Contaminated Land Management and Risk Assessment

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Land Quality Management Ltd

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Land Quality Management Ltd

Sound Science: Defensible Solutions

CIRIA C733
published March 2014

Asbestos in soil and made ground: a guide to understanding and managing risks

TRAINING
emaq+
CIRIA
Introduction
Advanced
In house
Online

Dose
Response
Roadmaps

CONSULTANCY
Risk assessment & SI
Sustainability assessments
Intelligent client function
Expert witness
Peer review

LQM/CIEH S4ULs
Coming Soon

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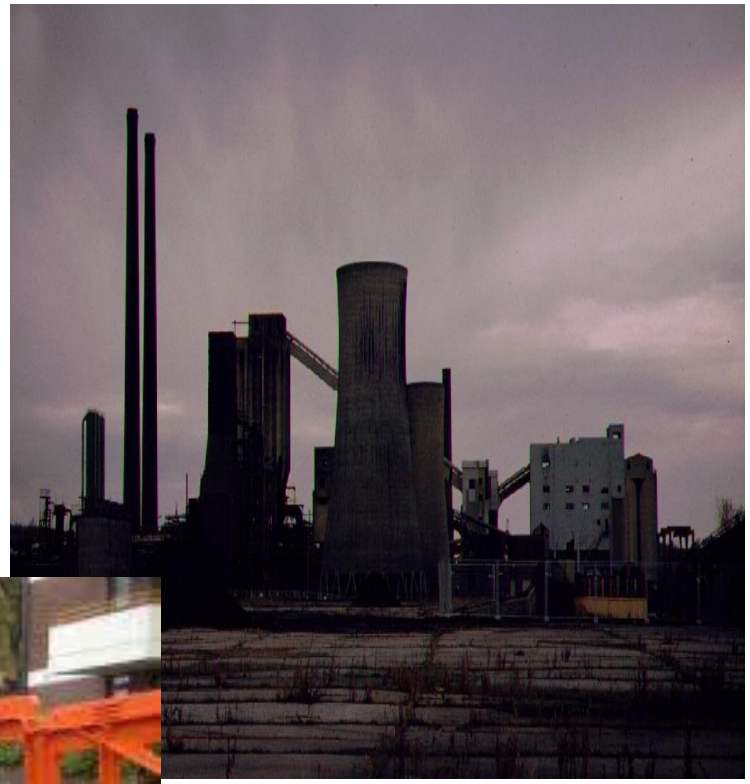
Sound science:
Defensible decisions

What is contaminated land?

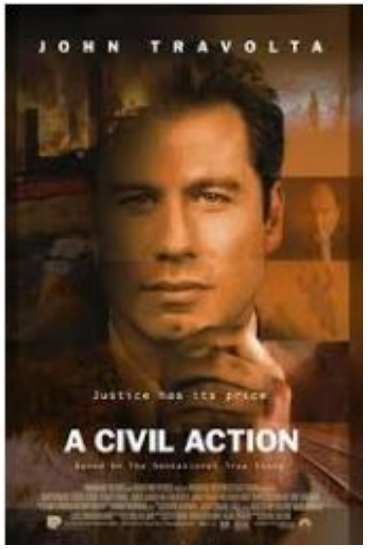
- Legacy from
  - historic industrial operations
  - poor waste management
  - aftermath of accidents
  - consequence of war

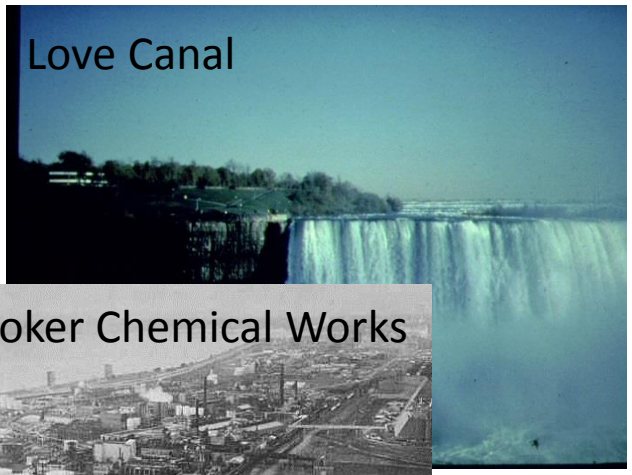


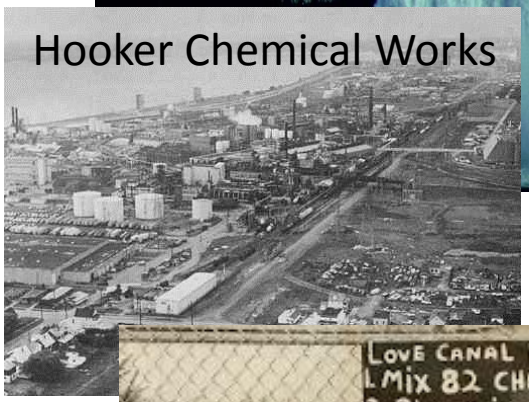
Some classic examples

Sound science: Defensible decisions

Woburn Massachusetts







- PCE in town water supply
  - W R Grace (chemicals)
  - Beatrice (tannery)

