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WATER QUALITY MODELS & PRIORITISATION

Using Data to Inform Modelling Programmes

December 2023

SUMMARY

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INTRODUCTION

The past timings of programmes did not coincide with the **PRICE REVIEW PROGRAMMES**

Outputs of models and knowledge of the likely assets requiring investment were still required to inform the **PR BUSINESS PLAN SUBMISSIONS**

THIS LEADS ON TO OTHER CHALLENGES IN AMP8

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WATER QUALITY MODELS
NO TIME?

- No time to build models but we still need answers
- Too many models to build but we still need answers
- Not enough resource to build models but we still need answers…
- **SO, WHAT CAN WE DO WITH THE DATA WE HAVE?**

WHAT DATA
DO WE NEED?

- We decided on a relatively simple **BOSTON MATRIX** approach
- Based on agreed environmental and complexity scores
- So, river reaches *(and the assets within that reach)* were to be scored against:
  - Understanding of catchment and network status
  - Potential sensitivity, performance and complexity of receiving water
- For each measure, we applied a score, to reflect an assets performance
- Score was inevitably subjective, but based on several iterations of discussions was weighted according to importance

SCORING
PROCESS

- Water Company asset data
- EDM Models
- MCERTS
- Etc.

- River Flow Data

- EA Water Quality Data

- Channel Complexity
- Reach Complexity

SCORING PROCESS

OUTPUTS

Scores

Plots

Prioritised List

EXAMPLES
SCORES & OUTPUTS

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												water quality last date of data collection				
River Reach name	No. Listed assets	No. of additional assets	Best available flow data within river reach	Best available flow data upstream/ downstream	Score In reach = 10 Up/down of reach = 5 None = 1	Flow data range (years)	Score >20yrs = 10 5-20yrs = 5 0-5yrs = 1	water quality data available	No. of samples	Score >200 = 10 50-200 = 5 <50 = 1	Range of data (years)	BOD	DO	ammonia	un-ionised ammonia	Score BOD = 2.5 DO = 2.5 Amm = 2.5 Un-ionised amm = 2.5
Alfreton Brook from Westwood Brook to Amber	4	8	None	Q95 (Amber at Wingfield Park)	5	1971-2021	10	MD-51113100 MD-51113480	243 206	10 10	2000-2019 2000-2021	27/10/2016 06/12/2021	11/2/2019 06/12/2021	11/2/2019 06/12/2021	11/2/2019 06/12/2021	10 10

River Reach name	Complexities Birfurcation(s) or pool	Flow through pool	WQ data upstream or downstream of pool	WQ asset on 1 or both channels of bifurcation	Complexity score:
Alne - conf Claverdon Bk to conf R Arrow	Bifurcation	No	N/A	No	10
Anker from River Sence to River Tame	Pool	Yes	Upstream and Downstream	N/A	5
Hatchford-Kingshurst Brook from Source to R Cole	No	No	N/A	N/A	0

EXAMPLES
SCORES & OUTPUTS

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Environmental data		Complexity		Risk category	No. reaches	No. assets
Min	Max	Min	Max			
0	20	0	5	Low confidence, Low complexity	15	44
21	40	0	5	High confidence, Low complexity	85	216
0	20	6	10	Low confidence, High complexity	3	16
21	40	6	10	High confidence, High complexity	13	45

