Would a deep nuclear waste repository in West Cumbria be safe?

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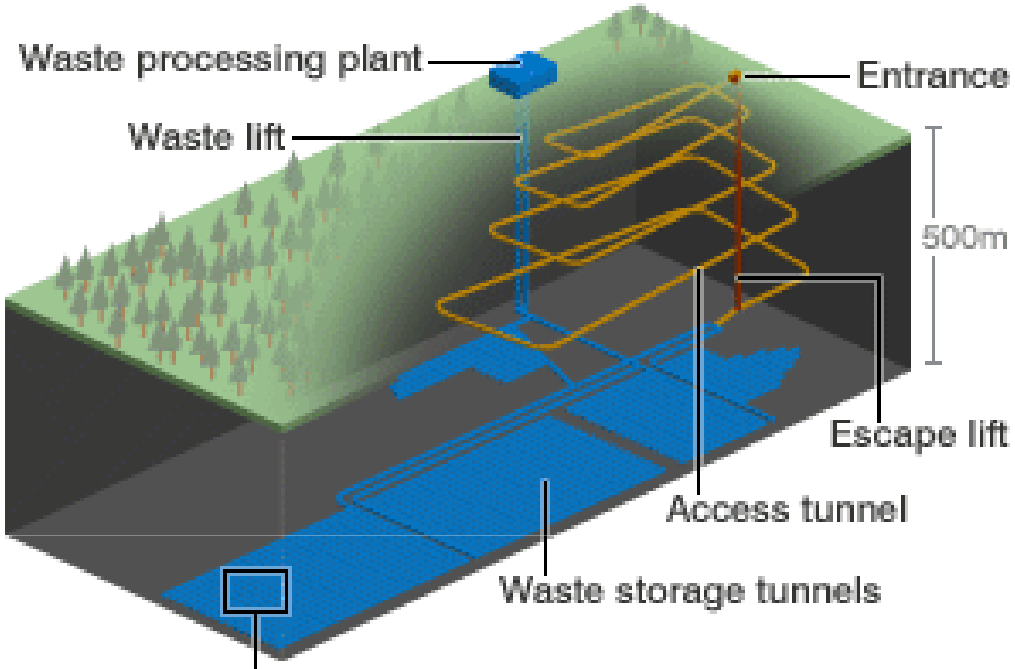
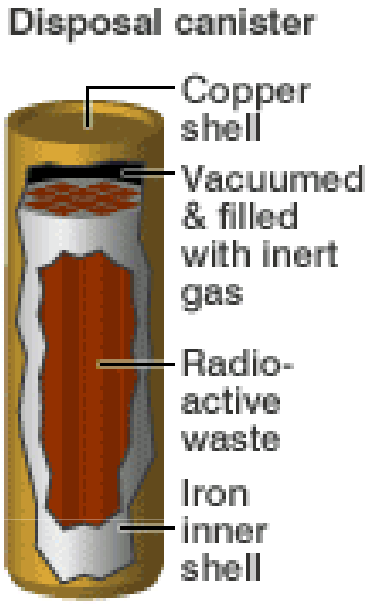
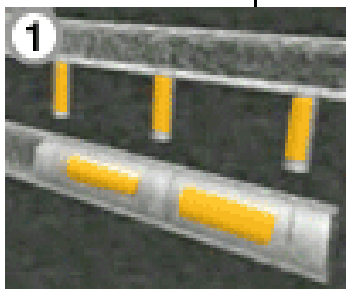
Overview

- A deep nuclear waste repository poses risks to future generations
- Site selection is part of ensuring safety (optimising radiological protection)
- Councillors have a moral (and legal) obligation to consider all the existing geological information (including the 1997 Nirex Inquiry findings)
- West Cumbria is geologically unsuitable and the council should therefore withdraw

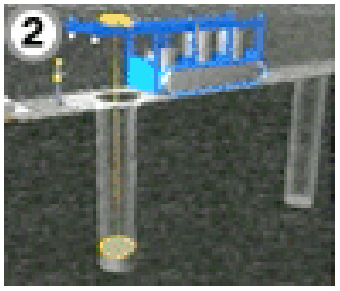
DEEP DISPOSAL OF RADIOACTIVE WASTE - THE FINNISH MODEL



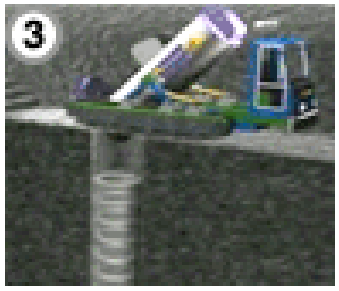




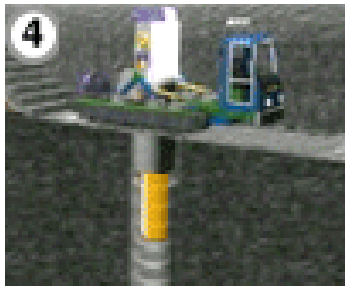
Canisters stored vertically/horizontally



