Integrating sustainable drainage systems - Henry Box affordable housing scheme, Witney: Case experience from Oxfordshire UK

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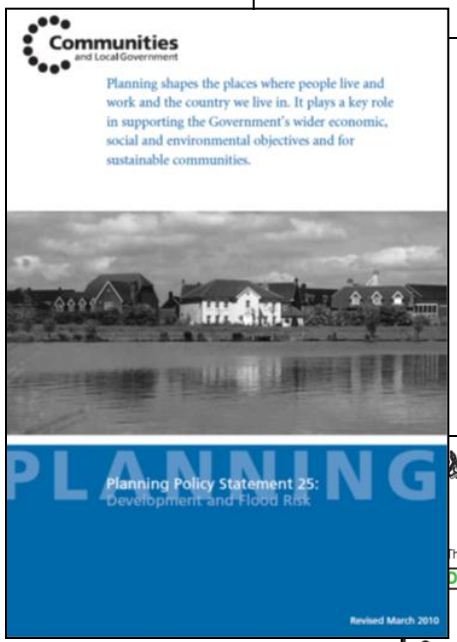
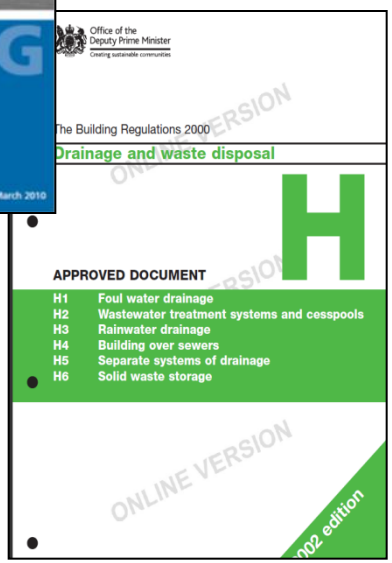
From standards & guidance to legislation…





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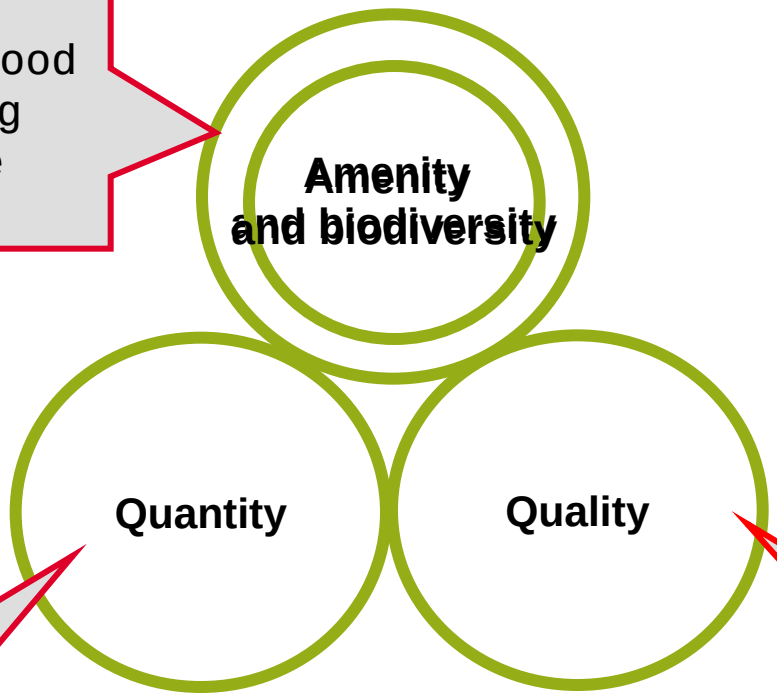
Consultation on the Implementation of the Sustainable Drainage Systems provisions in Schedule 3

Flood and Water Management Act 2010

December 2011

Interpretation of forthcoming National Standards

Greater focus on 'functionality': loading, soil erosion, maintenance, flood risk and using public space



Volume and or rate control to greenfield runoff or 2l/s/ha

Prescribed number of treatment train stages.

