"Sponge City"- a breakthrough of urban flood risk management and land use planning: the case of Ningbo pilot study

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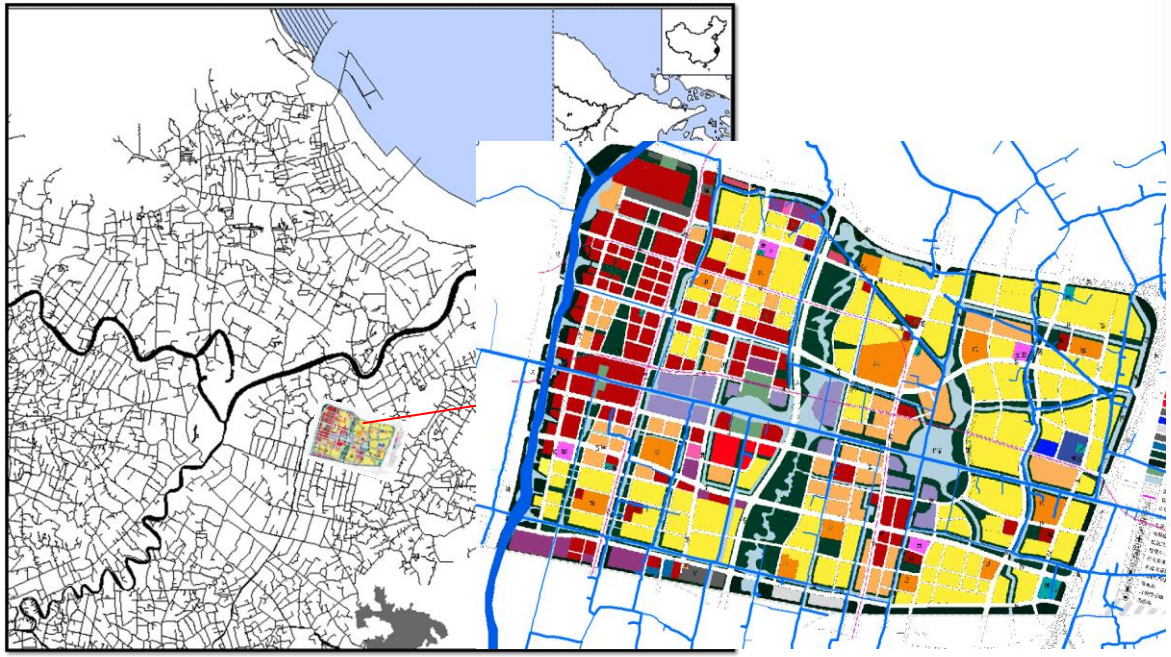
INTRODUCTION

CHN State Council Guidance: a combination of "infiltration, delay, net, use, storage, discharge" measures to minimize impact on the urban ecological environment.

Ningbo responded positively to national calls, for development of urban practice; short, medium and long-term planning strategies; and promotion of sponge construction practices.



