



July 2010

## Annual Awards Special

### Awards briefings

To promote the annual awards scheme and the entrants' efforts in support of the society and excellence in trenchless systems and techniques to a wider audience, UKSTT have created this special edition newsletter to include edited highlights of the shortlisted submissions for 2010. (Shortlisted projects only appear once)

#### New Installation (Large)

Winner

#### Belfast Sewers Project - Northern Ireland Water



##### Challenges

- Reduce risk of out-of-sewer flooding and pollution
- Rehabilitate largely Victorian sewer system
- Overcome complex ground conditions comprising fluvial glacial deposits, sandstone, dolerite intrusions, boulder clay and sandy gravel

##### Tunnelling Solution

- 3.7km trunk tunnel with a 4m diameter bore driven by an earth-pressure-balance machine (EPB)
- 3.7km tributary tunnel with a 2.44m diameter bore driven by EPB

- 1.8km tributary tunnel pipe-jacked with internal diameter up to 1.95m

##### Results

- Creation of 825,000 cubic metres of additional stormwater storage
- Removal of 20 combined storm overflows
- Improvement to River Lagan water quality through 85% reduction of pollutant loadings

#### Rossendale Reinforcement Project - National Grid Gas



##### Background

- Reinforce gas pressures to East Lancashire to comply with National Grid Licence to operate requirements.
- Safeguard gas supplies into the future and remove the potential of failure to supply (estimated 26,000 consumers)
- Decommissioning of a 100 year old gas holder station.

##### Challenges

- Need to reduce environmental impact to local community i.e. noise, spoil removal, vegetation impact
- Significant traffic management challenges and construction time window and severely restricted construction access
- Major stakeholder management

##### Success

- Traffic management effectively managed and structures i.e. bridges were easily negotiated by drilling under or round the structures.
- Reduced noise levels causing less impact to the local community and large vegetation areas were left undisturbed due to drilling under the affected areas.
- Improved productivity and timescales were achieved compared to open cut techniques despite a later than planned start date.

#### Exeter Link Main

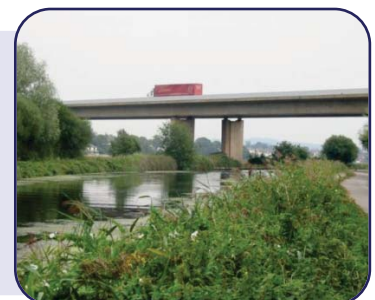
#### - Balfour Beatty Utility Solutions

##### Background

- Throughout 2009 BBUS teams, working on behalf of South West Water, undertook a 3km water main installation scheme from Exminster to Topsham – a stretch known as the Exeter Link Main
- The project crossed beneath the M5 motorway, Exminster Bypass, River Exe, Exeter Shipping Canal and a Site of Special Scientific Interest, requiring close liaison with numerous stakeholders, including archaeological and ecological agencies
- The scheme – which provided the area with a more secure, higher quality water supply – avoided numerous excavations along various commuter routes through innovative use of trenchless technology

##### Engineering Challenges

- BBUS successfully used Horizontal Directional Drilling techniques to:
- Cross the Exe Estuary (SSSI), acquiring permission from Natural England
- Pass through the Old Sludge Beds (Specially Protected Area), part of the



### Devon Wildlife Trust Nature Reserve

- Insert 2 x 740m steel pipes beneath the M5 Motorway Bridge, River Exe and Exeter Shipping Canal (oldest in the country)
- BBUS used a guided Auger Bore technique to cross beneath the Paddington to Penzance Mainline Railway. A specialist subcontractor was used as work entailed welding and slip-lining steel pipes with life expectancy of 300 years. As this operation took place on a recognised flood plain teams avoided using drilling fluids; employing large sediment tanks to reintroduce fluid from our excavations to the flood plain
- When excavation was required along the Exminster Bypass BBUS utilised a chain trencher technique (recycling all material), minimising disruption when compared to the traditional open-cut

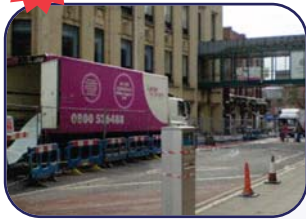
### Environmental Challenges

- BBUS went to great lengths to ensure its impact on the surrounding environment was minimal. BBUS commissioned an in-depth ecology survey at the outset, which provided results that ensured operational teams:
- Dug by hand around a woodland to prevent root damage
- Constructed fenced exclusion zones to protect badger setts
- Re-routed pipeline to protect slow-worm habitat
- Stripped, stored and replaced topsoil to protect species
- BBUS liaised with a large amount of environmental stakeholders throughout the works, gaining permission and guidance regularly
- When carrying out HDD works, BBUS ensured its specialist subcontractor supplied a mud recycling unit to accompany its rig. This allowed bentonite clays and mud to be recycled, ensuring that the quantity of waste earmarked for landfill was minimised

## New Installation - Small

Winner

### Blackburn – Keeping the City Flowing - Lanes Group plc



#### Background

- A crumbling Victoria egg-shaped sewer in Blackburn City centre desperately needed to be relined.
- Northgate, the project location was a busy one-way street in the main shopping area of Blackburn.

