UKWIR

ENVIRONMENT AGENCY

Counting the cost of groundwater quality degradation

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NATURAL ENVIRONMENT RESEARCH COUNCIL

Drivers

- More stringent regulation

1980 Drinking Water Directive

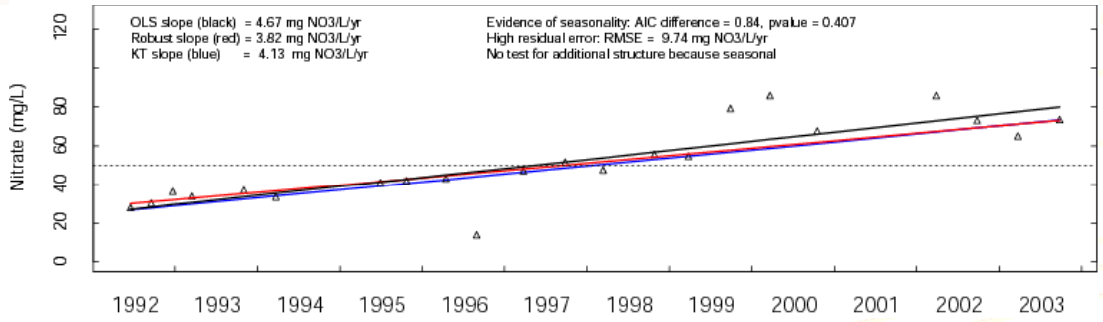
1989 Water Act

Water Supply (Water Quality) Regulations

1989 Nitrate, pesticides
1999 Cryptosporidium
2000 Arsenic, solvents, hydrocarbons

2003 The Water Environment (Water Framework Directive) Regulations

- Decrease in groundwater quality



British Geological Survey
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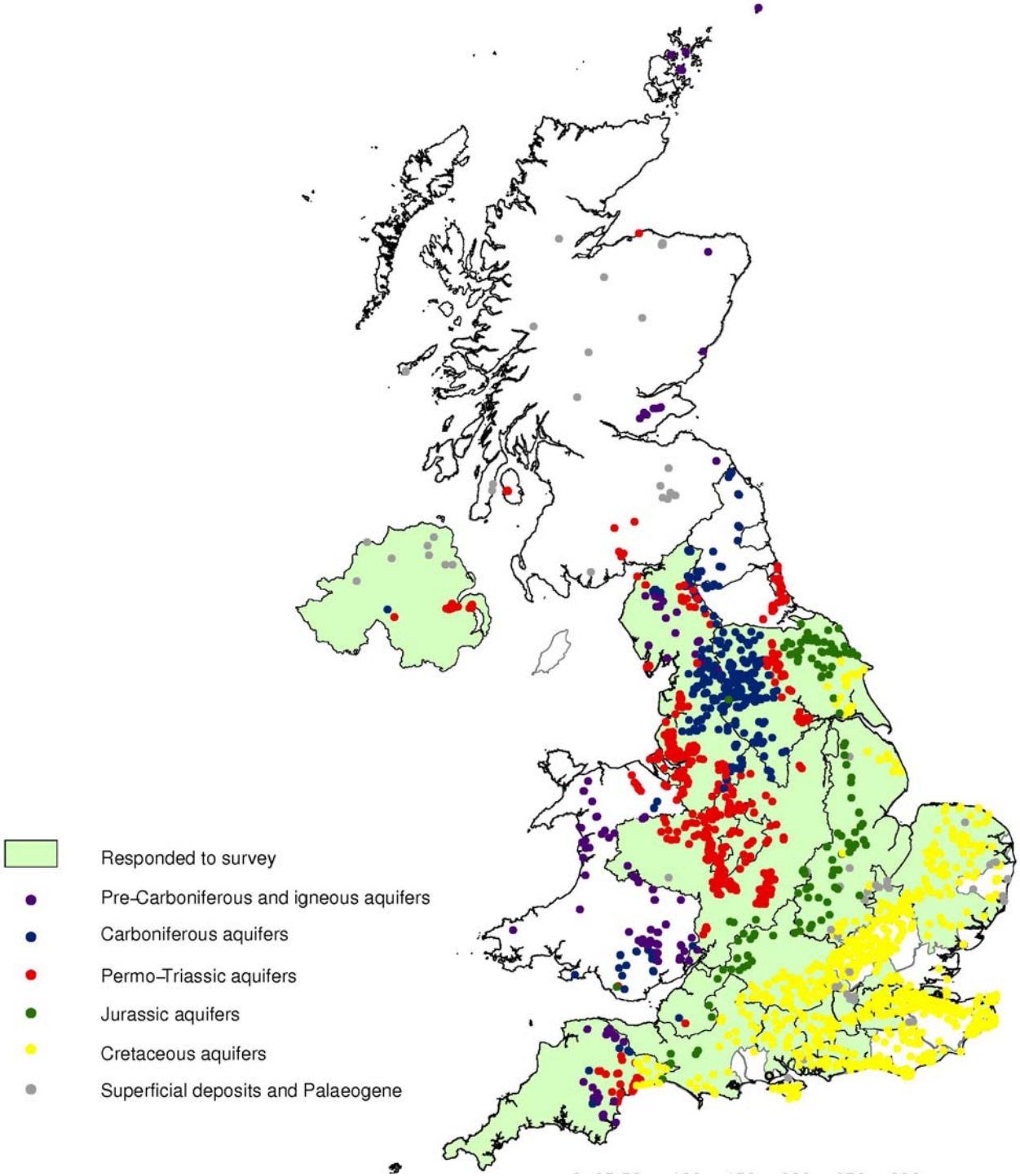
Survey response