River of fire: Chinese waterway becomes so polluted it bursts into flame after lit cigarette is thrown into it

http://www.dailymail.co.uk/news/article-2574714/River-fire-Chinese-waterway-polluted-bursts-flame-lit-cigarette-thrown-it.html

March 2014

Blazing river: A lit cigarette set the water on fire, and flames shot up more than 16ft into the air before it was extinguished by firemen in Wenzhou in eastern China

Cambridge Water versus Eastern Counties Leather

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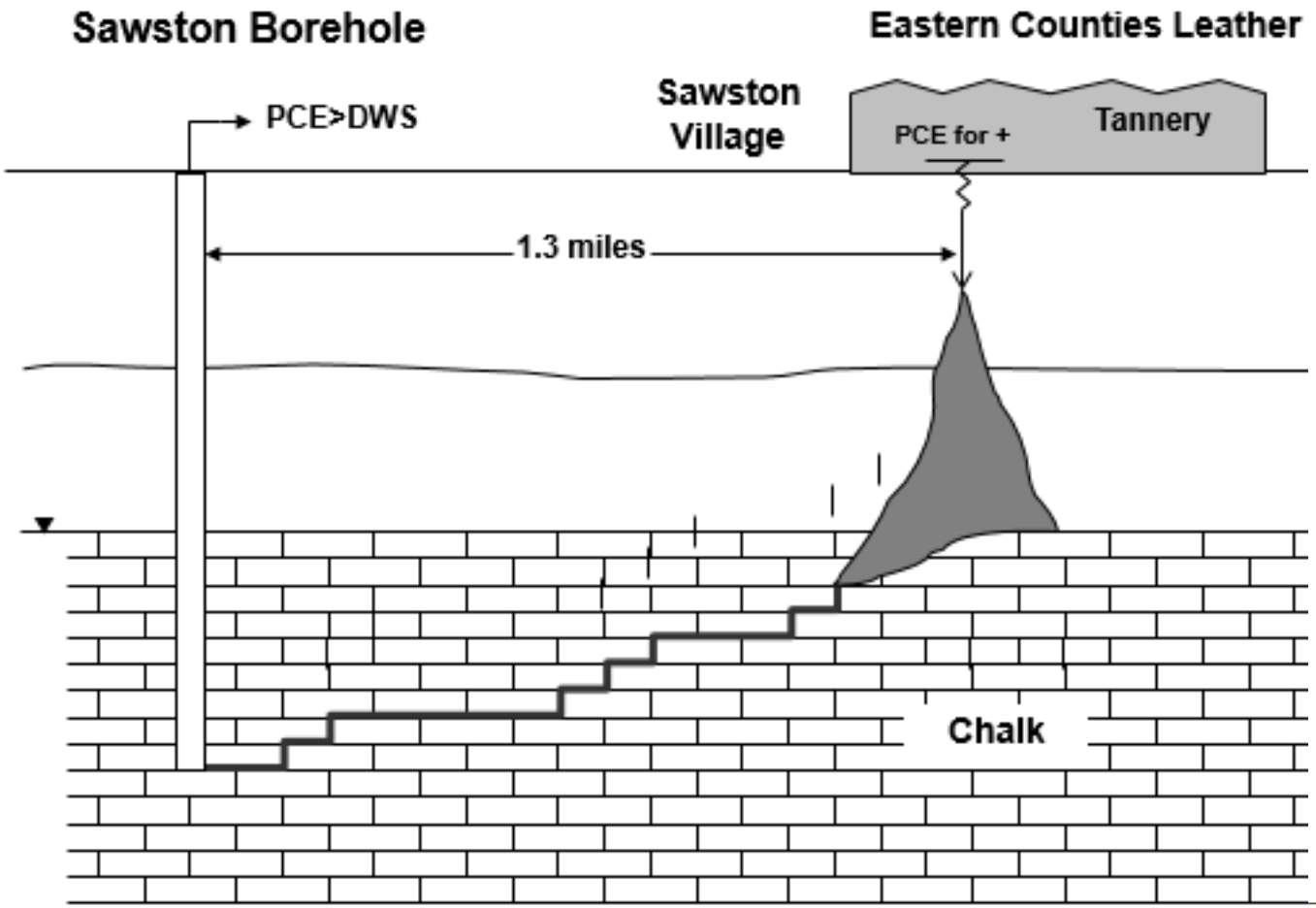
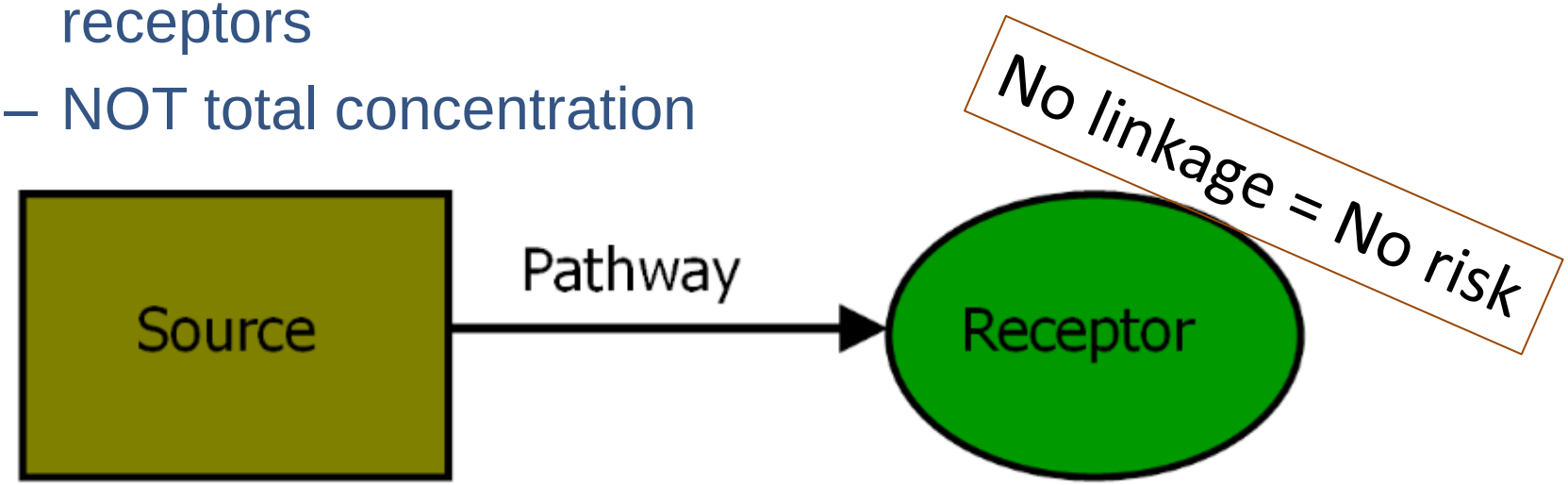