EXAMPLES

SCORES & OUTPUTS

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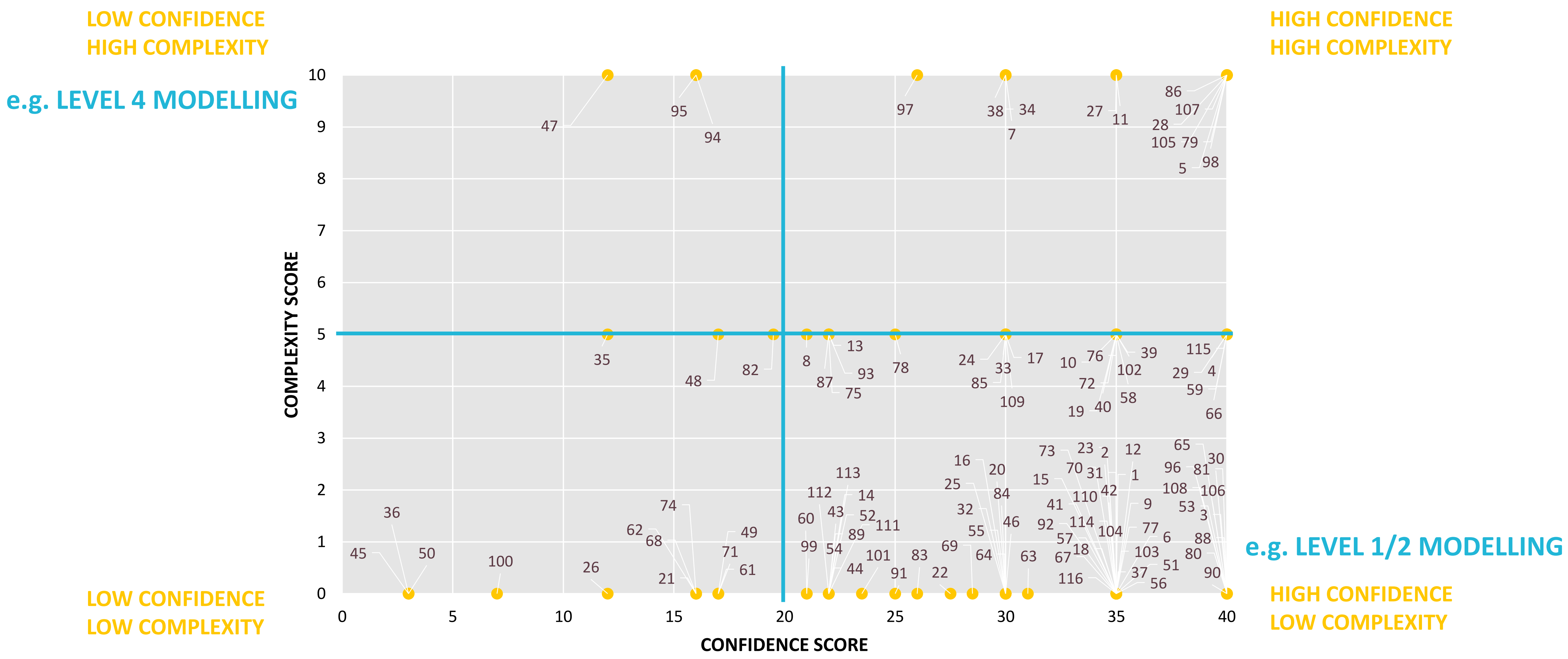