- 14 utilities
- 75.6% of supplied groundwater
- Unrepresented settings in Scotland & Wales 3% of total volume



Main quality issues

Diffuse pollution

- Nitrate
- Pesticides
- Hydrocarbons & solvents
- Other point sources

Point source pollution

Regulatory changes

- Cryptosporidium
- Arsenic

‘Natural quality problems’

- Iron & manganese
- Salinity

Calculated mean unit costs

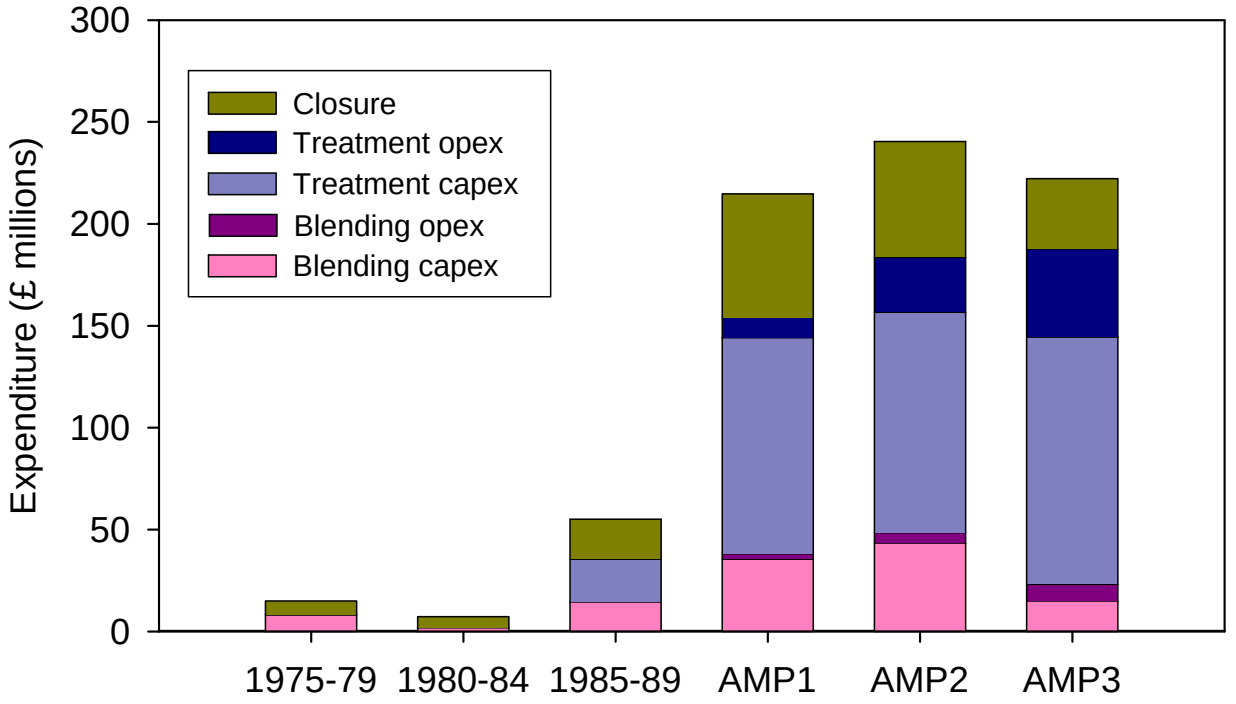
	Blending		Treatment	
	Capex (£/Ml/d)	Opex (£/Ml)	Capex (£/Ml/d)	Opex (£/Ml)
Nitrate	261,500	7.2	476,100	68.1
Pesticides	111,300	2.9	263,000	19.5
Cryptosporidium	-	-	359,000	16.6
Hydrocarbons	220,000		723,200	8.1

- All costs at 2003 equivalent
- Very large data ranges particularly for capex (95% CL= ± 60%)