What is contaminated land risk assessment?

- Decision on need for remediation is based on:
  - Risk posed to specific receptors
  - NOT total concentration
- Based on Source-Pathway-Receptor Linkage



Cambridge Water versus Eastern Counties Leather

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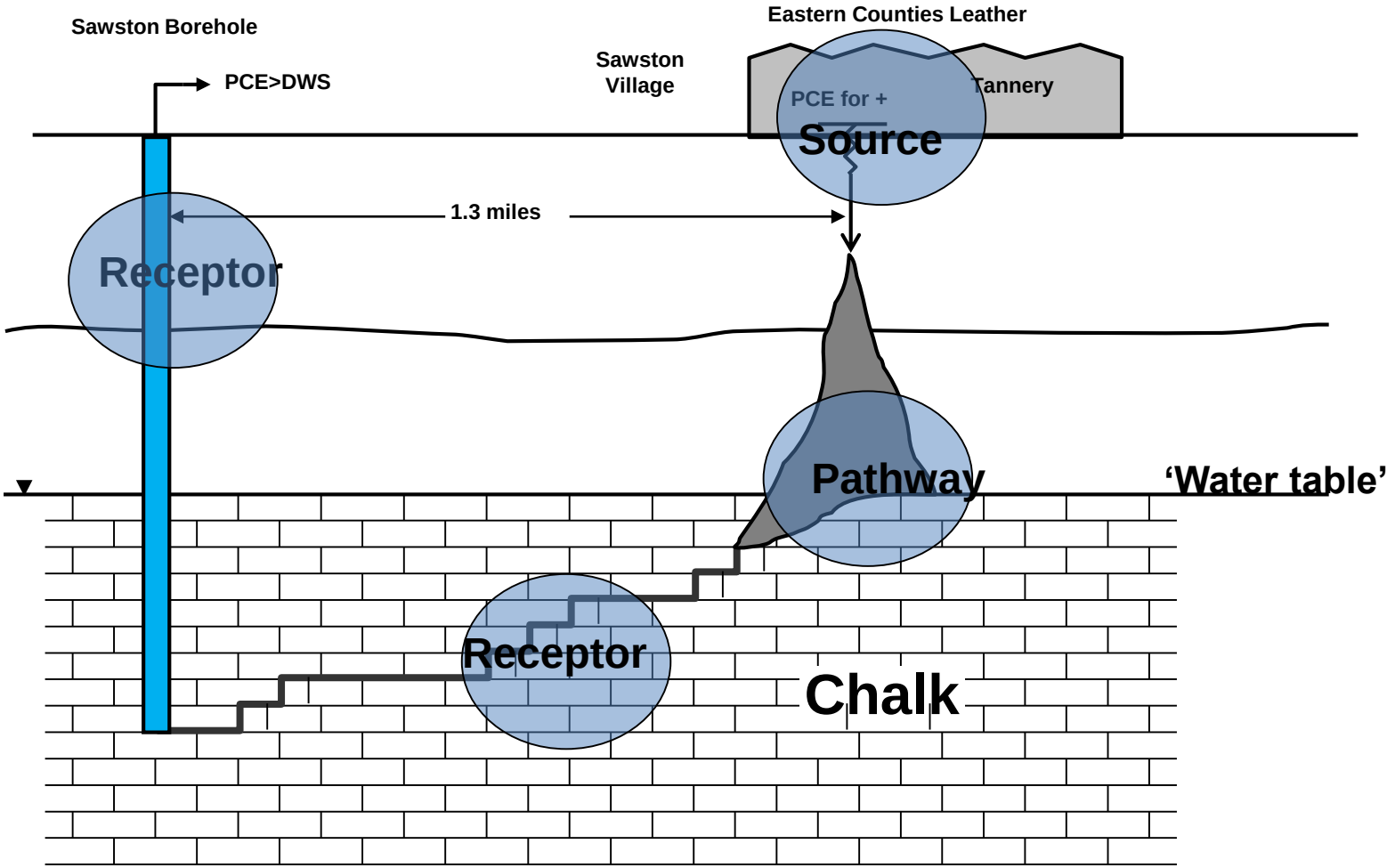

