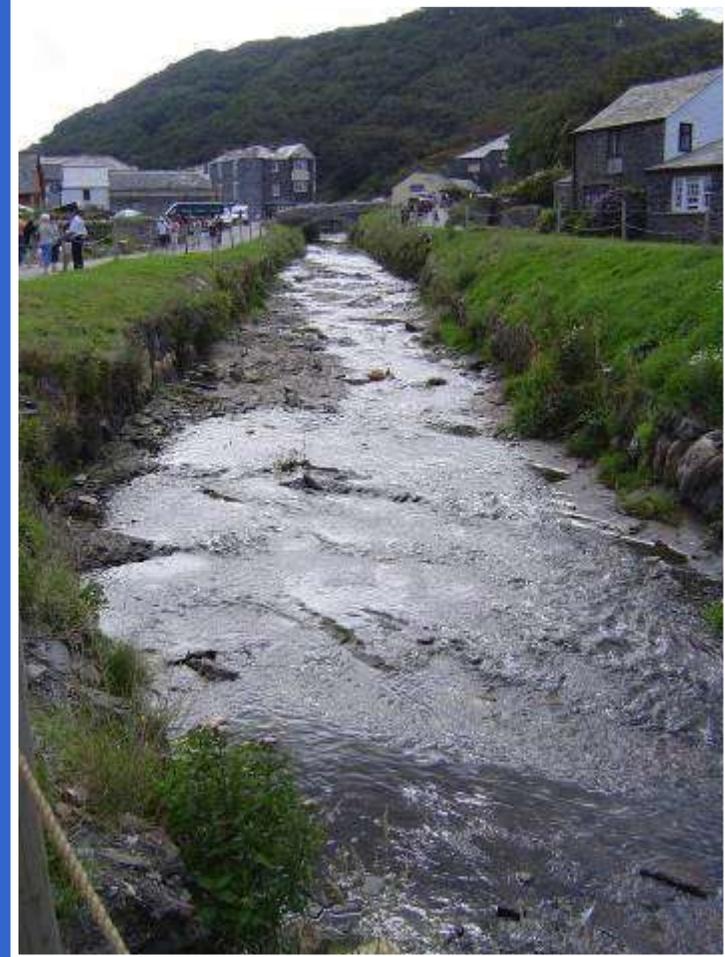


Bed lowering at Boscastle



Summary

- Constraints
- Flood risk in Boscastle
- Scheme proposal
- Bed lowering design and construction
- Share results and lessons learnt so far
- Completion in Summer 2008

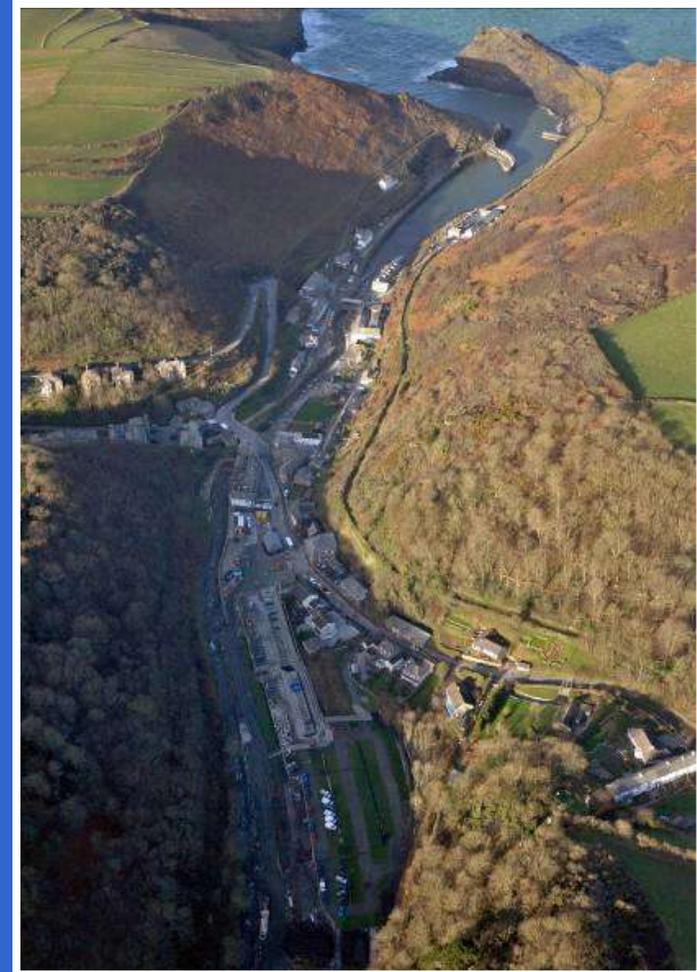


Boscastle



Overall Objective: work with the river's natural processes, maintain and enhance the distinctive landscape, wildlife and historic character