No quantification of limits / targets

Treatment train SuDS for QUALITY

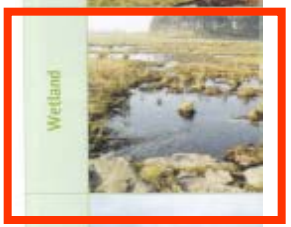
1. Filter drain

2. Swale

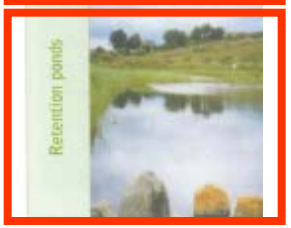
3. Trench

4. Detention basin

5. Wetland



6. Retention pond



7. Green roof

8. Soakaway

9. Rainwater harvesting

10. Permeable pavement

11. Attenuation systems

12. Channels and rills

13. Bio-retention

14. Infiltration trench

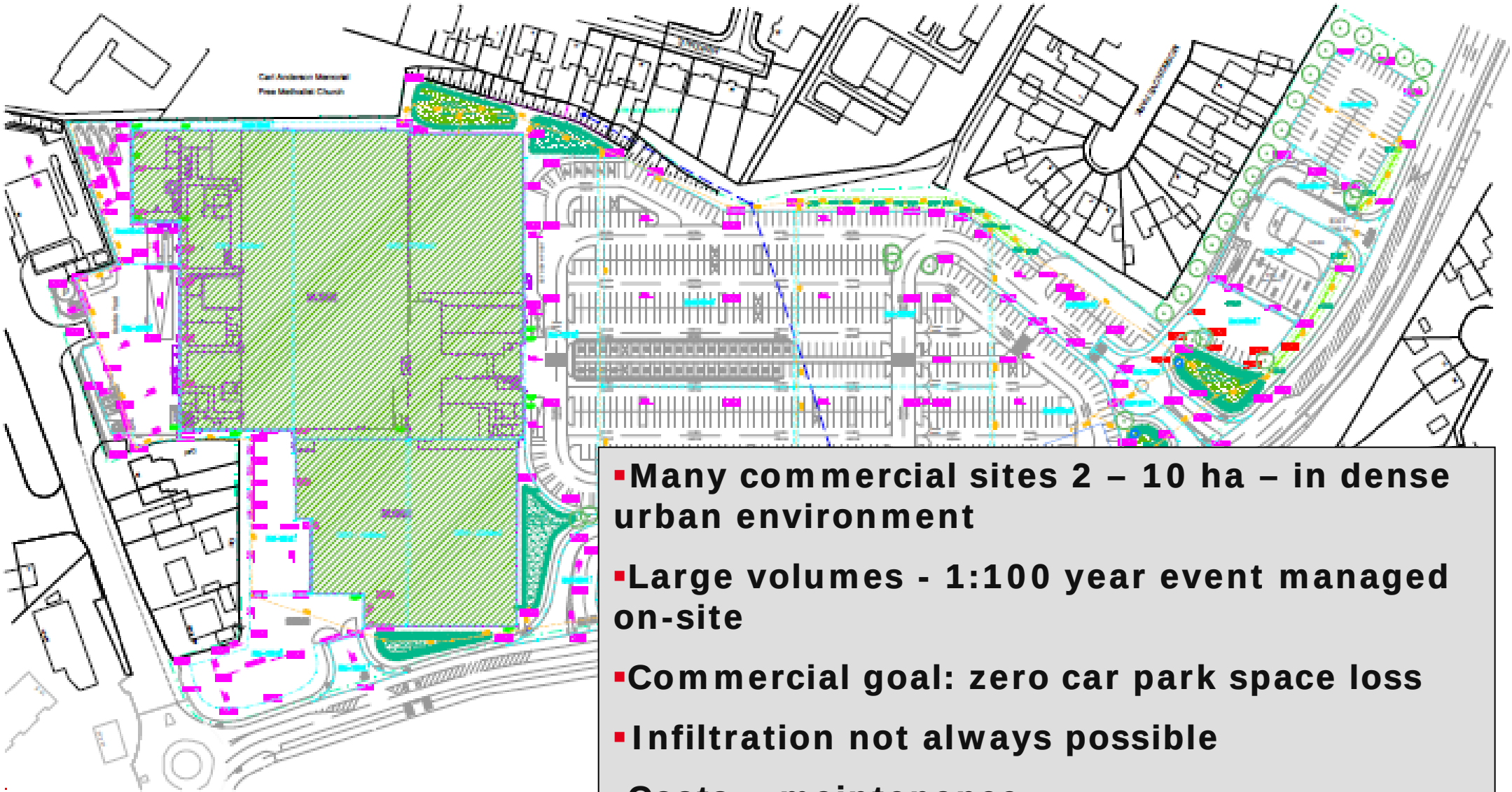
15. Filter strip

16. Rain garden

Water quality benefit

Source: Ciria C687 pp 27-29