EXAMPLES
SCORES & OUTPUTS

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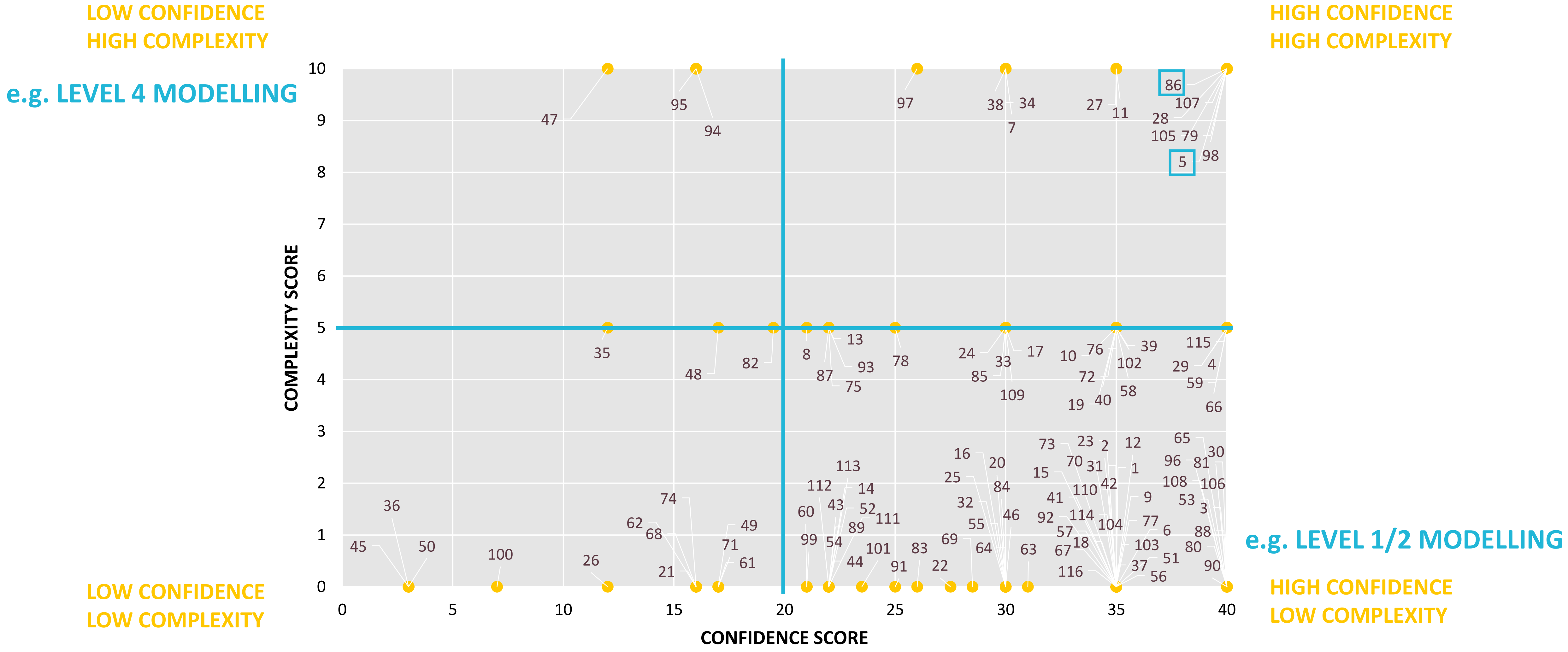