#### Engineering Challenges

- Lanes co-ordinated with no less than 5 companies to get the project off the ground.
- A partial 10 day road closure was granted to carry out the works.
- A planned PR campaign prior to the works ensured that all affected business were aware of the project.

#### Outcomes

- By using a concentric liner a tricky egg-shaped sewer was successful lined.
- Despite its city centre location and proximity to the main shopping area thanks to meticulous traffic management the project was a resounding success.
- Due to proactive approach not a single complaint was received from local businesses.
- The project was completed three days early.

## London Strategic Medium Pressure Gas Mains replacement Programme - River Thames crossing Windsor – National Grid

### Background

- Project scope - renew 17km of large diameter Medium pressure gas main from Slough to Windsor
- Various engineering difficulties along the 17km route which included the renewal of the existing 18" CI one way fed gas main underneath the River Thames
- 18" CI gas main is located on Crown land managed by crown estates for the government (Near Windsor Great Park)
- Consultation with Crown estates, Environmental Agency, Natural England & Site of Special Scientific Interest (SSSI). Authorised consent to lay.
- Existing 18" main could not be inserted as this is one way fed and around 20,000+ customers would lose their gas supply



### Engineering Challenges

- Initial site investigation shown that there was a possible alternative route over a nearby bridge (Albert Bridge)
- Traffic management set up to carry out trial holes on bridge deck area
- Trial holes proved inadequate depth of cover to protect new main upon installation and Crown estates opposed the new main being installed on the outside of Albert Bridge
- Further investigation of site area to check feasibility of pipe jack technique at a cost of around £650,000
- However pipe jack technique had large environmental concerns/issues and would have taken place during Autumn/Early Winter months
- Bore holes from a geotechnical/environmental specialist taken to evidence feasibility of pipe jack

### Outcomes

- HDD technique considered after examining geotechnical borehole survey results with consent given by EA providing we used a naturally biodegradable drilling fluid
- HDD company carried out trial drilling operations to ensure 8m depth was achievable with good bore hole stability in fields adjacent to River Thames
- Following successful trial the HDD operation of River Thames took place
- 5 Days to complete 160m x 315mm PE HDD operation in Late September 2009
- Total cost of HDD operation £63,000
- Total cost saving of river crossing using HDD instead of pipe jack £577,000
- Minimal environmental impact and minimal disruption to Crown estate and local farmers

## Bypass of Fulford Main fracture - Saint Gobain PAM UK

Also shortlisted for Renovation Small

### Background

- Bypass for 24" pumped sewer main fractured under A64 just South of York

- But one of last remaining habitats for the beautiful Tansy Beetle
- How to cross the A64 without affecting the Tansy Beetle?

### Engineering Challenges

- Sandy soil, Pipe 14m below A64, (very) restricted access, local naturalists watching carefully
- Solution was create an 80m long auger bored 900mm diameter steel casing under A64, pull Directional pipes through and then connect each end to existing main
- Pipes jointed one-by-one during pull back = reduced footprint
- No bentonite required = less environmental impact



### Outcomes

- Successful completion of high profile, environmentally sensitive project
- No beetles inconvenienced
- Completed ahead of schedule
- No disruption of sewage services
- Very favourable reporting in local press

## Renovation Large

### Rhosferig Tunnel Lining – Barhale Construction plc



### Background

- Project: Renovation work inside the Rhosferig Tunnel on the Central Wales Railway Line
- Initial Methodology: Sprayed concrete or viable alternative
- Renovation Technique: Sewer renovation technique to renovate railway tunnel

### An Effective Alternative - The Tunneline System

- Delivered a high quality lining in a fast, clean and efficient manner; saving cost and providing Network Rail with a truly cost effective and viable alternative
- Has no mechanised parts, is built entirely by hand and can be assembled or dismantled quicker than any other system, pressure placing the concrete eliminates vibration
- Is environmentally safe and is used in culverts, reservoir feeder tunnels and bridges over water.