Hole drilled in tunnel and lined with clay



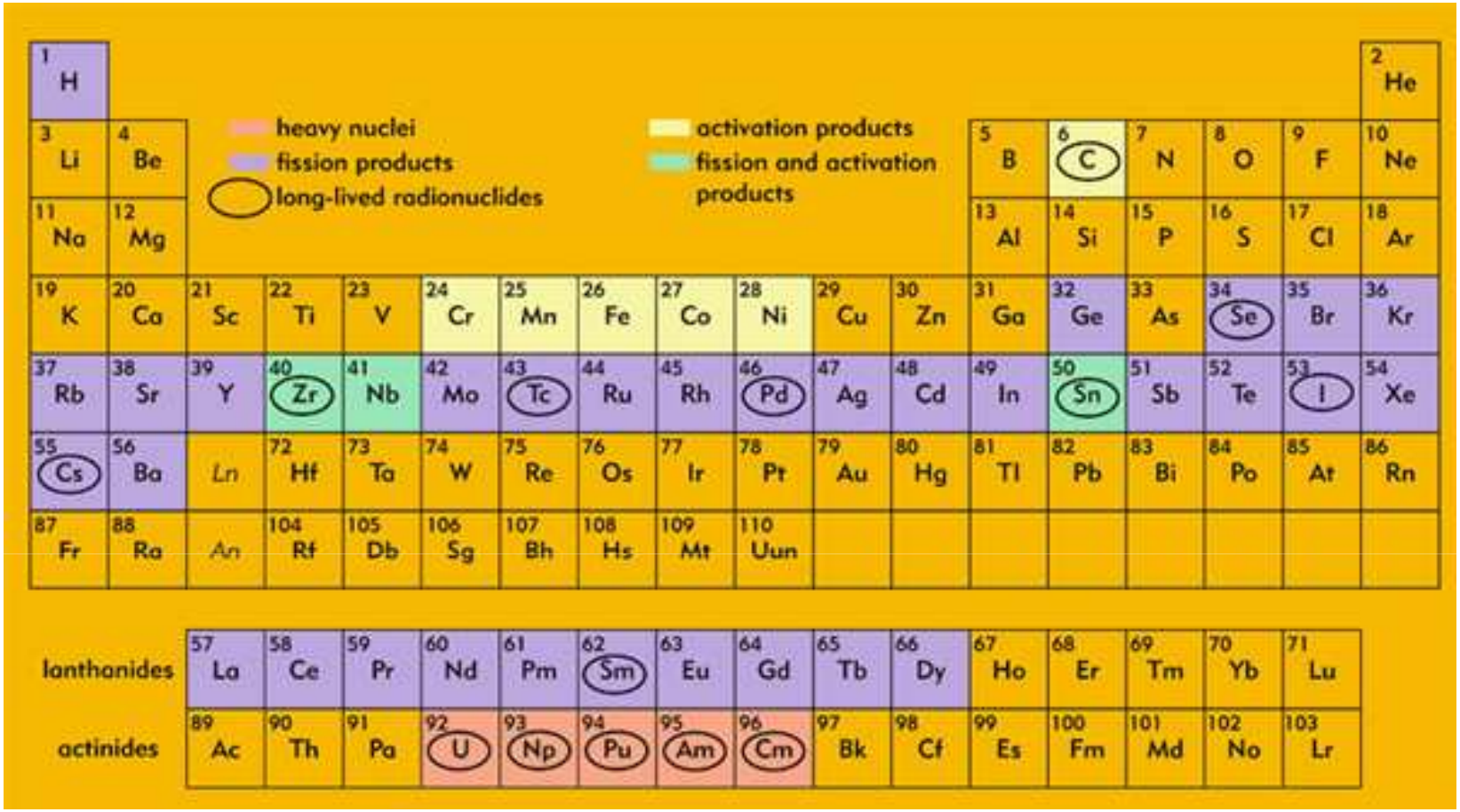
Canister transferred from transporter



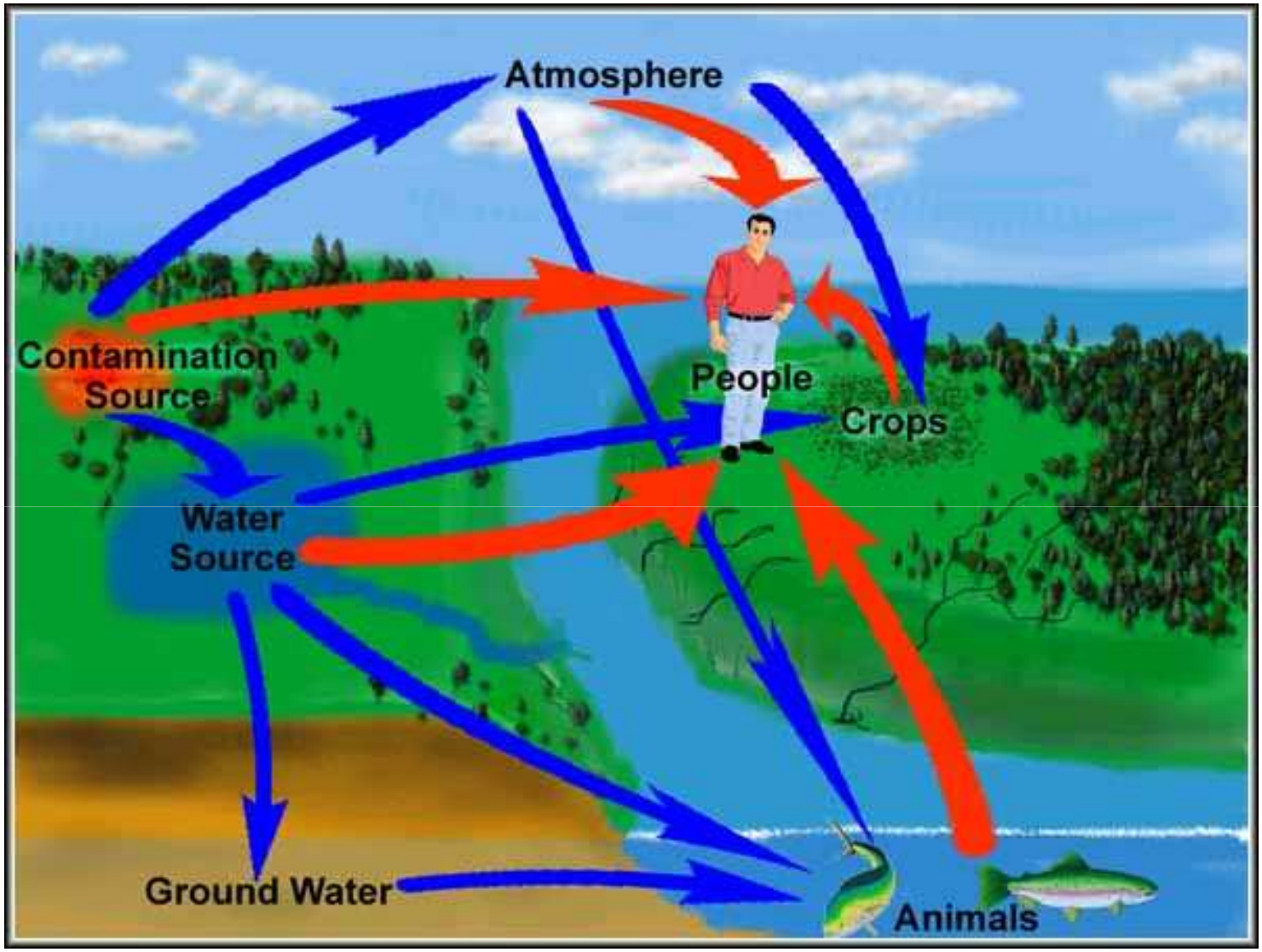
Canister sunk and hole sealed with clay

Proposed facilities

- Long-lived intermediate level waste (ILW). Cemented waste in steel barrels, cement backfill. Large quantities of gas from corrosion of wastes (CO_2, CH_4) and barrels (H_2).
- Heat-generating high-level waste from reprocessing in glass blocks. Steel overpacks.
- Heat-generating spent nuclear fuel (SNF) from Sizewell and new reactors. Copper canisters. Bentonite (clay) backfill.
- Encapsulation facilities for SNF.

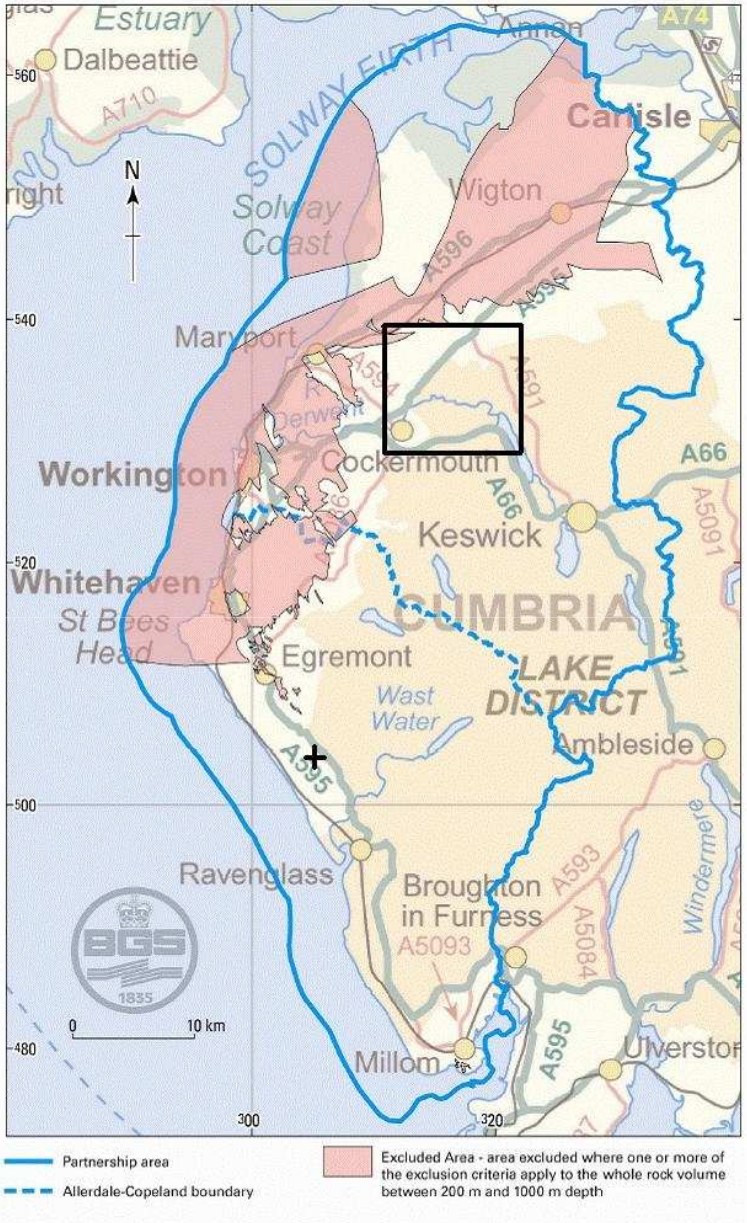


Radionuclide content of spent nuclear fuel


Atmosphere
Contamination Source
People
Crops
Water Source
Ground Water
Animals

One repository or two?
(CoRWM Document 2550, July 2009)