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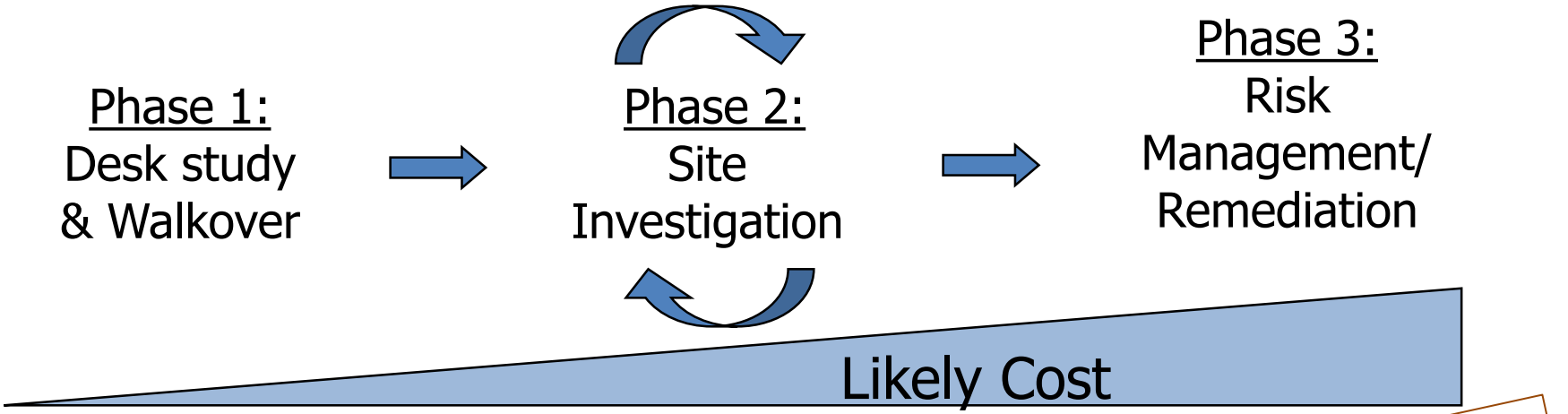
Examples of S, P, R

- Sources
  - Fuel tank
  - Factory
  - Paint booth
  - Gas holder
- Contaminants
  - Arsenic
  - Benzene
  - Pentachlorophenol
  - Benzo(a)pyrene
- Pathways
  - Ingestion of soil
  - Unsaturated Zone
  - Saturated Zone
  - Preferential pathways eg pipe, mine shafts
- Receptors
  - People
  - Aquifers
  - Ecology

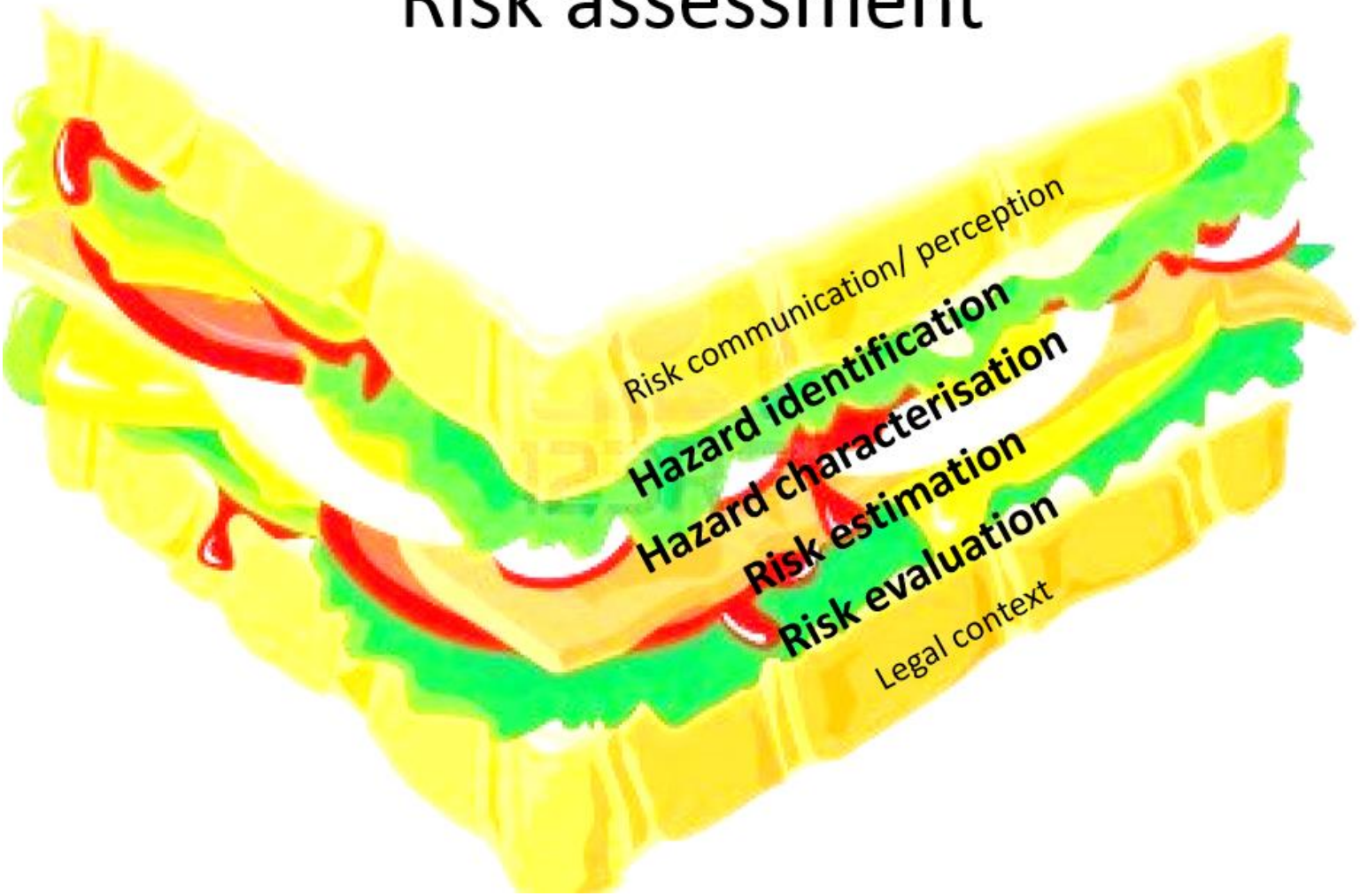
Risk based contaminated land management – the process



