Sustainable Communities
Sharing Knowledge

Water

Andy Gibson and Clint Cantrell

Best Practice for the Management of Wet Weather Overflows – Effects Based Analysis

A brief snapshot of urban drainage evolution…

“Night soil” collection carts – circa early to mid 1800s

City life before wastewater infrastructure…

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THE

Otago Daily Times.

"Inveniam viam aut faciam."

9 June, 1862

Death rate from infectious disease?
36 per 1000 people…

State of public health

Three months ago, in drawing attention to the defective sanitary condition of the city, the following passage occurred in the same column that the present now appears: "Dunedin is allowed to remain a city "which invites pestilence; every sanitary pre- "caution is neglected; its streets and the "surroundings of its dwelling houses reek "with impurity and filth — its inhabitants "imbibe poison in the water they drink — the "grim phantom of the inexorable destroyer "stalks through its streets ready to commence "his work of destruction, and everywhere, "around are those who, by the exercise of "little trouble and less sacrifice, might arrest "his deadly march. Sanitary precautions would "be adopted if the inhabitants possessing "wealth and influence in the town would "exert themselves to procure them. To these "we speak. Death is no respecter of persons, "and despite their wealth, their influence, their "prosperity, they may find cause to bitterly "regret the supineness which has permitted the "town they inhabit to develop itself into a "huge charnel house. If a few cases of

Ligar Canal was an open drain located in the middle of Queen St (the main street) in Auckland. It contained raw sewage and other unhygienic material. Open drains created perfect conditions for infectious diseases such as typhoid to spread through the community.

Typhoid Map – Wellington 1892

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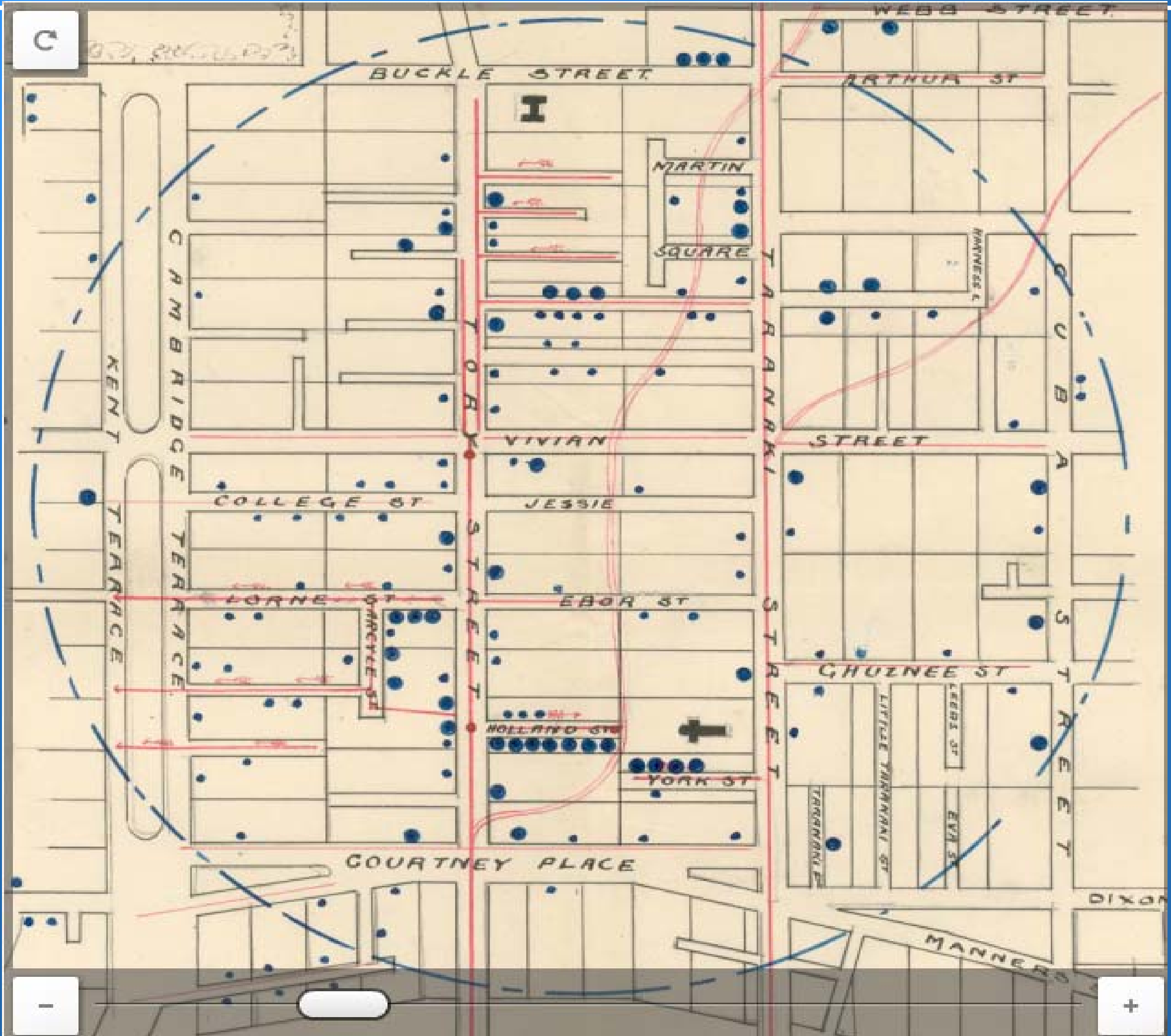


Iwi knew better…

Early Maori settlements were quite hygienic…

Sanitary arrangements included:

•Special rubbish disposal sites with people to oversee

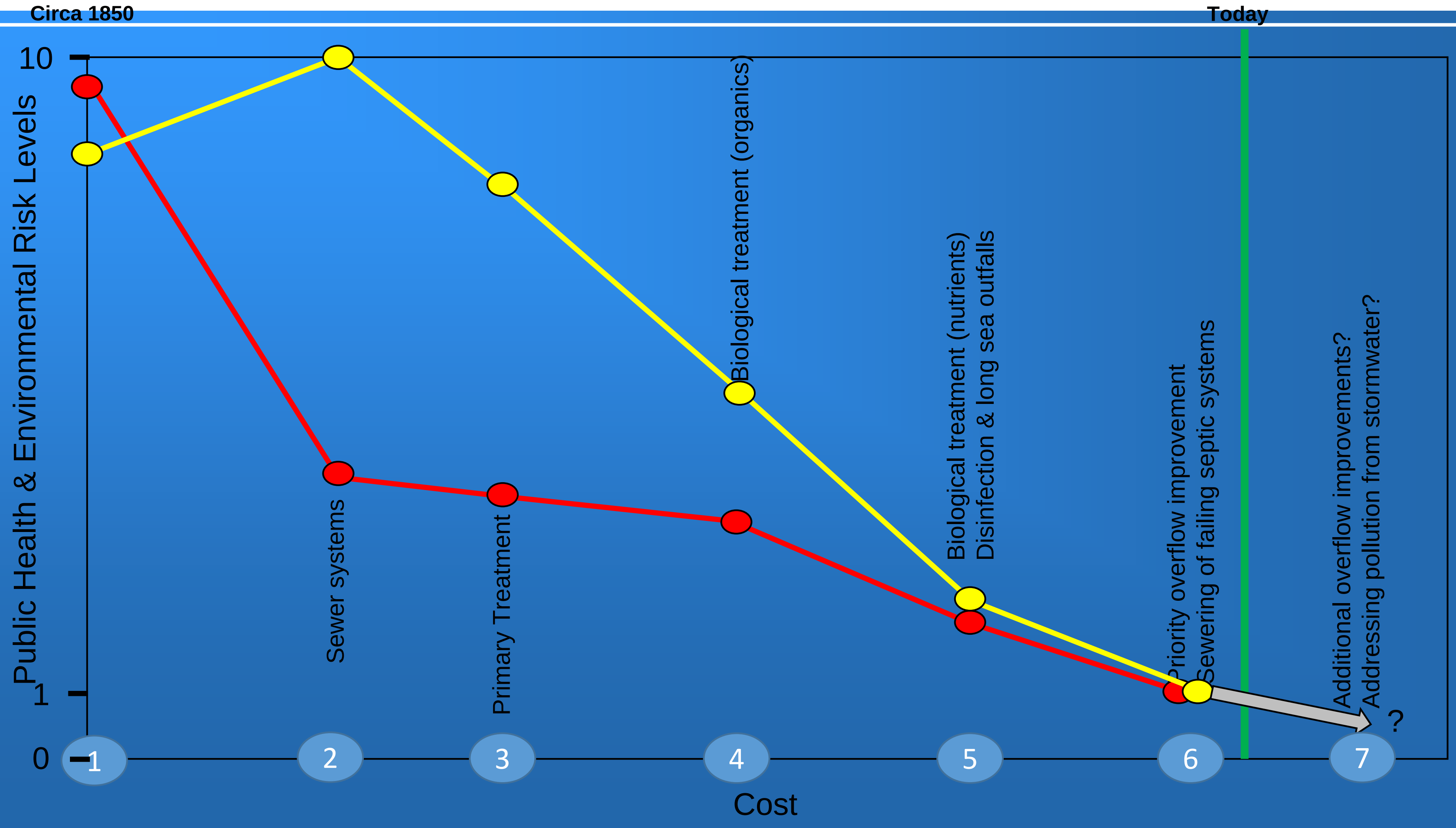
•Purpose built latrines where waste wasn't allowed to overflow

