Arsenic in the South West
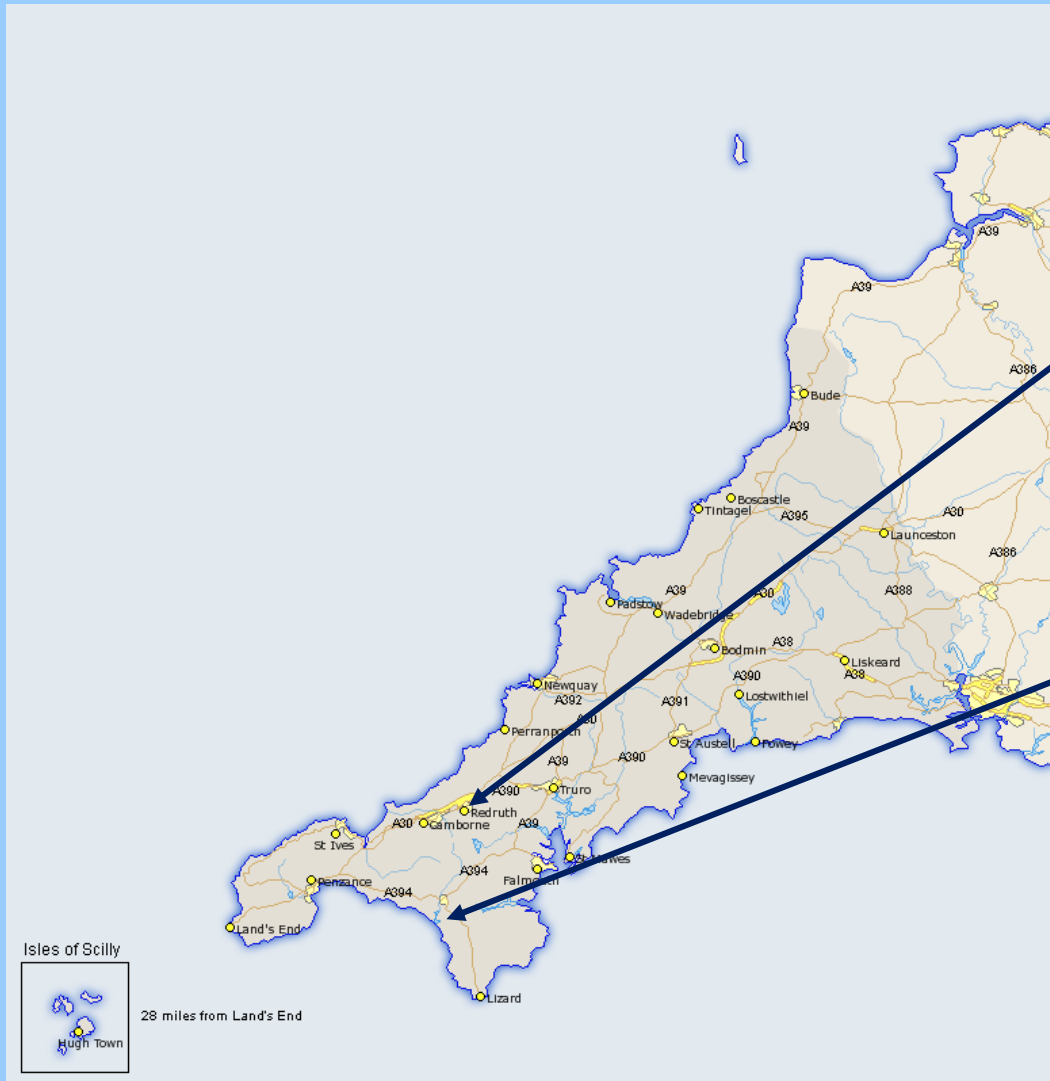
Case Studies

by
Rod Smith (John Grimes Partnership)