Implementing SuDS on commercial developments



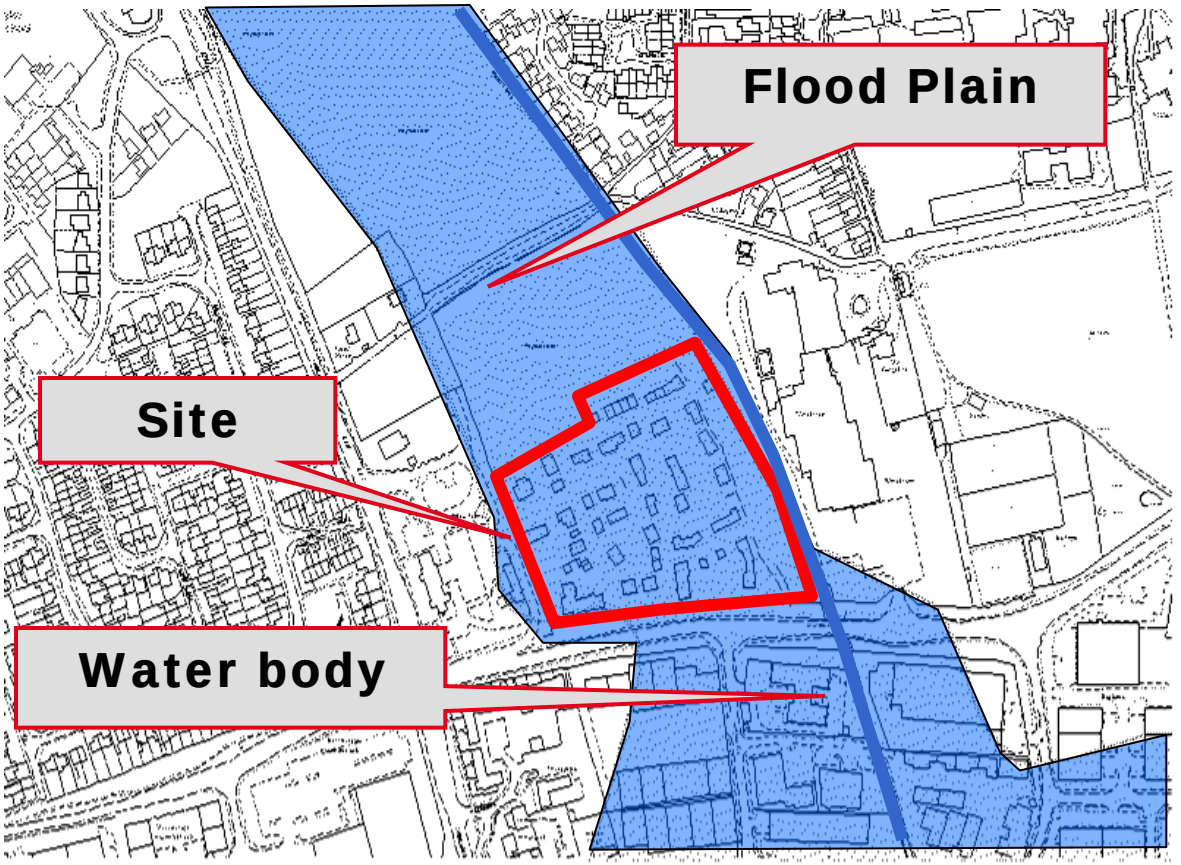
- Many commercial sites 2 – 10 ha – in dense urban environment
- Large volumes - 1:100 year event managed on-site
- Commercial goal: zero car park space loss
- Infiltration not always possible
- Costs – maintenance

Applying lessons learnt from housing

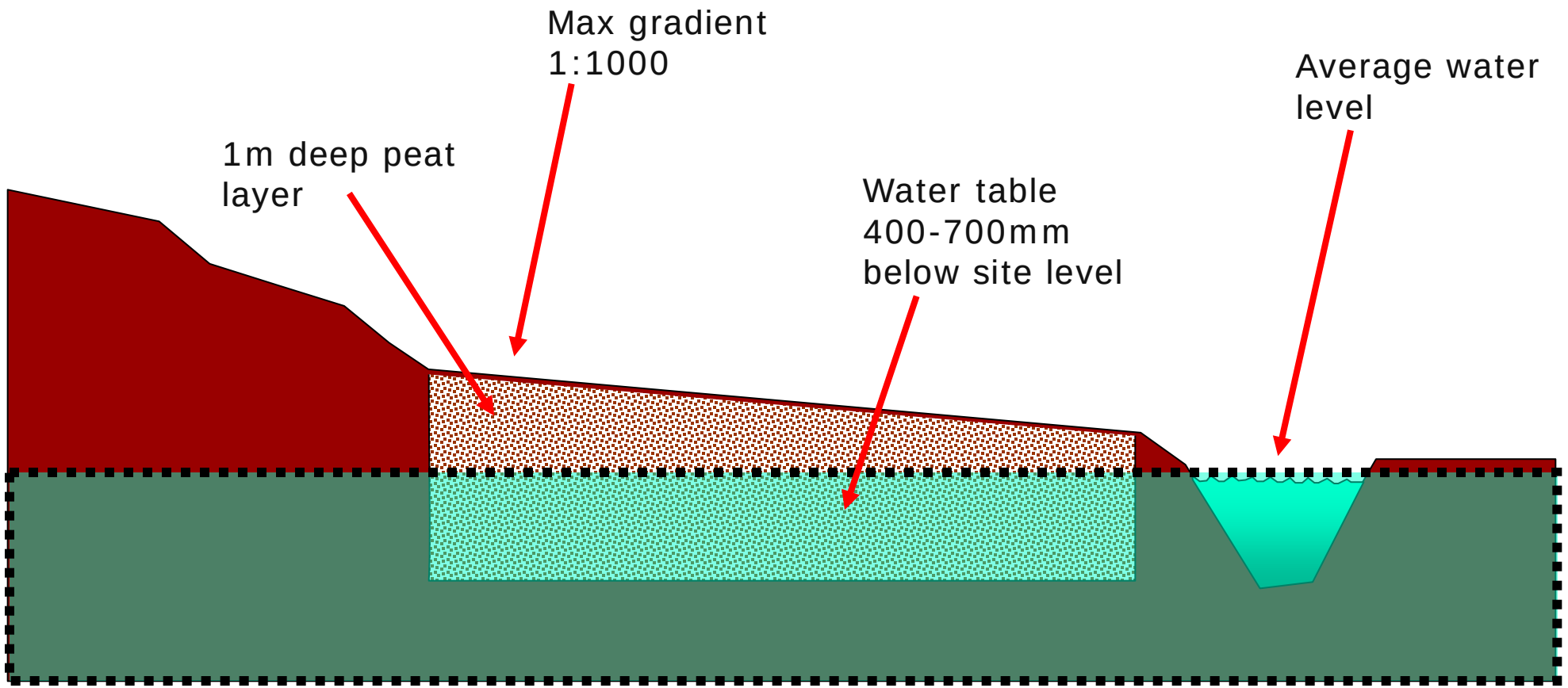
- Role of “on-site conveyance “ through linear channel systems
- Integrating SuDS components
- Managing quantity and quality separately