Update CSM at each phase

- Phased approach
- Develop and verify a conceptual model

Risk assessment



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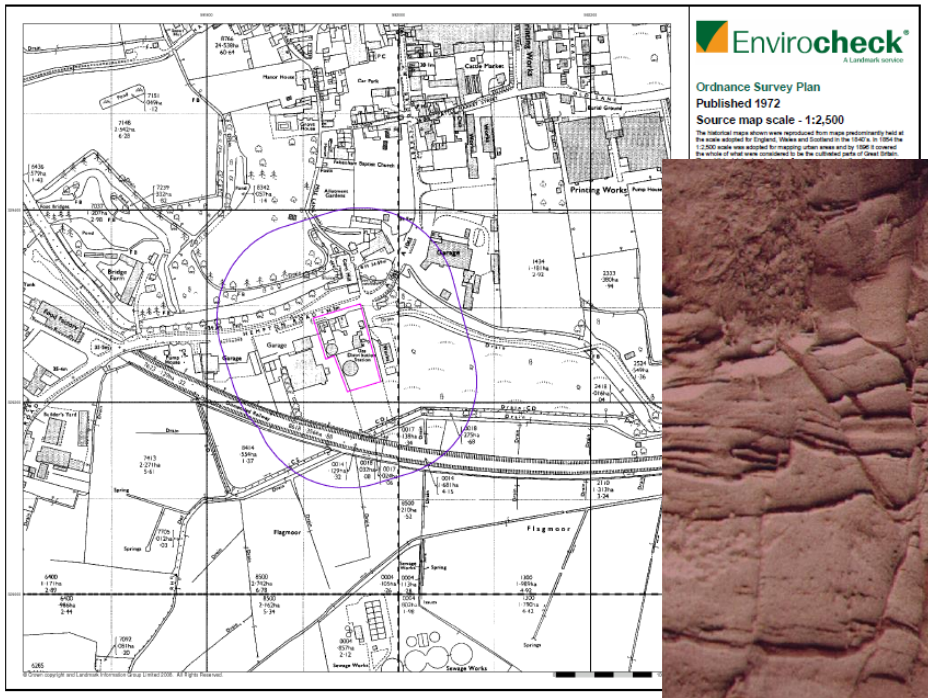
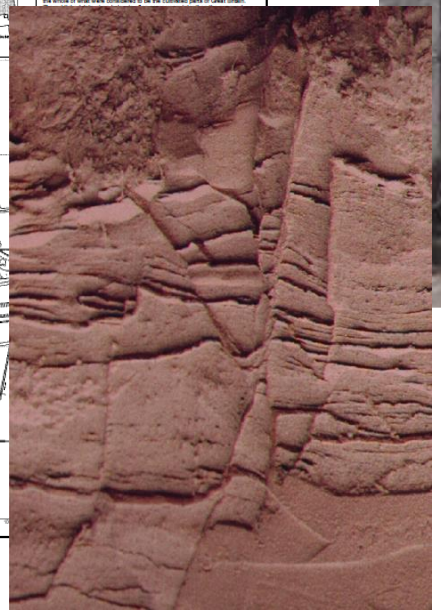
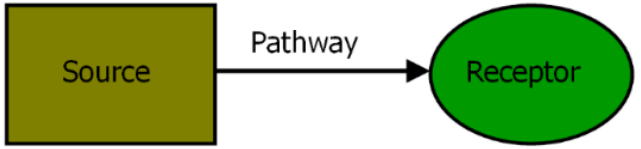
Defensible decisions