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INTRODUCTION

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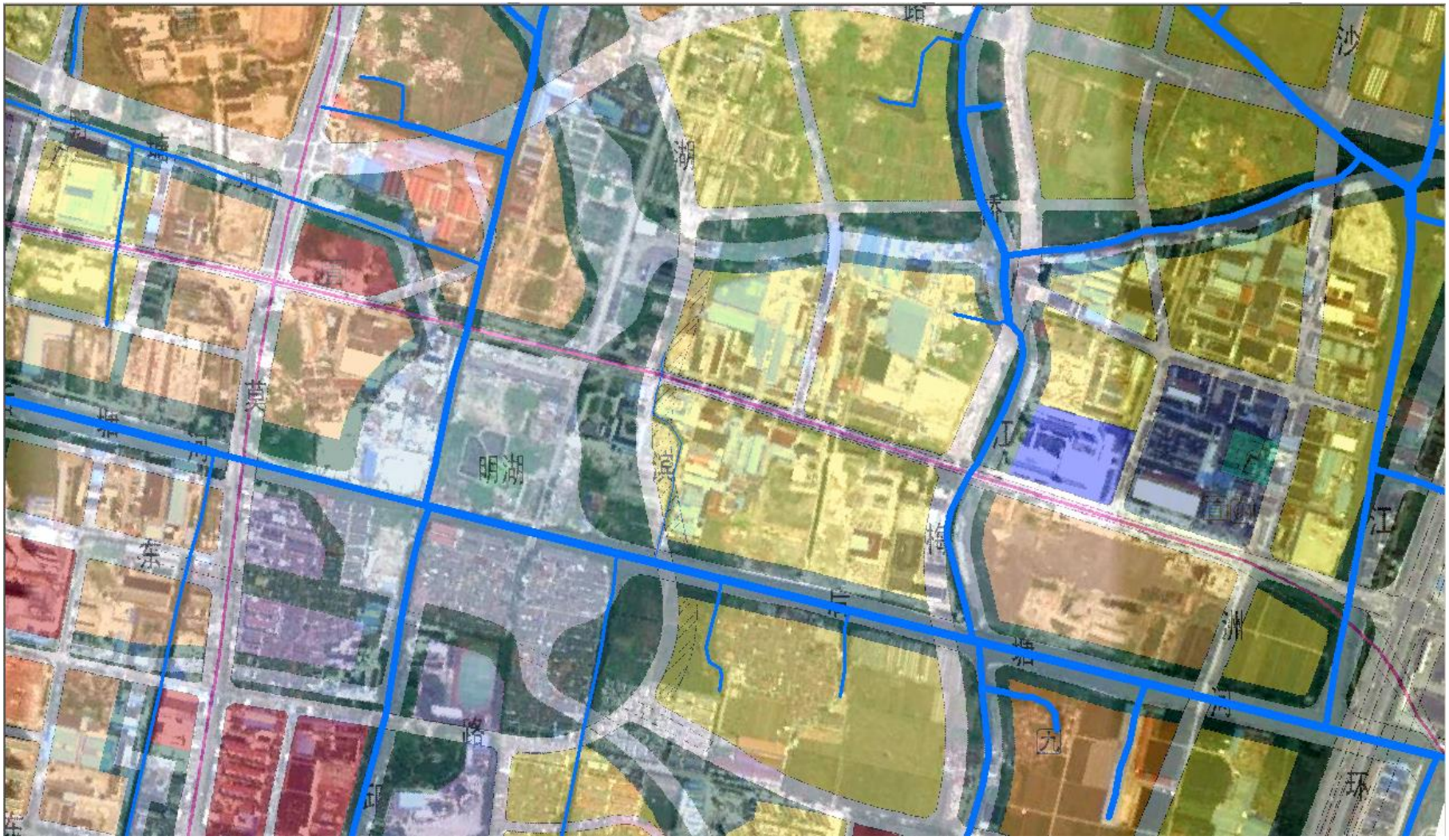
NET Master Plan



Ningbo Sponge City Construction Guidelines

- Reduction of runoff at source.
- Utilize the natural drainage system.
- Conservation of original eco-system and hydrological characteristics.
- Ecological remediation and restoration.
- Low impact development (reduce impact of urban expansion).