•Raised and sealed storehouses for food to prevent contamination

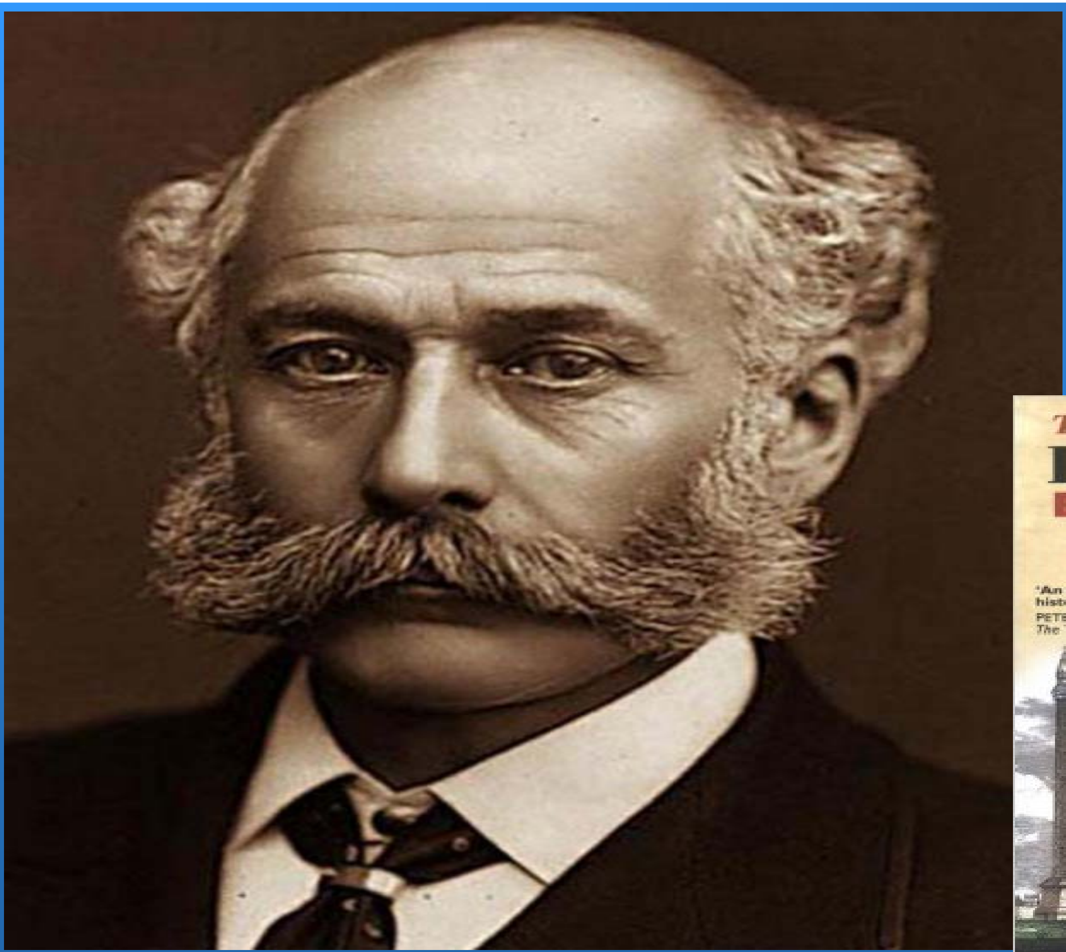
•System for identifying and regulating the use of different grades of water

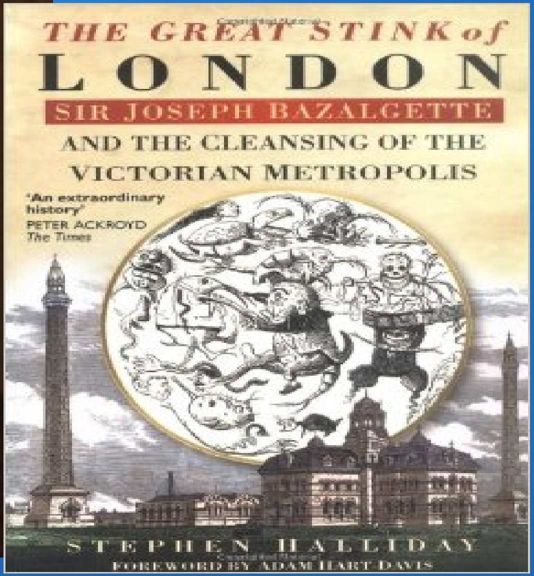
•Disposing of used water on land so as not to contaminant source water