### Outcomes

- More cost effective solution
- Much faster solution
- Lining is a higher quality than a sprayed concrete finish
- Produces less waste so more environmentally friendly
- No protection of ballast or drainage required as no air borne contamination created



### Rehabilitation of Ballyogan Stream Culverts - Insituform Environmental Techniques

### Background

- Twin concrete culverts, 1350mm Ø each 271m long

- Landfill site, difficult terrain with 11m overburden. Dangerous gases so non man entry solution CIPP
- Overhead 220Kv power lines, steep banks required extensive scaffolding & roller-bed system to install without craneage

### Engineering Challenges

- CIPP was preferred option because it minimised loss of cross sectional area & provided fully structural solution
- As it is a fish breeding river, it was necessary to minimise the time on-site. The works were completed in 3 weeks from start to finish
- Liner eliminated danger of leachate infiltrating to stream



### Outcomes

- The works were completed on time, on budget, and exceeded the clients expectation
- This has been the largest CIPP project carried out in Ireland to date and the success was due to the true partnering between the main contractor (Priority), the project manager (RPS), the client (DLRCC) and Insituform Environmental Techniques

## Leicester Trunk Mains Renovation – Severn Trent Water

### Background

- 2.2km trunk mains lining , 12.5km trunk mains cleaning, 12 & 18" trunk mains
- These trunk mains serve 65,000 customers. Trunk mains located in Leicester Ring Road and Soar Valley flood plain
- Historical hydraulic and water quality issues in complex trunk mains network



### Challenges

- Extensive stakeholder management facilitated a road closure of the Ring road in July 2009
- Extensive hydraulic modelling allowed supply plans to be prepared including a temporary change of water supply to Glenfield Hospital
- Innovative remote water quality monitoring vastly reduced streetworks activity

### Outcomes

- Innovative use of 'ice pigging' technique employed for work in Soar Valley flood plain – no excavations in sensitive environmental area
- Proactive H&S risk management system in place monitored with regular audits led to zero accidents and incidents
- Successful project completion in December 2009, ahead of programme. Significant water quality improvements in network

## Renovation - Small

### Swage lining – A UK Utility Record? – Denholm Pipecare

### Key considerations:

- Minimal disruption to the public





- Operation to be completed on time & on budget

- Local environment

**Client advantages:**

- 90%+ reduction in excavations
- Cost effective
- Proven safe technology

**Achievements:**

- Record breaking pull of 930m x 469mm

- Operation conducted during night to minimise disruption
- Effective partnership with NG & Morgan Est

## The Royal Train Shed – OnSite Central Ltd

### Background

- Sewer 14m deep ran under the Royal Train Shed and The Grand Union Canal
- Sewer was broken and 100% full of concrete under the building
- Asbestos contaminated land on the other side of the narrow Bridge
- No sewer diversion available as all other major utility services ran under the narrow Bridge that has single traffic flow leading into a 1mile long busy industrial estate.

### Outcomes

- The concrete was removed by a unique and extremely safe method of repair
- The “No-Dig” Premier-Pipe lining - the preferred repair PLUS extra benefits of being environmentally friendly and having a vastly reduced carbon foot print over alternative traditional “open-cut” methods of repair

- Work carried out without having to enter the upstream asbestos contaminated land
- Photo shows Andy Buckley - Anglian Water Engineer supervising the 900mm diameter structural Premier-Pipe lining being installed from the down stream manhole going upstream under the Royal Train Shed as a “blind shot lining”



## Small Scheme

### Electronic Site Investigation, Sheffield BSF, High Storrs School. - Adien/Vinci Construction Ltd

#### Background

- The Building Schools for the Future (BSF) programme will see every state secondary school in England – around 3,500 in total – rebuilt or remodelled over the lifetime of the programme.
- Sheffield City Council, VINCI Construction UK and Partnerships for Schools (Pfs) are working together to deliver this programme through the Sheffield Local Education Partnership (L.E.P).
- As part of this VINCI Construction has won a £25m contract for High Storrs secondary school.

### Challenge

- Adien’s involvement - As part of the design phase of all the Sheffield BSF schools and High Storrs School Adien were asked to carry out a full 3D utility survey and overlay the results onto a topographical survey.