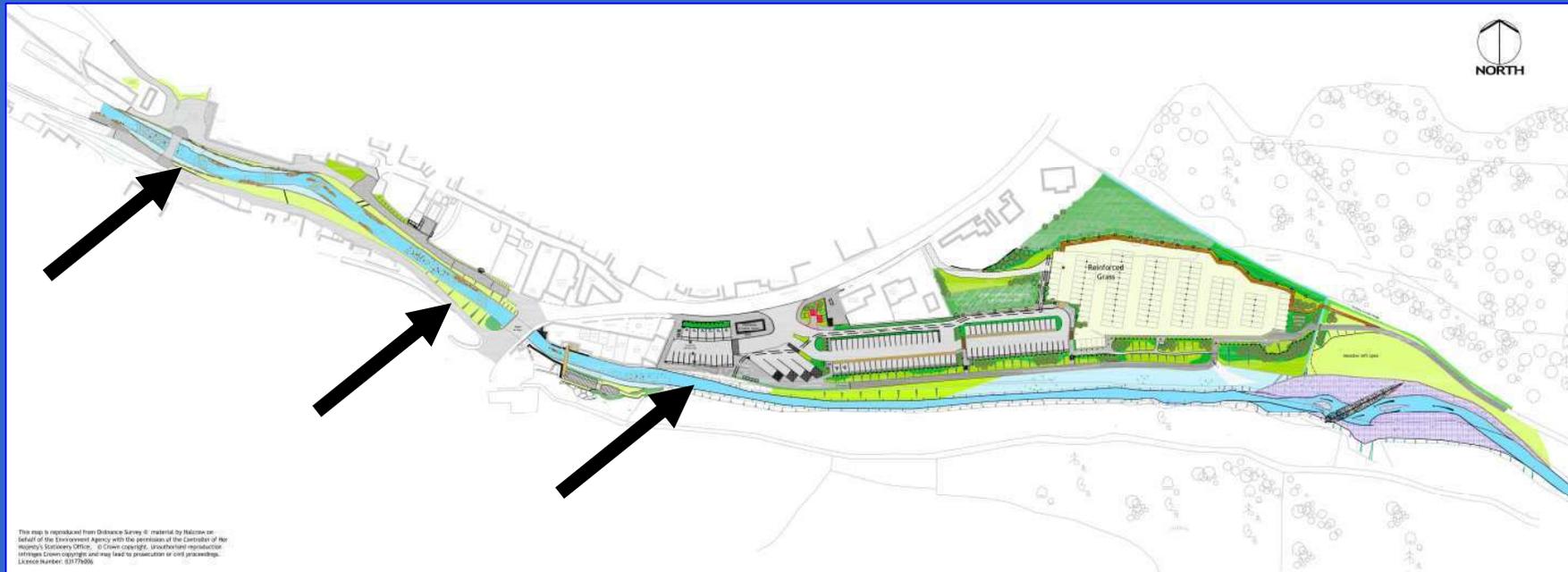
River Valency

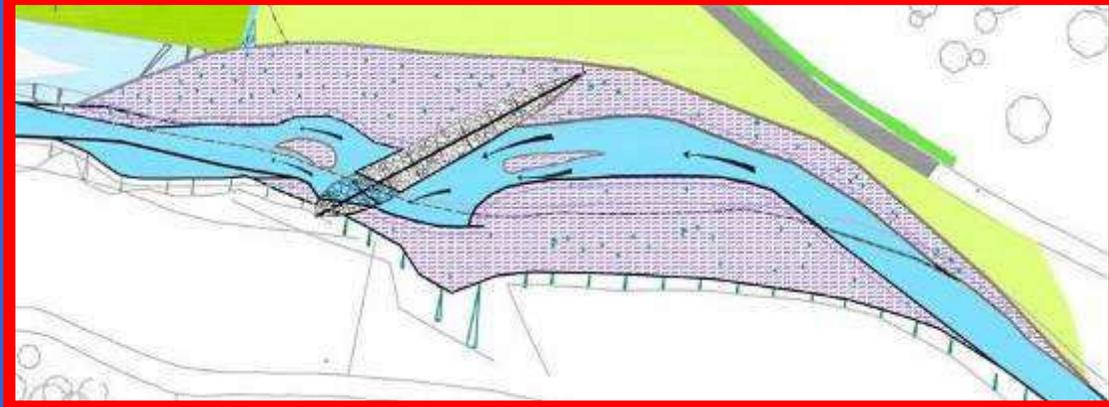