The Henry Box housing scheme, Witney, Oxford UK - 2002

- Land owned by Oxfordshire County Council
- Identified for affordable housing
- 92 houses on 1.1 hectares
- Sovereign Housing Association
- Atkins as consultants
- 2002 completion



A site with some engineering challenges…



Drainage overview – high invert conveyance via linear combined kerb drainage

ACO KerbDrain

Geo-cell storage System i.e. ACO StormBrixx

Perforated pipe

Over edge drain to swale

Type B filter material

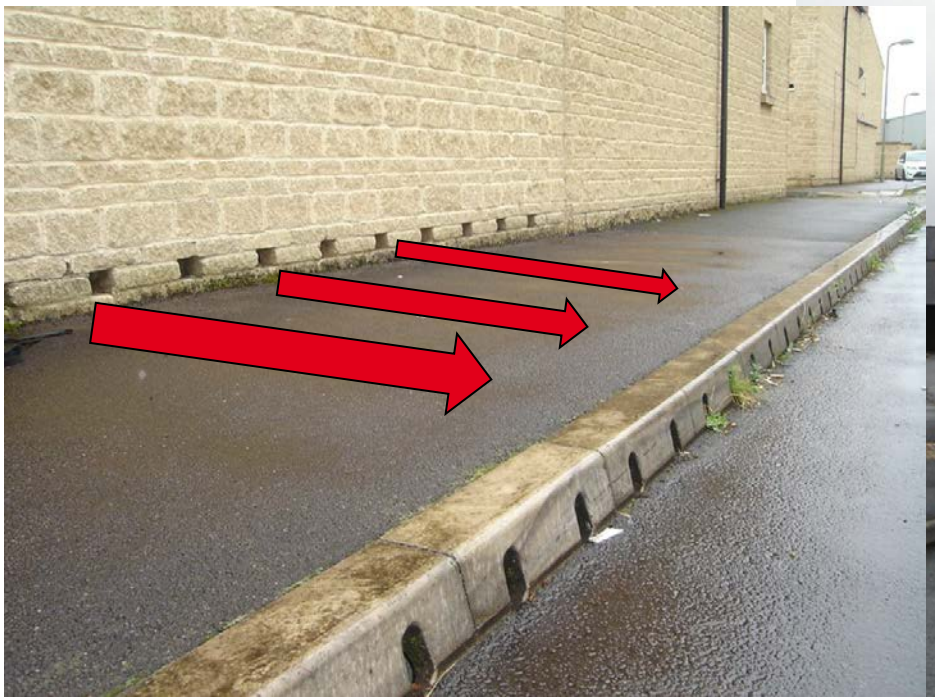
Watercourse

Pipe

Swale

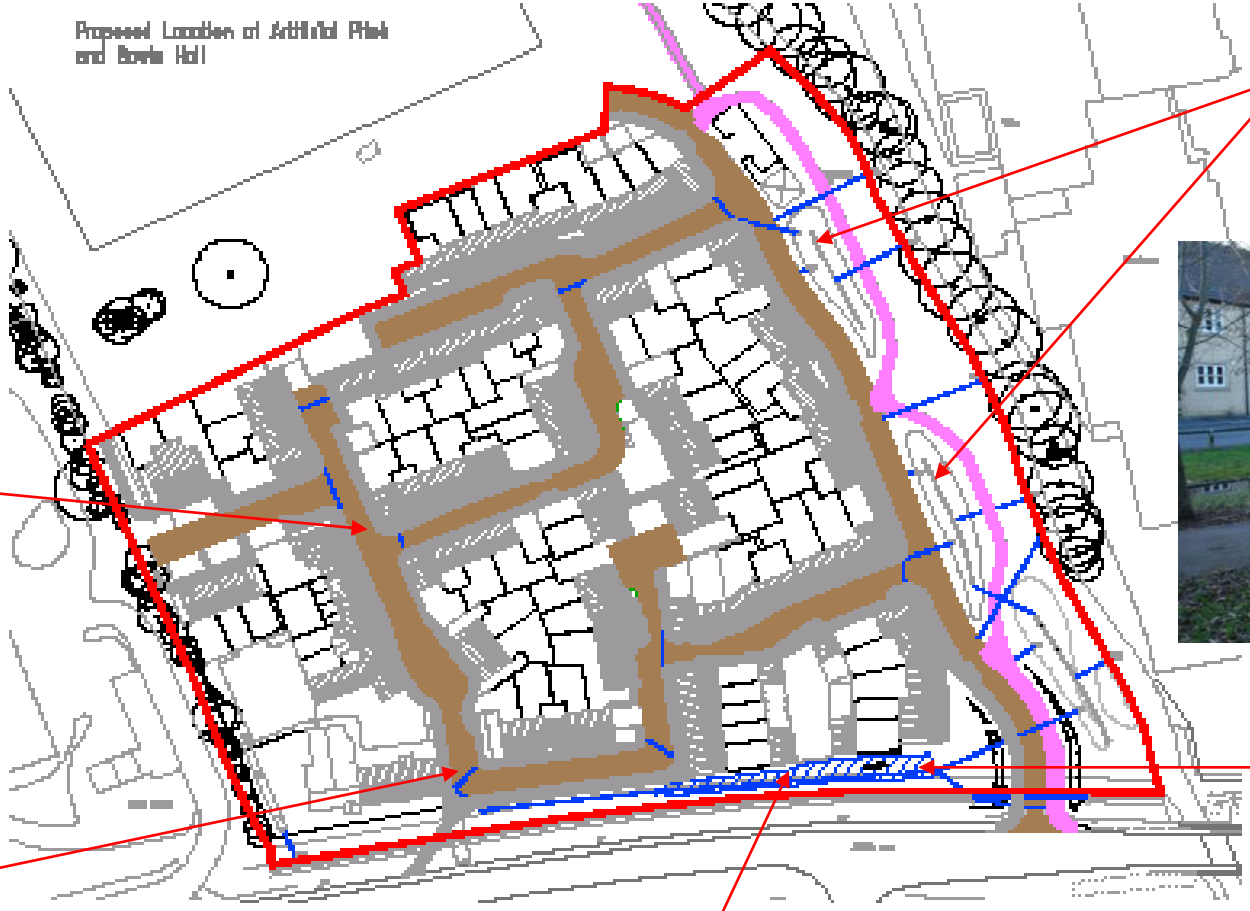
Resilient details

- Overland flood flow accommodation in structures



Roof drainage connection to conveyance system

Site design theme – conveyance at high invert



Swales

Combined kerb drains

Ditches

Tight radius

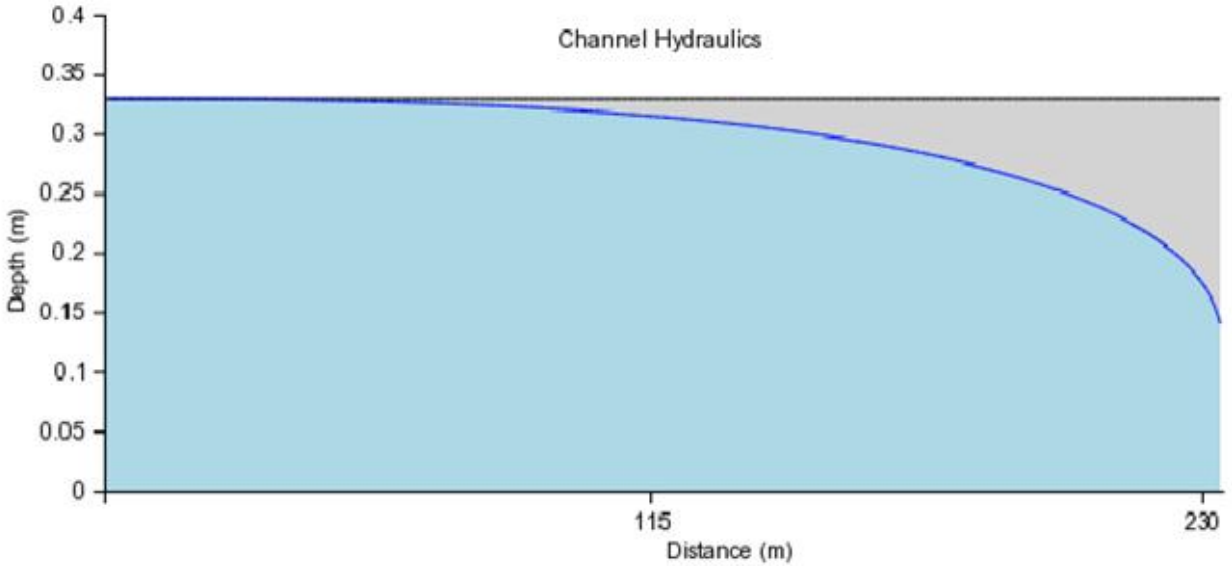
