HPA Contaminated Land Radiation Protection Framework

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14th European ALARA Network Workshop, Dublin, 2012

Radioactively Contaminated land

- Distinction between planned and existing exposures is not always clear for contaminated land

- 2 main categories:
- Change in land use of land known to be contaminated
  - New groups of people exposed to existing source
  - Possible changes to exposure pathways
- Contamination discovered on land where public have access but with no planned change in use
  - situation considered for intervention actions

HPA Guidance

- Guidance issued in 1998 regarding exposures from ‘practices’ remains valid (planned exposure situations)

  Optimisation below dose constraint of 0.3 mSv per year

- Optimisation of existing exposure situations performed on basis of residual levels of dose

  HPA recommended reference levels between

  1 – 20 mSv (2009)

  HPA provided guidance on dose criteria for designation of contaminated land (2006) – residual level of dose of 3 mSv

Contamination usually heterogeneous

Patchy encountered in the UK at:

- Industrial sites (NORM - slag, gas mantel production)
- Nuclear licensed sites

- Variability in radionuclides, concentrations and mixed with ‘clean’ areas

Contamination by radioactive objects in the UK at:

- Beaches near the Dounreay and Sellafield nuclear sites
- Beach and headland at Dalgety Bay

- Discrete objects, very sparse, may have very different characteristics

Assessments

Patchy contamination

Assessments are relatively simple

- Use of generic parameter values and models
- Default dose coefficients
- Scaling estimated exposure accounts for probability of encountering radioactivity

Discrete contaminated objects

- Assessments can be very complicated
  - More specific account of object characteristics eg size, solubility
  - Need to specifically assess the probability of encountering objects

If exposures not certain to occur....

Consider both the dose received assuming exposure occurs

AND

Consider the probability of the exposure occurring

Ensures adequate control of:

- low dose, high probability
- High dose, low probability

Note perception of risk different for these 2 situations

Assessment of health risks

- Deterministic effects
  - If absorbed doses are well below thresholds, then deterministic effects will not occur whatever the probability of encounter.

- Stochastic effects

Overall risk =

(annual probability of coming into contact with an object)

x

(risk of contracting a fatal cancer during a lifetime if contact with the object did occur)

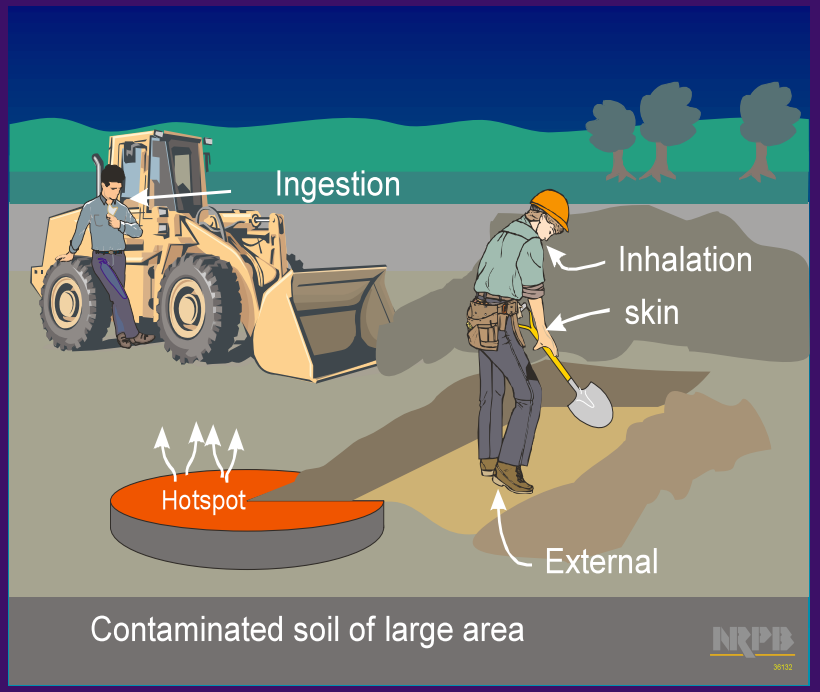
"contact" = exposure pathway, eg. skin contact, ingestion, inhalation