Phase 1:
Desk study and walkover survey







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Phase 1:
Desk study & Walkover

- Establish former uses and activities
- Formulate **initial** conceptual model
  - Likely sources, pathways, receptors
  - Uncertainties
- Identify additional work needed

Hazard identification

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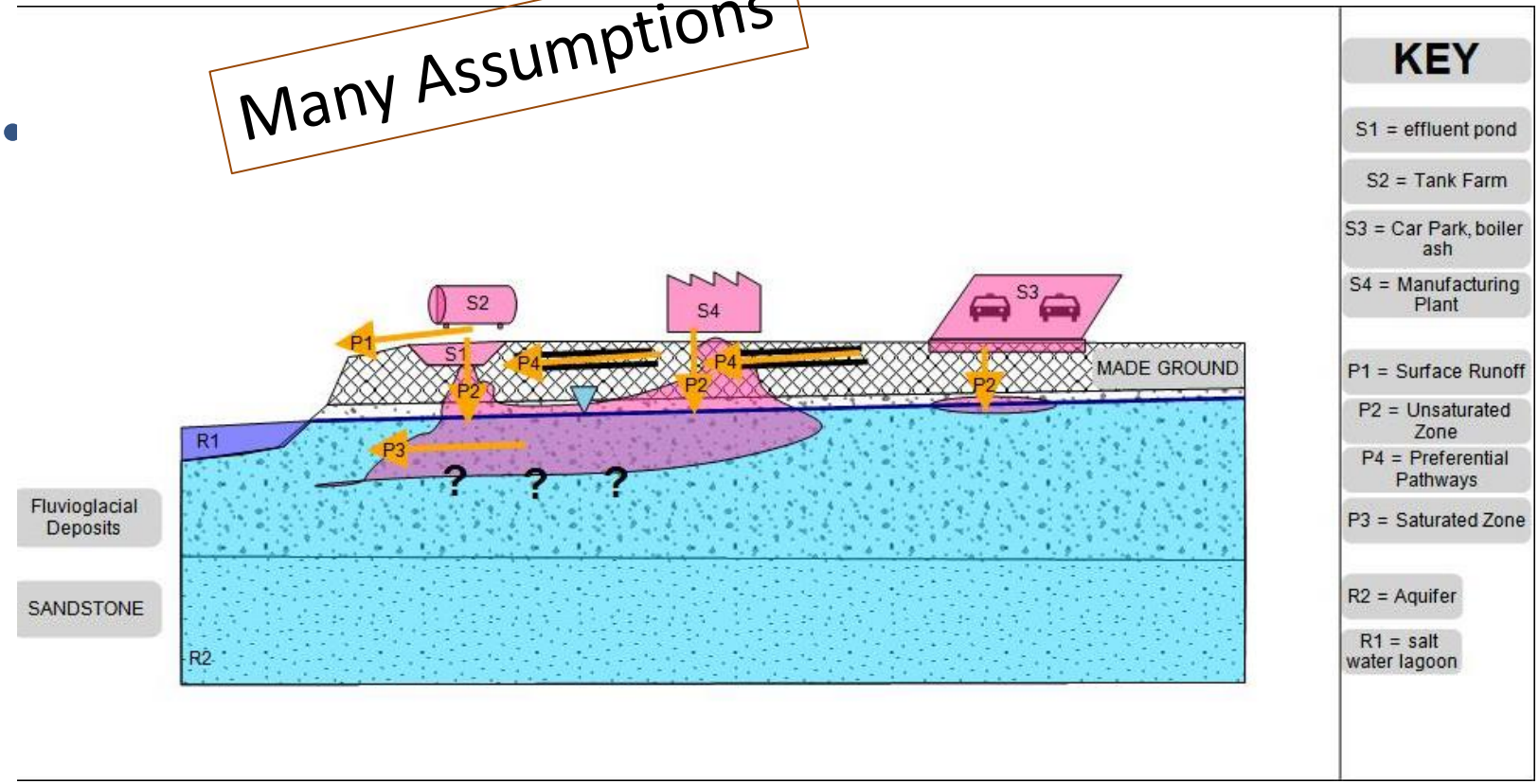
CSM at Phase 1

Many Assumptions



Phase 2

Intrusive Investigation & Risk Assessment

Phase 2:

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Site investigation & characterisation

- Physical investigation of ground
- Collection of soil/water/gas samples etc.
- Field and laboratory testing

- What contamination is present on the site ?
- Where is the contamination?
- What are the materials beneath the site ?
- Groundwater –depth and direction
- Gases

Hazard assessment

Phase 2:

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Risk estimation & evaluation