Modelling Approach

1. Data Collation: flow rates, discharge points.

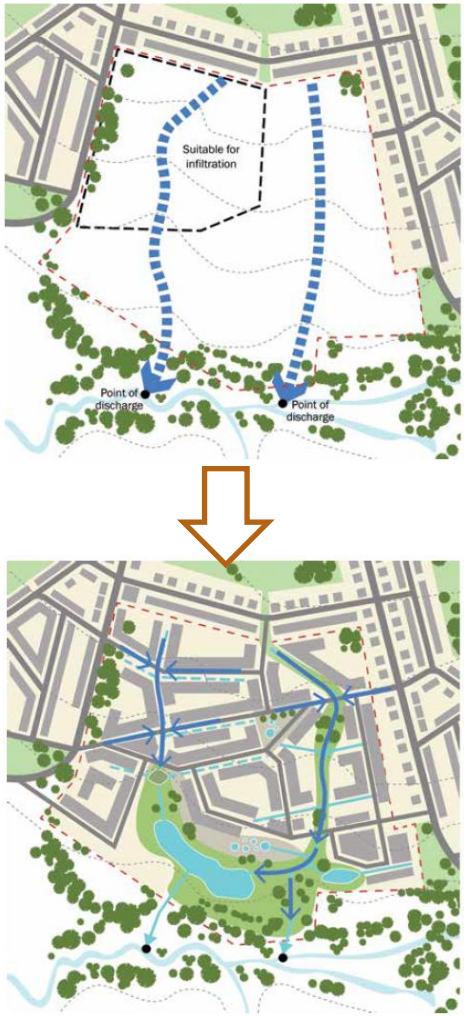
2. Map existing catchments areas

3. Model peak flow – existing condition
(Site scale and plot scale)

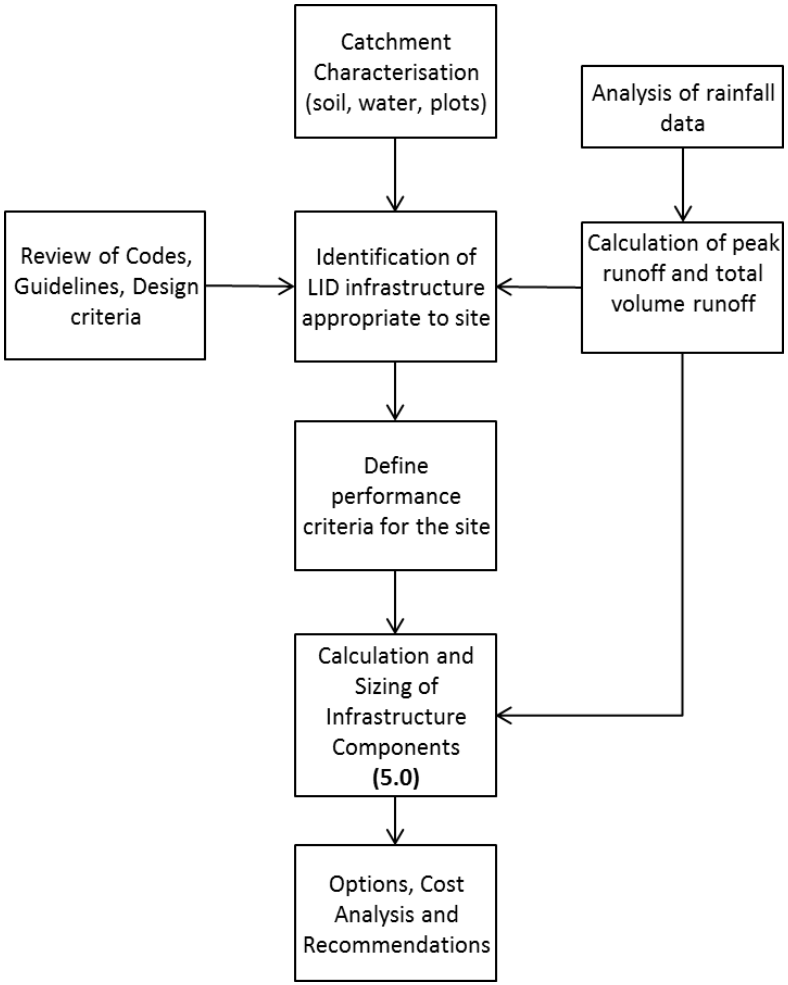
4. Develop design option (scenario) catchment areas, green areas, building area ratios.

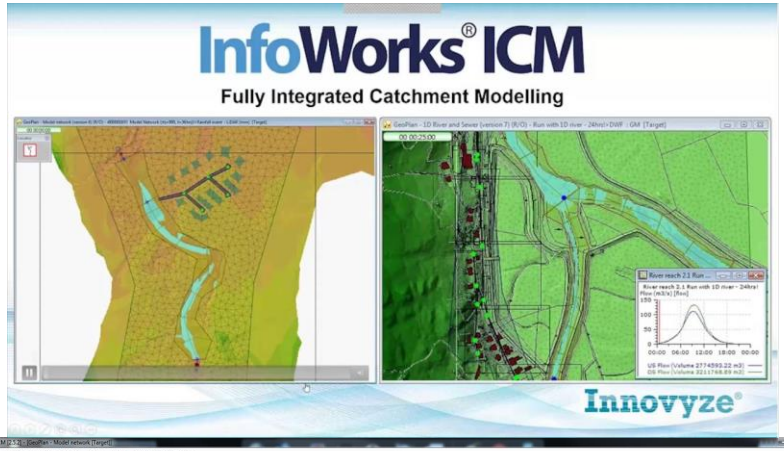
5. Model peak flow pathways (site and plot scale) for different design scenarios.