Case Studies

Case Study 1 - Sandy Lane, Redruth, Cornwall

Case Study 2 - Helston Urban Extension

Geology Framework of the South West

SWCLF

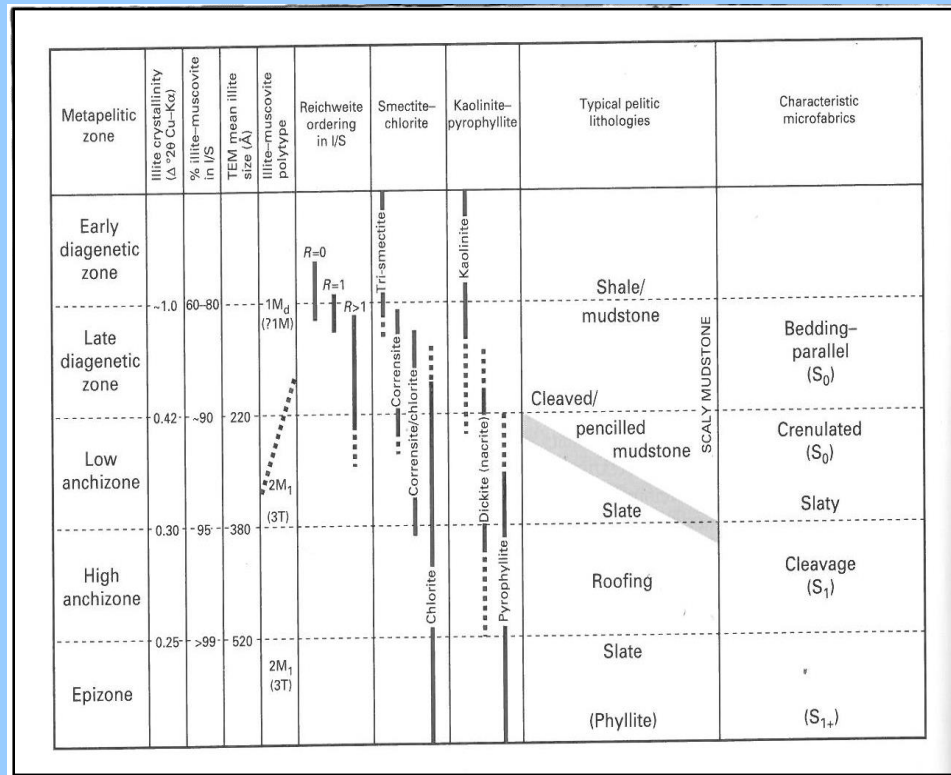**JGP | JOHN GRIMES PARTNERSHIP**

