

C768: SuDS Construction guidance

Case Study 37.2

Highways upgrade A1 Leeming to Barton



Project Description

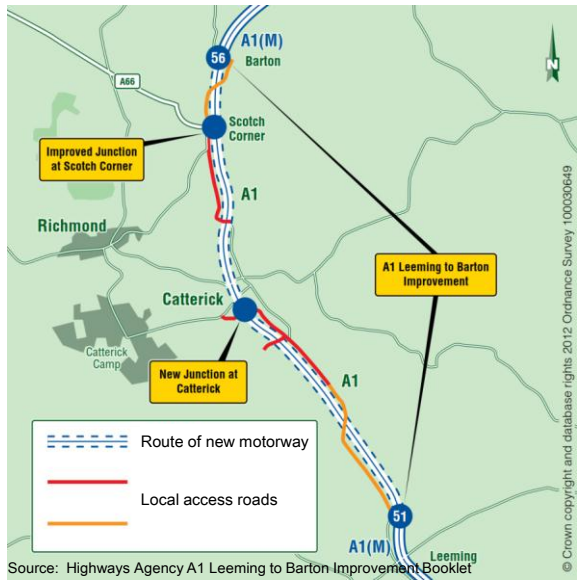
Upgrading a 12-mile stretch of the A1(M) from an existing dual carriageway to a three-lane motorway and local access roads.

- Project included the construction of:
 - 19 km of new motorway
 - Similar length of new and improved local roads
 - Highway drainage incorporating SuDS
 - Partnership funding of flood mitigation measures benefiting both highway and local towns (including Catterick)



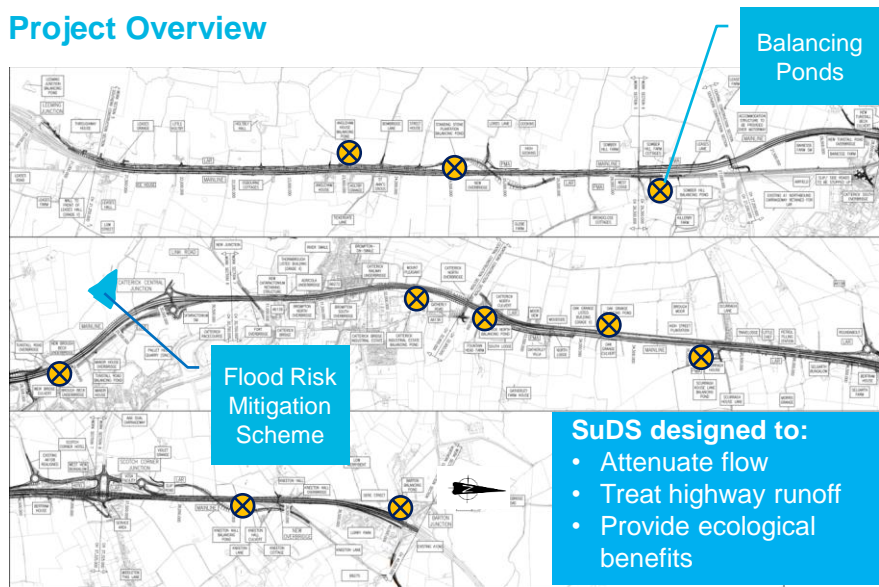
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Project Location



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Project Overview



Other SuDS features (filter drains etc.) not shown for clarity

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Drainage Features: Mix of SuDS and traditional drainage features

Traditional Drainage Features

- Trapped gullies,
 - Catchpits,
 - Filter drains
 - French drains
 - Petrol/oil interceptors
- Purpose: To collect water and filter pollutants deposited by traffic.