- "*A key technical and scientific question is whether it is possible to find a* [single] *site that will be suitable... This is important because of the possible effects of cement-bentonite interactions and of alkaline waters on HLW* [vitrified high-level wastes]" (para 12.30)
- "*Situations can be envisaged in which a site could accommodate one part… but not both, or where … it would be preferable to have separate surface facilities and access...*" (para 12.39)



Footprints

ILW/LLW: 1km^2

Legacy HLW/SNF: 3km^2

New build (high burn-up) SNF: 5.7km^2 ?

Total: 10km^2 plus?

Depends on burnup, cooling period, geology, number of new reactors & reactor lifetimes

[Source: Nirex + Hugh Richards]

Longlands Farm is not excluded, although it was previously rejected as unsuitable (Nirex Inquiry decision 1997)

The Nirex Inquiry 1995/96

- ‘Rock Characterisation Facility’ (first stage of a deep ILW repository) at Longlands Farm (near Gosforth)
- Appeal rejected by Sec of State 1997
- Inquiry considered whether the site showed sufficient promise to justify blight/noise/visual impact etc.
- Rejected on 3 grounds:

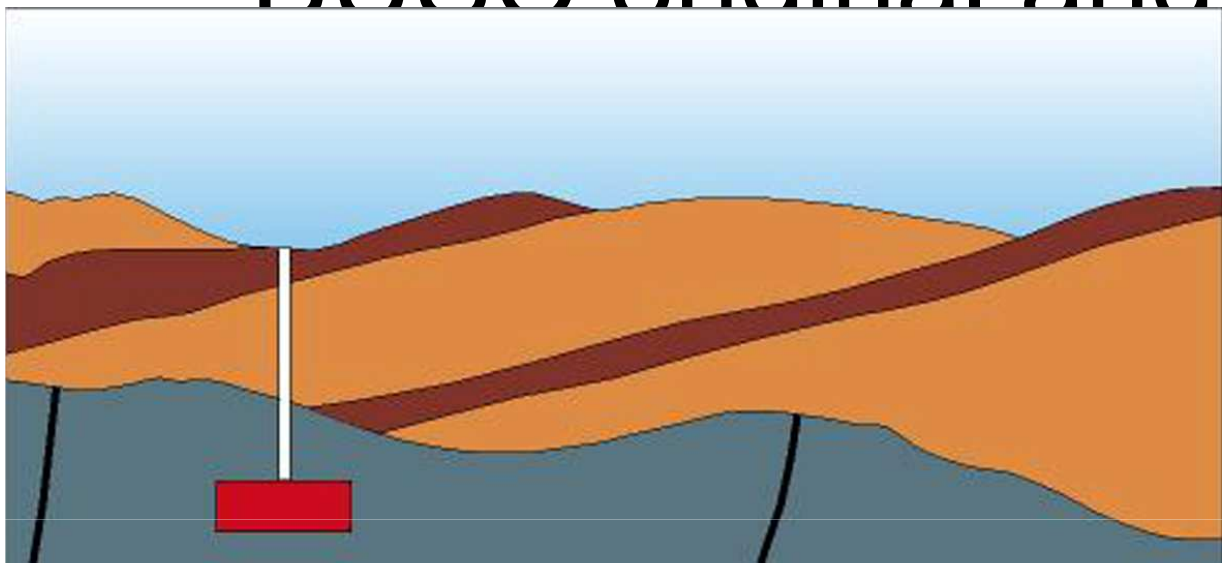
1. Site geologically unsuitable
2. Site selection process flawed
3. Scientific understanding inadequate

- “*Nirex made the fatal error of choosing a site for political, not scientific, reasons. The company thought a dump close to Britain's largest nuclear complex would be more likely to win the support of the local community than a dump elsewhere. But it knew little then about the geology of the site, and has struggled ever since to come up with data showing it would be safe.*”

(New Scientist, 22nd March 1997)

- "*There is no doubt in my mind that right from the start it was clearly obvious that there were major geological problems associated with this site*". Prof John Mather, CCC geology advisor. BBC File on Four, 27th May 1997.
- "*In conclusion, Sellafield was always a long shot. The site was chosen for non-scientific reasons, in a decision-making process which concealed its true geological problems.*" Dr (now Prof) Stuart Haszeldine & Prof David Smythe, The Geologist, 1997.

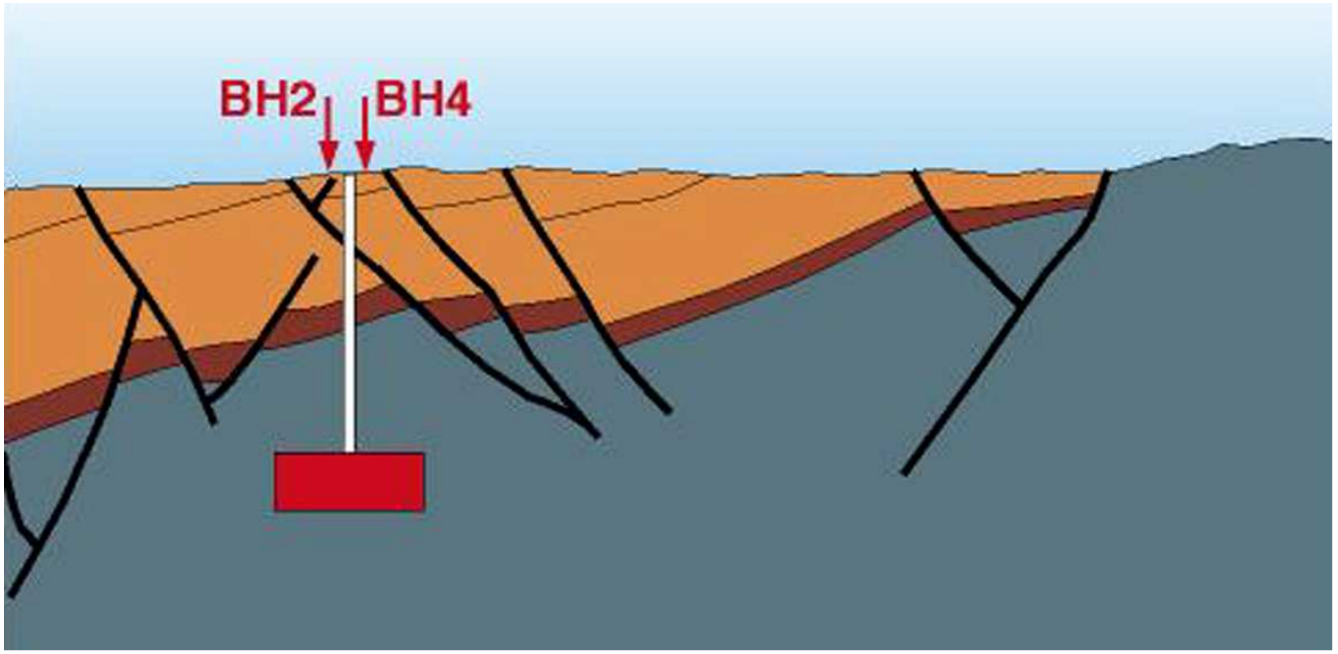
BUSC original and “variant”



