



HardSPEC is....

- A first-tier model for estimating surface water and groundwater exposure resulting from herbicides applied to hard surfaces
 - Any man-made impermeable surface, such as concrete or asphalt and including railway ballast, that is not intended to bear vegetation
- Used by UK regulators to support environmental risk assessments for change of use, or new herbicides
 - CRD - Chemicals Regulation Directorate
 - PSD - Pesticide Safety Directorate
- UK specific

History of HardSPEC

- Disproportionate contamination of water by herbicides applied to hard surfaces
- Atrazine/diuron highly mobile
- Need for new products on 'hard surfaces' market



- Old risk assessment assumed all product was removed after 25mm of rainfall
- Need for more realistic scenario to represent herbicide usage on hard surfaces
- Hard Surfaces Steering Committee created comprising government, industry, researchers





Collaborative project



Key issues

- The primary purpose of the model is to predict herbicide concentrations in water in order to assist Regulators in assessing environmental risk of herbicides applied to hard surfaces
- CRD has a UK-wide remit
 - When developing representative scenarios, some broad assumptions would be necessary = Tier 1 model
- Four hard surface scenarios that differ by:
 - Proportion of different hard surface type
 - Application method or pattern of application
 - Dimensions of water body
- Underlying processes describing the fate of the chemical after application are the same



Groundwater (Railway) exposure scenario

Ballast/substrate:
Depth; Water retention;
Bulk density; Organic carbon

Depends on herbicide
properties - half-life

Standard properties of:
Hydrogeology & physico-chemistry

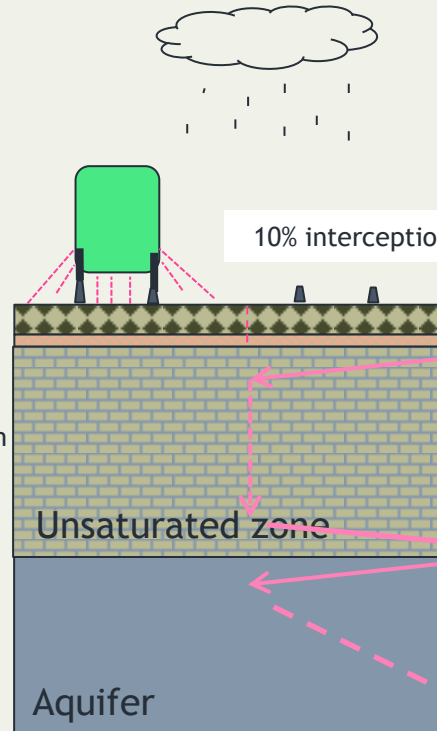
Chalk
Jurassic Limestone
Triassic sandstone

Ballast sub-
model

Attenuation
factor

1D slug
injection

5 m

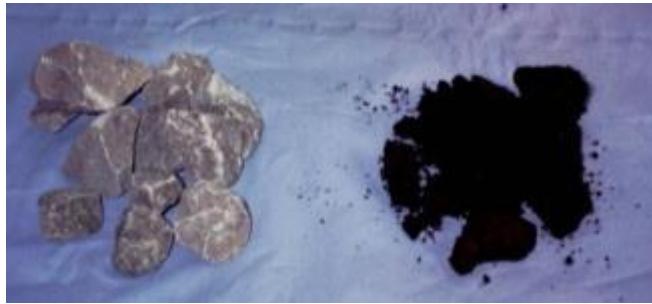


75th percentile
wettest spring (1959-
1981)

75th percentile wettest
value for average daily
recharge

Data were generated for:

- Ballast and substrate characteristics



- Herbicide attenuation



Groundwater characteristics

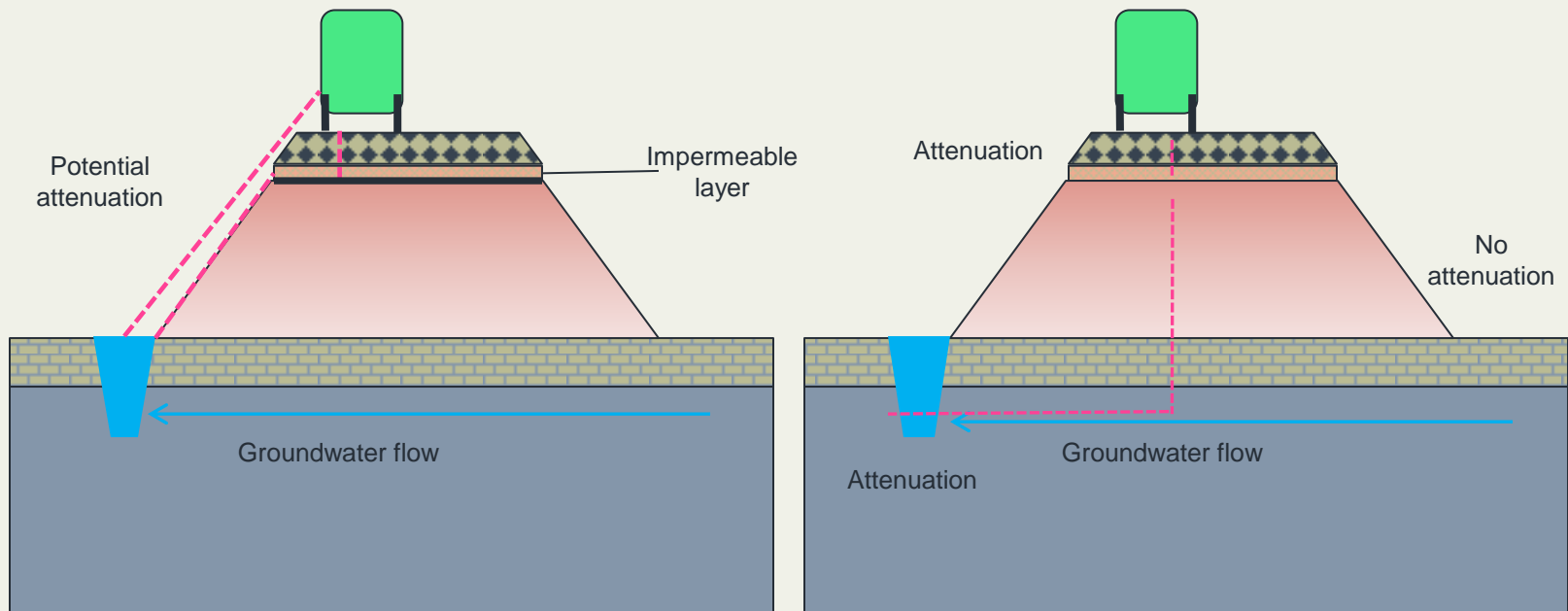
- Based on Environment Agency Groundwater Source Protection Zones
 - Outer Source Protection Zone (SPZ) = 400 day groundwater travel time
 - Inner Source Protection Zone (SPZ) = 50 day groundwater travel time
- Statistical analysis of EA data to give other parameters
- Data simplified to give average flow velocities and distance from contaminant source to well.



Surface water exposure

- Herbicides can enter surface water:
 - Directly via spray drift
 - Via 'runoff'

- Via leaching



General

- HardSPEC represents reasonable worst-case conditions for UK
- Avoided use of e.g. 90%ile worse case for all parameters
- But for railway/groundwater scenario, it is 99.8th percentile worst-case for aquifer vulnerability
- Validation shows the prediction are reasonable - but railway validation data are limited



Options for model refinement

- Attenuation of herbicide in ballast substrate
 - This would require a robust data set and is likely to be expensive (data generation + implementation in model)
- Attenuation of herbicide in runoff
 - Practical studies feasible
- Area targeted by spray

Future developments

- Sensitivity analysis
 - Identify parameters that have largest impact on the output
 - This will assist with focussing areas of refinement
- Amend drift calculations
- ?????? Ideas and feedback welcome!