### Outcomes

- Sustainability - By reducing the amount of excavation and the associated plant and equipment emissions the carbon footprint of the project was managed effectively and carbon emissions were reduced when compared with conventional techniques.
- Design - The results Adien provided allowed the design to be modified and to enhance the efficiency of the construction process by modifying building lines and service connections to suit the existing infrastructure below ground.
- Funding - Utilising the Adien approach to trenchless detection and mapping has enabled Vinci and the project partners to reduce costs by 35% when compared with conventional trial pit excavation.

*“The accurate surveys provided by Adien on these projects has meant the risk and costs associated with unknown services have been dramatically reduced” - Jenny Baxter (Senior Engineer – VINCI Construction Ltd)*

## PB15 & in2 Save Time and Costs at Roakes Avenue - Dyno-Rod

### Scope of Works

- 1970’s Pitch Fibre Private Sewer (7 houses)
- 33 metres (Re-Round & CIPP Line)
- 46 metres (in2 pipe)
- 5 excavations to house PB30 hydraulic machine (2m+ deep)
- 15 days work

### System Development

- New Hydraulic Puller (PB15 Machine)
- Specially designed and manufactured docking station
- Unique in2 Pipe Replacement System
- When combined worked within a 600mm x 450mm manhole



### Delivered Benefits

- Job successfully completed 5 days early
- No excavations and associated health & safety issues
- Significant reduction in costs
- Very satisfied customers

## Winner Middlebrook Cycle Track – Lanes Group plc

### Background

- Environment Agency identified defective sewer running alongside the river with the potential to cause environmental contamination.
- The sewer ran underneath a public right of way and within 8 meters of a rail track.

### Engineering Challenges

- Lanes co-ordinated with no less that 5 companies to get the project off the ground.



- Months of planning ensured that all factors had been considered, from working near potentially hazardous Giant Hogweed to the safety of the public and how to keep the right of way accessible.

- Some out of the box thinking was needed as the sewer was directly underneath an bridge which posed a problem for the scaffolding.

• The Lanes solution was to borrow technology and methods usually found in warehousing – an industrial conveyor belt!

### Outcomes

- The project was a complete success with Lanes Group's Sewer Renovation division relining 112 metres of 600mm diameter Sewer.
- The project cost a fraction of the cost of a typical 'Excavation project'.
- Thanks to extensive planning the relining installation only took 4 hours.
- The cycle track remained open for the duration of the project.

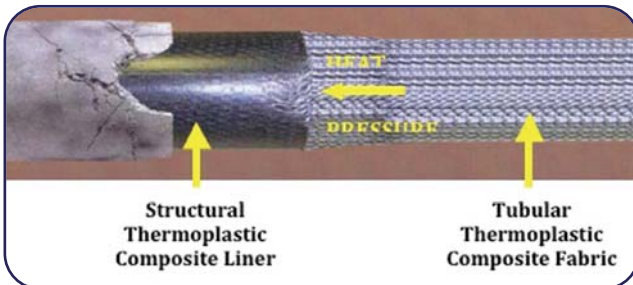
## Innovation

### First rehabilitation of a 200mm diameter potable water mains pipe using the latest trenchless melt in place pipe (MIPP™) process – Anglian Water Plc / Onsite Central Ltd / Aqualiner Ltd

#### Background

- Aim of trial was to evaluate the latest trenchless MIPP™ technique which involves forming a structural standalone pipe in the latest environmentally friendly thermoplastic composite materials

#### MIPP™ Process



- A woven tubular textile "sock" comprising a mixture of glass fibre and polypropylene fibres was inserted into the pre-cleaned water mains pipe
- A heated pig was passed through the thermoplastic composite "sock" which melted it prior to it being consolidated against the pipe wall using a pressurised rubber inversion tube.
- The molten thermoplastic composite sock cooled against the cast iron pipe wall to form a structural standalone liner capable of withstanding up to 60 Bar short term pressure

#### Benefits

- Reduced cost and disruption to traffic and public
- Improved water quality, elimination of leaks and

demonstration of a fully structural class 'A' liner

- Potential to re-furbish up to 3 times amount of water pipes for a given budget compared to open trench processes

## Hydrant Cleaning System – Balfour Beatty Utility Solutions

(A zero excavation method of cleaning riser sections within water pipes)

### The Problem

- Scale and corrosion generally build up at points of slow or stationary water. This can be dealt with by excavating, cleaning and relining water mains, yet riser sections beneath fire hydrants are not easily accessible

- This means that scale may build up and prevent sufficient water from flowing up through the riser when required by emergency services. Amassed scale may also prevent the deployment of camera systems for infrastructure assessment

- Significant scale build up can also minimise flow area within T-pieces, disrupting flushing processes. Stagnation can lead to water discolouration and may impact upon quality of supply to end-users