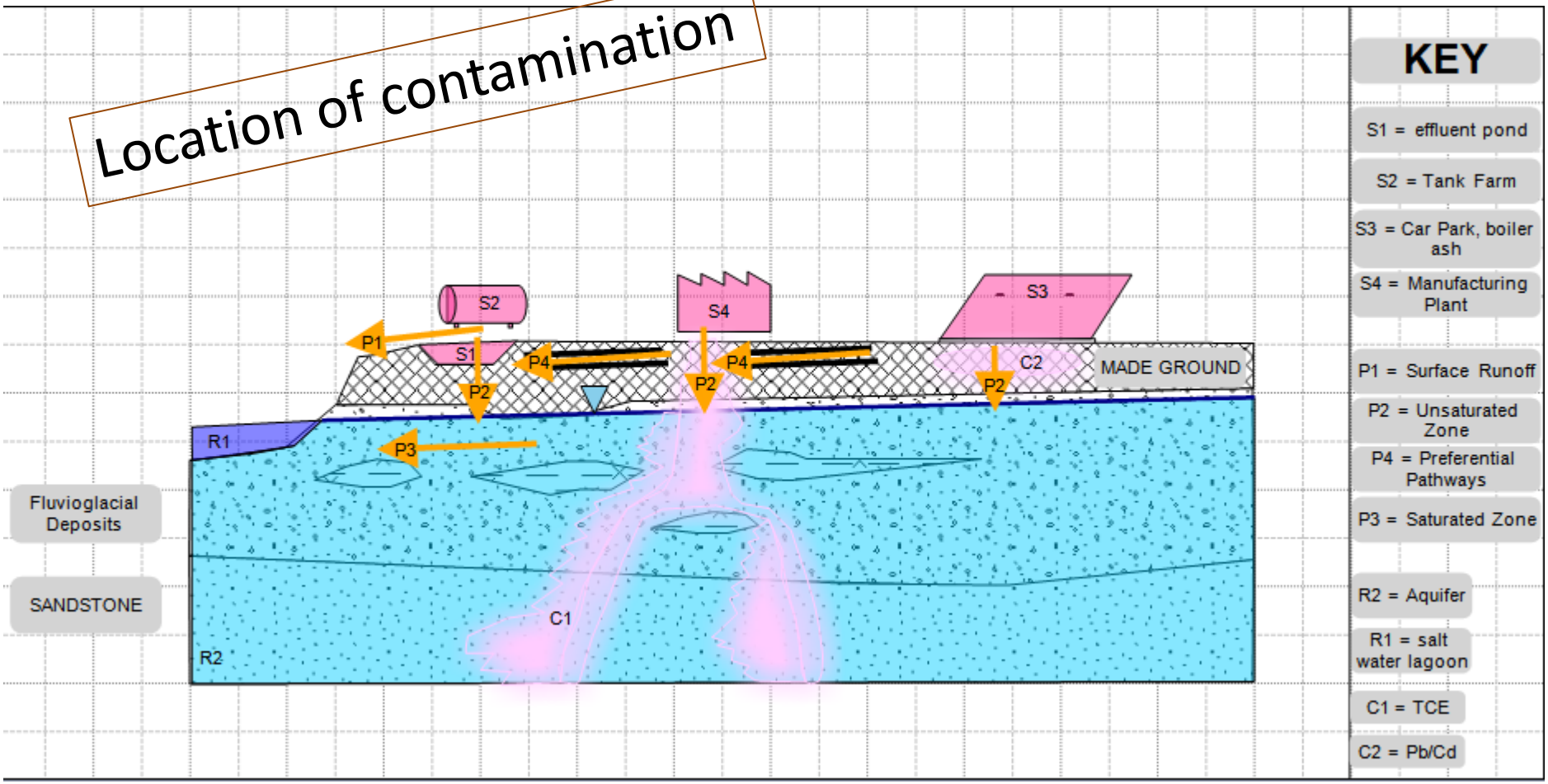
- Does the contamination at the site present a risk to the receptors?
  - Screening values: DWS, EQS
  - Site specific assessment
  - Acceptability of risk

- **Update** conceptual model
  - Increased information
  - Reduce uncertainty
  - Some/all potential sources eliminated
  - Some/all potential contaminant linkages eliminated

Subsurface materials

Phase 2 CSM

Location of contamination



Risk based contaminated land management

The process

Step 1 **Determine Legislative Context**

Step 2 **Hazard Identification**
What is it?

Step 3 **Hazard Assessment**
What is the context?

Step 4 **Risk Estimation**
How much?

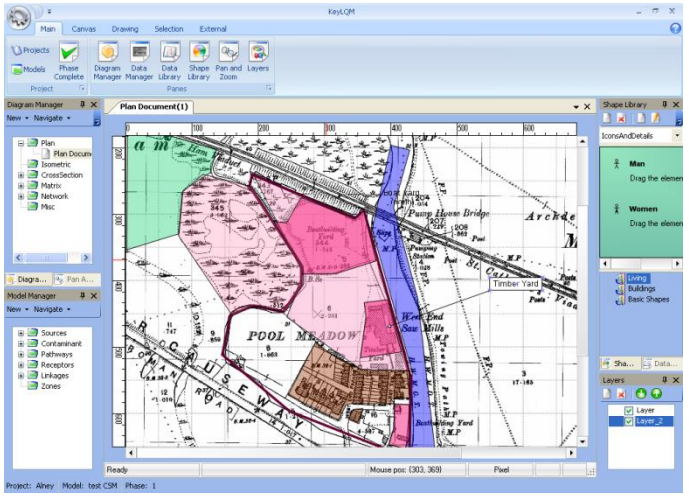
Step 5 **Risk Evaluation**
Decision on acceptability