Basin Divisions

(from Leveridge and Hartley 2004)
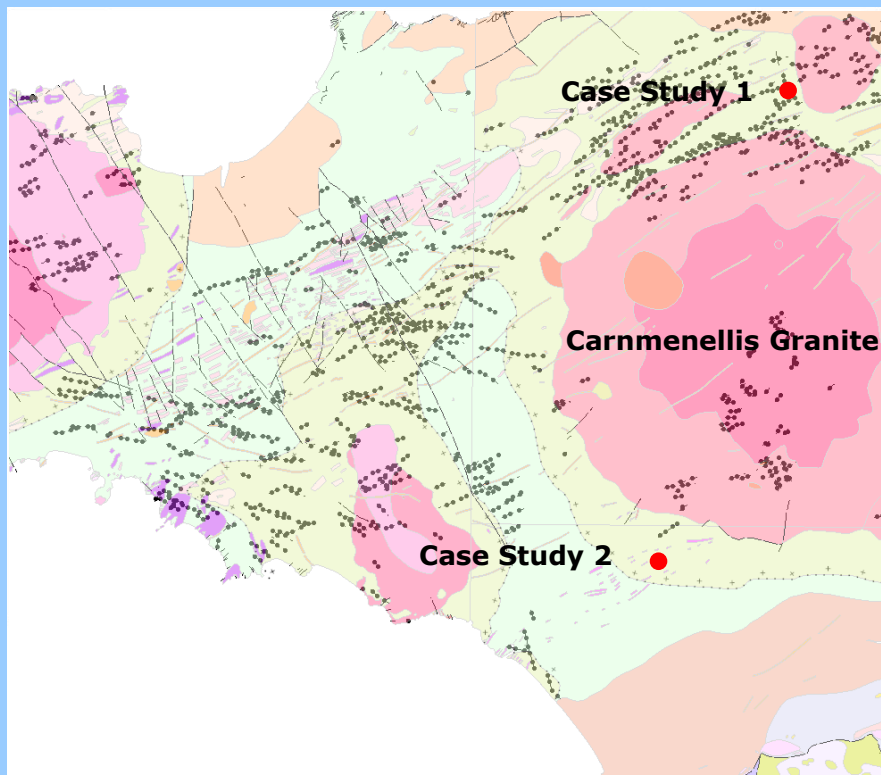
Metamorphic Map of South West
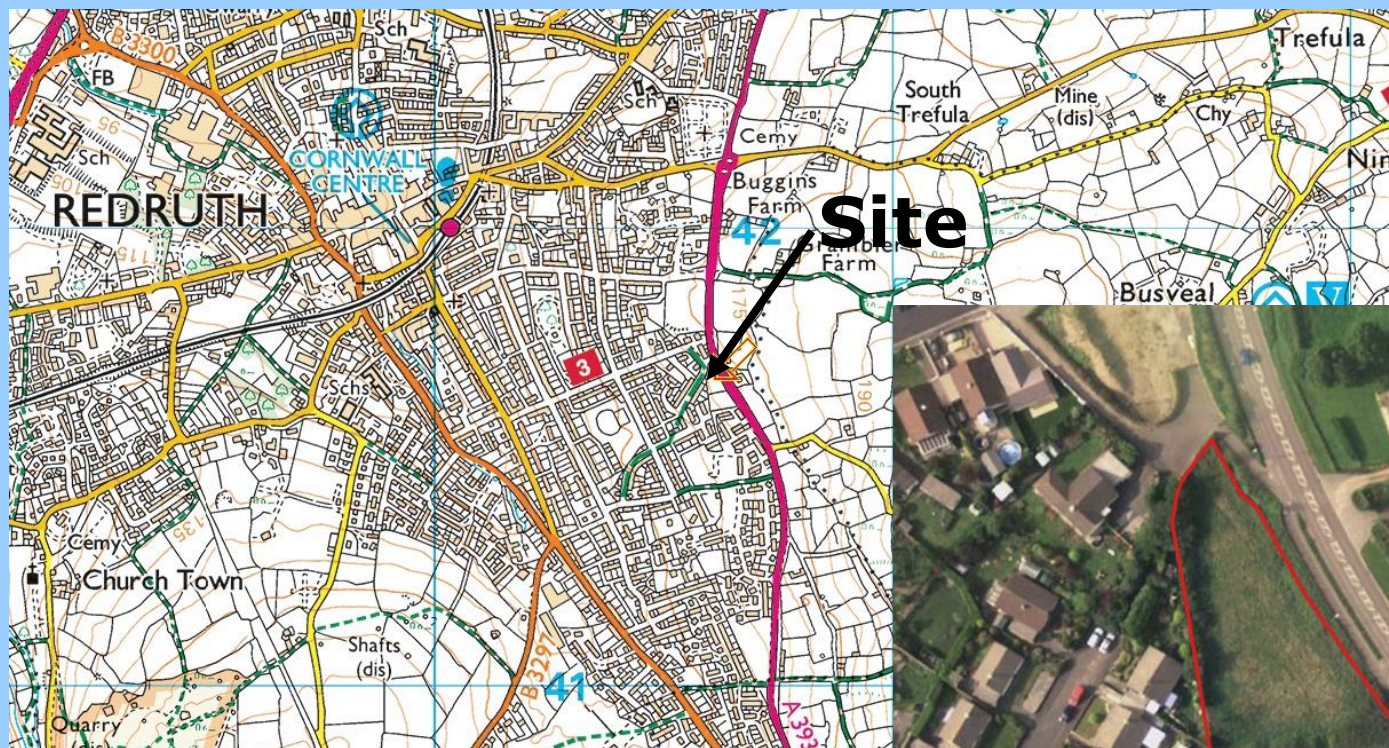
(from Warr 1991)