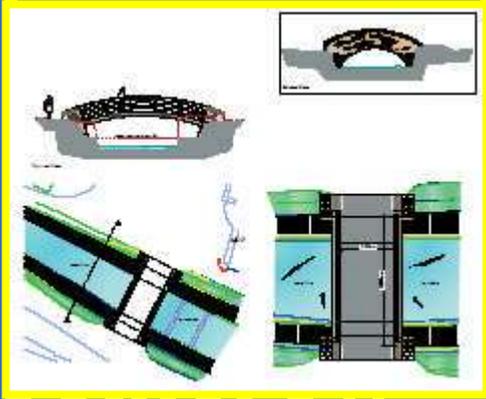
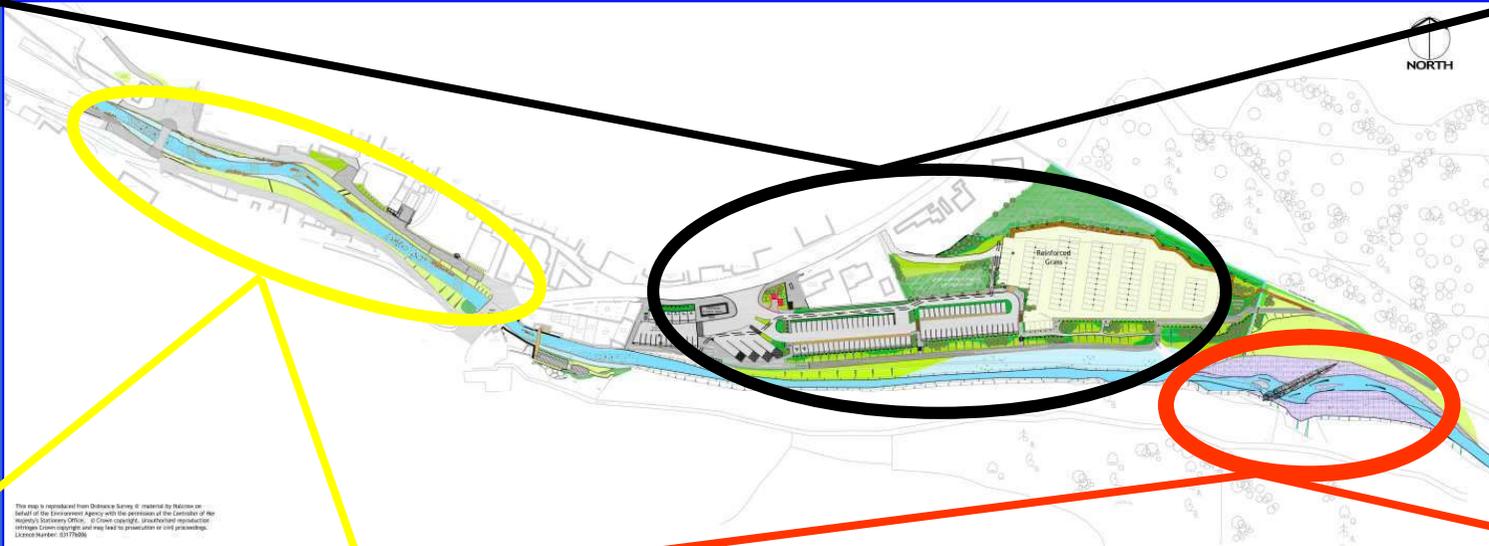
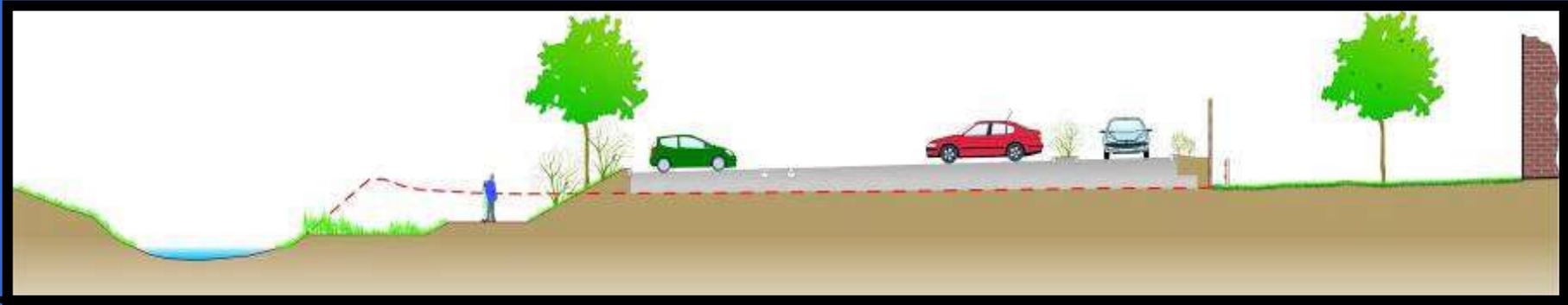