Development of assessment methodologies

Widespread/patchy contamination:

W36 (HPA); RCLEA (Defra); ReCLAIM (NDA)

- Contamination distributions:
  Exposed, buried, disturbed buried
  Patchy and uniform
- Land use scenarios: agriculture, recreational, housing, offices & school, building construction



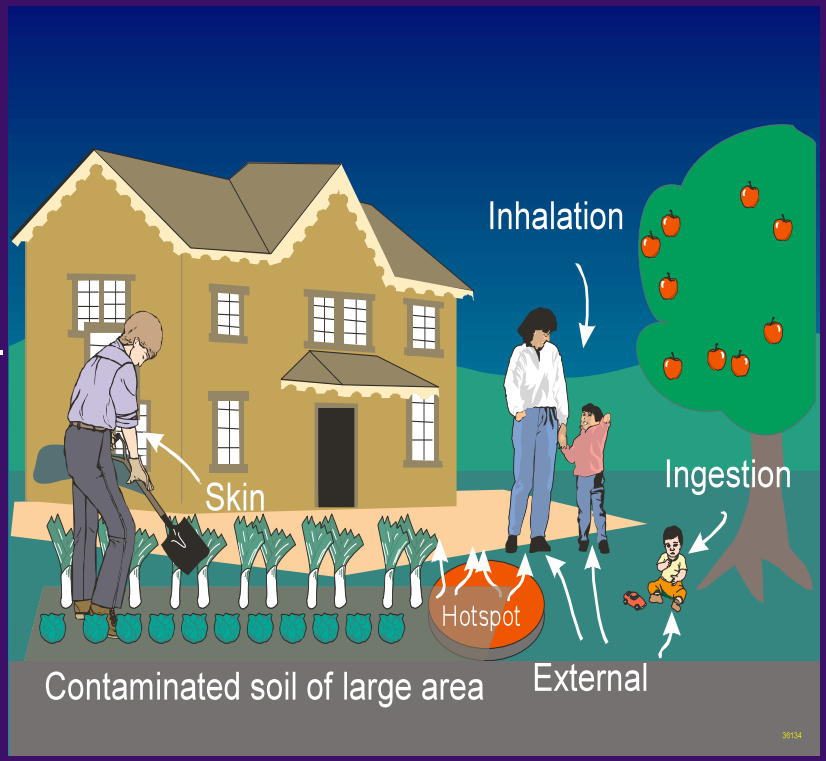
Contamination by radioactive objects:

approach used at Dounreay / Sellafield / Dalgety Bay (HPA)

W36 endpoints

For all scenarios:

- 36 radionuclides of relevance for contaminated land in the UK
- Doses as function of age – Sv/y per Bq/g in soil
- Maximum dose across all scenarios
- Results can be scaled to measured activity concentrations



Guidance on assessing health risks from heterogeneous contamination

- Provide practical guidance on assessment of health risks, particularly discrete objects
  - Tiered assessment
  - Defining assessment areas
  - Defining source term
  - Defining scenarios and pathways
  - Defining the representative person
  - Probability of encounter
  - Radiological protection interpretation of an assessment
    - Opinions of stakeholders

Format of guidance being developed

- Practical guidance on performing an assessment for heterogeneous contamination
  - Description of features that should be considered
  - Questions to guide the direction of an assessment
  - Discussion of how to interpret the results

To conclude:

- HPA has recommended criteria for contaminated land for planned and existing exposures
- Tools are available for evaluating doses & health risks from radioactively contaminated land
- HPA is finalising guidance on assessment of health risks from heterogeneous contamination
- Assessments can be used to guide clean-up criteria for remediation and to inform remediation strategies including on-going monitoring