Case Study 1

Carnmenelliş Granite

Case Study 2

Case Study 1 - Sandy Lane, Redruth, Cornwall

- 0.35ha
- Proposed residential development with gardens
- Geology: Mylor Slate Formation

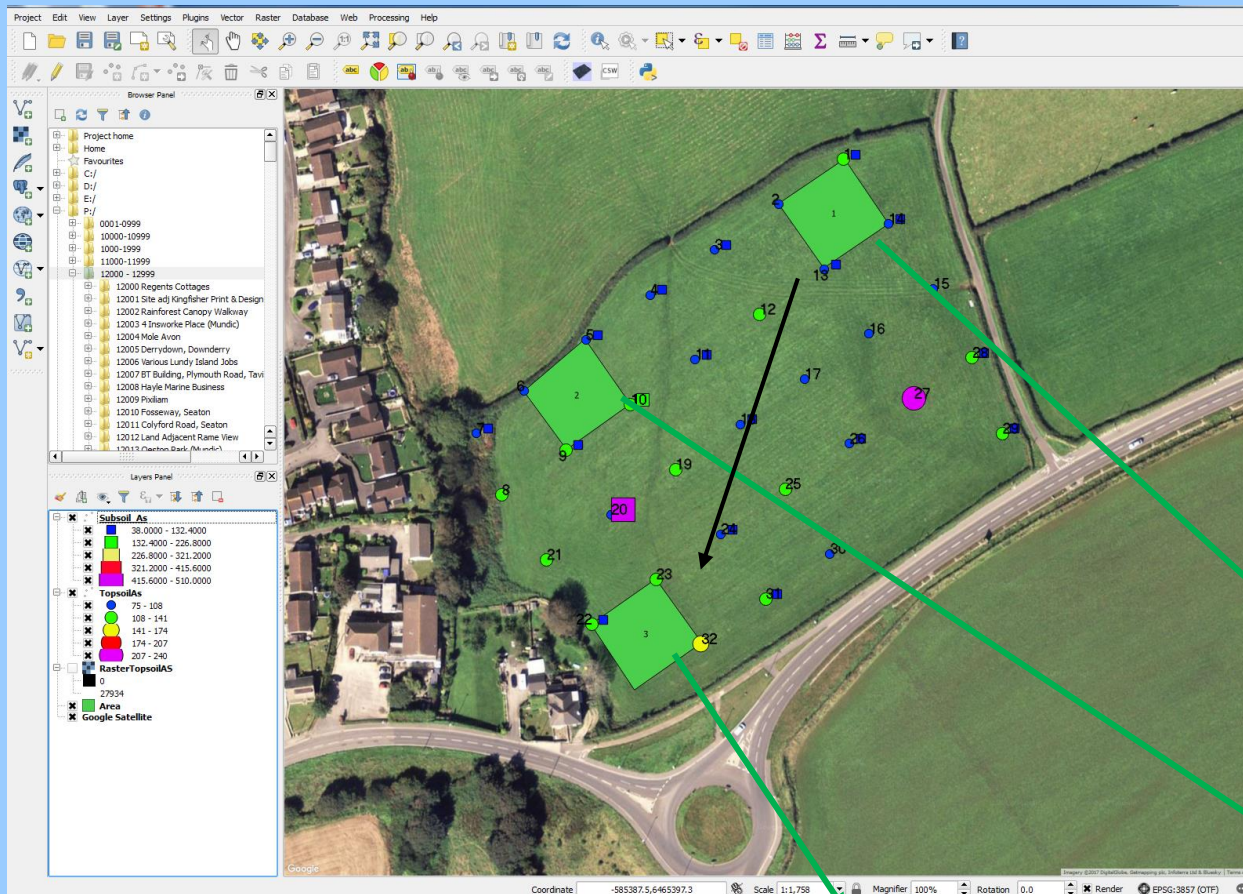# Case Study 2 - Helston Urban Extension, Helston, Cornwall
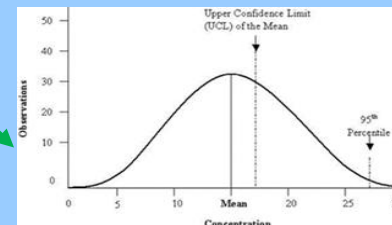
SWCLF

