5 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| 6 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 7 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 |

How many samples can we extract?

It depends, we know that usually, the contamination with oil with PCB is easily delimited, so the number of samples could be around 20% of the total squares (TN).

In cases of large sites for assessment, the total of samples to extract is determinate by the following table.

For areas over 100 hectare (ha), we can use the following formula:

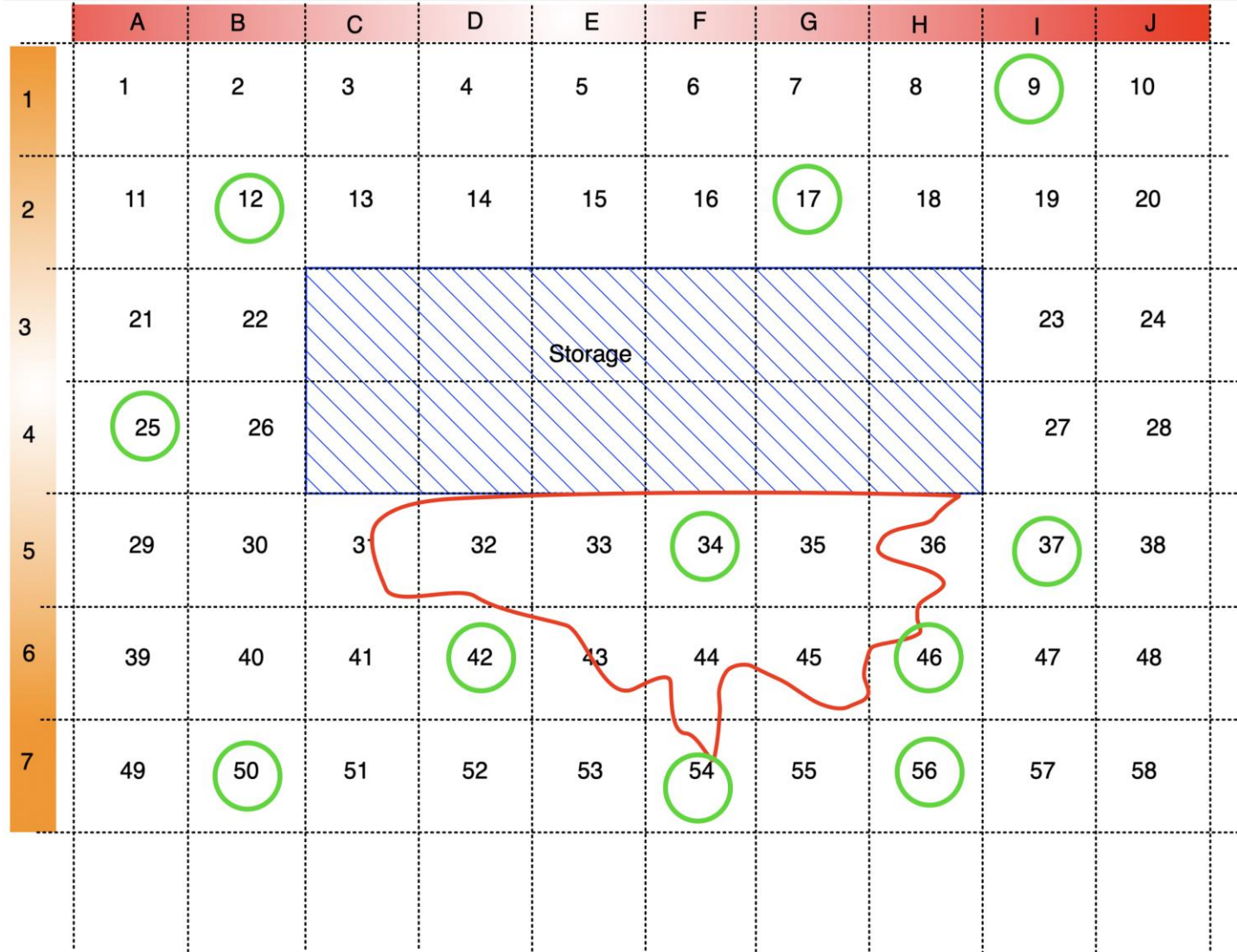
$$N = 0.1 X + 40$$

Where:

X = Surface (ha)

| Area to be assessment (ha) | Number of samples to extract |
|----------------------------|------------------------------|
| 0.1 | 4 |
| 0.5 | 6 |
| 1 | 9 |
| 2 | 15 |
| 3 | 19 |
| 4 | 21 |
| 5 | 23 |
| 10 | 30 |
| 15 | 33 |
| 20 | 36 |
| 25 | 38 |
| 30 | 40 |
| 40 | 42 |
| 50 | 44 |
| 100 | 50 |

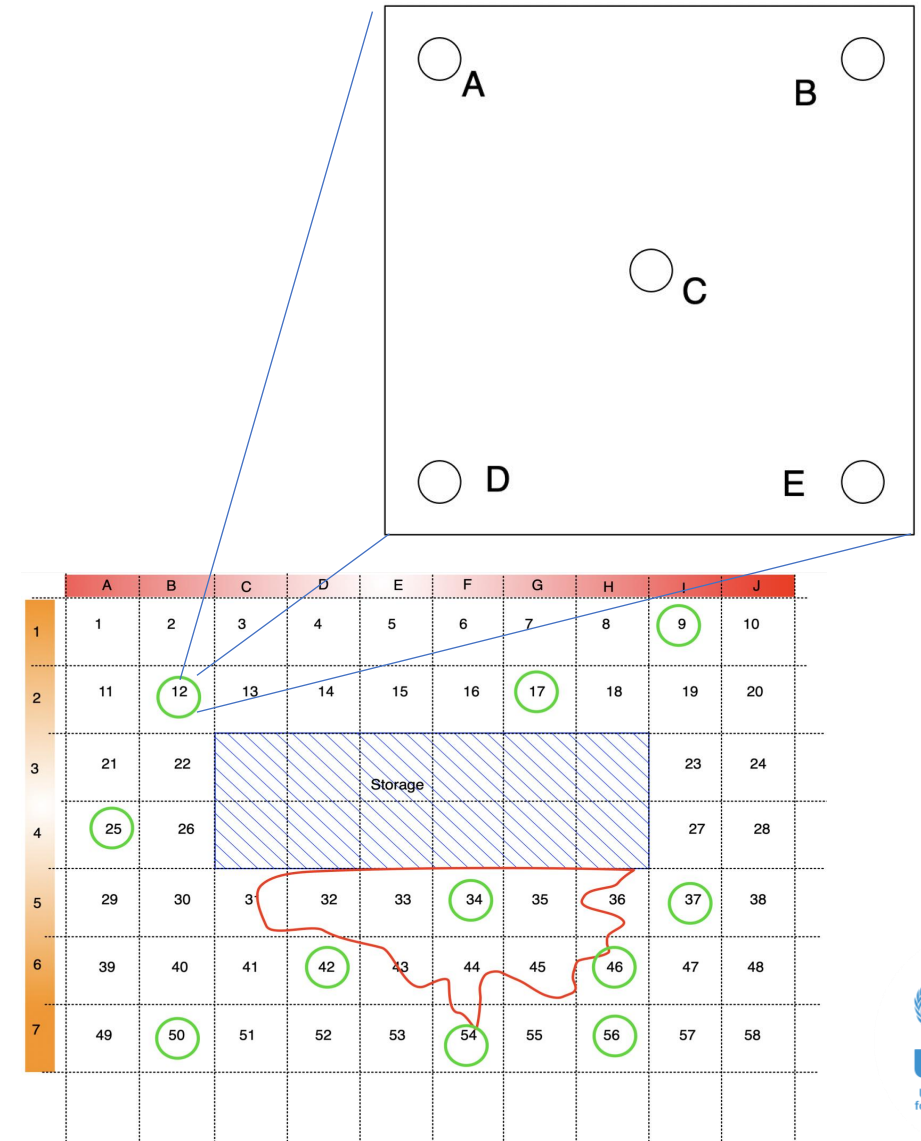
| | |
|----|----|
| I1 | 9 |
| B2 | 12 |
| G2 | 17 |
| A4 | 25 |
| F5 | 34 |
| I5 | 37 |
| D6 | 42 |
| H6 | 46 |
| B7 | 50 |
| F7 | 54 |
| H7 | 56 |



Excel formula = TRUNC ((RAND () * (TN-1) +1), 0)