On-line storage

Channel design methodology

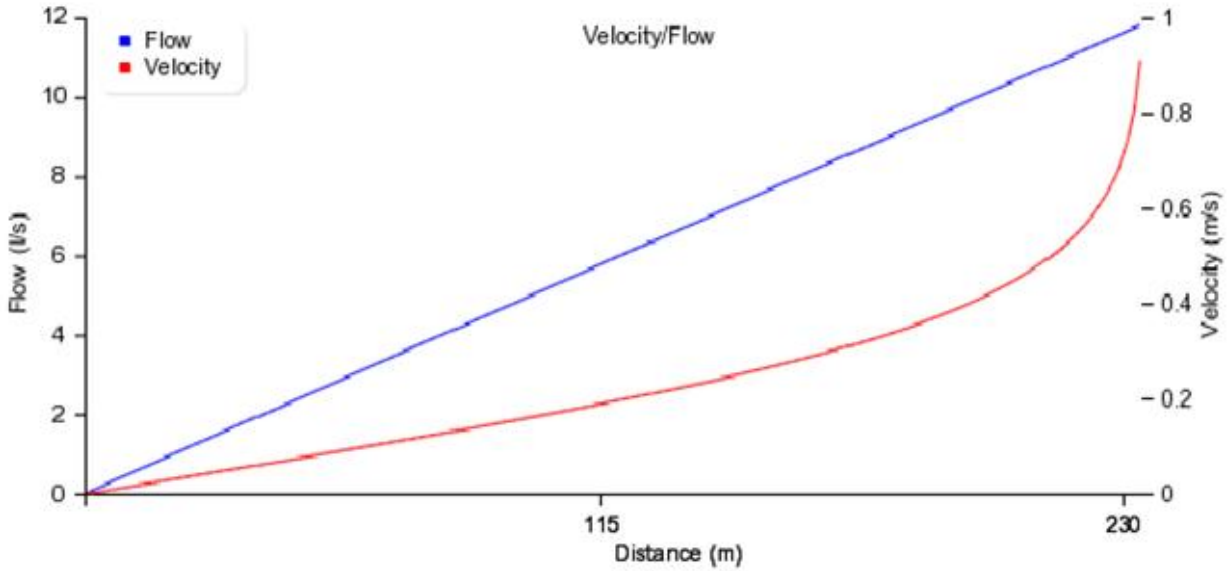
Gradient	Uniform flow		Steady Non-uniform flow	
	Velocity m/s	Capacity l/s	Velocity m/s	Capacity l/s
1/1000	0.491	23.57	1.14	57.4
1/100	1.55	74.53	1.49	71.5

Table 1. Adapted from Naqvi. M. 2003 – Design of Linear Drainage systems

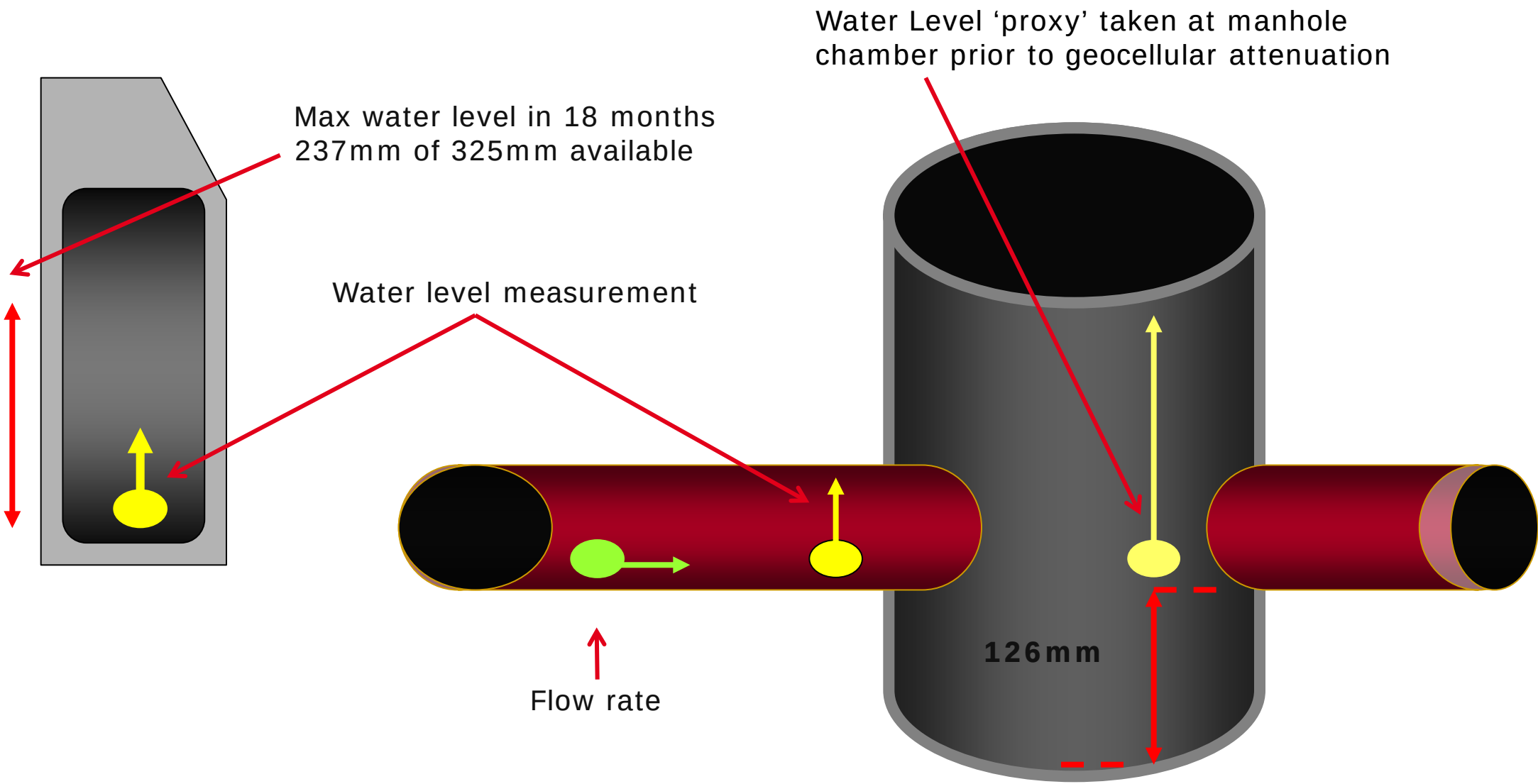
Water level and flow velocity in channel