Original concept for Basement under Sedimentary Cover

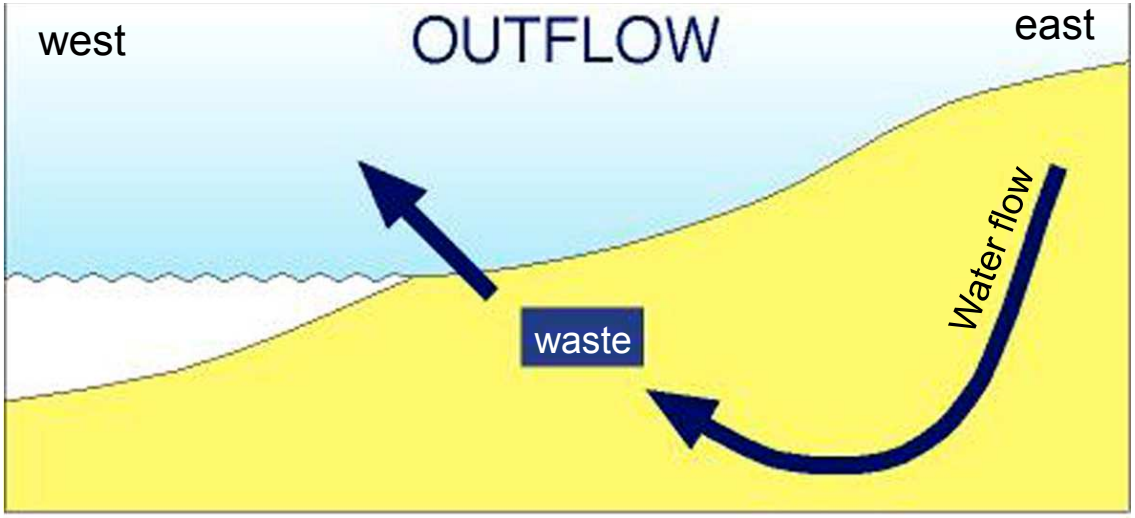
Nirex report 71, 1989

Basement “variant” Nirex Report 263, 1992



Cumbria

Do good sites exist?

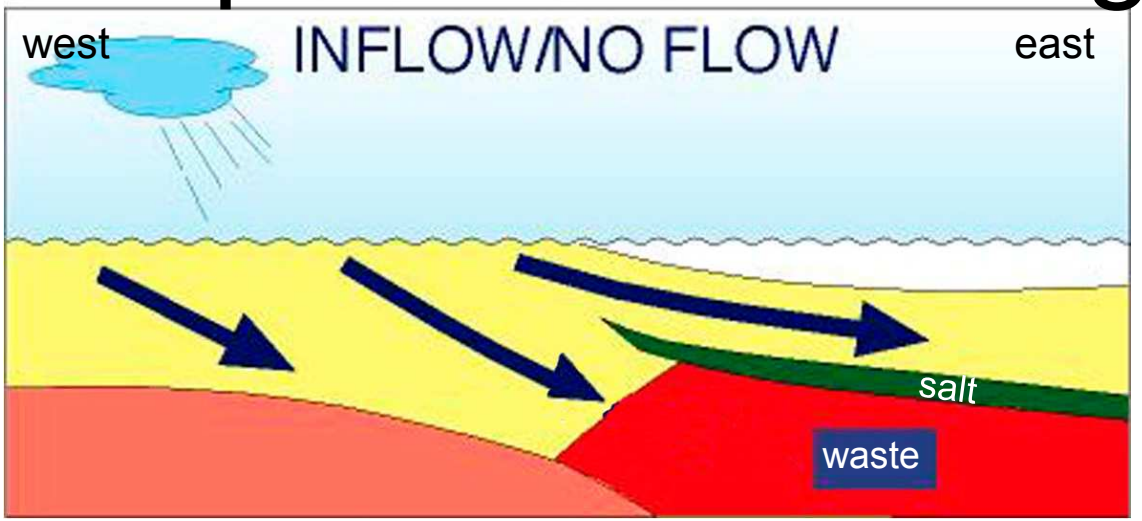


Water flow is driven by the elevation of mountains, and INEVITABLY rises to surface as “artesian” springs.

When toxic waste dissolves, there is **no natural barrier** to pollution entering drinking water and the sea