Likely sediment deposition





The bed lowering challenge



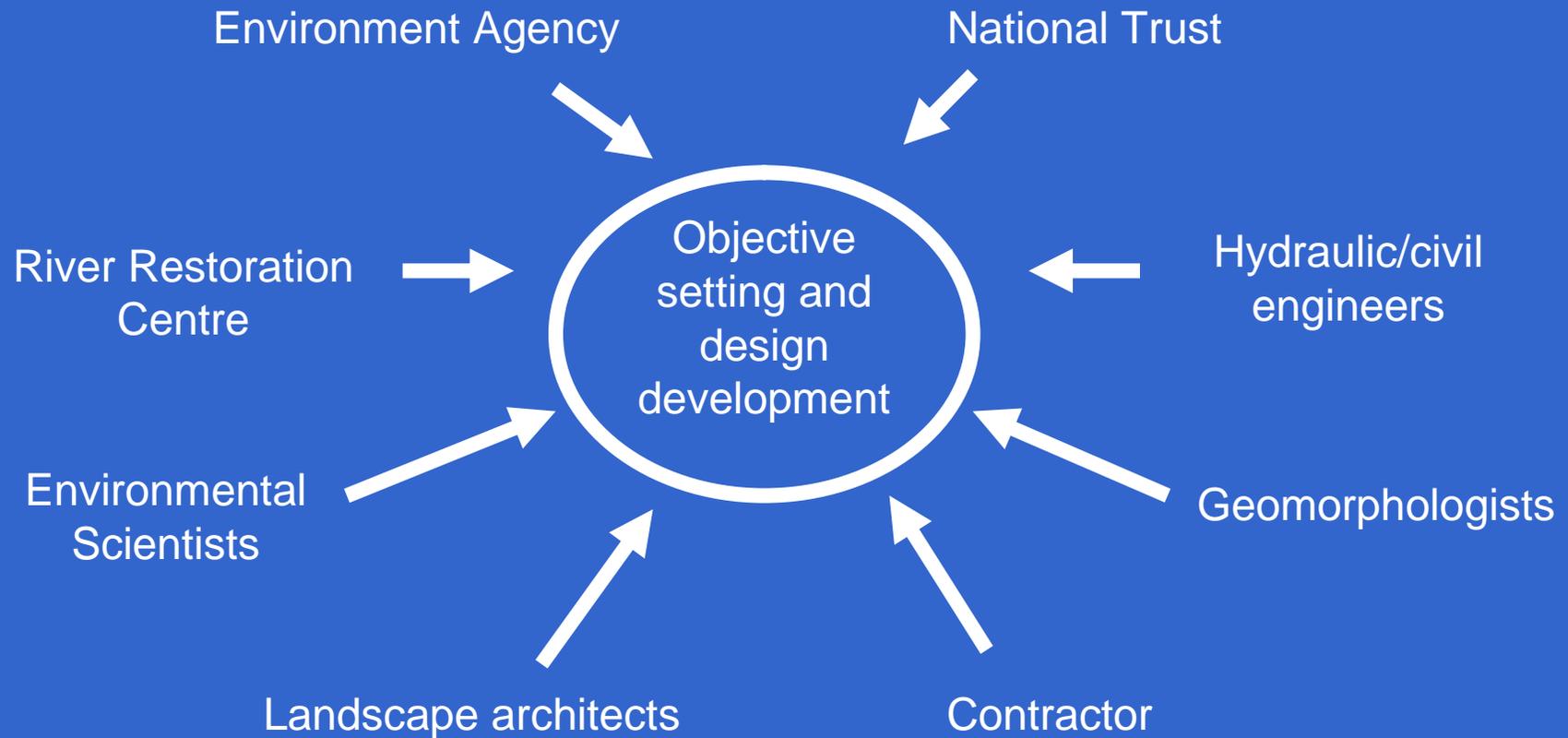
- Man made channel
- Formed of soft slate layers and hard quartz
- Salmonid (Atlantic salmon & sea trout), eels and bullheads
- Lower the river bed by 1m for 300m

What are the construction risks?