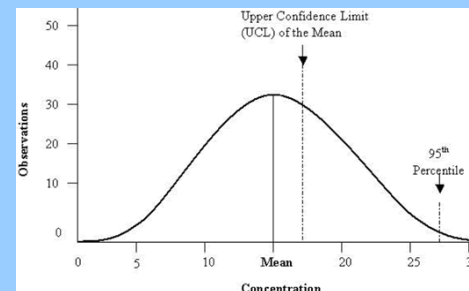JGP | JOHN GRIMES PARTNERSHIP

Site

- **2.67 ha**
- **Proposed mixed development including residential with gardens**
- **Geology – Mylor Slate Formation**

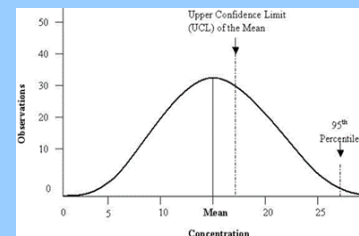# Sampling Strategy –
Example 2 - Helston Urban Village

UCL95 For the site as a whole – 120mg/kg
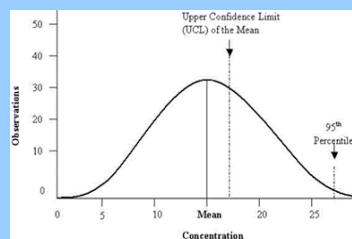
CL:AIRE (2008), Guidance on Comparing Soil Contamination Data with a Critical Concentration

UCL95 -103mg/kg

UCL95 -140mg/kg

UCL95 -128mg/kg

Global Spatial Autocorrelation

Tobler's Law – "Everything is related to everything else, but near things are more related than distant things"

Moran's I Method

Case Study 2 – Helston Urban Extension
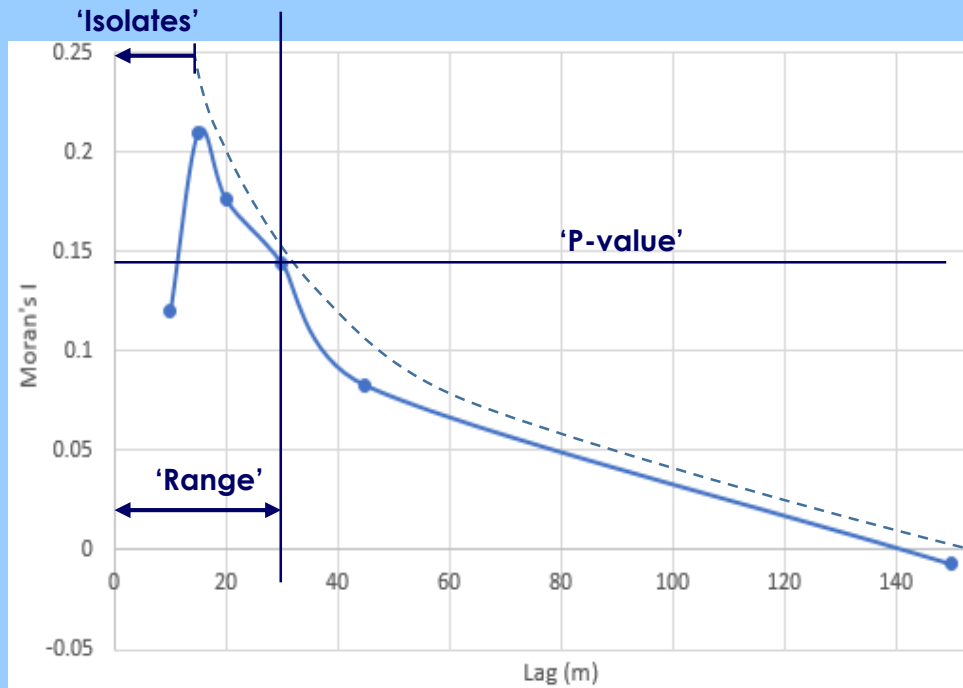
Variogram Method

Case Study 1 – Sandy Lane, Redruth

Local Indicators of Spatial Autocorrection (LISA)