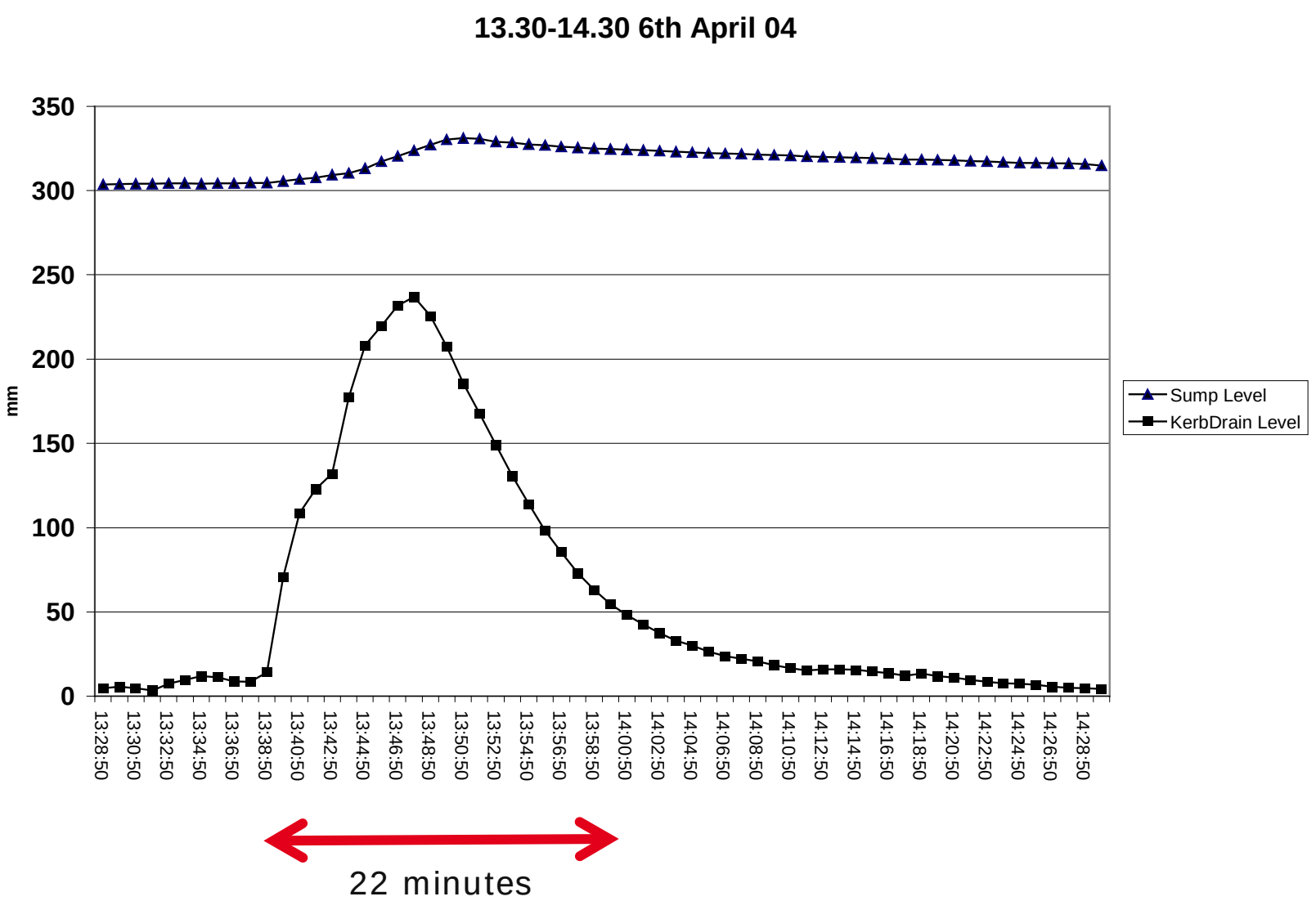
- Lateral inflow (50mm/hr intensity) 182.5 l/hr
- Overall length 230m before surcharge
- Velocity ≈ 0.3m/s for 160m



Measurements



Measurements on 6th April 2004



10 years on

Observations on performance

Roof drainage connection to conveyance system – effect on debris build up?