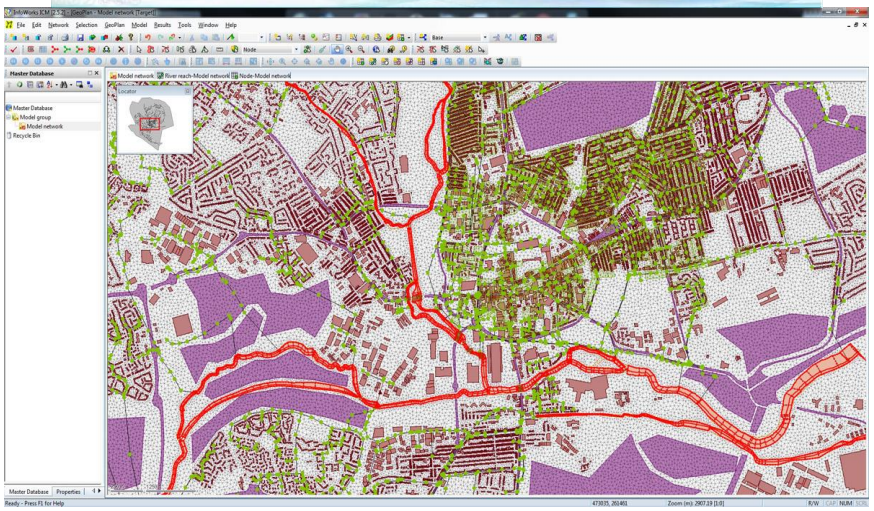
6. Design criteria (inflow rates for design events) for each plot.