Sampling Strategy – Sandy Lane

Site Sampling

↓

Experimental Variogram
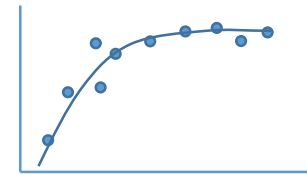
Model Variogram

↓

A kriged contour surface incorporating a prescribed level of uncertainty

Risk Assessment

Exposure Model – CLEA Model

Generic Assessment Criteria:

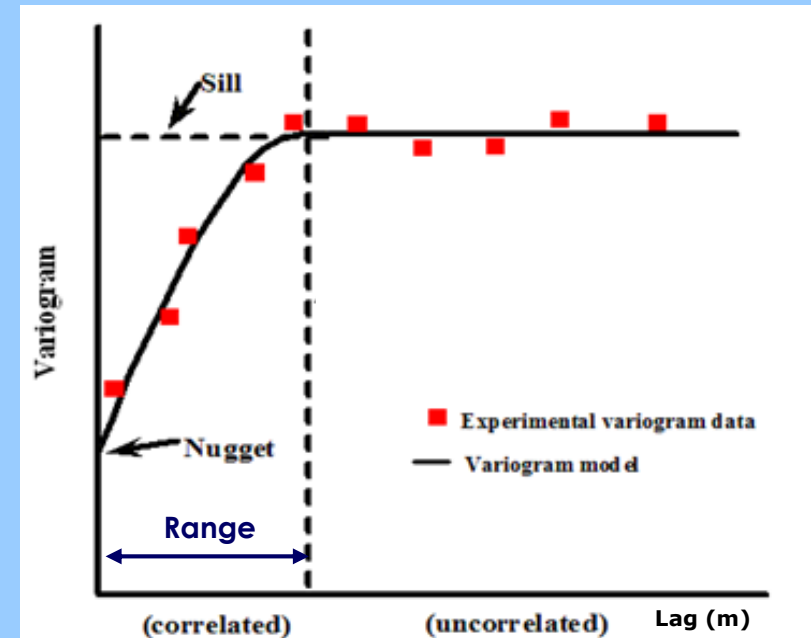- Soil Guideline Values (SGV)

- Category 3 Screening Levels (C4SL)

- Suitable 4 Use Levels (S4UL)

Detailed Quantitative Risk Assessment

- PBET   ⟶

- Soil : Plant Concentration Factor (CF)

- Ruby *et al* Method
- Ruby Modified Fernandez
- Unified Barge Method

Sequential Extraction

Comparison of Sequential Extraction Results Using Wenzel et al (2001)