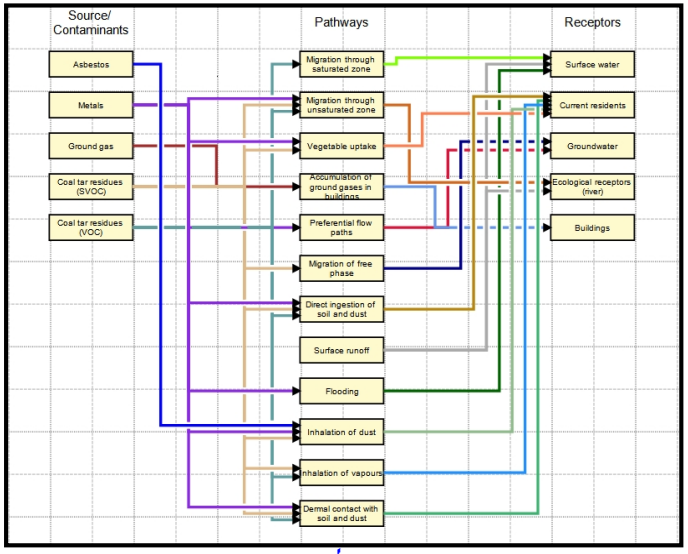
Uncertainty
Magnitude and consequences

Sustainability appraisal ???

After McCaffrey, Street & Nathanail 2007
SNIFFER UK CC02

The method: conceptual site model





www.keycsm.com

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Phase 3 CSM – Risk Management / Remediation

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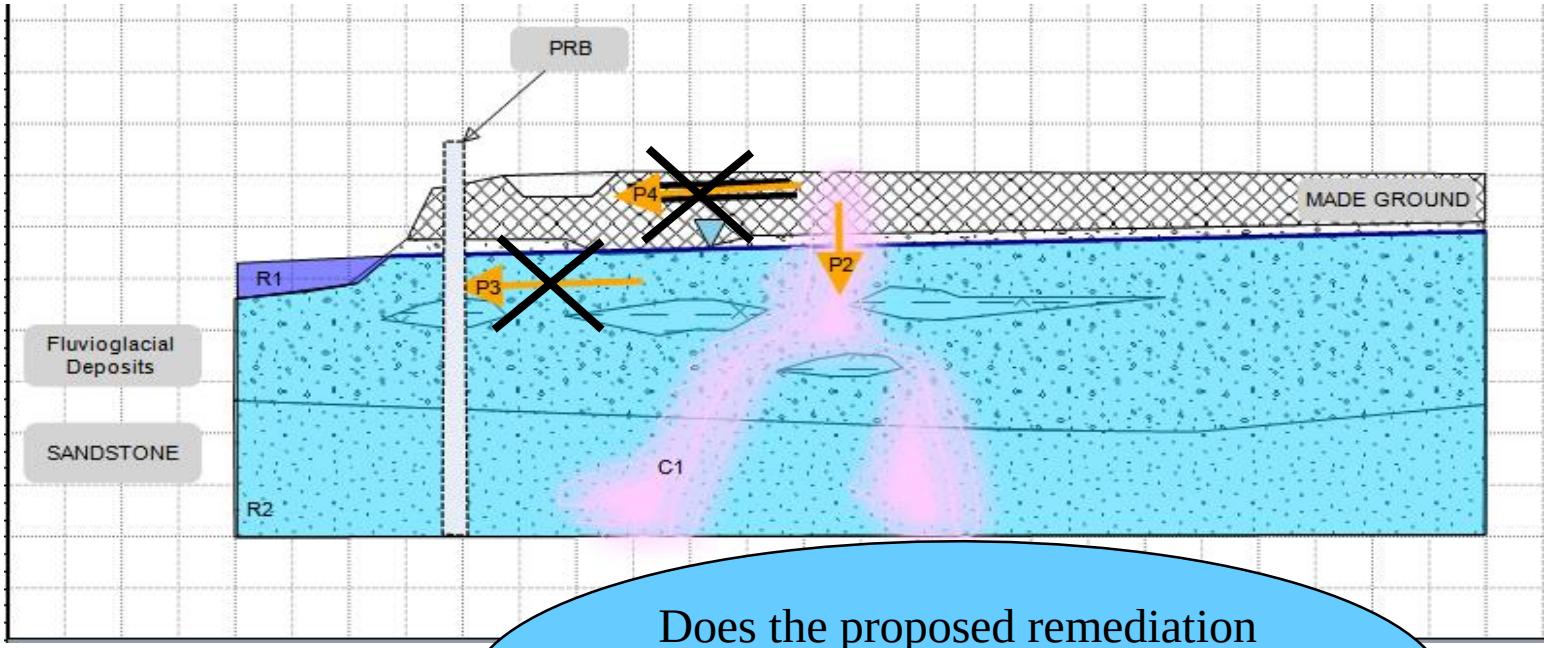

Does the proposed remediation **demonstrably** break the contaminant-pathway-receptor linkage?

Verification

- Remediation is followed by verification
- To demonstrate that remediation has been effective
- Design verification alongside design of remediation

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Conclusions

- Contaminated Land is a legacy from our past
- Manage it based on risk
- Phased Process
- CSM is a key tool
- Remediation: **Demonstrably breaking** the source-pathway-receptor linkage

- How can contaminated soils be remediated?

  That is what the next speaker will cover

Legal caveat

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