ENVIRONMENTAL DATA ASSESSMENT

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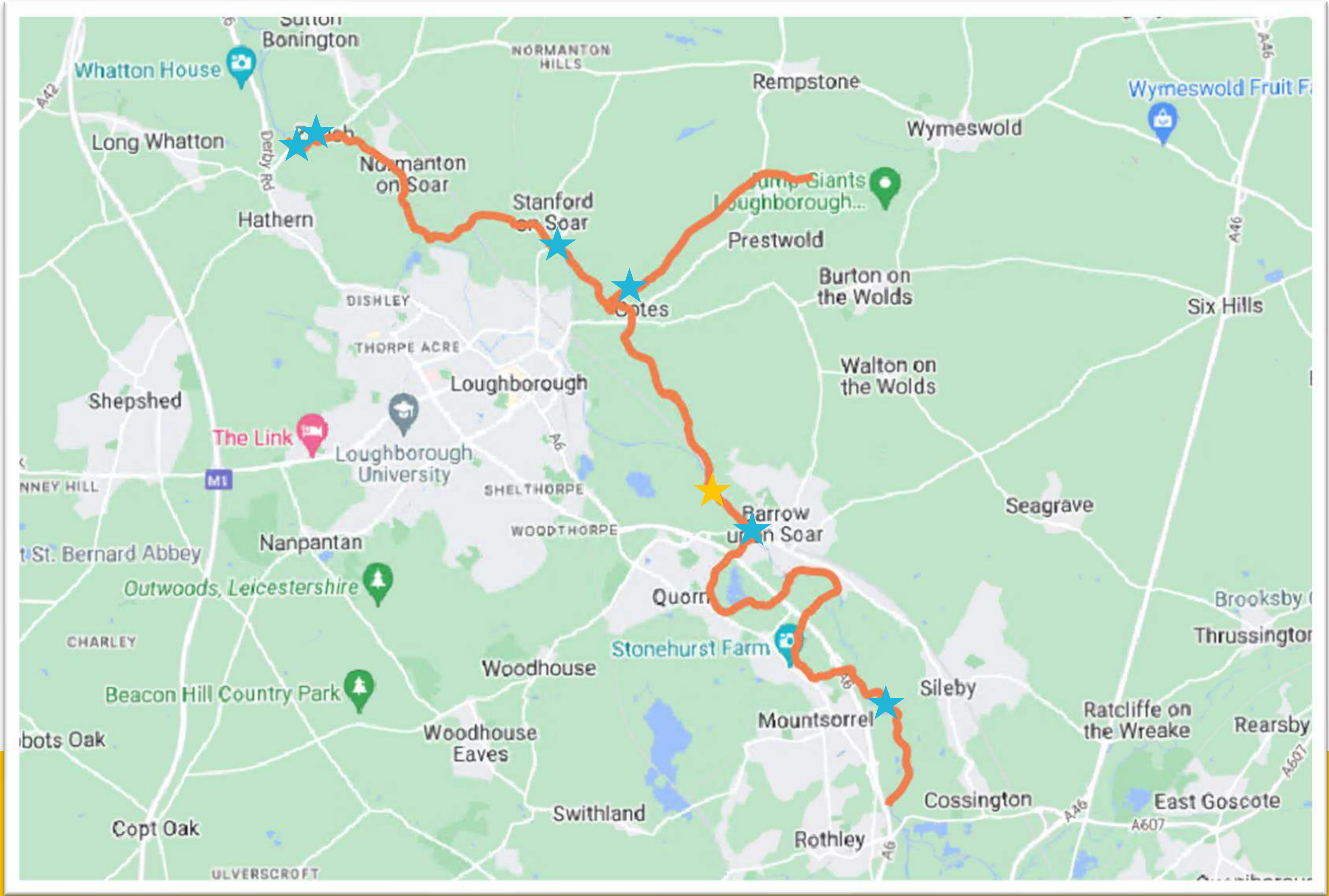
- Flow data available within the reach = 10
- Flow data available for more than 20 years = 10
- Samples of BOD, DO, un-ionised ammonia and ammonia = 10
- More than 200 water quality samples available = 10