This has **poor site** performance

compared to East England

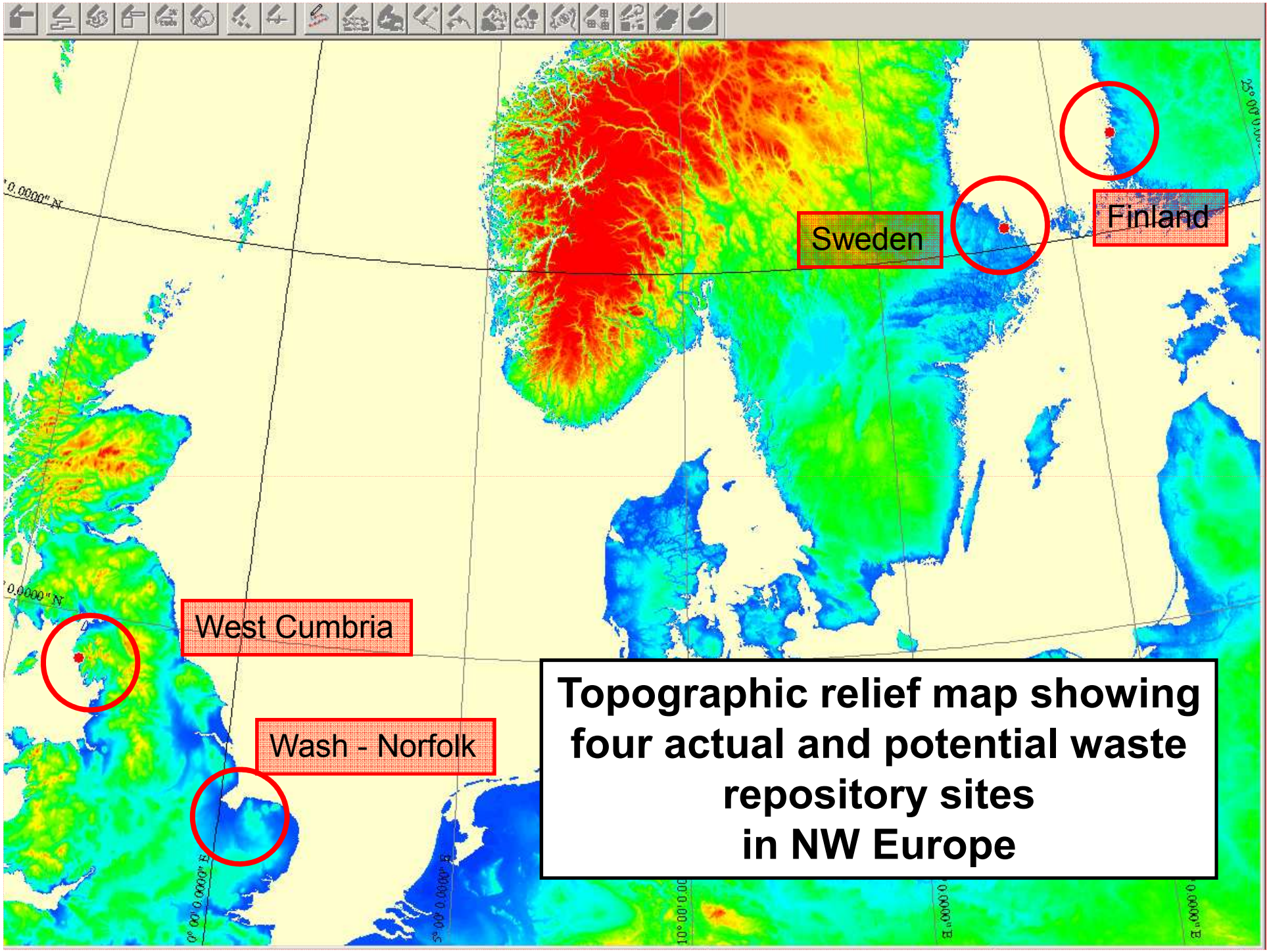


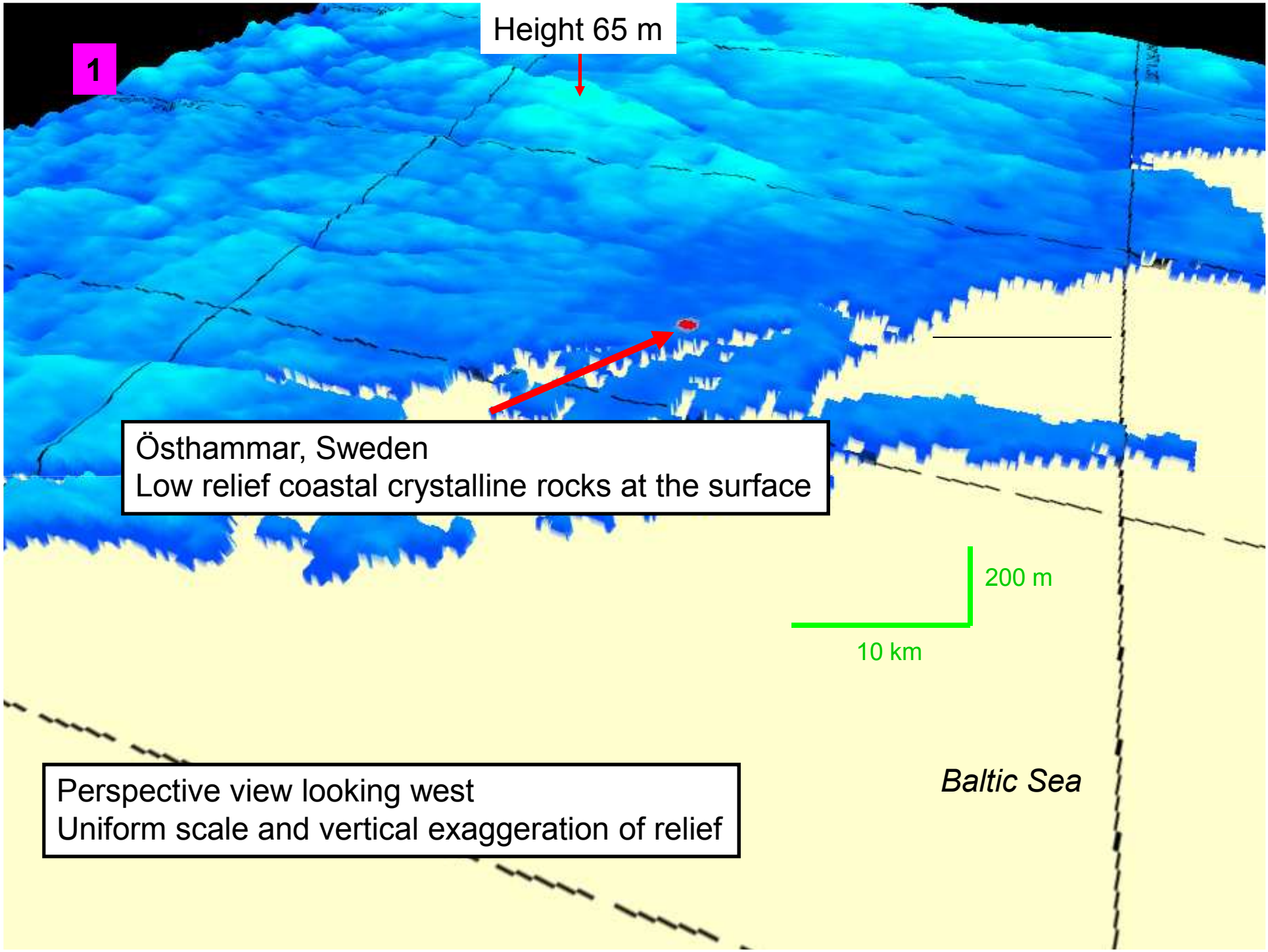
Water flows out from the land.

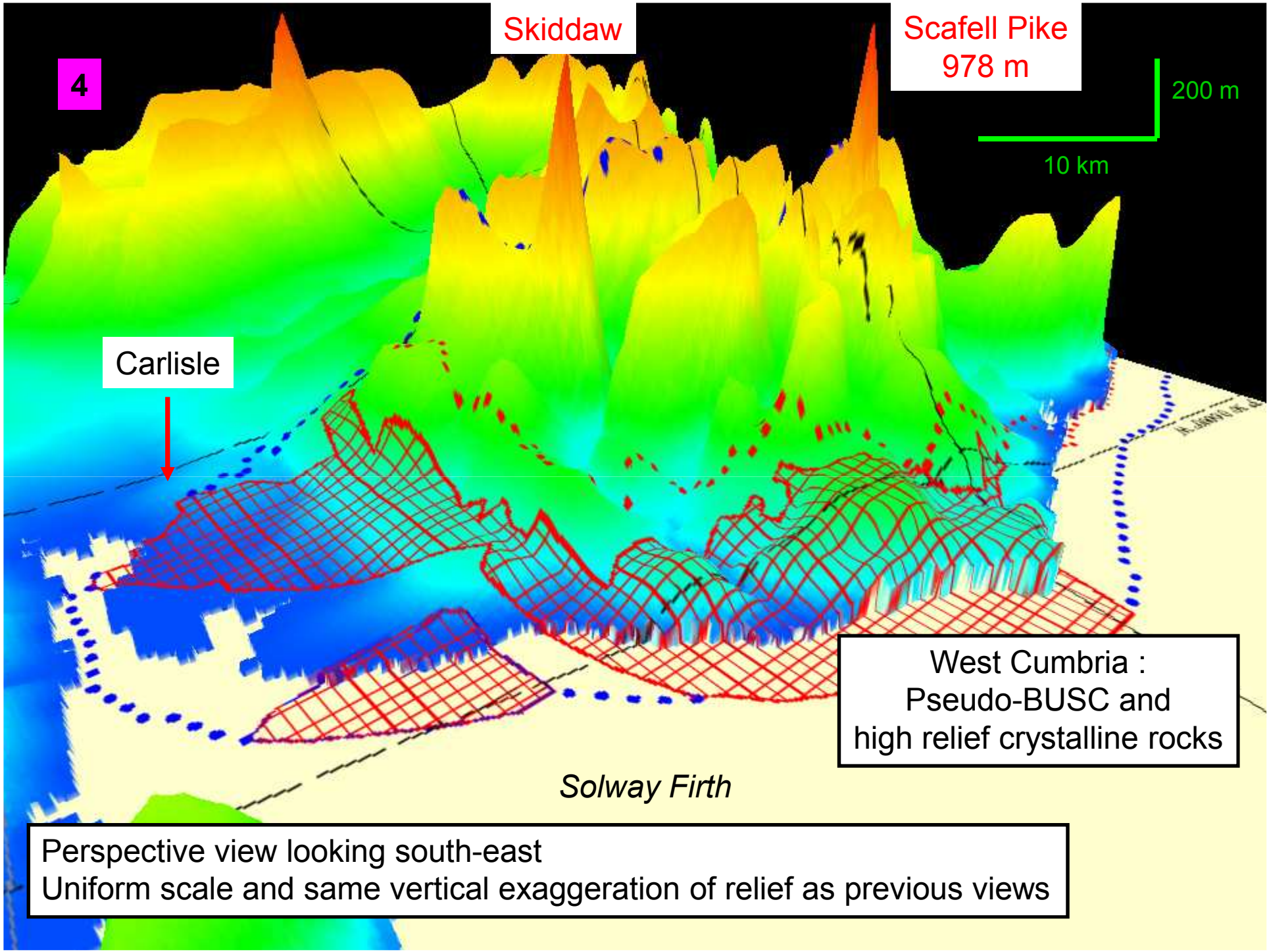
Water can not flow through layers of salt, which seal as a secure “lid”