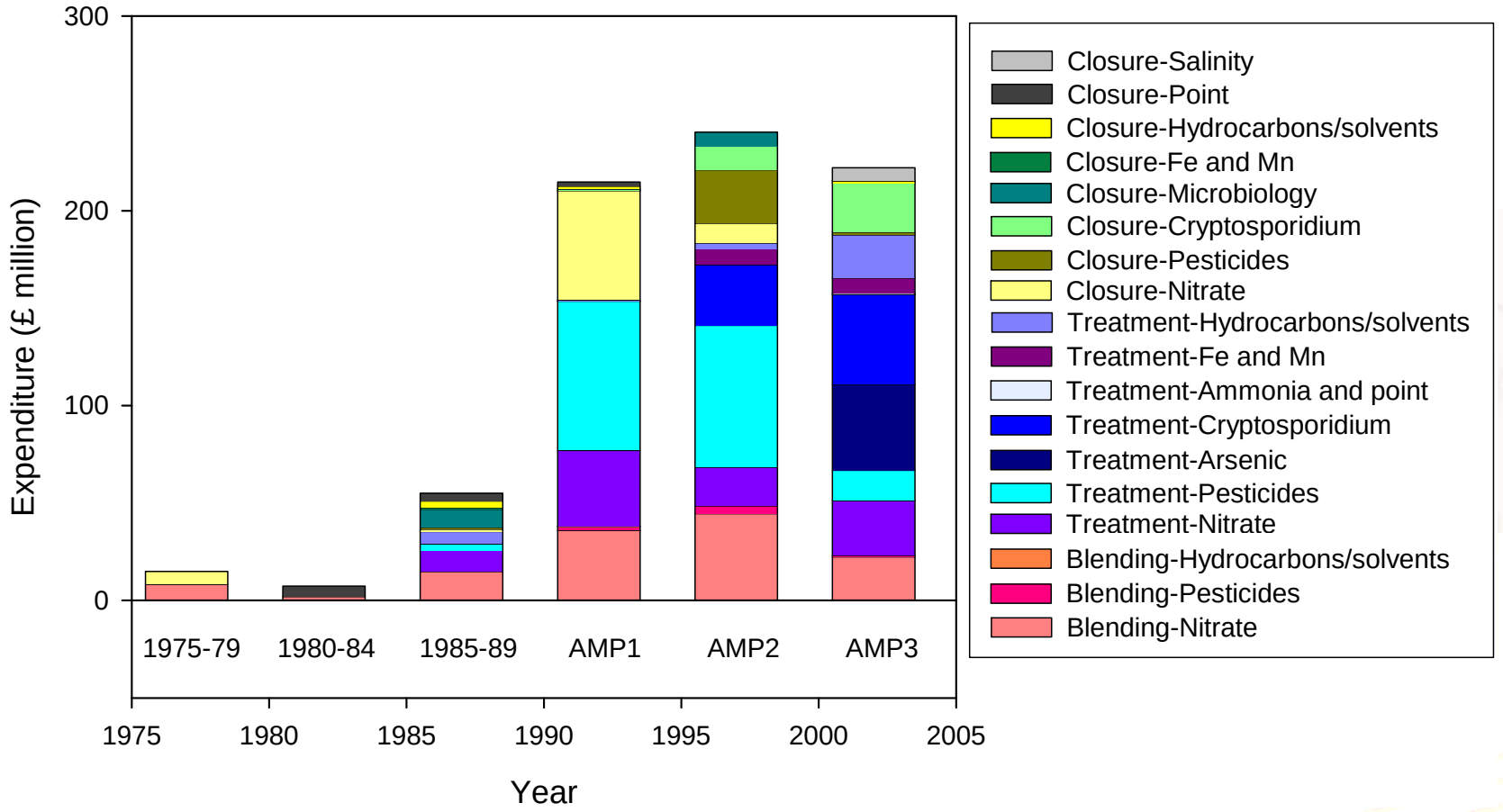
Estimates

- Missing abstraction volumes
- Missing treatment and blending costs, particularly opex
- Cost of replacement sources
- Scaling-up to 100% response