TOTAL = 40



COMPLEXITY ASSESSMENT

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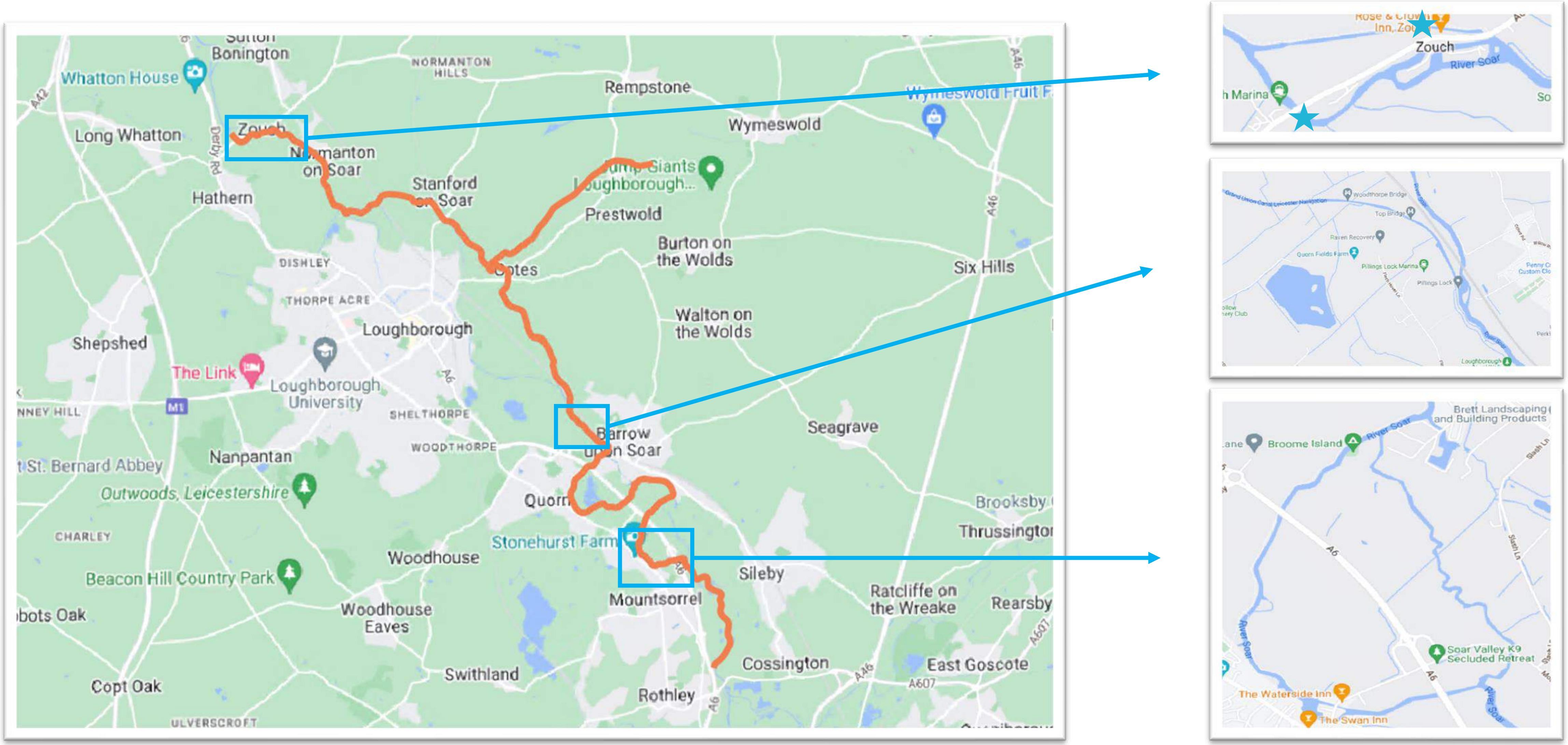