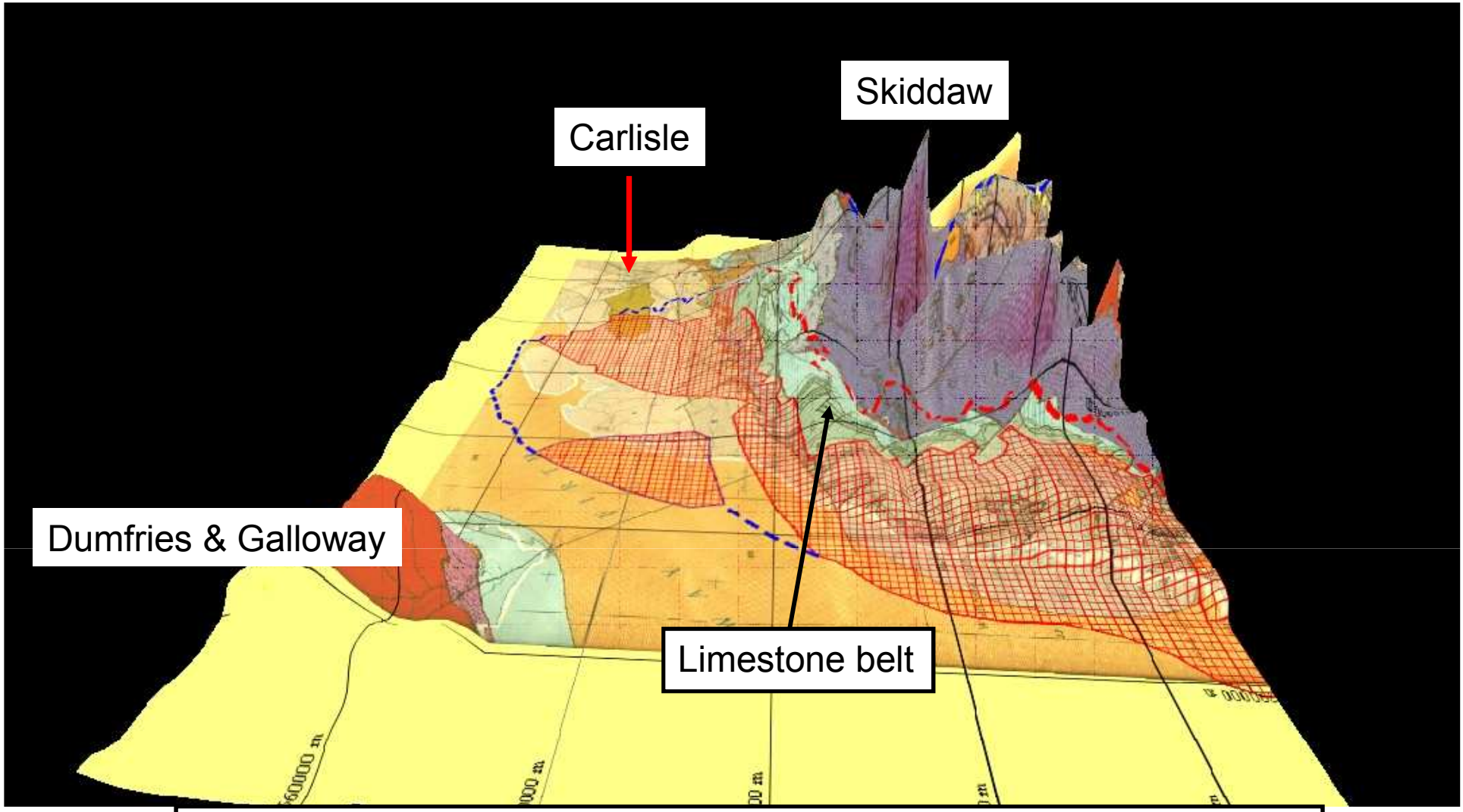
When toxic waste dissolves in static water (red) there is no flow up through the “lid” from this backwater

This has **good site** performance


Finland
Sweden
West Cumbria
Wash - Norfolk
Topographic relief map showing four actual and potential waste repository sites in NW Europe


1
Height 65 m
Östhammar, Sweden
Low relief coastal crystalline rocks at the surface
200 m
10 km
Perspective view looking west
Uniform scale and vertical exaggeration of relief
Baltic Sea


4
Skiddaw
Scafell Pike
978 m
200 m
10 km
Carlisle
West Cumbria :
Pseudo-BUSC and
high relief crystalline rocks
Solway Firth
Perspective view looking south-east
Uniform scale and same vertical exaggeration of relief as previous views



BGS geology map draped over the terrain. Perspective view looking east.
Next we examine the limestone belt between the exclusion zone and the National Park.