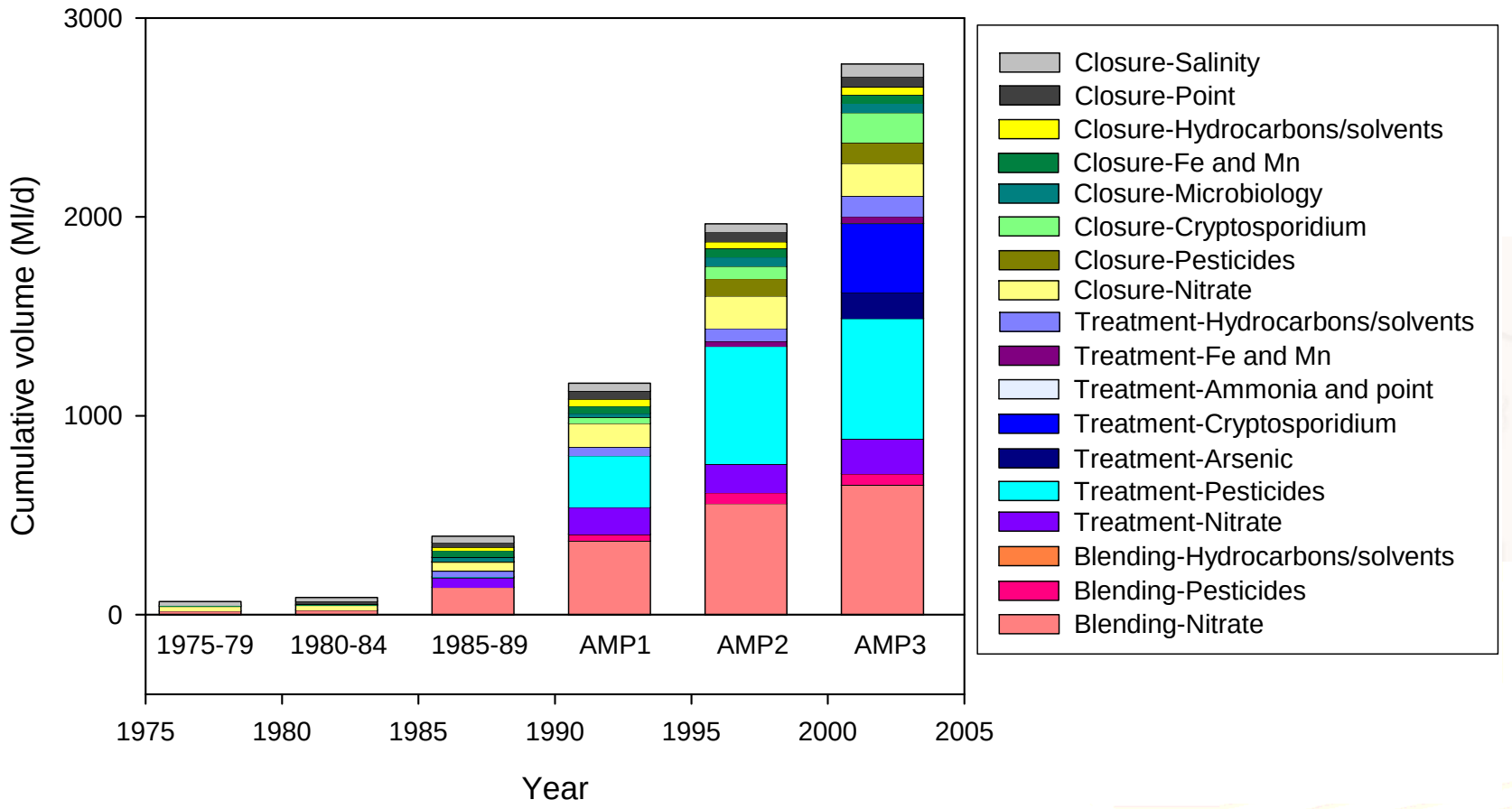
Industry costs to 2004, opex & capex



Industry costs to 2004, problem & action



Amount of water affected



Future scenarios tested

A. **Best case:** linear extrapolation based on past trends for nitrate only

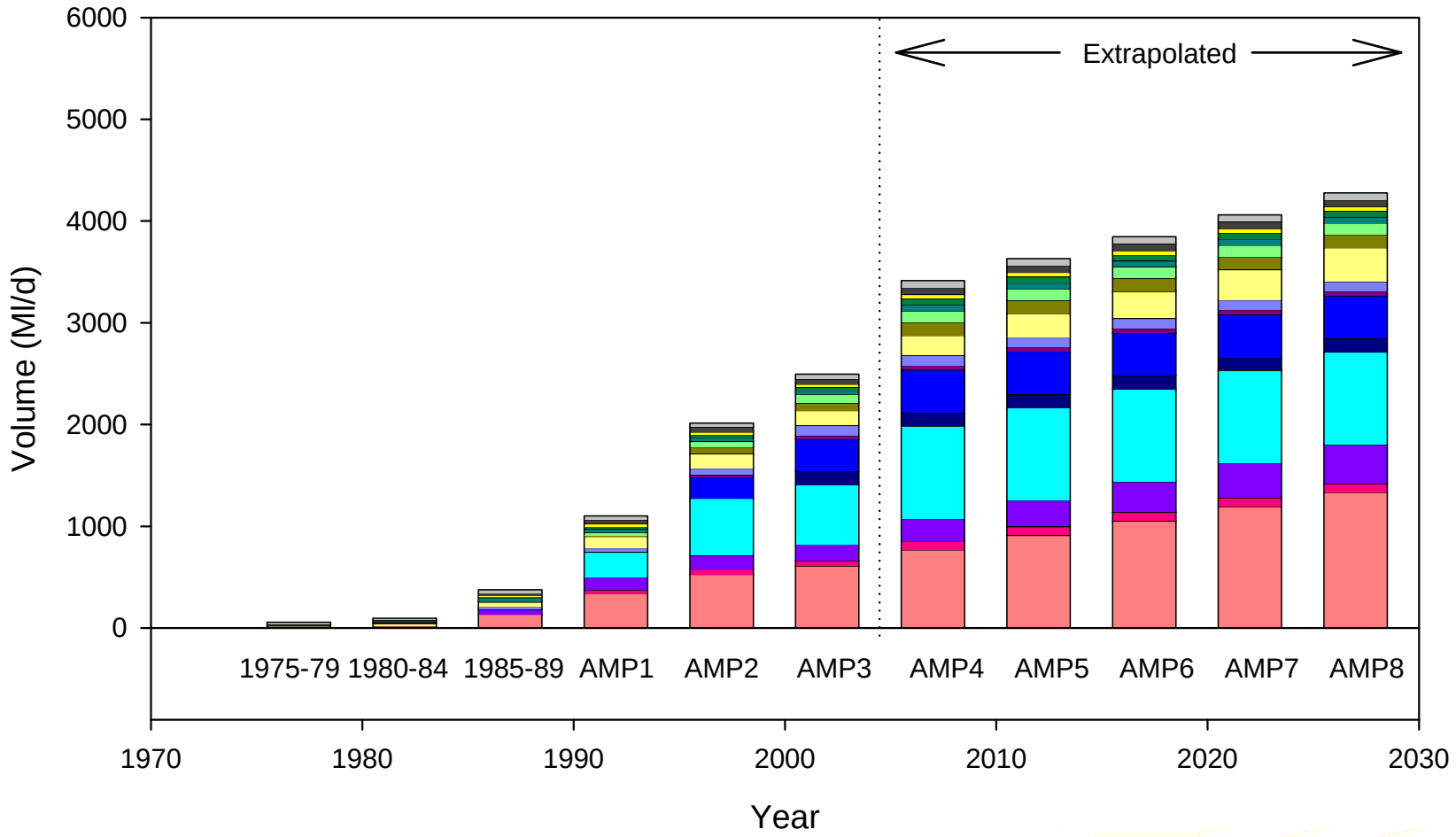
B. **Likely case:** linear extrapolation based on past trends for all contaminants except Cryptosporidium and As