Evolution of step change benefits from wastewater infrastructure investments



The impacts of sewer systems…

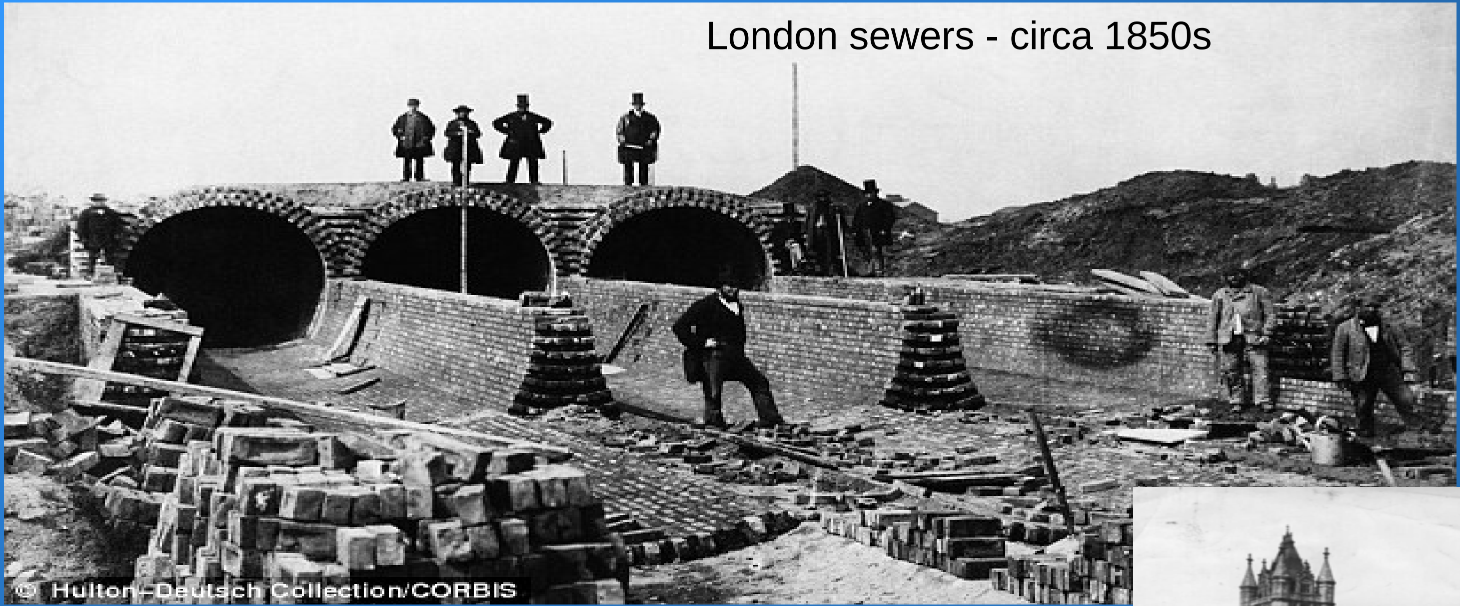




Sir Joseph Bazalgette 1819 to 1891

Impact of sewer systems…

London sewers - circa 1850s

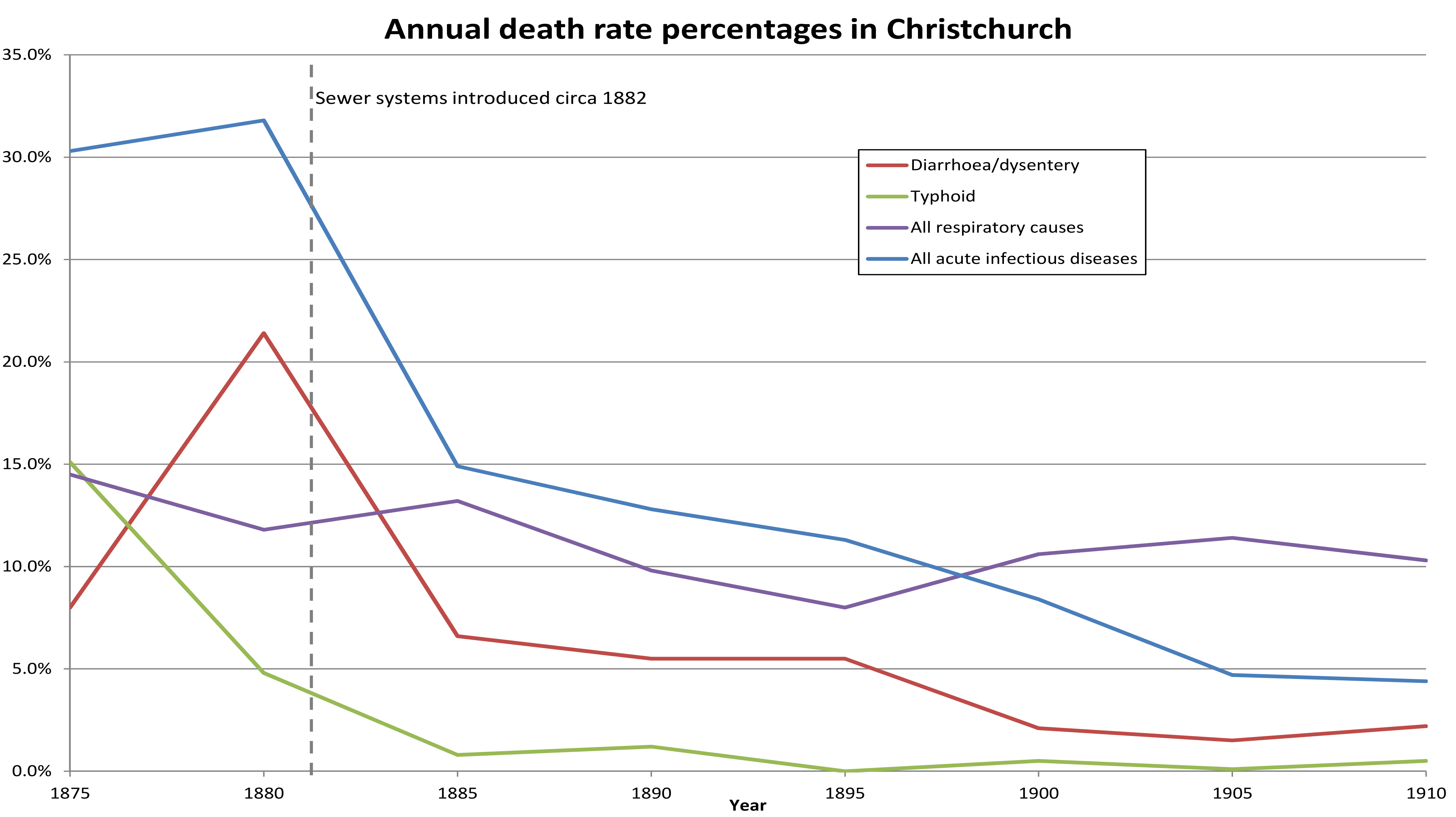


Stormwater

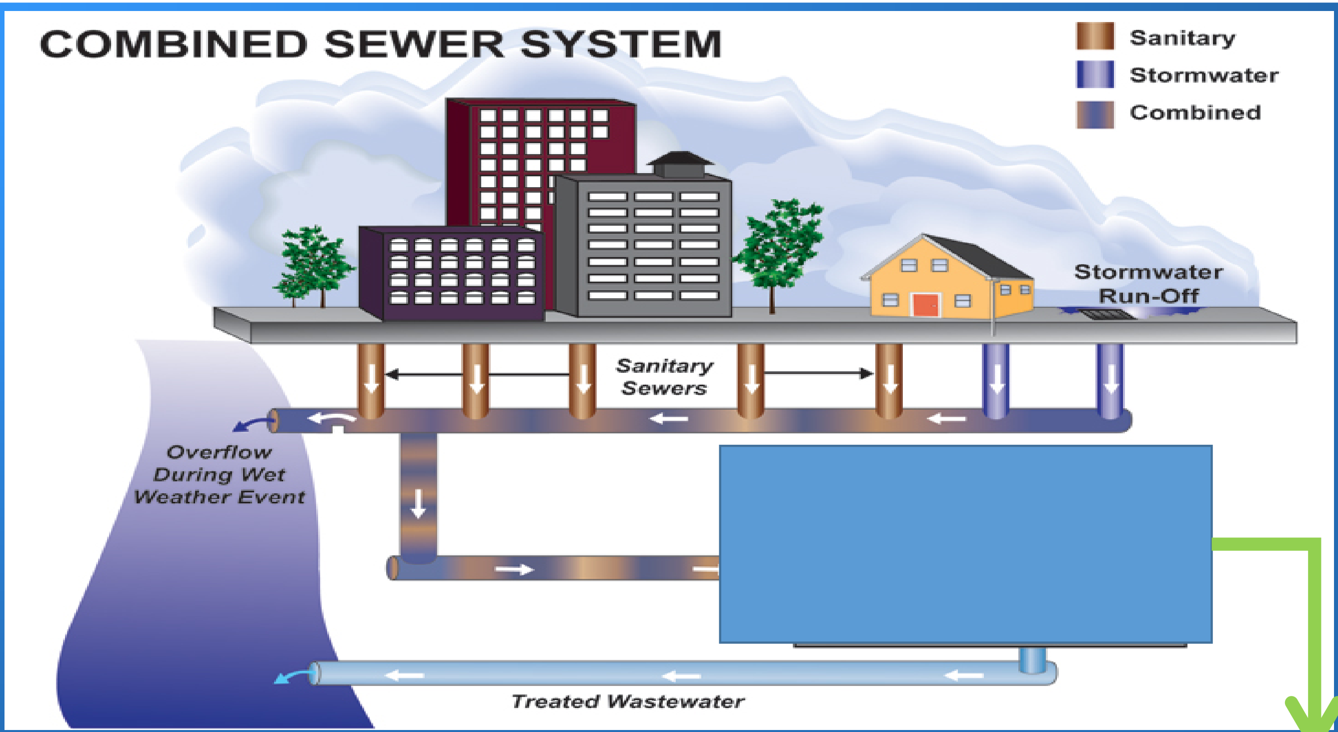
Wastewater

Combined Sewer

1850s to early 1900s


Annual death rate percentages in Christchurch
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Sewer systems introduced circa 1882
Diarrhoea/dysentery
Typhoid
All respiratory causes
All acute infectious diseases
1875
1880
1885
1890
1895
1900
1905
1910
Year