### The Solution

- As part of the live mains cameras and sensors project, BBUS worked closely with Yorkshire Water to produce a device that incorporates a miniature camera device and a high pressure jetting system, which is launched via an existing fire hydrant

- Via live video streaming to an attached laptop computer, operatives can determine how much scale needs to be removed. High pressure directional water jets are operated to remove scale, while the innovative camera allows re-examination upon completion

- The HCS ensures continual flushing of water from start to finish. Scale is discharged to nearby drainage facilities, preventing discolouration and contamination of supply

### The Benefits

- The HCS completely removes the necessity to excavate when there is high scale build up within a riser section, as it is launched via an existing fire hydrant. This has a range of benefits:

- Reduced cost – no excavation/reinstatement costs or landfill charges; greater productivity (one team, one visit)
- Minimised disruption – speedy process, minimal site construction
- Reduced environmental impact – no waste to landfill; less vehicle miles; reduced carbon output
- Improved safety – no danger of utility strikes; reduced risk of injury to employees / members of public

## Nant Pibwr Culverts – Barhale Construction plc

### Background

- Project: Three failing masonry culverts to be replaced with two new 1.5m dia. pipes jacked under the South Wales Railway line

- Initial Methodology: Fill the failing culverts and abandon them

- Innovative Solution: Relining the culverts using the innovative Tunneline System to provide Network Rail with an equivalent and much more economical solution



### A simple solution

- Using two wet coffer dams to control the flow, lining formers could be erected and sealed on one tide
- Filling by pumping concrete under pressure into the formers on the following tide took three hours
- By using the Tunneline system; the concrete can be placed in extreme conditions without loss of quality

### iPlus® Composite High Strength Liner - Insituform Technologies Ltd

#### Innovative Technology

- Insituform has developed the "next generation" of CIPP liners with High Strength & fiber reinforcement for trenchless construction
- iPlus® Composite
- Reinforced with carbon and glass fibers

- "Sandwich structure" technology
- Laminate design method optimally locates the structural reinforcing materials
- Fiber –reinforcement provides maximum structural strength with pipe wall thickness reduced by nearly 50% compared to standard CIPP
- Thinner walls=less resin=better flow capacity + less energy & fuel=less carbon emissions
- Cost-effective and Environmental friendly solution

#### The project

- iPlus® Composite "next-generation" CIPP liner

- Corrugated steel culverts ranging from 1.0m to 1.6m under Highway in Exeter renovated
- Rectangular stone culvert for network rail at Edale successfully renovated with fast installation & no disruption
- Long Term operational security of culverts assured with maximum strength, minimal cross sectional area loss & environmental friendly solution.



### The Hydrascan Typhoon Water Mains Cleaning System - Kilbride Ltd

#### Background

- Hydro Jet Propelled vehicles 6" – 60" Dia.
- Range 500 metres from single entry point – up to 2 km

range from two excavations!

- 1.5D bend multiple bend passing capability.

#### Fully Controllable Cleaning:

- Angle
- Pressure
- Distance
- World Class Cleaning Results.
- Image shows pipe where pig has stopped cleaning – light area = cleaned dark area = dirt.
- Consistent cleaning results – typically a fraction of the DWI's max PCV levels.



### UKSTT Chairman's Annual Young Engineer Bursary

*This year's UKSTT annual chairman's bursary, available to young engineers, was won by Leanne Ford from Wessex Water. Designed to be used by the winners to help them travel and expand their knowledge and use of trenchless systems world wide. This year's award was sponsored by South West Water*

Her project entitled 'Bridgwater, Smuggling Tunnels, Castle Walls and a antithetical preservation by Soft lining' covered the complex delivery of a significant relining project.



Apparently in 1690 the Duke of Chandos constructed an underground passage through the former 13th century Bridgwater Castle wall. This passage was later re-designated as a sewer used by Smugglers!



The Wessex Water team thought it sounded a bit far-fetched until archaeologists on site confirmed it to be 'As an archaeological find, its exceptional' .

With the view of preserving the masonry structure for future study, Lianne's team re-evaluated the hydraulic requirements of the catchment by 'Infoworks' computer modelling, resized the sewer, stabilised the defects, and lined the sewer with a Polyester CIPP liner with a reinforced pre liner despite the coach loads of sightseer's.

# NO-DIG LIVE

## 5-7 October 2010

### Stoneleigh Park, Nr Coventry. UK

## Annual Awards & Dinner 2011

### Friday 15th April 2011

#### Holiday Inn, Birmingham. UK

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