- Under/over excavation due to hard/soft rock
- Damage to historic walling and Grade II Listed Buildings
- Weather
- Noise and vibration – adverse Public Relations
- Salmonid migratory season
- Public safety during tourist Season
- Potential for Pollution ~ machines in river



Collaborative design process



Bed Lowering Design Objectives

- Avoid deep 'geometrically uniform' channel
- Improve flood capacity and sediment conveyance
- Work with the bedding planes of the river
- Work 1m away from historic walling and buildings to avoid damage
- Incorporate cascades and pools, and cover for fish
- Incorporate low flow channel for ecology and visual amenity



Design principle: analyse bed rock

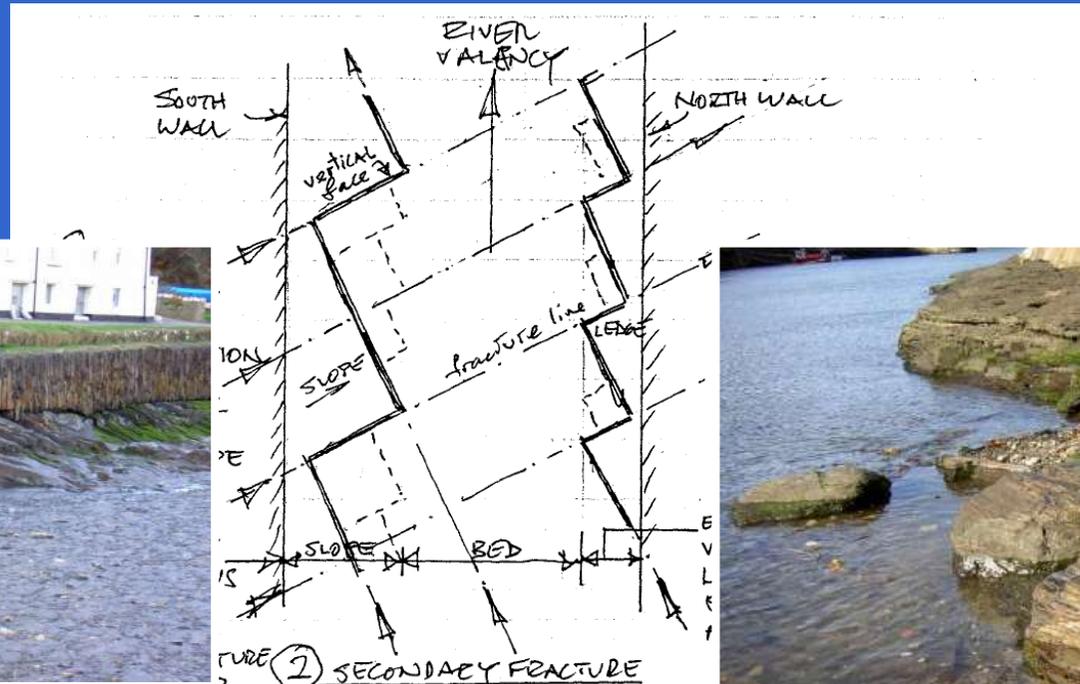
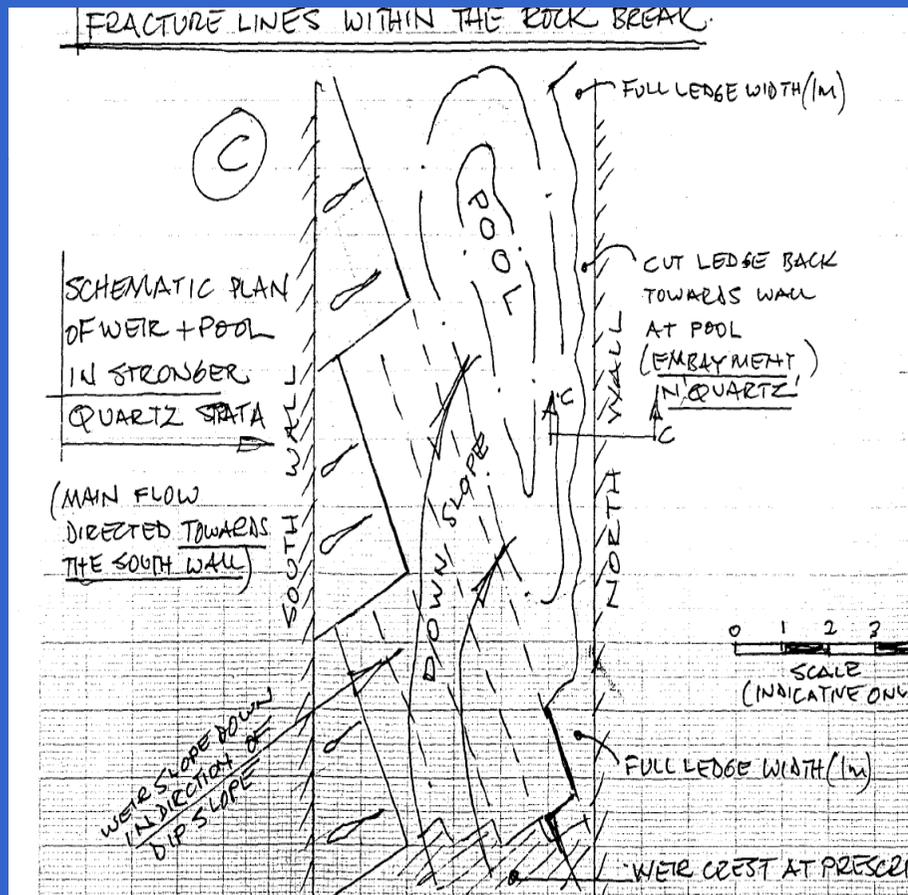