Impact of wastewater treatment…




Mangere WWTP today


Mangere WWTP 1960


Kelly Tarlton Sewage Tanks 1911

Impact of priority wastewater overflow controls…

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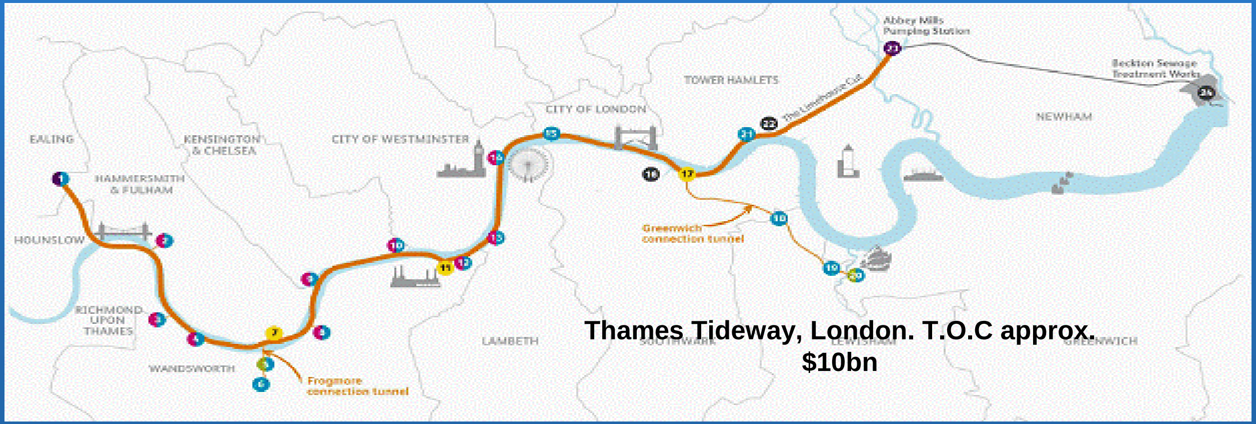
Northern Beaches Storage Tank, Brookvale
Built 2013, Cost $70 million

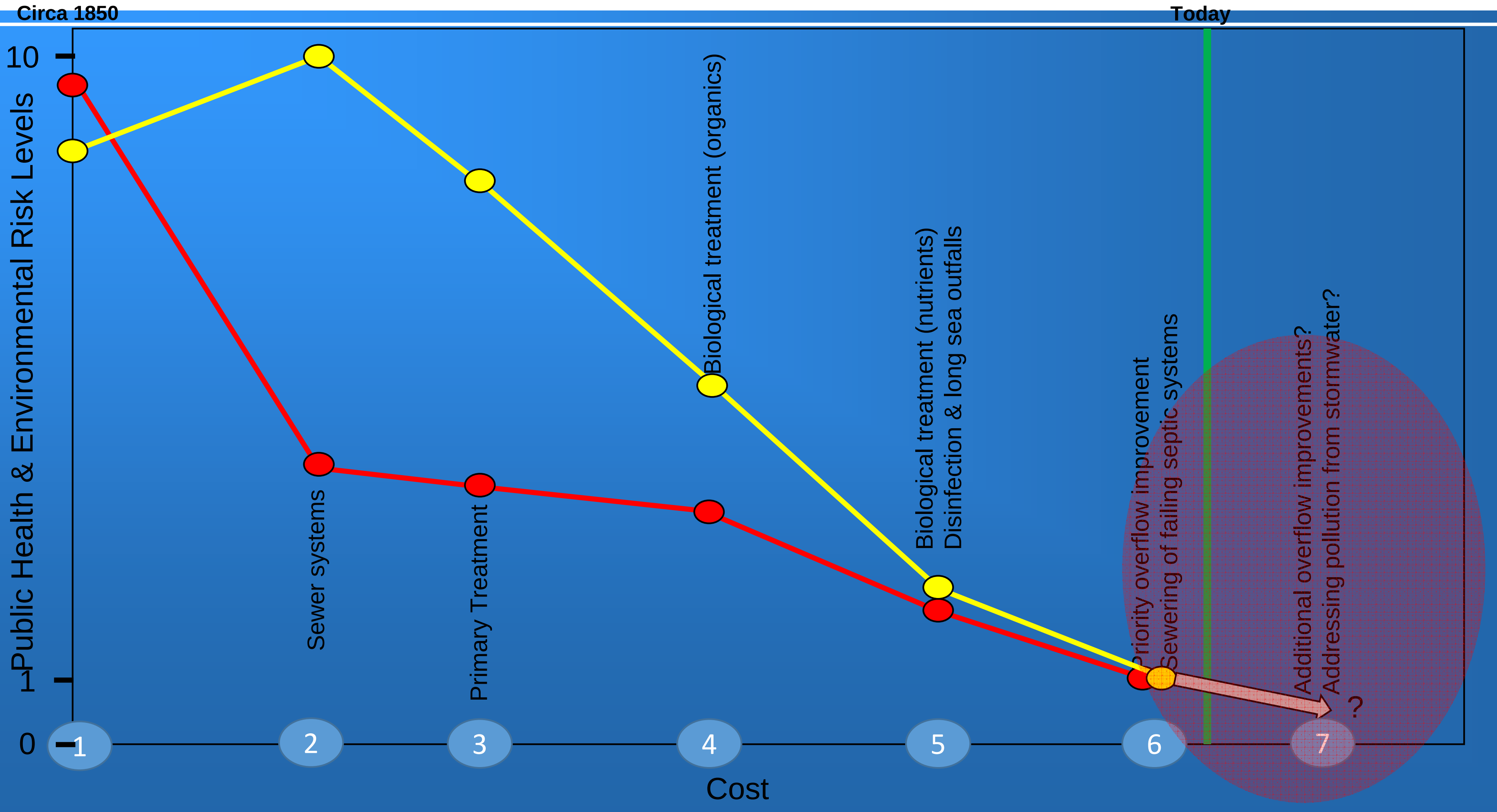
Blackpool, storage tank and associated works, Cost approx. $400m



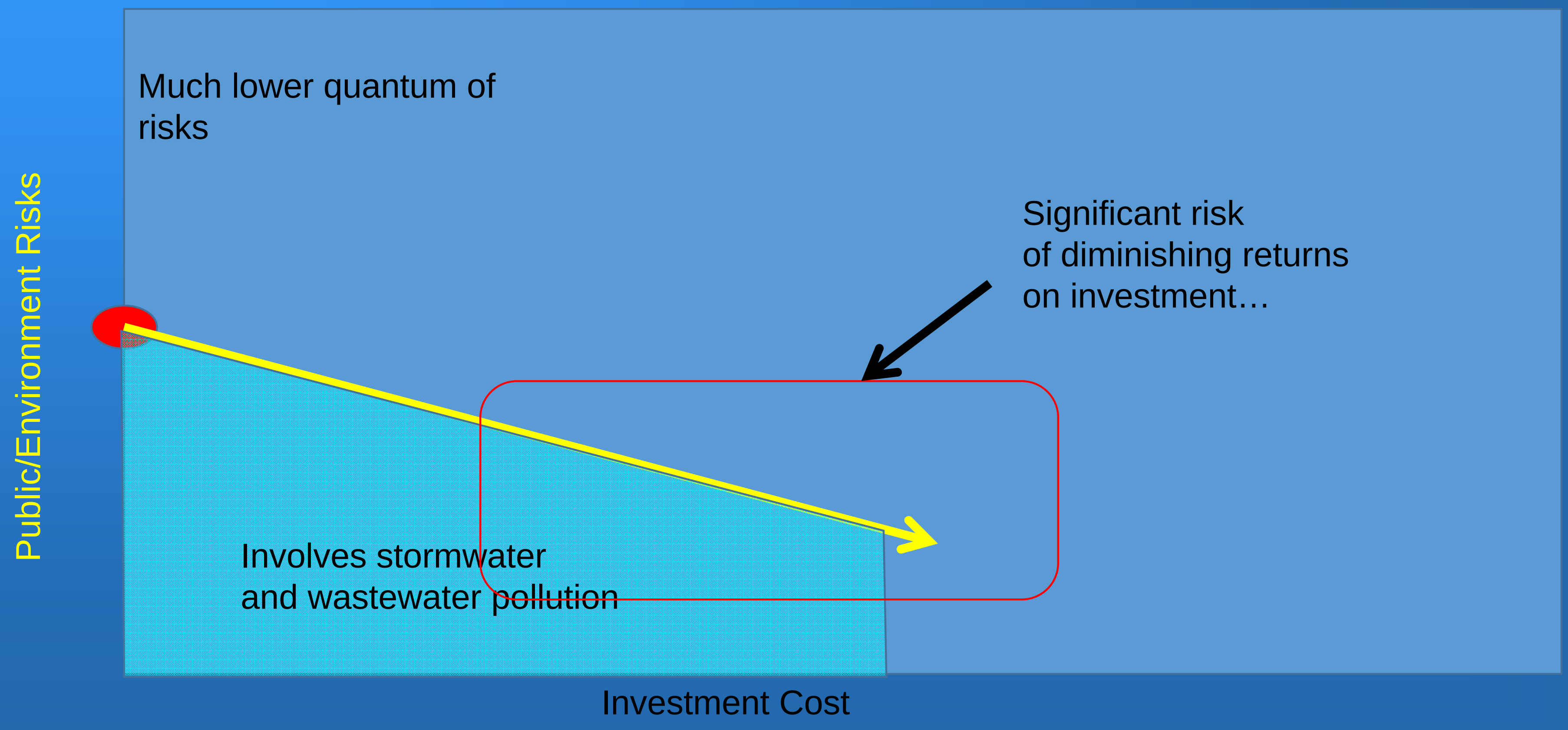
Thames Tideway, London. T.O.C approx. $10bn