Plot-scale studies: InfoWorks ICM

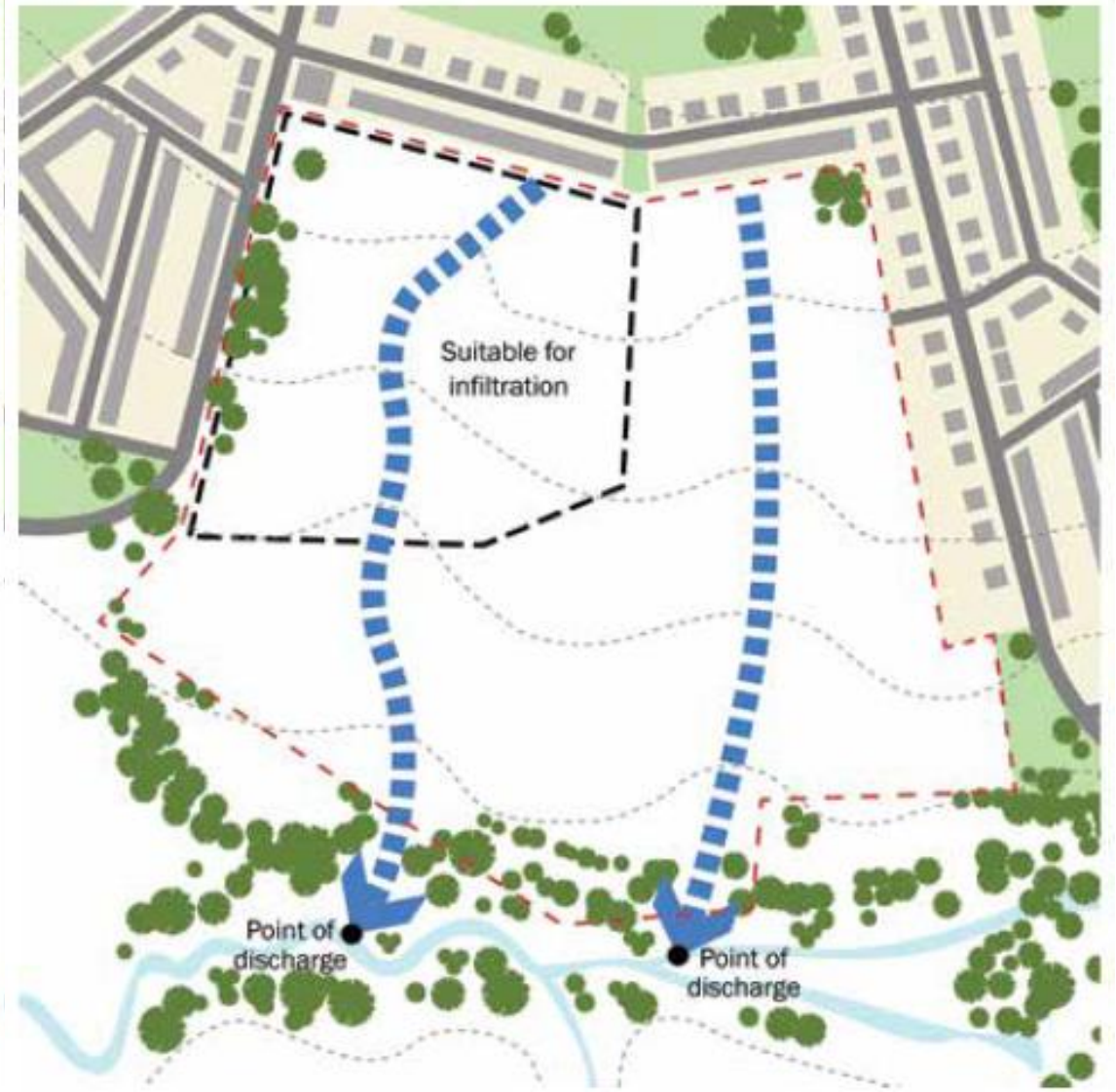






METHOD

Plot-scale Studies



Describe flow rates and discharge points at present time

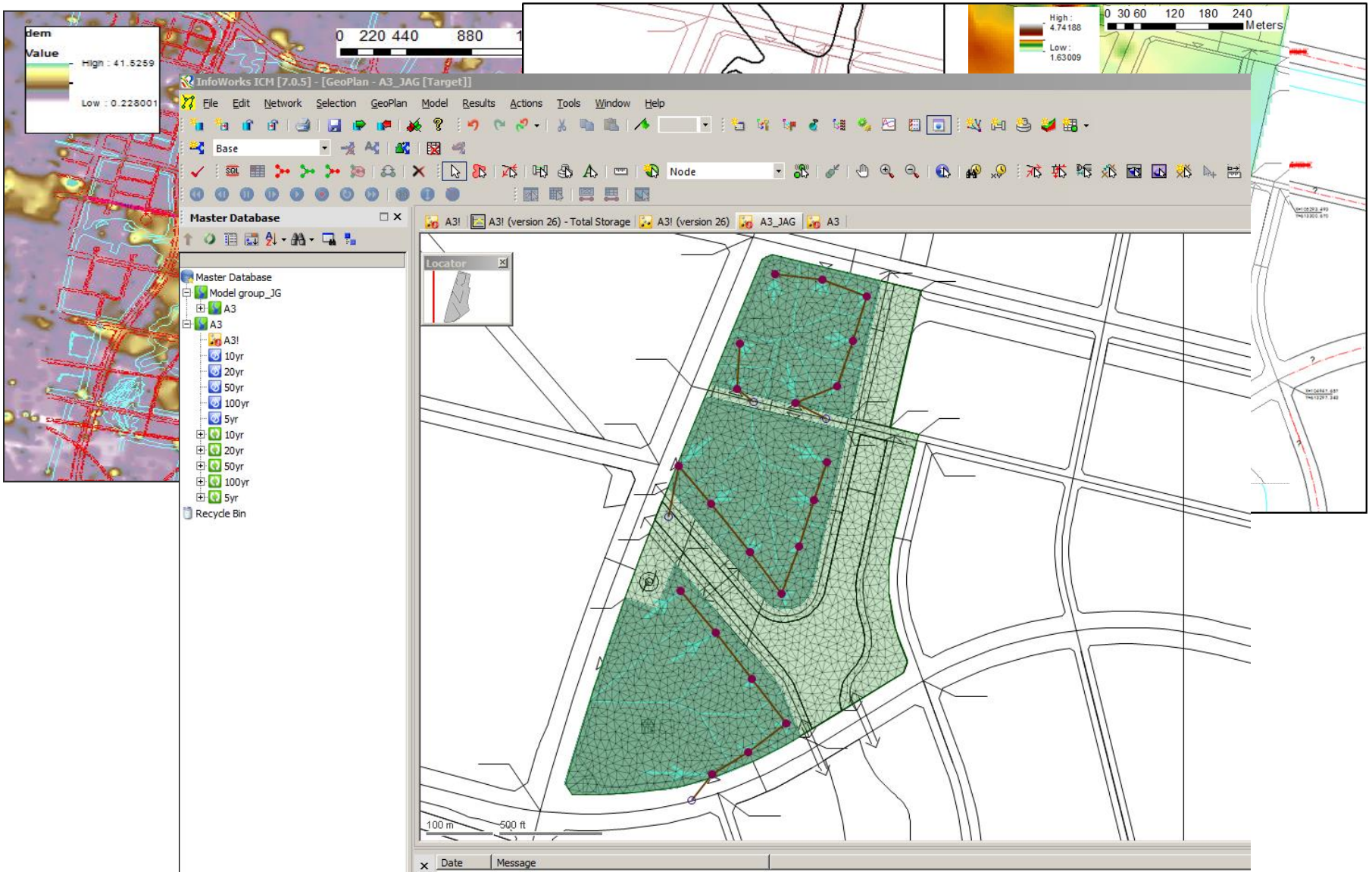
Define surface water catchments

Define green parks and corridors

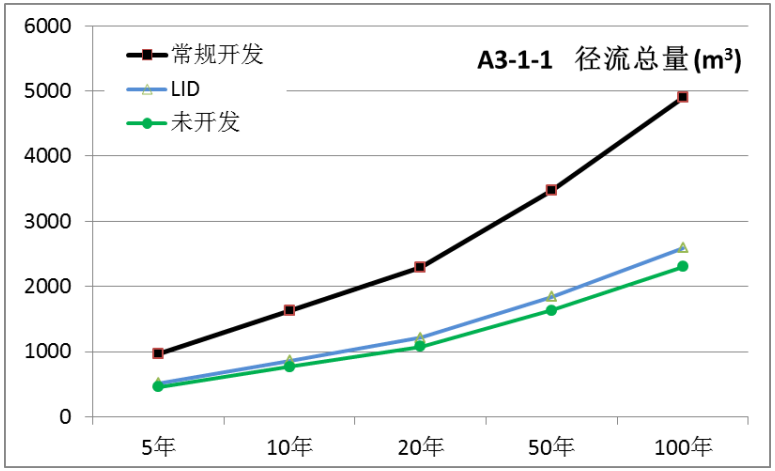
Define road network

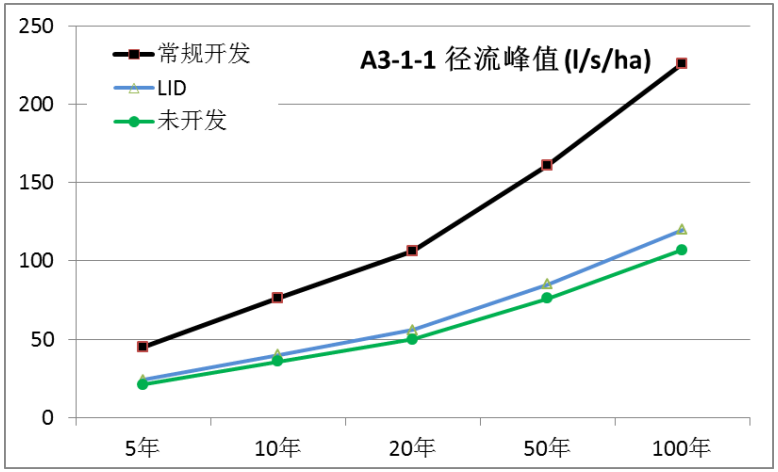
Define peak flow pathways

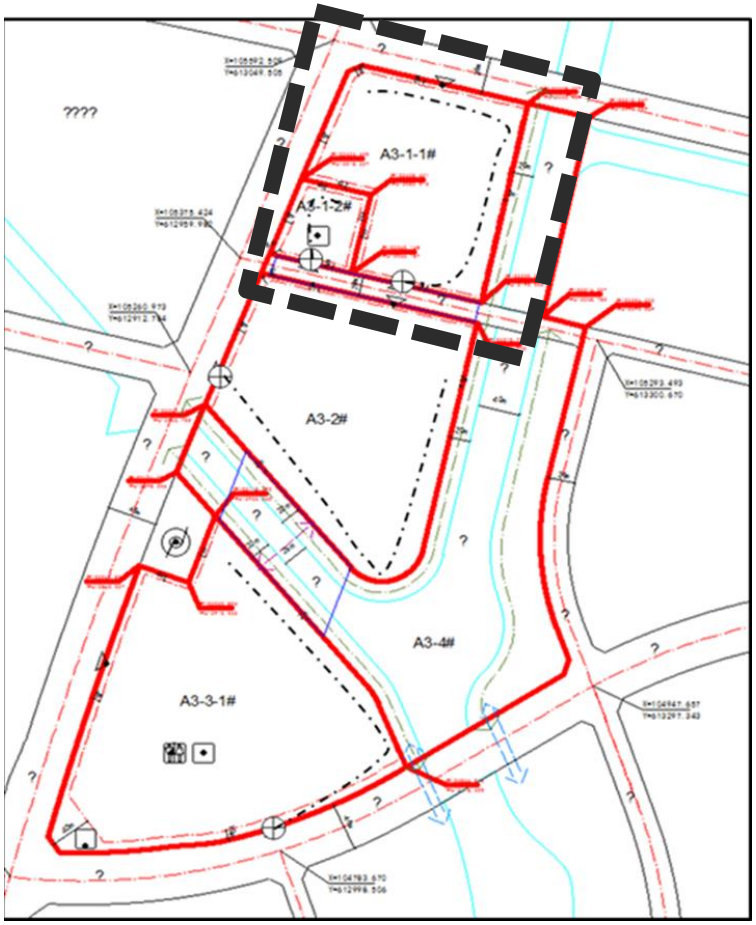
Plot-scale Studies: Plot A



Plot A Studies:







RESULTS

Plot A Studies:

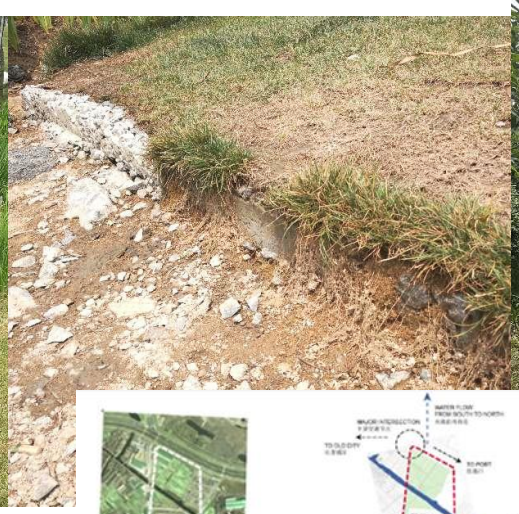
	农业用地	商业用地	居住用地	沥青路面	可渗透路面	混凝土	绿地		
	0.2	0.7	0.4	0.7	0.1	0.8	0.15	综合径流系数 CT	