FIGURE 2. SECONDARY FRACTURE LINES INDIRECTION OF THE NATURAL STRIKE OF THE ROCK (AT RIGHT ANGLES TO DIP SLOPE)

A
SIMPLIFIED PLAN OF RIVER CHANNEL SHOWING THE EFFECT OF NATURAL FRACTURE LINES WITHIN THE ROCK BREAK.

Design principles: Cascades and Pools

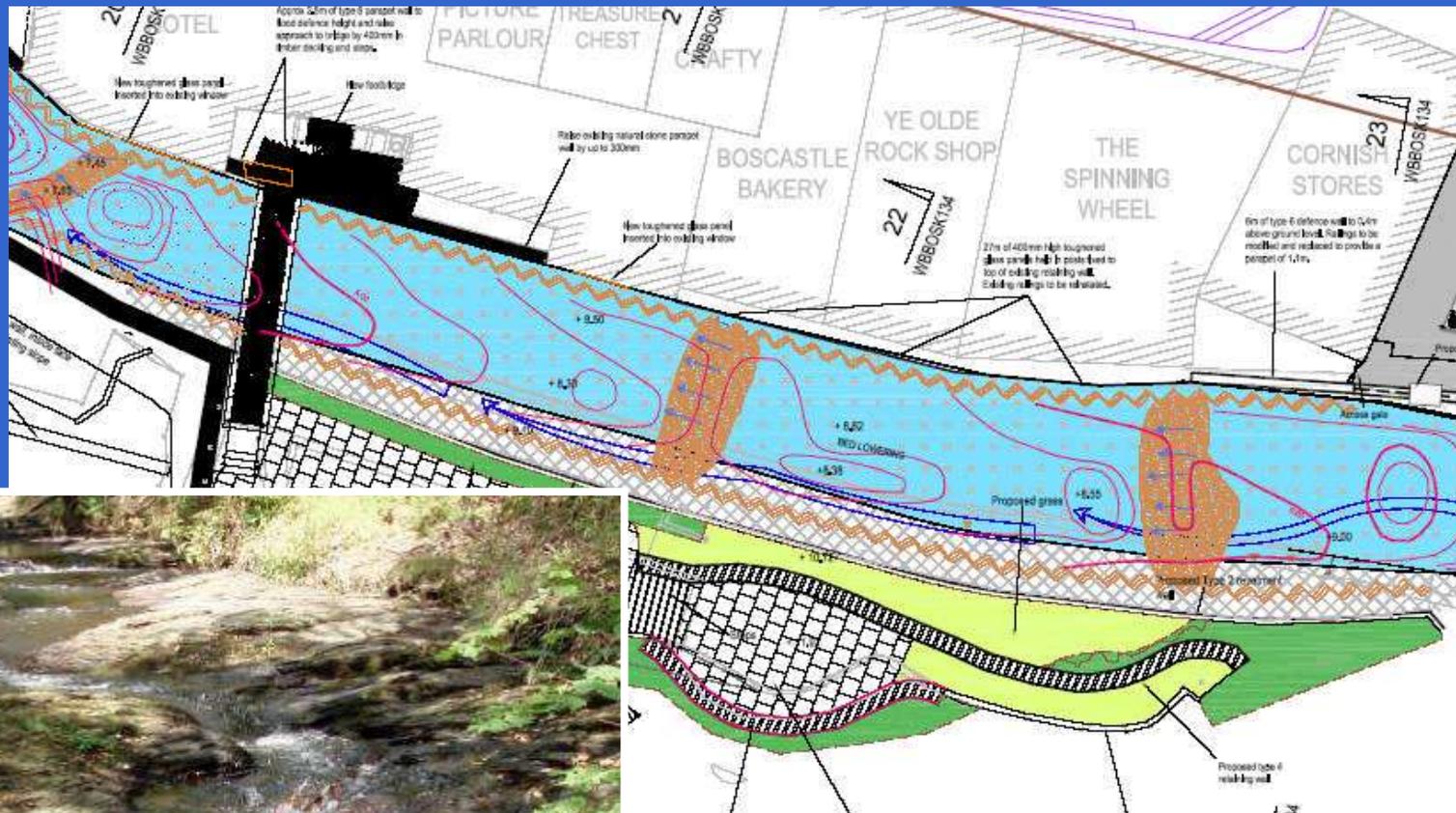


Design principles: fish passage



- Chutes into pools to attempt to keep pools free of gravel
- Embayments for fish to rest out of current
- Removal of obstructions to fish passage

Design principles: Low flow channel



Approach to the excavation

- Fish rescue and removal of gravels
- Information boards for the public
- Trial excavation to test machinery and properties of rock