Evidence mounting of questionable returns on investments…

Evolution of step change benefits from wastewater infrastructure investments



A different framework for moving forward…



Traditional approach to catchment water quality management...

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"Silos"

Treatment Plant	Urban Stormwater	Industry	Wastewater Overflows	Farmland Runoff
				

Regulatory focus

Evolution of approach & understanding

Snap shot of conveyance capacity (e.g. 5 ADWF)

Static
Infrastructure

Outputs focus…

Spill frequency & volume (e.g. 2 spills/yr)

Dynamic
Infrastructure

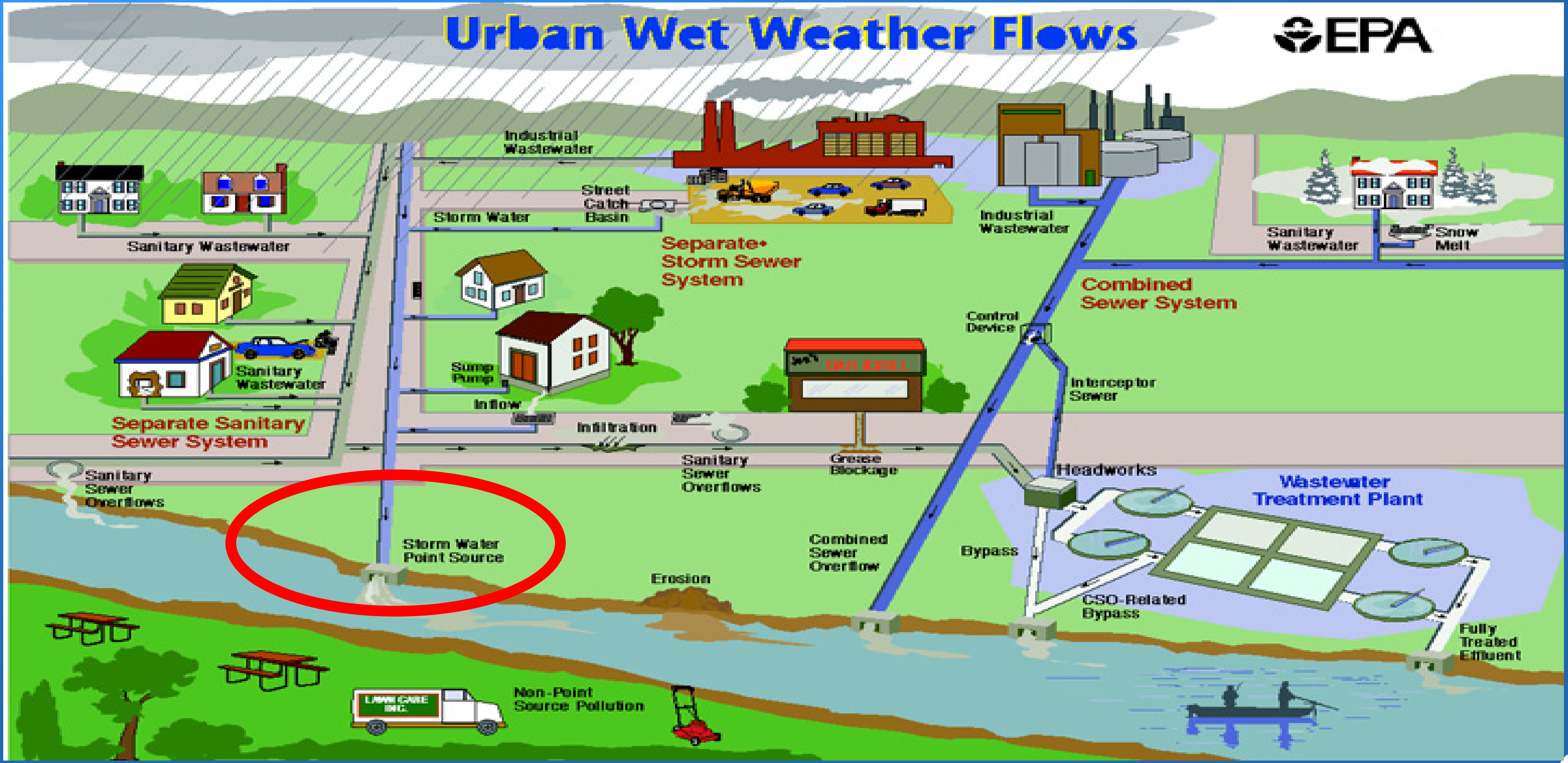
Outputs focus…

Relative risk/impact of overflows on community & environment

Effects Based
Infrastructure & receiving environment

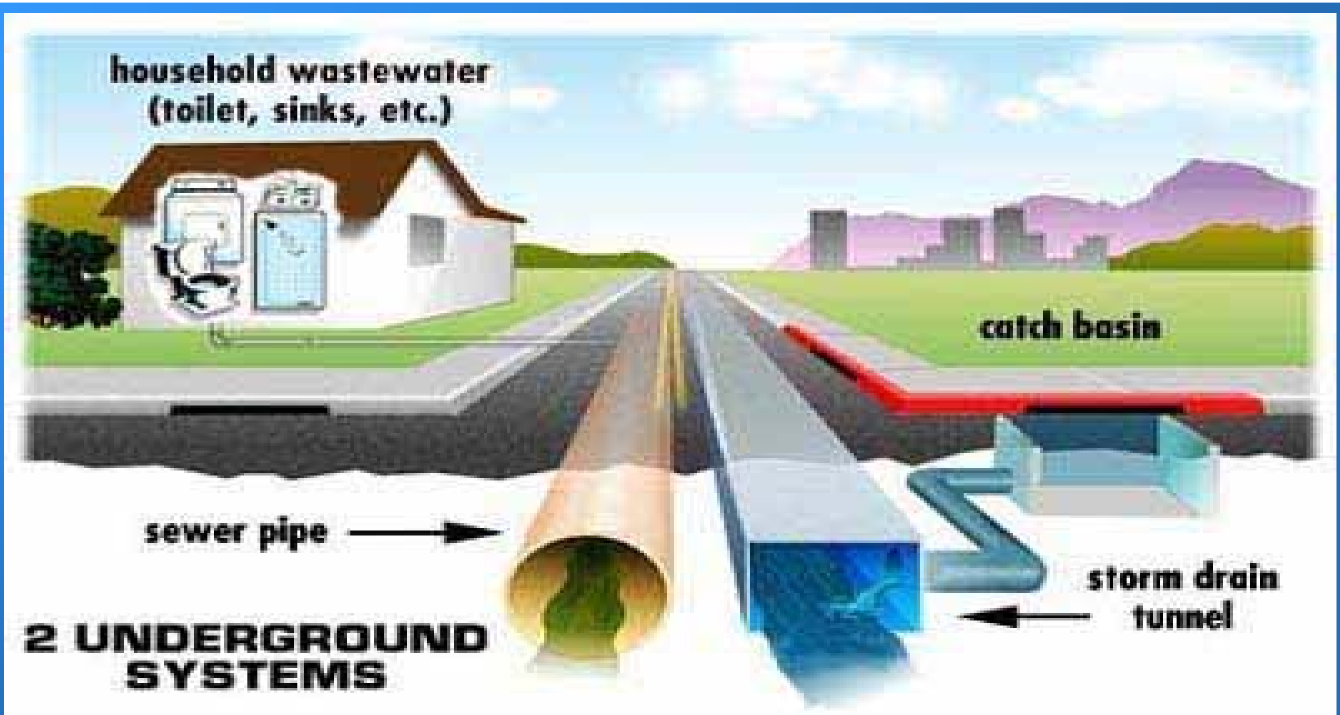
Outcomes focus…

A brief snapshot of urban drainage evolution...