A 3-1-1	100							0.20	**未开发** 100%农业用地
A 3-1-2	100							0.20	
A 3-2	100							0.20	
A 3-3-1	100							0.20	
A 3-1-1	30		30	10		20	10	0.395	**常规开发** 普通城市
A 3-1-2	30		30	10		20	10	0.4	
A 3-2	30		30	10		20	10	0.395	
A 3-3-1	30	20	20	10		10	10	0.415	
A 3-1-1	30		30		30		10	0.195	**LID** 可渗透路面
A 3-1-2	30		30		30		10	0.2	
A 3-2	30		30		30		10	0.195	
A 3-3-1	30	20	20		20		10	0.285	
A 3-1-1	30		10		30		30	0.145	**LID 和绿色屋顶技术** 可渗透路面 减少 75%建筑径流
A 3-1-2	30		10		30		30	0.145	
A 3-2	30		10		30		30	0.145	
A 3-3-1	30	5	5		30		30	0.16	

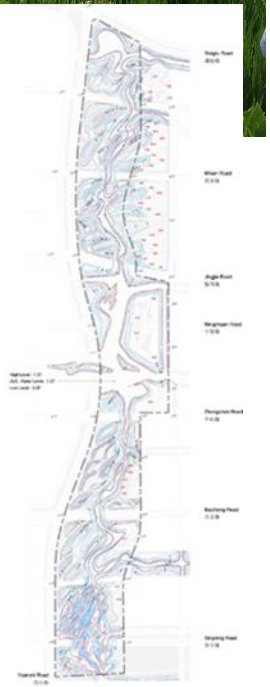
RESULTS

Plot A Studies:

Function	Facilities	Unit	Cost/ Unit (RMB)	Total (Ten thousand)
detention	infiltration pit	m3	1000	5026
	bio-retention facilities		475	2387
	green-roof		200	1005
	pervious concrete road		130	653
	sunken greenbelt		45	226
retention	swales	m3	115	15
conveyance	dry pond	m3	1000	230
	wet pond		500	115
	stormwater wetland		600	138
	retention basin		450	103

Ningbo Cases





CONCLUSION

- Source control and Sponge City concept widely accepted
- Much attention paid to non-structural measures
- Anyway – 10 minutes is short, let us talk more in the dinner or @ coffee break

Thank you!

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