- Toolbox talk for digger driver with visual references
- Hydraulic excavation followed by architectural excavation
- River Restoration Centre (RRC) and Fisheries provided site supervision
- Sign off from all stakeholders



How did we break out the rock?



- Bucket, tooth, milling machine and by hand
- Worked into the flow so sediment moves downstream
- Worked with the natural bedding planes and fault lines of rock

Result of architectural excavation



Left bank
reference
in harbour

Result of architectural excavation



Right bank
reference
in harbour





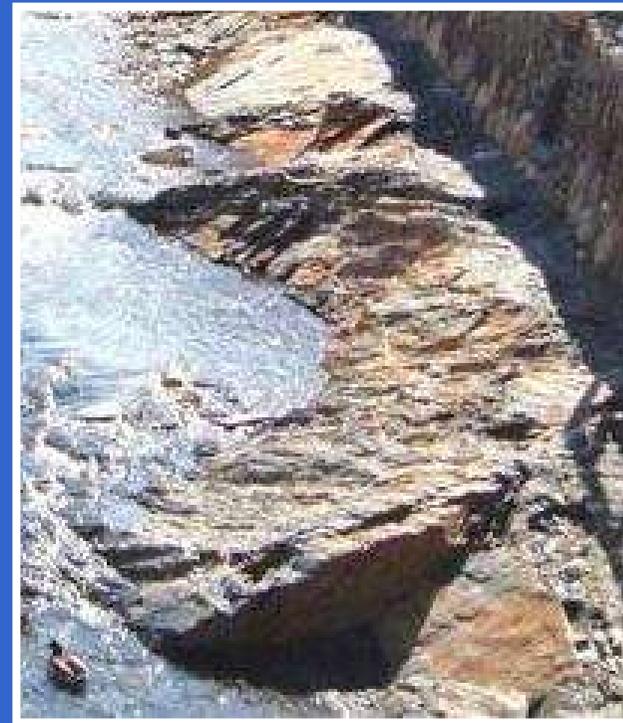
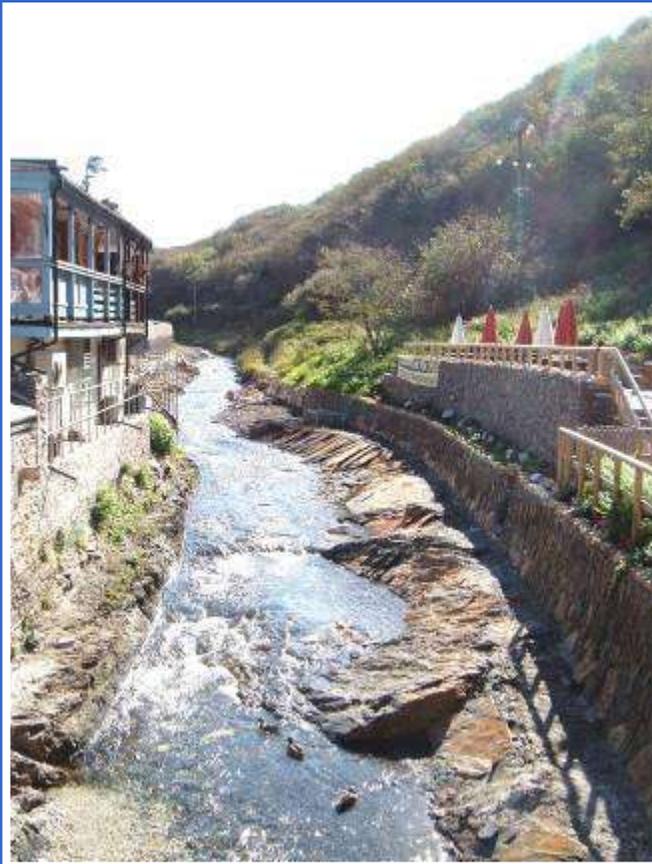
Halcrow