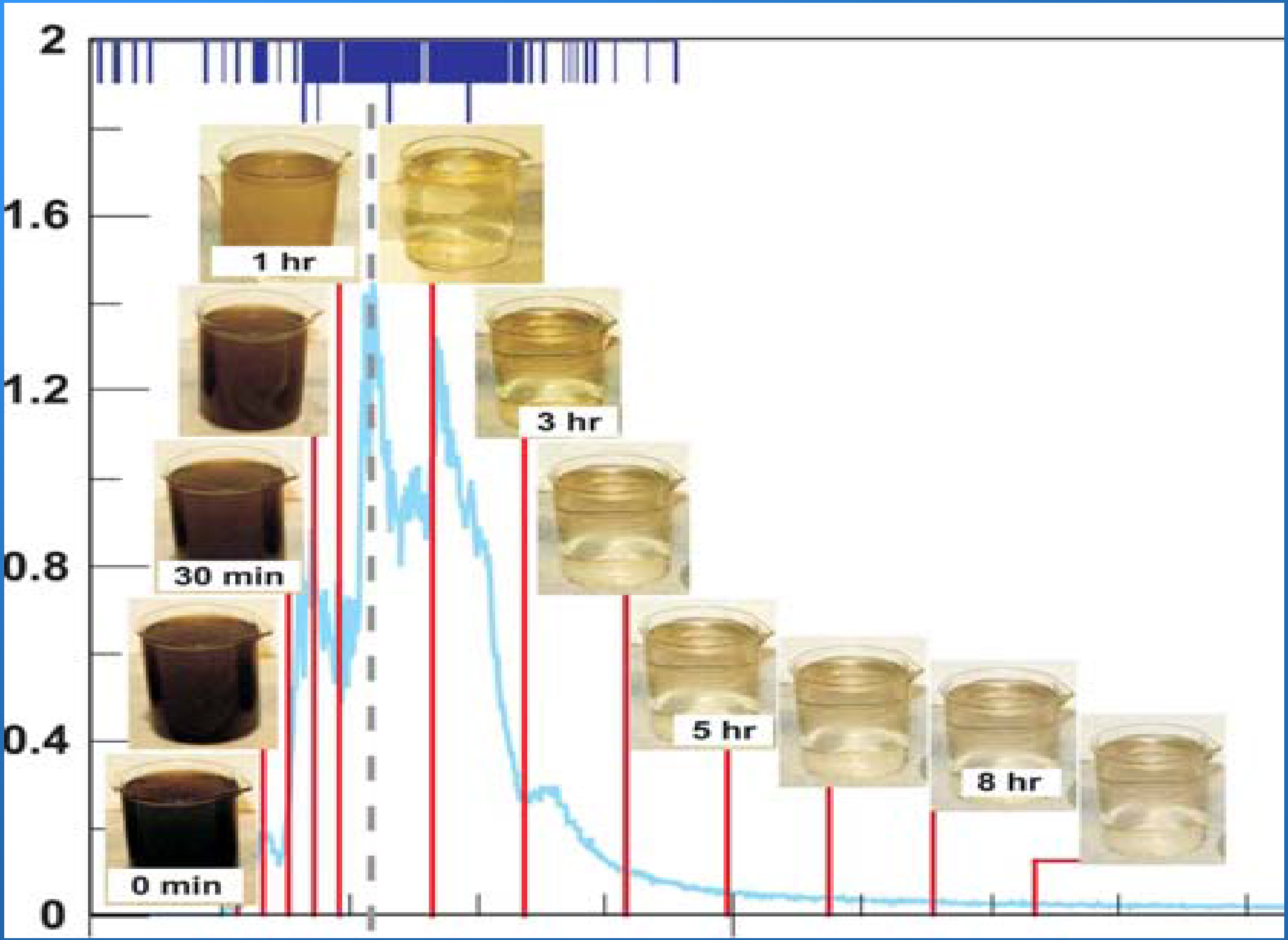
Present day…

A brief snapshot of urban drainage evolution...



Separated systems -
starting in 1960s……

Stormwater Pollution



Stormwater pollution is now a dominating factor

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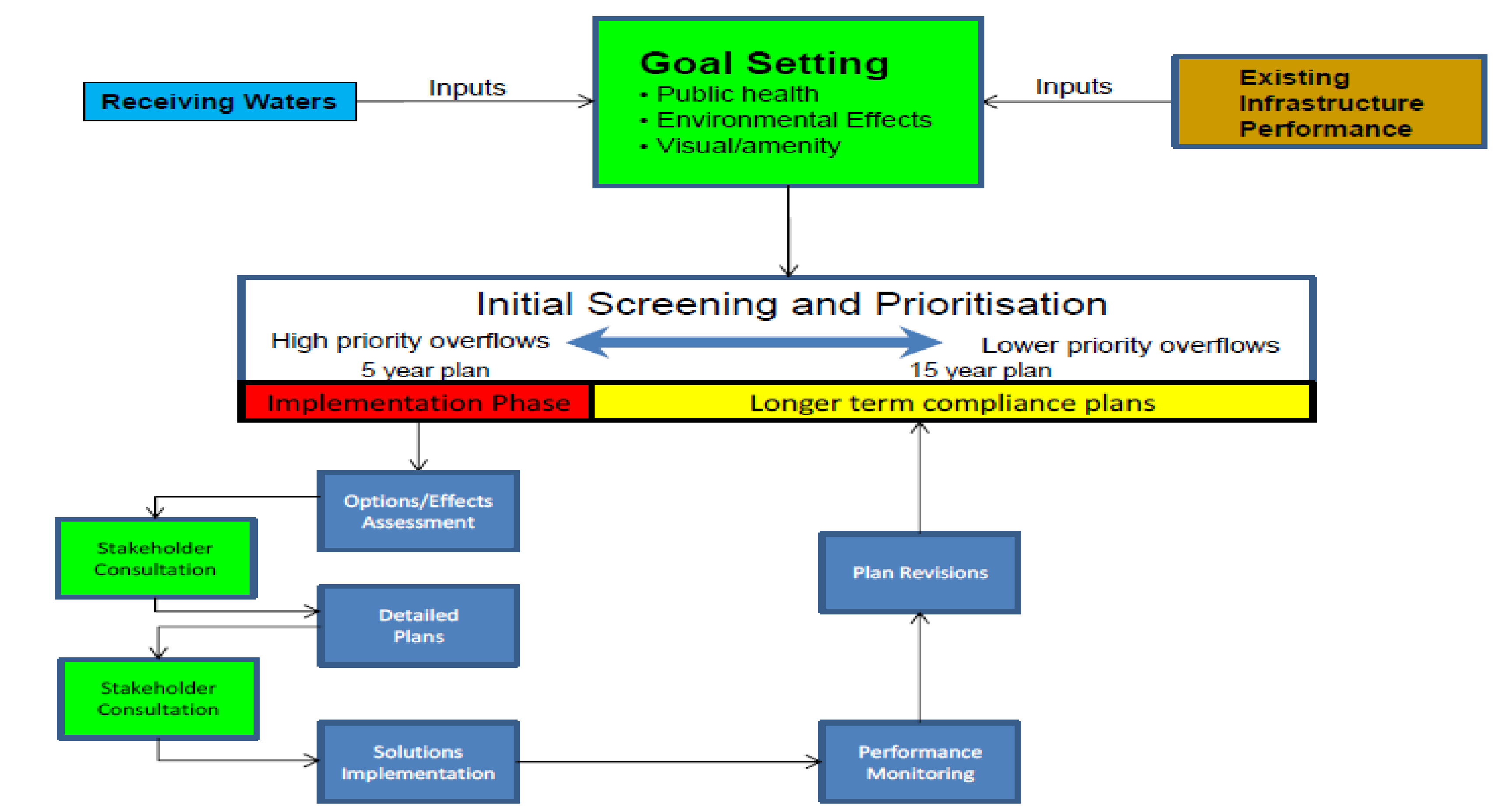
SCOTTISH WATER solutions

Addressing overflows alone will only achieve a “moderate” status per the Water Framework Directive.