Case Study 2 – Helston Urban Development

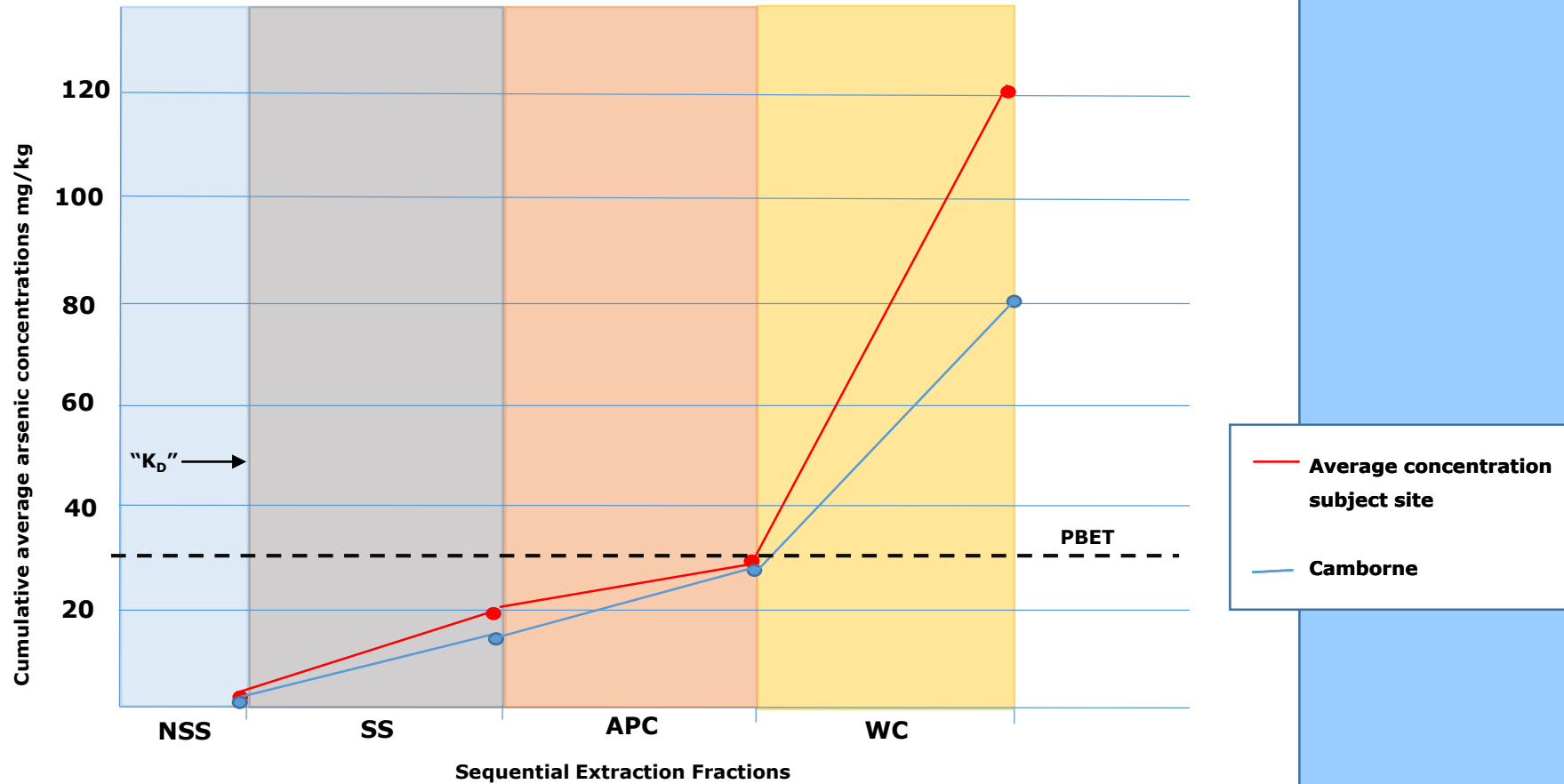# Case Study 2 - Helston Urban Village – Summary of default CF's and CFs derived from regional studies

Produce Type	Default CF recommended by EA in SR2 (2009) [Geometric mean] dry weight/dry weight	Measured CF [Geometric Mean] (*Xu & Thornton*, 1985) dry weight/dry weight	Measured CF (*Warren et al. 2003*) dry weight/dry weight	Measured CF (*JGP*) dry weight/dry weight	Measured CF (AFS Agency *) dry weight/dry weight
Green vegetables	0.00479	**0.00312** (lettuce)	Not measured	Not measured	-
Root vegetables	0.00388	**0.00065** (carrot)	Not measured	Not measured	-
Tuber vegetables	0.00120	Not measured	0.00015 (potato)	0.00017 (potato)	**0.00029 (potato)**
Herbaceous fruit	**0.00345**	Not measured	Not measured	Not measured	-
Shrub fruit	**0.00120**	Not measured	Not measured	Not measured	-
Tree fruit	**0.00701**	Not measured	Not measured	Not measured	-
Cabbage	-	-	-	**-**	0.00017

* Meharg *et al* (2013)Arsenic Speciation and localization in horticultural produce grown in a historically impacted mining region

Sandy Lane, Redruth (Subsoil Summary)

UCL95	109mg/kg
MAV	134mg/kg
SSAC	199mg/kg

Sandy Lane Topsoil UCL95 – 320mg/kg

Helston Urban Village – Topsoil Summary

UCL95	120mg/kg
MAV	140mg/kg
SSAC	149mg/kg

Thank You

Questions?

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