Result of architectural excavation



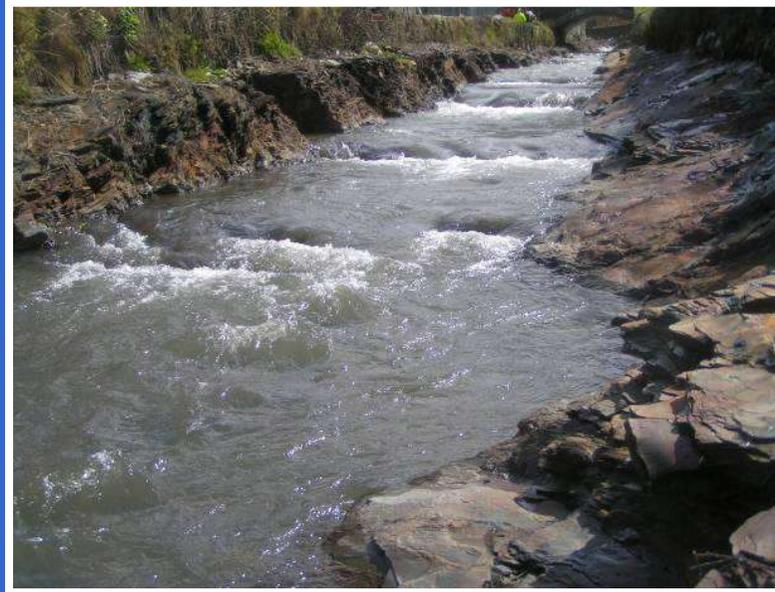
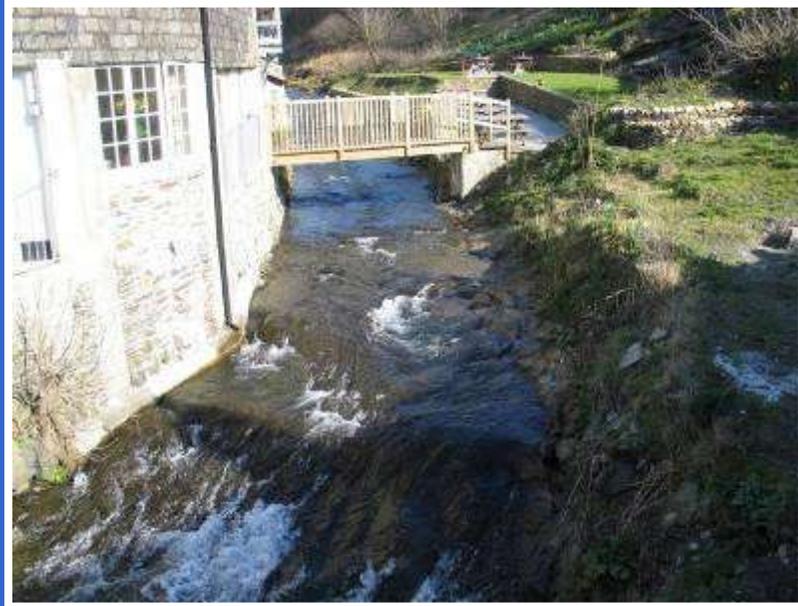
Embayments



Resting pools under bridges



Cascades and pools



Lessons learnt so far

- Visual references for the contractor are worthwhile
- Work progress is dependant on the weather
- Rock determines the finish
- Collaborative design is fundamental
- Site supervision is essential
- Created interest for the public
- Regular sign off during progression



Conclusion

- Severe constraints on the flood risk management scheme led us to bed lowering on a large scale
- Against a driver to increase hydraulic capacity we applied River Restoration techniques incorporating natural river features benefiting ecology and visual amenity
- The 'unlimited sediment supply' is managed by the flood risk management scheme
- Bed lowering and braided section to be complete by Summer 2008
- Geomorphology and fisheries monitoring for five years



Acknowledgements

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- Andrew Cooper (Nicholas Pearson Associates)