Sediment in channel run?

At drop kerb constraint

At cross carriageway junction

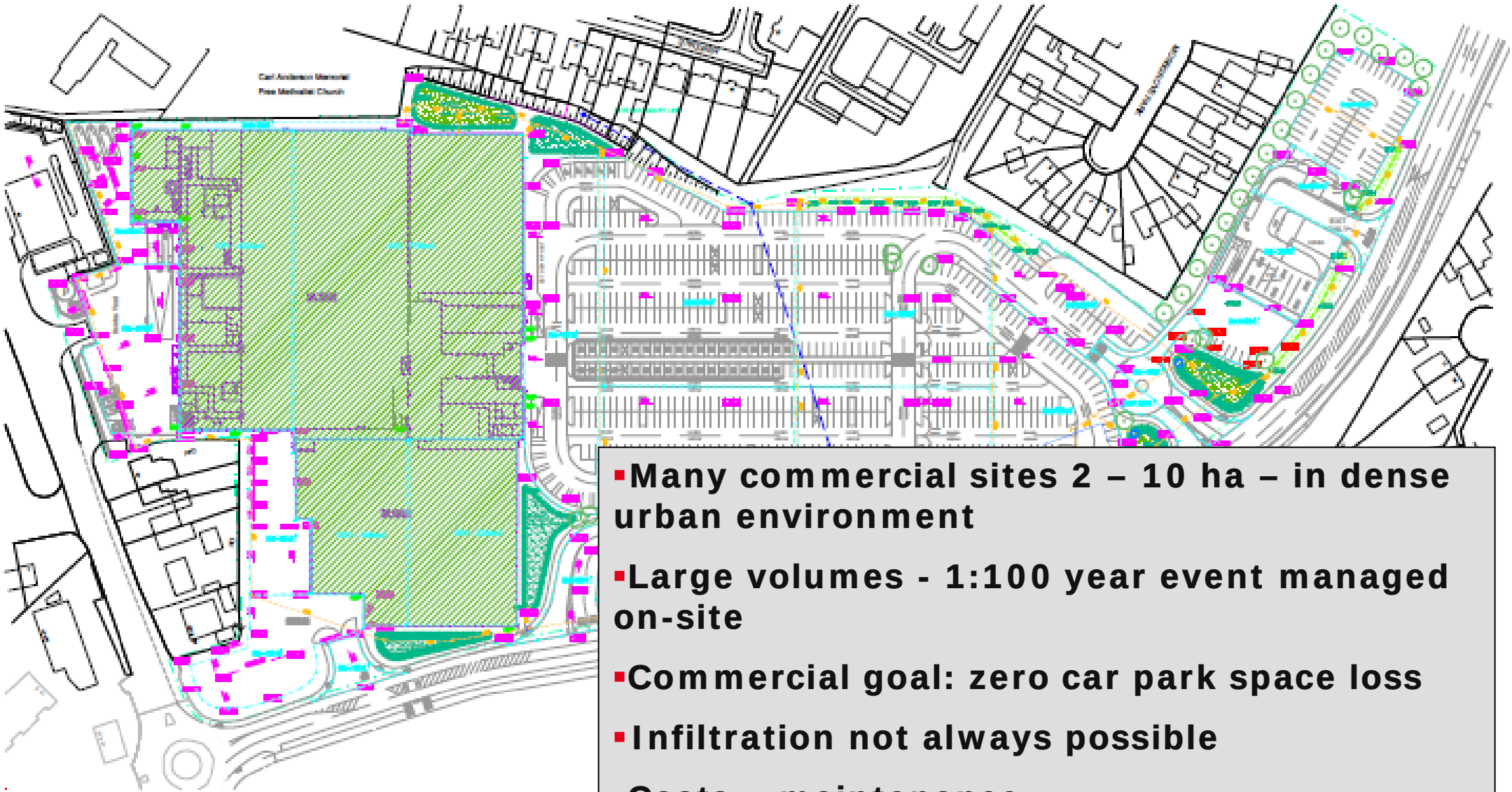
At swale treatment stage

At outfall to watercourse

As employed on Henry Box - Witney

- Conveyance – at or near surface using linear channel drains
- high invert outlet to subsurface geocellular attenuation
- discharge to swale (treatment)
- discharge to watercourse

Implementing SuDS on commercial developments



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Integrated sustainable drainage

On commercial / urban projects

- Conveyance – at or near surface using linear channel drains (high capacity QMax for example)
- **high invert outlet to surface vegetated swale (treatment)**
- discharge to high invert outlet to subsurface geocellular attenuation
- discharge to watercourse

Thank you for listening

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