Overflows only contributed 20% of bacterial contamination observed at bathing beaches.

Manchester Ship Canal

Where to from here?
A road map...



Desktop Risk Assessment Process

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Environment

Likelihood:

- Type of waterway (Aerials, GIS)
- Total Flow (Annual – from Sewer model)

Consequence:

- Distance to aquatic receptor (GIS, flow path model)
- Locality of aquatic receptor (Aerial, GIS)

Potential for Benefit:

- Total Nitrogen % contribution of overflow vs. stormwater (Sewer model)

Environmental Category

Public Health

Likelihood:

- Type of waterway (Aerials, GIS)
- Frequency (Sewer model)

Consequence:

- Distance to recreation site (Aerials, GIS, flow path model)
- Type of recreation site (Aerials, GIS)

Potential for Benefit:

- Total Enterococci % contribution of overflow vs. stormwater (Sewer model)

Public Health Category

Amenity

Likelihood:

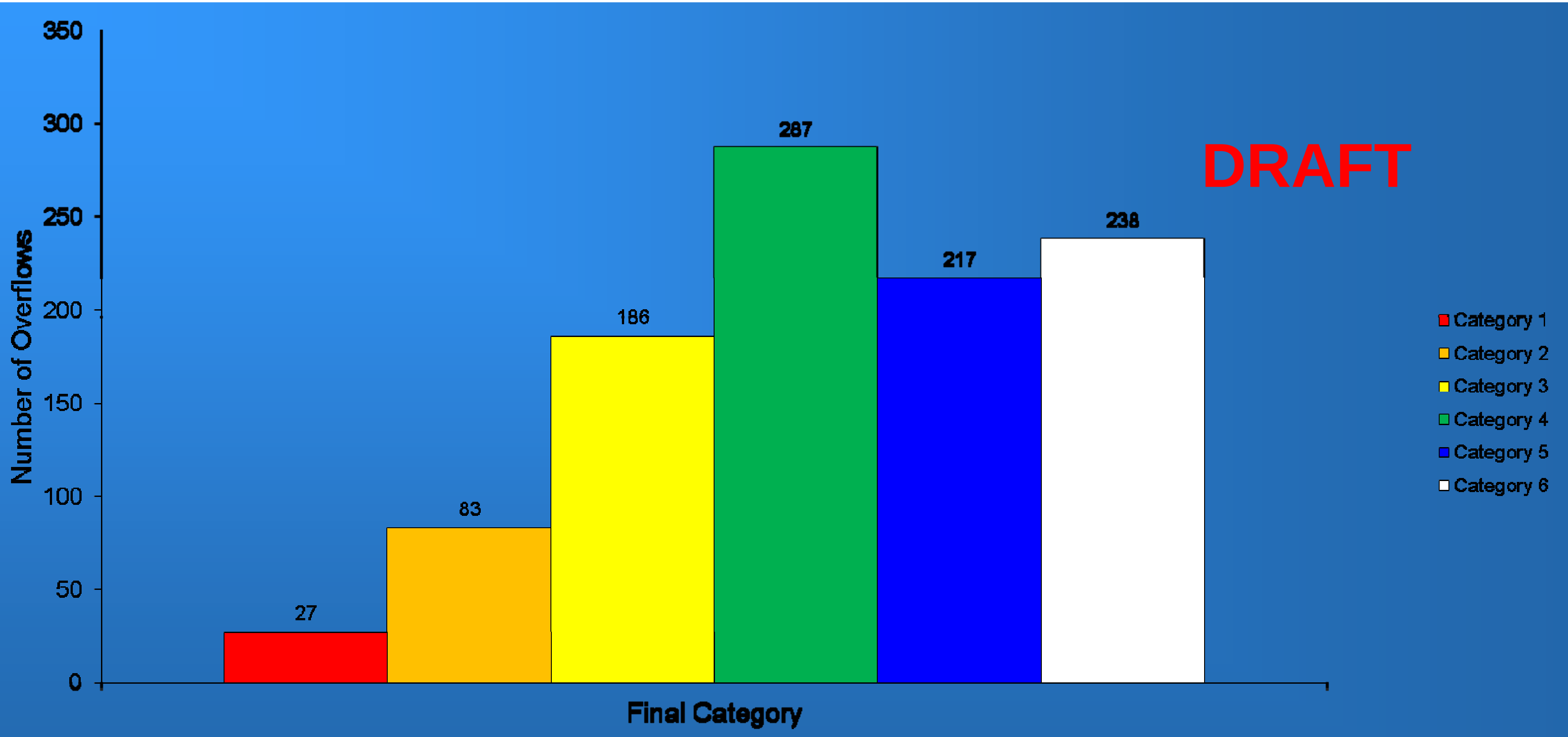
- Frequency (Sewer model)
- Accessibility to waterway (Aerials, GIS)

Consequence:

- Naturalness of waterway (Aerials, GIS)
- Surrounding land uses (Aerials, GIS)