C. **Worst case:** as B but with no new blending/treatment after AMP4 – curtailment after 2010

Assumptions:

- Demand remains at current level - no account of demographic or climate changes
- No quality improvements from protection measures
- No further regulatory changes or ‘new pollutants’

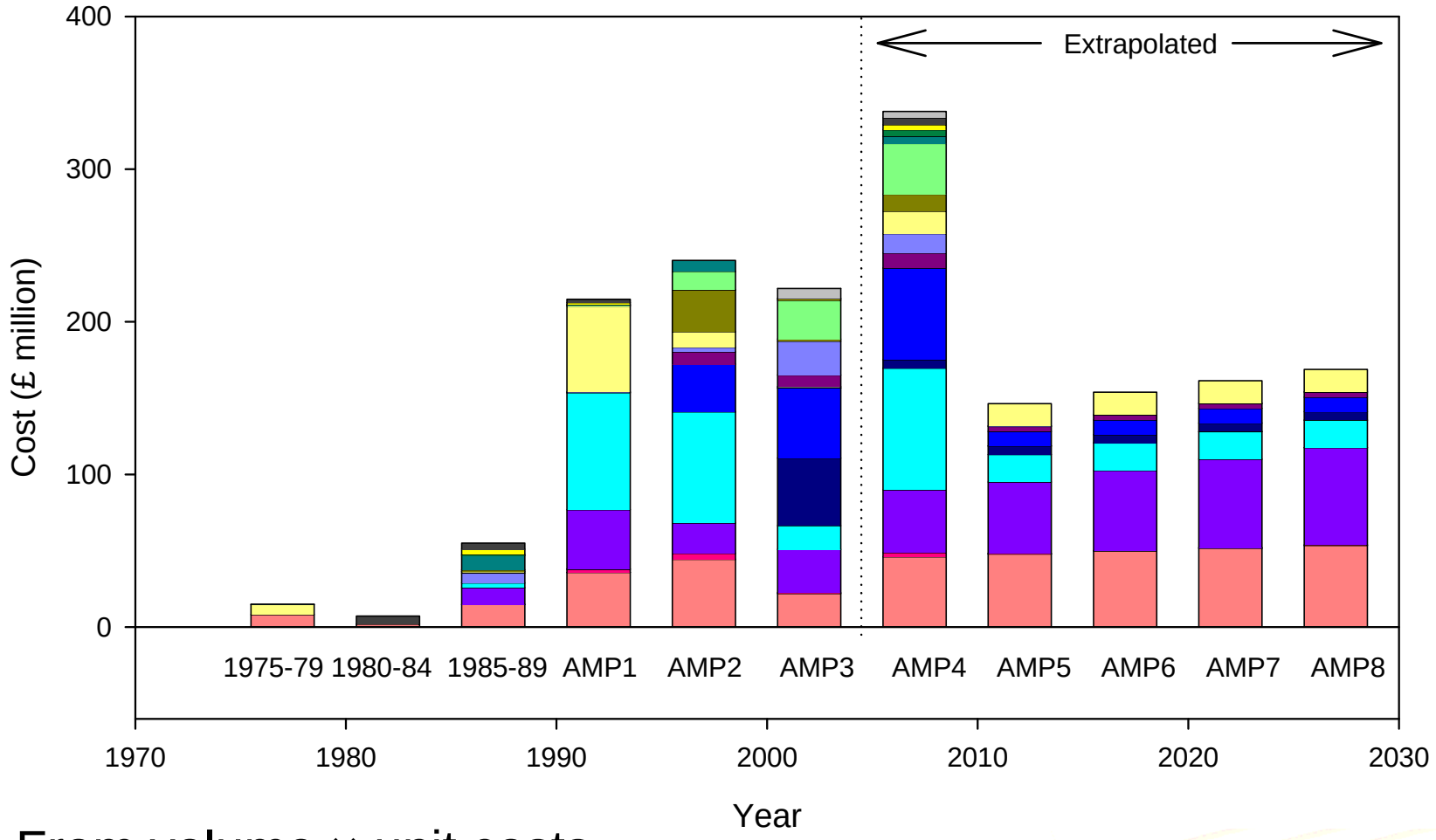
Scenario A - volumes



Total = 4300 Ml/d by 2029

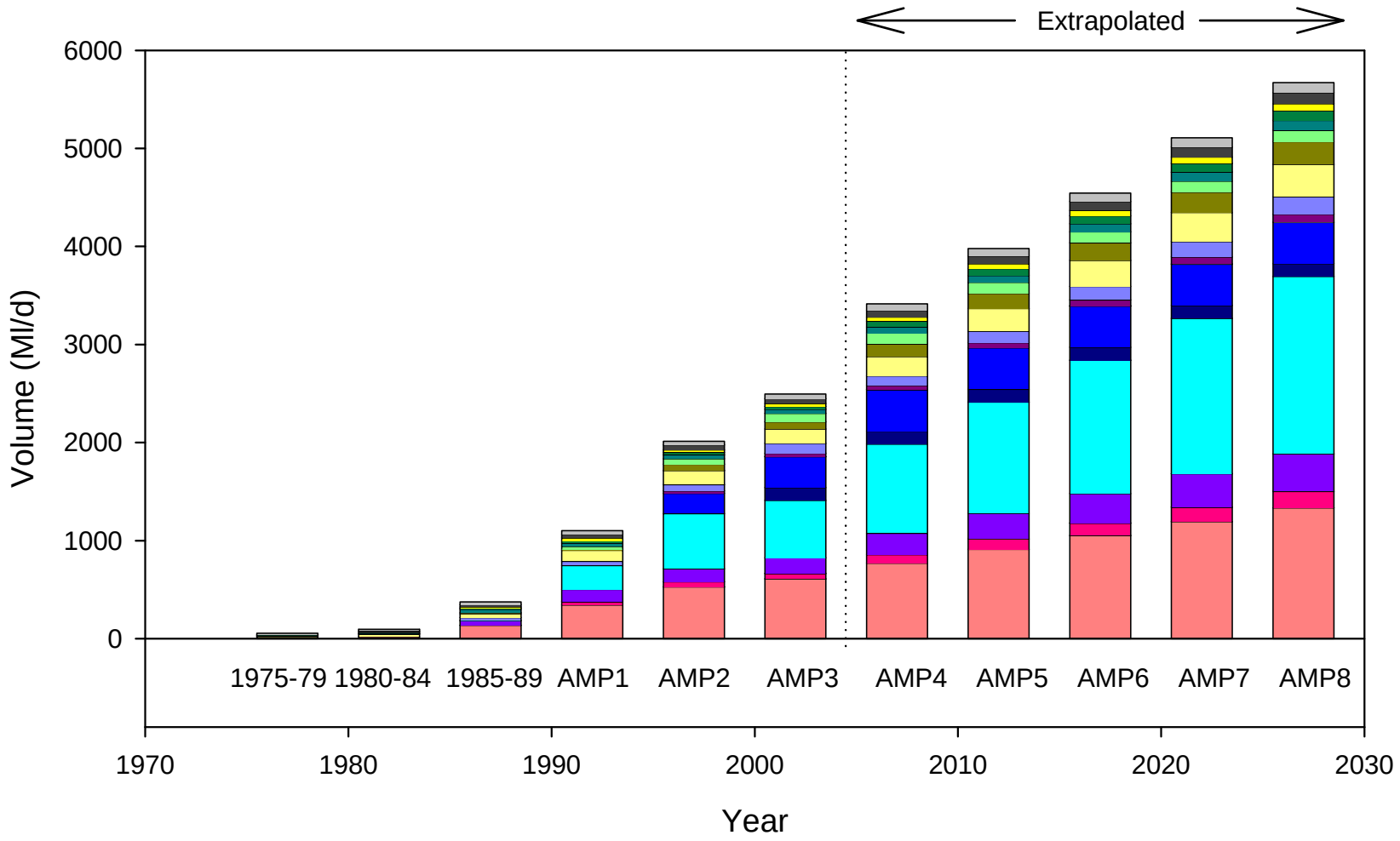