HYDRAULIC COMPLEXITIES
RIVER SOAR

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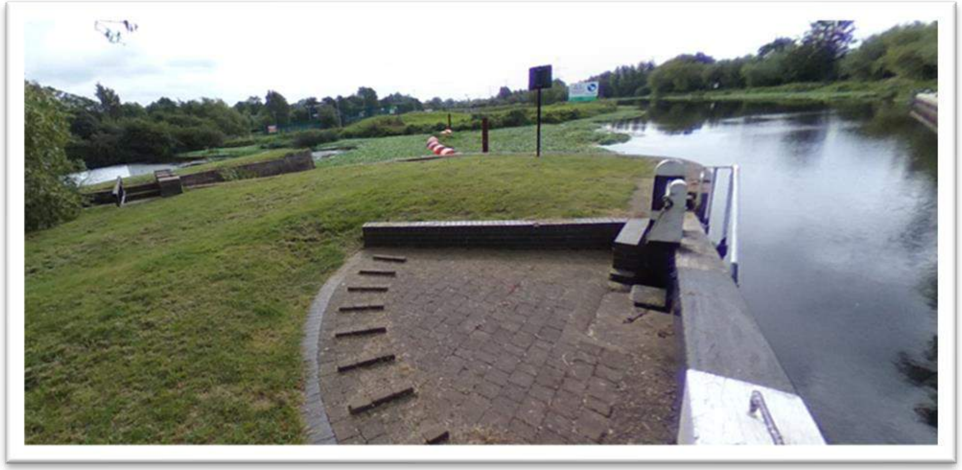
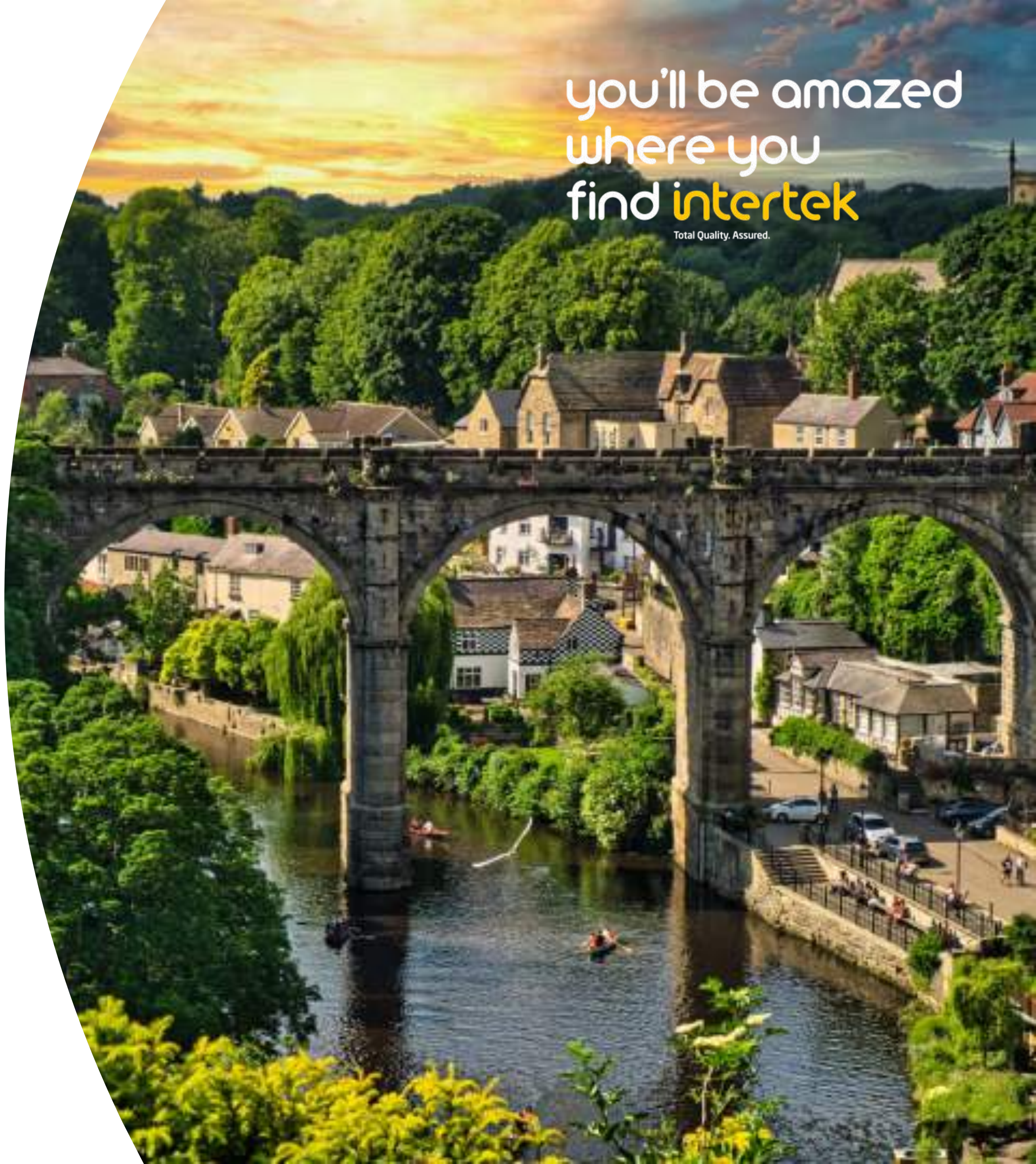


ENLARGING THE DATASET

These initial studies have used a relatively simple dataset, although over reasonably long time periods

No reason why further datasets can't be introduced, including:

- Better EDM data (i.e. more widespread and a longer dataset)
- Ecological data (actual representation of the ecology of the river, not chemistry or abstractions of invertebrate communities)
- Continuous monitoring data in AMP8



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CONCLUSIONS

- Our method successfully identified high risk assets and allowed models to be simplified which will save valuable time and resources
- Big data can be managed to obtain valuable outputs and machine learning can increase this value but is not essential
- Our method can provide a vital ‘first step’ indicator of the need for further modelling

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Thank you

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