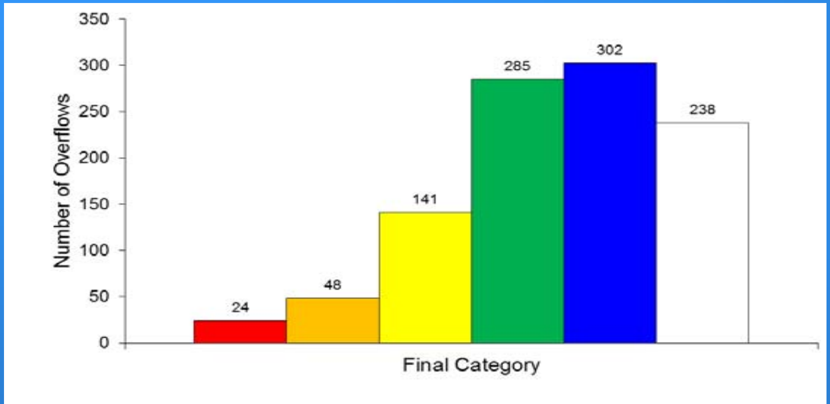
Amenity Category

Overall Risk Profile

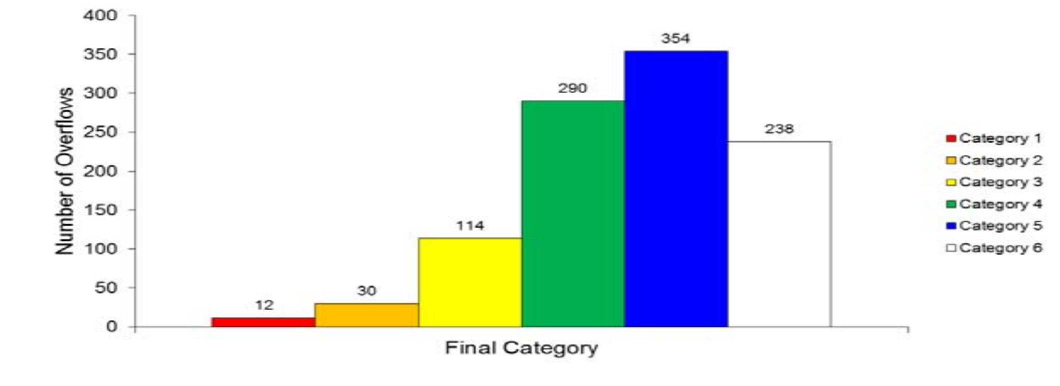


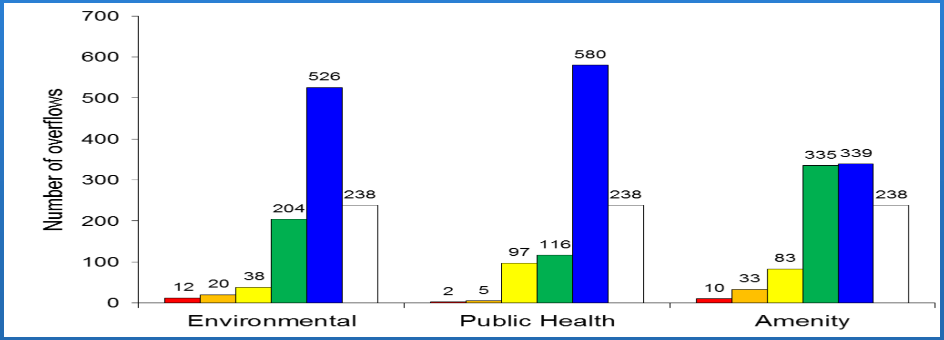
Draft Risk Profile

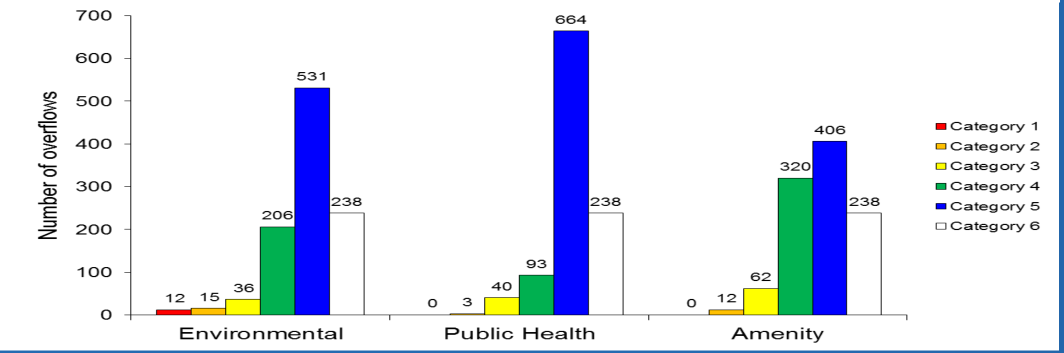
Overall overflow risk profile – current conditions



Overflow risk profile - frequency targets met*

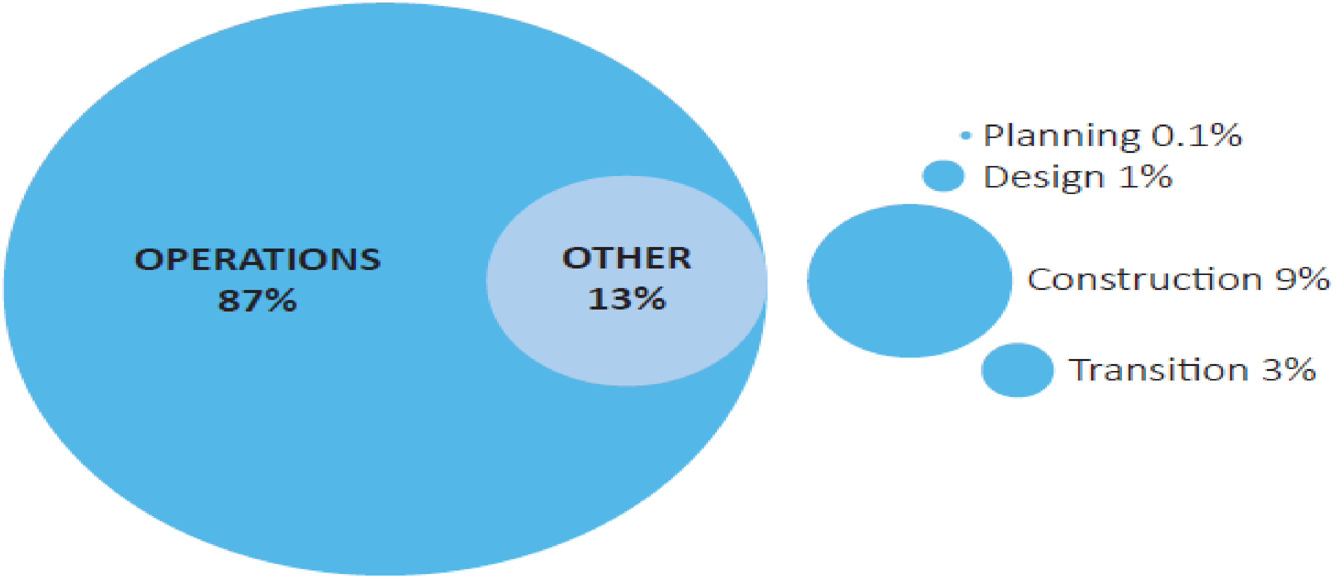






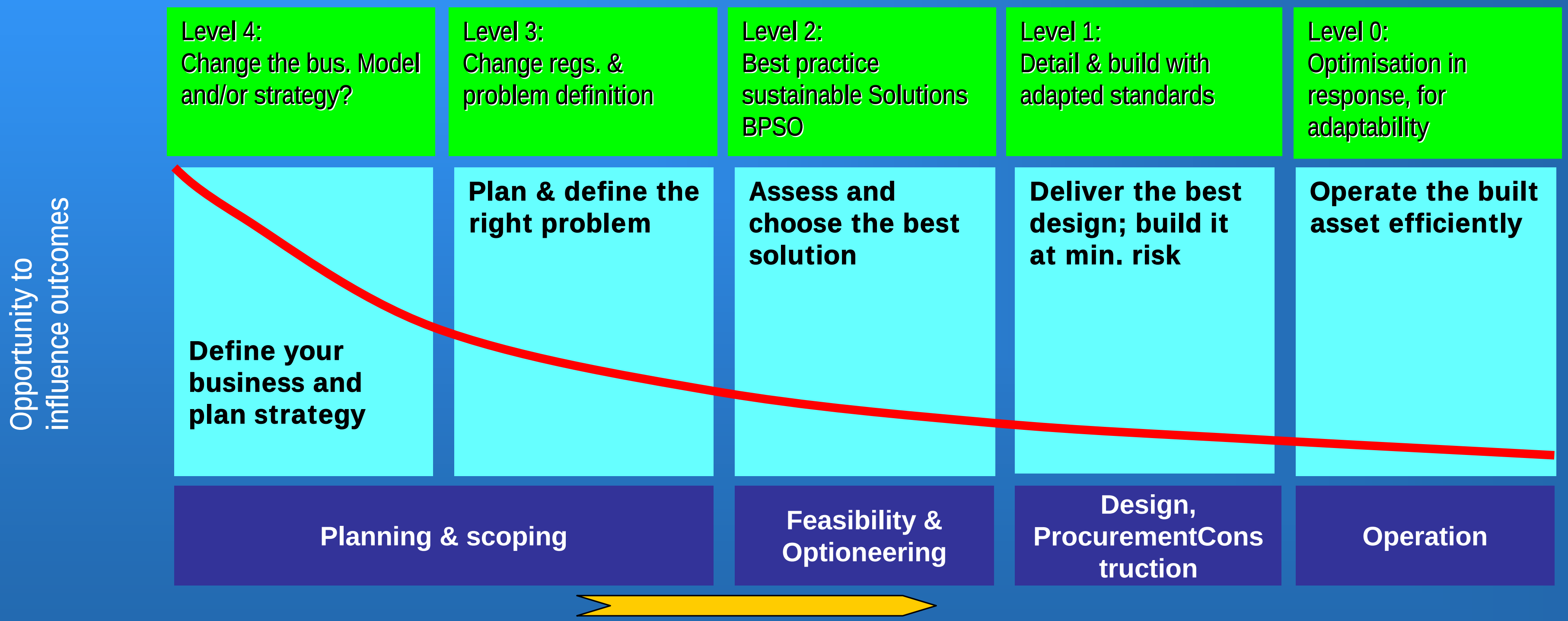
The relative cost of planning?

New Zealand BIM Handbook July 2014



Proportional split of whole of life costs of an asset

The value of planning?



Thank You