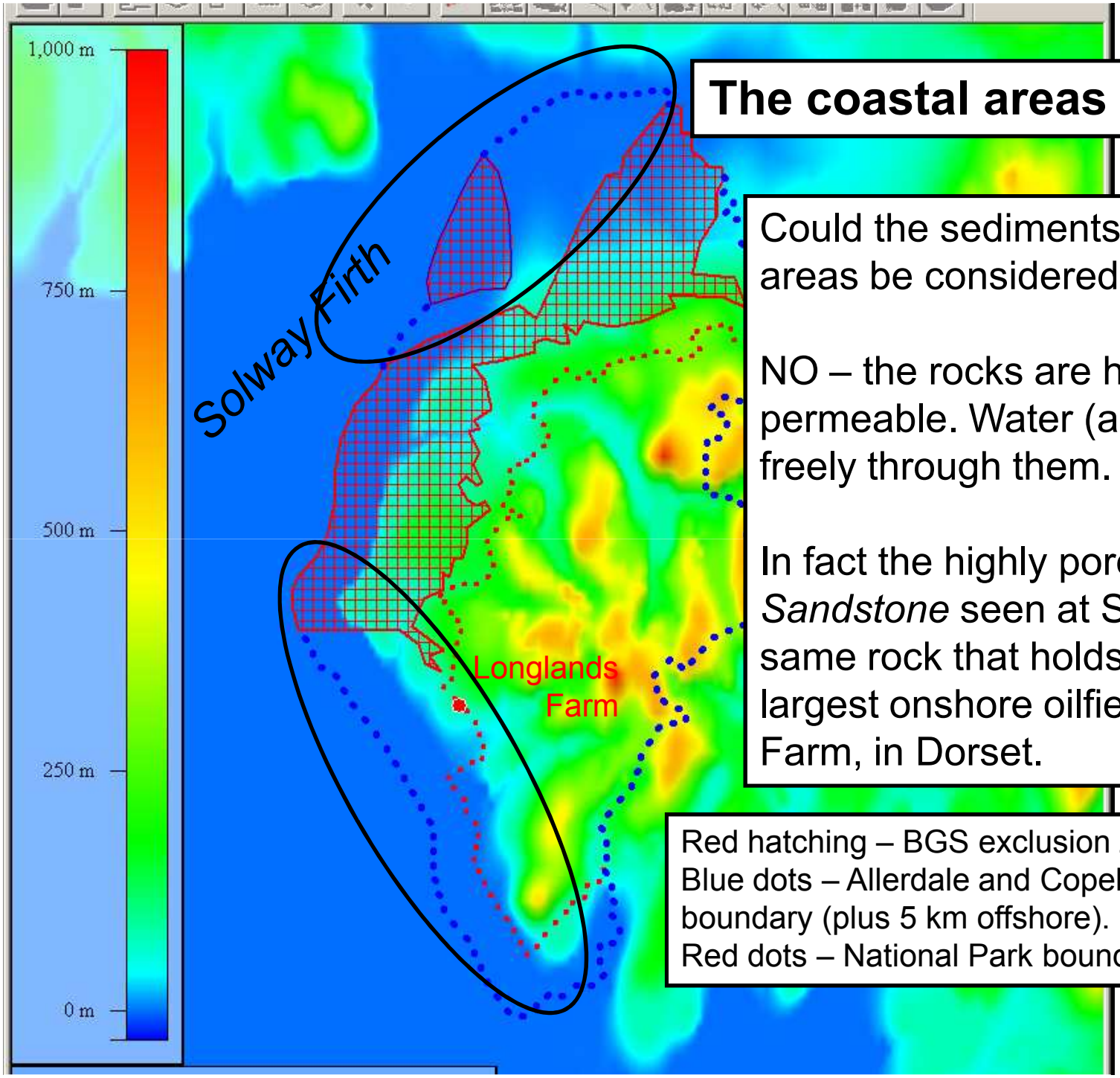
The limestone belt around the northern flanks of the National Park

Answer : NO !

"Groundwater (hydrogeology)
The Carboniferous rocks are structurally complex with fault zones offering either conduit flow conditions or acting as groundwater flow barriers. Near the surface, the Great Scar Limestone Group and thin limestone beds in the Yoredale Group may exhibit karstic fracture-flow in the near surface, while the mudstone beds are poorly permeable and inhibit vertical groundwater movement. There are no known deep karstic formations."

- From the BGS screening report, p. 19

- The geology of both the cover rocks and the volcanic host rock is even more complex than at Sellafield.
- The presence of limestone cover rocks was previously ruled by the BGS to exclude a potential site.
- Such an environment would fail completely to conform to international norms.



The coastal areas and offshore

Could the sediments within these areas be considered?

NO – the rocks are highly permeable. Water (and oil) can flow freely through them.

In fact the highly porous *Sherwood Sandstone* seen at Sellafield is the same rock that holds Europe's largest onshore oilfield, Wytch Farm, in Dorset.

Red hatching – BGS exclusion zones.
Blue dots – Allerdale and Copeland district boundary (plus 5 km offshore).
Red dots – National Park boundary.