Groundwater supplied 2002 = 5178 Ml/d

Scenario A - costs



From volume × unit costs

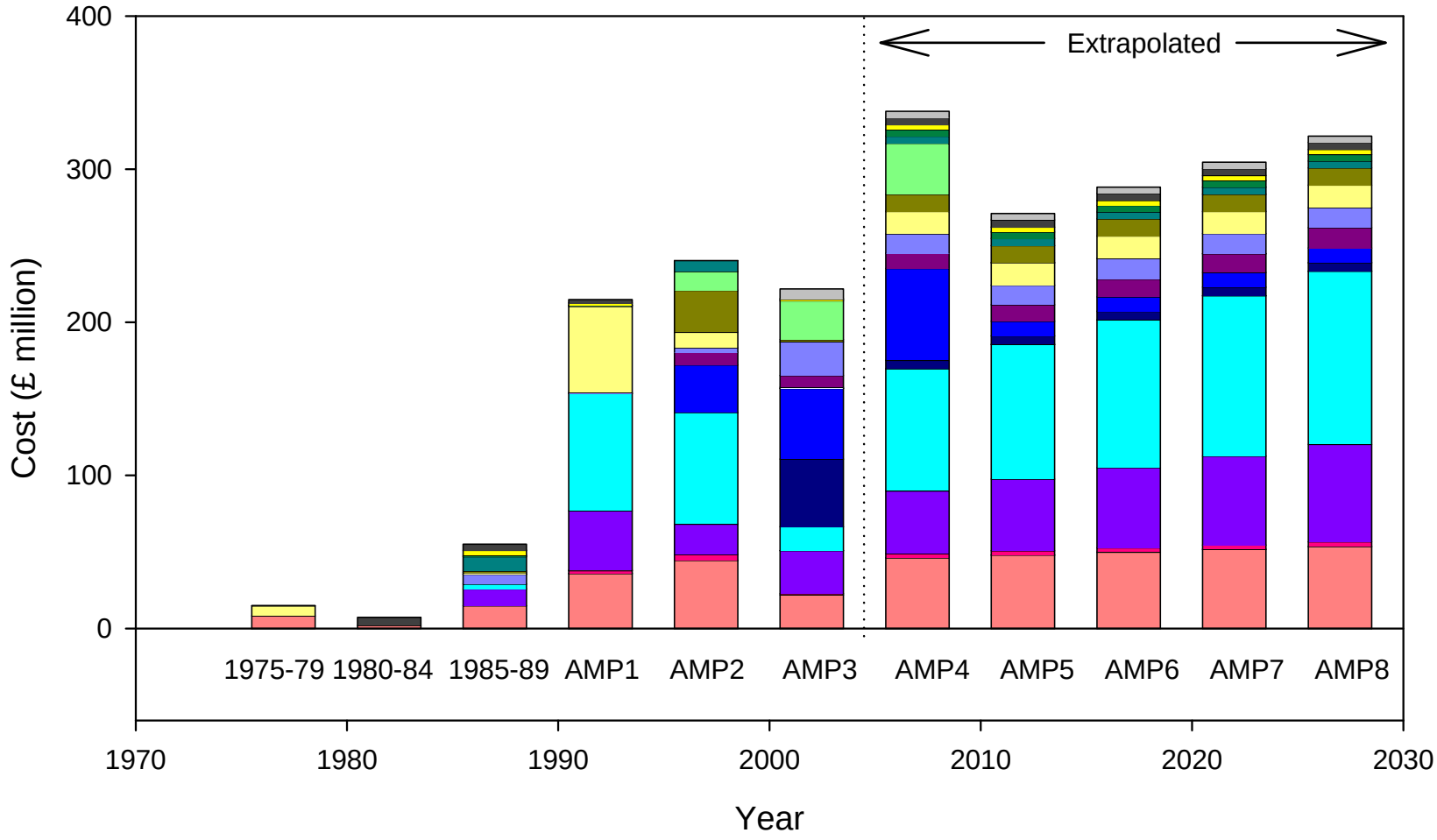
Scenario B - volumes



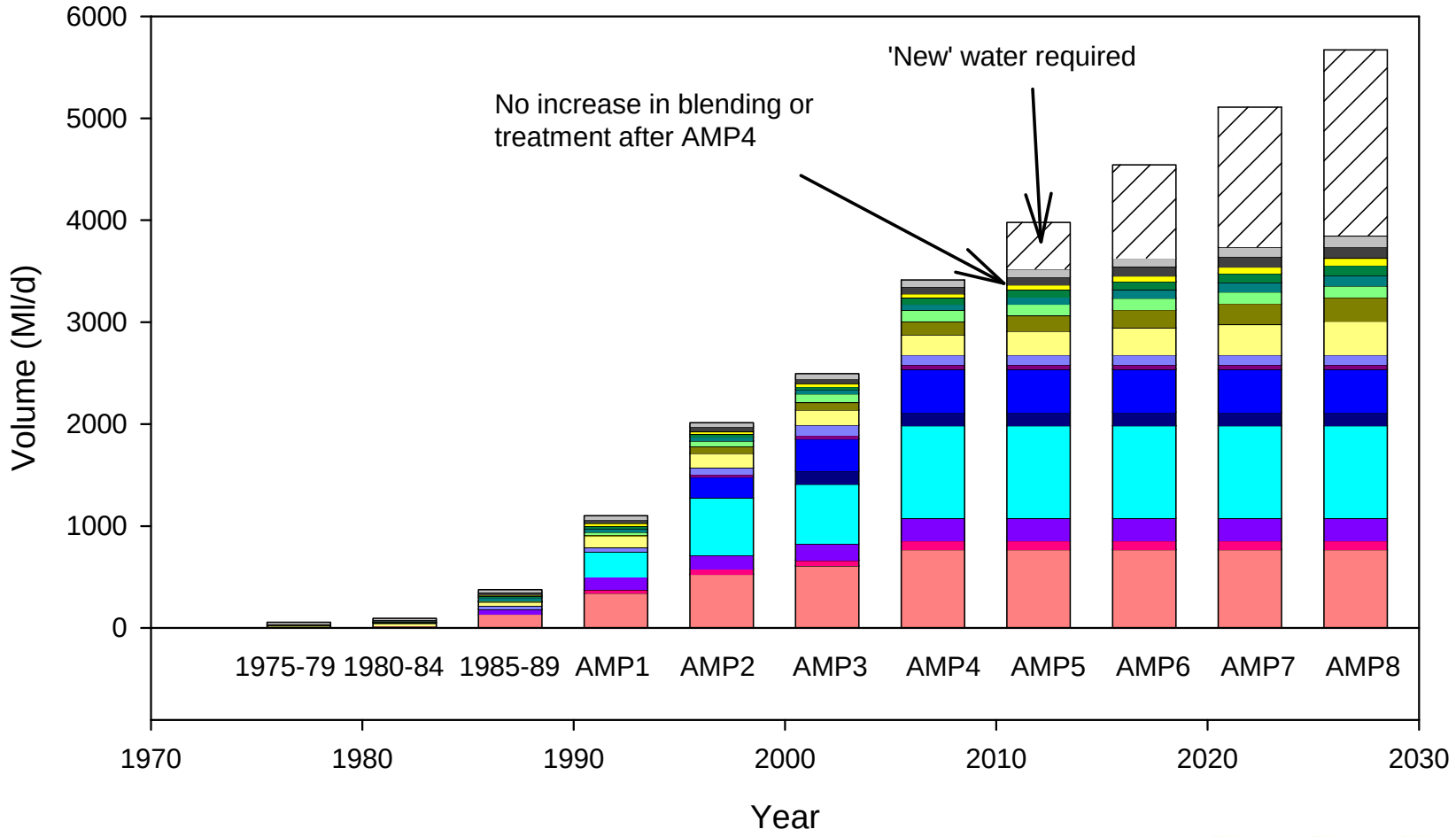
Total = 5700 Ml/d by 2029

Groundwater supplied 2002 = 5178 Ml/d

Scenario B - costs

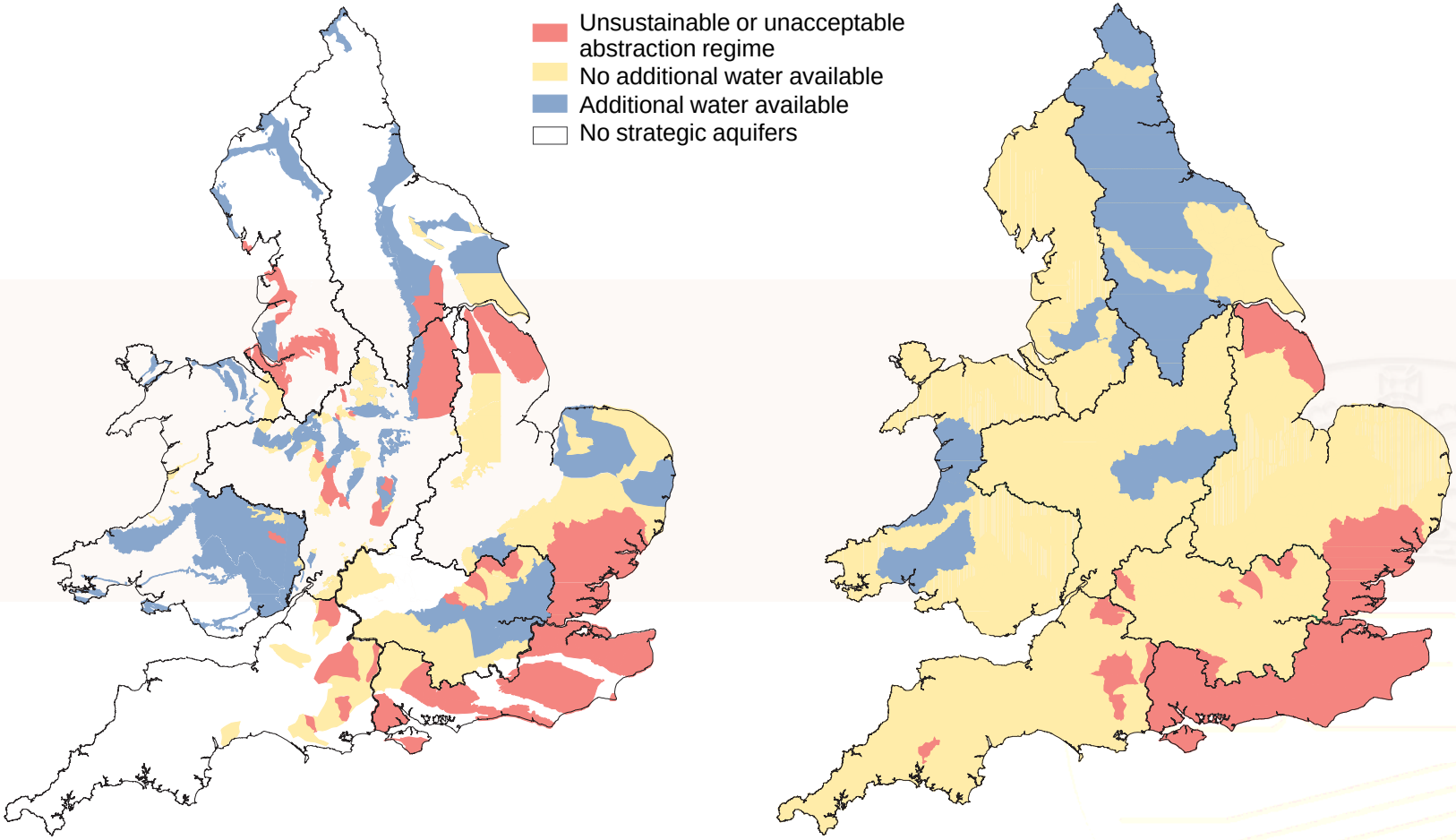


Scenario C - Groundwater shortfall



1800 Ml/d by 2027

Water availability



Groundwater

Summer surface water (from EA, 2001)

Mean capital costs for replacement water

	Cost (£ million/Ml/d)	Cost per AMP period (£ million)	Total AMP5 – AMP8 (£ million)
New groundwater source	1.3	580	2,300
Surface impoundment	2.75	1,240	4,950
Desalination	3.35	1,500	6,000

Conclusions

- 2450Ml/d of supplied water is affected – **50%** of total
- Actions additional to disinfection have cost the water industry **>£750 million** from 1975 to 2004
- In 25 years time, groundwater quality deterioration could affect 4,300 – 5,700 Ml/d (from **80% to all**)

Implications for water industry

- Changed economic balance of options - e.g. towards leakage reduction
- Limitation of groundwater treatment under the WFD could lead to a supply shortfall
- Alternatives, such as surface water impoundments or desalination, are very costly
- Emphasis back on managing and protecting resources