SuDS Features

- Ponds, offline storage structures and online storage
- Cut-off valves downstream of all outfalls and upstream of ponds (to contain pollutants in the event of a significant spillage)
- Attenuation to reduce downstream flooding

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Unusual Constraints: Local RAF Bases

Concerns open water in attenuation ponds could increase risk of wild fowl strikes

Solution: Two Stage Ponds

Stage 1 Wet forebay pond

- Reed planting masked permanent water to discourage flocks of birds
- Treated residual pollutants passing through the first stage SuDS

Stage 2 Detention basin

- Restricted discharge to watercourses



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Two Stage Pond Features



Baldersby East and West Ponds visible highlighting forebay with reeds and secondary dry retention storage area,



Attenuation pond with reed planted forebay

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Detention Basin Features



Base of detention basin



Angleham pond overflow

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Issues Encountered

Issue	Impact, Benefit, Response
Project-wide	<ul style="list-style-type: none"> • Earthworks sequencing and traffic management defined the construction programme • Earth movement planned by a full-time earthworks manager • Attenuation ponds created early • Cut and fill balance limited multiple handling
High groundwater table and flotation of geotextiles	<ul style="list-style-type: none"> • All ponds needed an impermeable liner one metre below the bed • One pond with artesian pressure required membrane to be buried eight metres deep • Pressure relief system adopted to reduce excavation depth

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Issues Encountered

Issue	Impact, Benefit, Response
Nesting birds during pond construction	<ul style="list-style-type: none"> • Consider timing of the nesting season to limit impact.
Value Engineering/ Change Management	<ul style="list-style-type: none"> • Filter drains replaced conventional concrete v-channels. • <u>Consequence:</u> Residual risk in installing nearby safety barriers due to reduced lateral support to the barrier posts.

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Lessons Learned

Item	Comment
Communication	<ul style="list-style-type: none"> Frequent dialogue with Highways England, the Environment Agency and the local authority throughout eased the approvals process.
Reed planting	<ul style="list-style-type: none"> Phase 1 reeds planted 4/m². This led to overcrowding, Reduced to 1/m² for Phase 2.
Outfall from the fore bay pond susceptible to clogging by dead reeds.	<ul style="list-style-type: none"> This was re-designed with 40 mm stone and a filter drain, Tests carried out to select the most suitable length of filter drain Five metre buffer strip around the filter drain was also put in place to further reduce clogging.

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Key Construction Messages

SuDS: Not viewed as an onerous task given the scale of highway earthworks

Soil Management: Good soil to be used along the highway construction and poor soils in the ponds.

Construction Sequencing: One pond was partially constructed before the start of the highways earthworks to accommodate the discharge of surface water

Sediment Control during Construction: Limited using straw bales, sediment entrapment mats, silt fences, and grass filter strips

SuDS Understanding: Highway scheme designers and contractors see SuDS as **Business as Usual** – therefore not necessarily seen as innovative

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Lessons Learned

Item	Comment
Non-highway drainage (e.g. embankments)	<ul style="list-style-type: none"> • Possible to drain directly to French drains
Biodiversity	<ul style="list-style-type: none"> • Significant biodiversity benefits have developed • Ponds were designed to discourage newts during the construction phase.
Cellular Storage	
Acceptability	<ul style="list-style-type: none"> • Used in areas not adopted by the local authority as acceptable to Highways England,
Construction	<ul style="list-style-type: none"> • Available space and ground conditions required a temporary sheet piled strutted coffer dam during construction. • Resulted in difficult access around the edges as struts caused an obstruction.
Lining	<ul style="list-style-type: none"> • Tanks provided with double geomembrane liner to: <ul style="list-style-type: none"> ○ Reduce the risk of leakage (in or out). ○ Prevent pollution from the construction process reaching a local aquifer.

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Wider Benefits Achieved

Item	Comment
Strategic Flood Risk Management	<ul style="list-style-type: none"> • Worked with Environment Agency on flood risk and drainage in the Brough Beck area • Delivered wider flood mitigation measures to mitigate flooding in Catterick village



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Catterick Flood Management Scheme – Storage Area on Brough Beck



Highways England partnership funding of Environment Agency Scheme

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The team

Client/Employer  **HIGHWAYS AGENCY**

Employers Agent  **ATKINS**

Employers Valuation and Property Adviser 

Joint Venture Contractor  

Contractors Designers   

Local Highway Authority (Key Stakeholder) 

* Formerly 

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