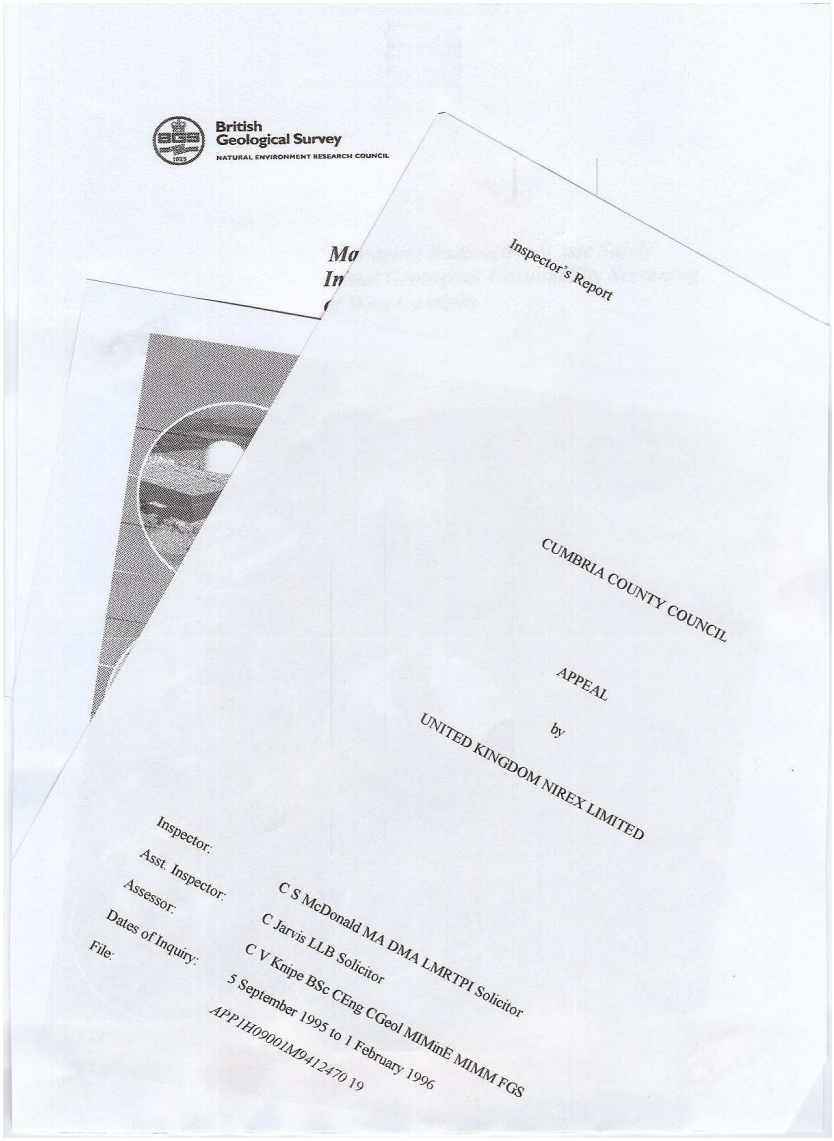
Comparison with Sweden

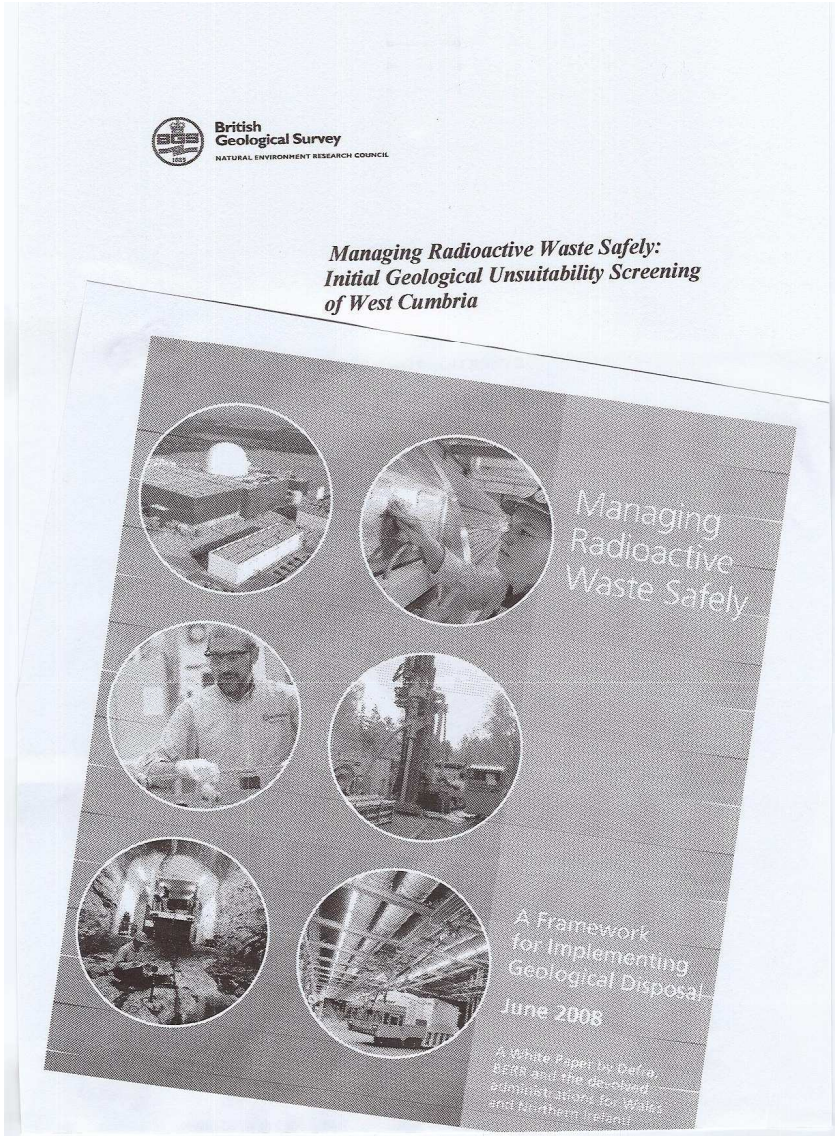
1. Sweden is not trying to return to an area that has already been found to be unsuitable.
2. Sweden is seeking to optimise radiological protection: *"Forsmark's advantages in terms of prospects for satisfying the requirement on long-term safety are very clear. The main reason is that there are few water-conducting fractures in the rock at repository depth. …This provides great safety advantages for the long-term performance of the copper canister and the bentonite clay*". (SKB, 2009)
3. The selected geology in Sweden is very different from West Cumbria (it is flat).
4. Sweden still has problems (e.g. with copper and bentonite) that will also apply to W Cumbria

The geology of West Cumbria is politically inconvenient

In all Government documents the history of nuclear waste disposal now starts in 2003

If Nirex is mentioned at all the problem is described as ‘public acceptability’ not ‘geological unsuitability’





The Nirex Inquiry findings have been airbrushed out…

page 6. WINDOWS 8/4/99 Picture: John Story | The groom, Mr Robson,

Gosforth will fight dump

By Alan Irving

GOSFORTH will bring out the "Home Guard" to fight any new threat to dump nuclear waste on its doorstep even though £6 million a year could be offered as a sweetener.

The village won its "No to Nirex" battle but Cumbrian anti-nuclear group CORE say suspicions have been raised over claims by an eavesdropping Sellafield contractor that Gosforth is on the hit list for an underground waste repository.

The contractor alerted Cumbrians Opposed to a Radioactive Environment (CORE) over an alleged conversation on the Longlands Farm site which Nirex planned to turn into the UK's only engineered dump.

CORE is revealing this information for the first time following the new House of Lords report telling the Government that putting nuclear waste into an underground store is the right solution.

And although a new burial site is yet to be identified, Longlands is expected to be one of about 20 to be looked at in consultation with the public.

Members of the House of Lords Select Committee for Science and Technology visited Longlands as part of its year-long investigations.

And CORE says the contractor was working there when they committee members came for a look.

In his handwritten letter to the group, he claimed: "After the Lords left, a few others stayed with much slapping of backs and joviality. We learned from the BNFL engineer overseeing the work that the covers would be coming up in two years and the go-ahead given for building not only the rock lab but the store itself.

"I hope I am wrong but the feeling on site among us contractors and BNFL people is that it is inevitable.

"For the sake of my children and theirs yet to come let's hope one isn't built. A surprising amount of folk would be against it and sign any petitions."

The letter adds: "Once again sorry for remaining anonymous."

Martin Forwood, campaigner for CORE, said he had no reason to disbelie the claim because so far Sellafield workers who had blown the whistle anonymously on site problems were proved correct.

"Why should somebody take the trouble to write to us if they are not concerned. We take it very seriously — it is not being mischievous.

"The letter about this conversation makes us suspicious especially as Nirex no longer want to abandon £200 million worth of boreholes sites. They have asked permission from the county council to keep them open longer for national research."

Officially, Longlands has not been ruled out of the reckoning as a future dump and Nirex claim it still holds promise.

Now the Lords suggest financial compensation, perhaps up to £6 million a year, for the area or areas eventually earmarked as a disposal site.

But at Gosforth, Dick Wright, leader of the Action Committee which toasted in champagne when Nirex lost its rock lab case, issued a hands off warning.

"Money or no money, we don't want the dump because the site is not safe or suitable. I think it will come back on the list and some people in the area might be swayed by compensation which is perfectly fair after everything else notably safety has been settled.

"We thought the public inquiry gave justice and if that was set aside there would be a good old fight with the 'Home Guard' going straight back in. We are stood down but forces would be re-mobilised."

House of Lords Science and Technology Committee's visit to Longlands Farm June 1998 (reported 8th April 1999 after publication of the Lords' report)

- The Lords' report recommended:

1. Changing planning law so the scientific evidence could never again be cross-examined prior to site selection
2. Paying local compensation
3. Setting up a new committee to devise a process to make putting the waste back in West Cumbria 'publicly acceptable'

- On 24 June 1999 CCC refused planning permission to Nirex to keep the boreholes (on the grounds the site had been rejected as geologically unsuitable)

The new geological criteria

- Professor Sir Keith O'Nions, Government Director of Science (Apr 06 – Jul 08). Backed Nirex at the inquiry in 1995.
- Feb 2007: Criteria Proposals Group (CPG) and Criteria Review Panel (CRP) set up
- 15th Feb: Royal Society writes to DEFRA's Chief Scientist, expressing concerns that site selection was being rushed and that the time-scale for developing the geological criteria was too short, stating "*It seems to us most unlikely that such work can be done, carefully, robustly and credibly in a few weeks*"
- April 2007: W Cumbria invited to express interest
- May 2007: geological criteria published

Geology & hydrogeology	x	Unchanged (unsuitable)
Safety	x	Larger quantity of more dangerous wastes (heat-generating)
Science and technology	x	New problems identified e.g. copper corrosion, gas generation, clay + heat
Site selection	x	Still political. Failure to optimise safety.
Socio-economic & environmental	x	Larger footprint, National Park, encapsulation facilities, increased blight

Legal issues

- Change in planning law does not remove the legal requirement to optimise radiological protection, including choosing the right geology and weighting safety highly to meet the obligation to prevent undue burden on future generations (cf. Sweden & Inquiry findings)
- Failure to consider geological suitability could lead to an unsafe site (due to sunk costs) or waste of public money & unnecessary impacts on constituents (due to rejection at a later stage)
- BGS criteria are necessary but not sufficient: the Nirex Inquiry findings are still valid

Responsibilities of councillors

- Sustainable development: requires choosing the right geology to ensure the safety of future generations
- Responsible use of public monies (which should not be wasted on investigating unsuitable geology)
- Obligations to constituents (including avoiding blight and unnecessary environmental impacts, especially on the National Park and protected sites)

Conclusions

- A deep nuclear waste repository poses risks to future generations
- Site selection is part of ensuring safety (optimising radiological protection)
- Councillors have a moral (and legal) obligation to consider all the existing geological information (including the 1997 Nirex Inquiry findings)
- West Cumbria is geologically unsuitable and the council should therefore withdraw