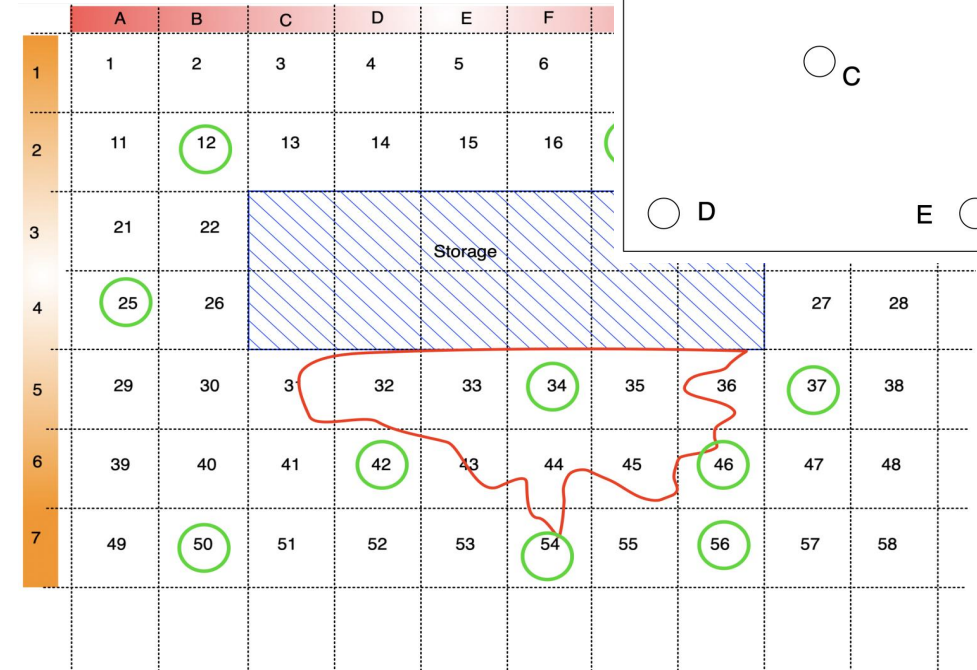
Sample Extraction

- In each selected square (marked in green), we will get 2 composite samples, one at 15 cm soil depth and the other at 30 cm depth.
- For each composite sample 5 subsamples will be collected from the points marked as A, B, C, D, and E.



Sample Extraction

- Finally, we will get two samples from each square.
- 11 squares were selected, therefore in total 22 composite samples from the site will be collected to determine the contamination.
- Each subsample must be thoroughly homogenised
- Each subsample must contribute an equal amount of material to the composite
- The composite samples must collect in a glass vial and correctly labeling.



- To preserve the samples, the containers/glass vials must be properly sealed.
- The use of chemical agents is not necessary to preserve the soil samples.
- For their conservation, it is convenient to keep them cool (4 to 6 ° C) and in dark places.
- The samples must be process within 14 days of sampling.
- Fill the chain of custody form for the traceability of samples



eurolins Spectrum Analytical **CHAIN OF CUSTODY RECORD**

Project No: 3-6 Special Handling: Sample 7-17-18 (Retention Type)

Client: WTC Project No: 2012-055 Date: 9/20/12

Location: WTC Analyst: WTC

| Lab No. | Sample No. | Date | Time | Initials |
|-------------|------------|---------|-------|-------------|
| 2012-055-1 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-2 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-3 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-4 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-5 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-6 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-7 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-8 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-9 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |
| 2012-055-10 | 1-12 COMP | 9/17/12 | 13:00 | [Signature] |

Subscribed By: [Signature] Received By: [Signature] Date: 9/20/12 Time: 9:55 AM

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- Field Book for Describing and Sampling Soils V3.0, National Soil Survey Center Natural Resources Conservation Service U.S. Department of Agriculture, September 2012.
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/research/guide/?cid=nrcs142p2_054184
- Soil Sampling Report Wayland Town Center Municipal Parcel Boston Post Road/Andrew Avenue Wayland, Massachusetts December 8, 2017 – CMG ENVIRONMENTAL, INC.
https://www.wayland.ma.us/sites/g/files/vyhlf4016/f/uploads/soil_sampling_report.pdf
- EPA guideline for composite soil sampling :
https://www.epa.sa.gov.au/files/8370_guide_composite.pdf
- Muestreo y caracterización de un sitio,
<http://www2.inecc.gob.mx/publicaciones2/libros/459/cap3.html>
- Guía para el muestreo de suelos – Ministerio del Ambiente – Peru -
<https://www.minam.gob.pe/calidadambiental/wp-content/uploads/sites/22/2013/10/GUIA-PARA-EL-MUESTREO-DE-SUELOS-final.pdf>



Thank you for your attention !

<https://www.pcb.unitar.org/>

