

PWI TECHNICAL SEMINAR

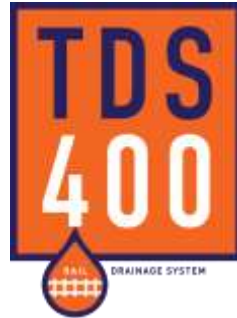
UNDER PRESSURE:

EARTHWORKS & DRAINAGE FIT FOR THE FUTURE



ENGAGE WITH US
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GROW WITH US





The Innovative TDS400 Transport Drainage System

Carl Hopkins: Managing Director, Civil Water Management Ltd

**Mark Dennis Howells, BEng (Hons) IEng MPWI MIAM
Network Rail Senior Asset Engineer (Drainage & Lineside) Western Route**

The Team



Carl Hopkins
Managing Director

A forward thinking leader and award winning entrepreneur with a strong background in commercial sales, finance and business operations.

An Innovator with over 20 years experience managing high value projects and teams.



Paul Withers BSc (Hons)
Non-Executive Director

A hands-on, solution focussed Chartered Civil Engineer with 40 years experience, specialising in major civil engineering and marine projects.

An Industry Code of Practice Author.



Patrick O'Neil
Technical Director

Specialising in Intellectual Property, product development and business operations.

A skill set acquired from building the northern division of the UK's largest CPD education training provision for senior leadership teams.

Climate Change

The Challenge: More Frequent - Heavier Storm Events



The Sustainable Integratable Solution: TDS400 Transport Drainage System



- The system deploys modular drainage units made from up to 95% polymeric waste.
- It is porous and robust, and it enables a path of least resistance to be created that releases excess water, down and away, from infrastructure assets and into existing drainage systems.
- PADS approved by Network Rail (PA05/07347) and certified for use as part of structural, track, earthwork and drainage assets.

The Sustainable Integratable Solution: TDS400 Transport Drainage System

- TDS400 should be designed in accordance with NR/L2/CIV/003, Issue 7 (Engineering and Architectural Assurance of Building and Civil Engineering Works) and NR/L2/CIV/005, Module 9 Issue 1 (Drainage Design). Taking into consideration any existing drainage systems.
- The required widths and thicknesses of the system are engineered for each specific scheme.
- TDS400 reduces trench width excavation by up to half.
- Used in the replacement and/or reduction of ballast, perforated plastic pipes, concrete channel drains, stone backfill materials, geotextiles, traditional methods and other carbon intensive practices.



Environmental Benefits and Made in the UK

- **Recycled Polymeric Content: Quality Controlled Feedstock**
Standard drainage panel up to 95% recycled content, using UK sourced recycled polymeric waste.
- **Removes polymeric waste from the open environment and is recyclable**
- **Significant CO2e reductions calculated:**

Traditional Trench Excavation

600 mm wide trench
300 mm depth (Rail Ballast Cover)

= 315 Tonnes Rail Ballast Excavated p/km

TDS400 Trench Excavation

300 mm wide trench
300 mm depth (Rail Ballast Cover)

= 155 Tonnes Rail Ballast Excavated p/km

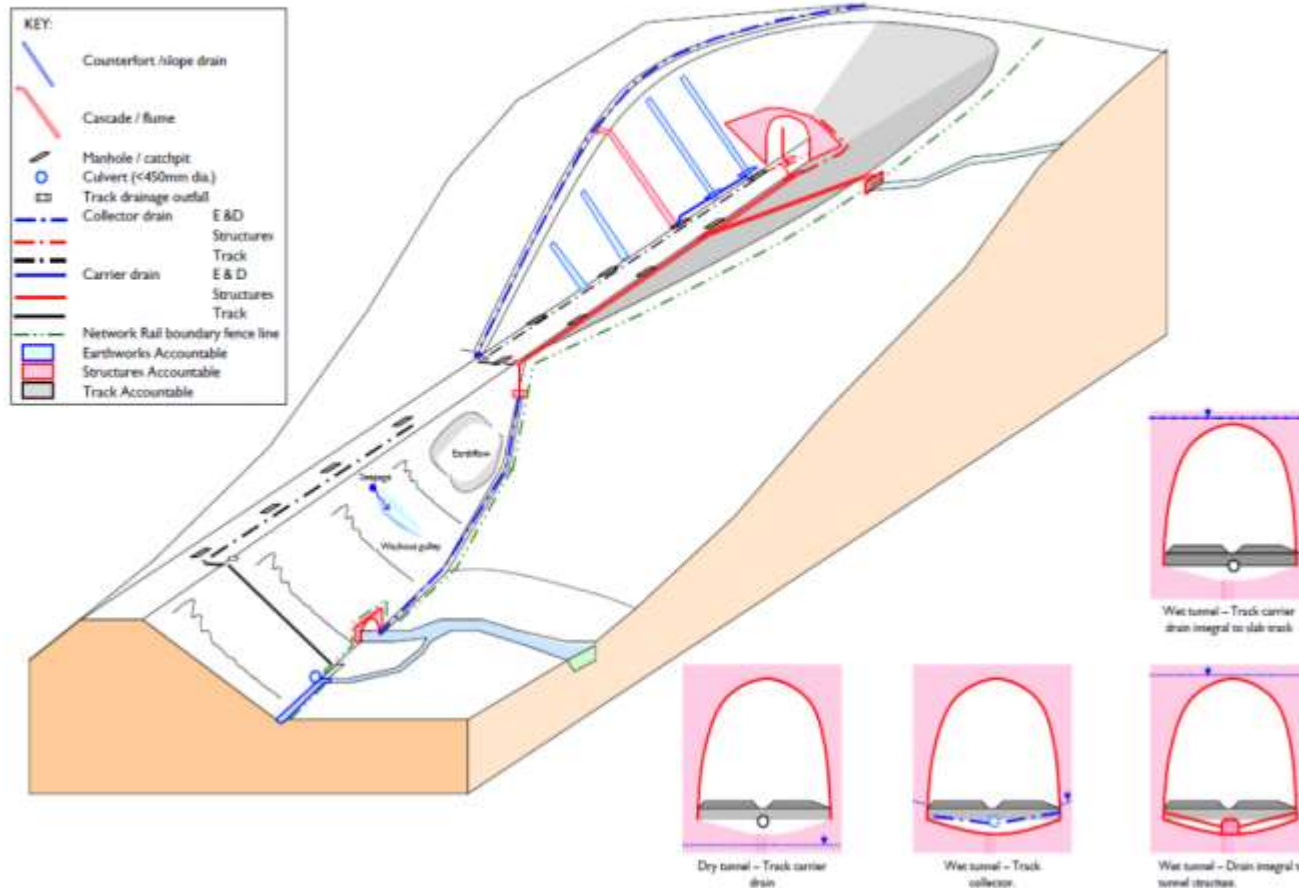
RESULT: 160 tonnes of rail ballast is not excavated / disturbed

0.7kg CO2e attributed to granite ballast per kg (ICE)

112 tonnes CO2e reduction per km of drainage from narrower trench excavation alone.

The Rail Landscape

Drainage Connectivity = Network Resilience



‘Whole Drainage System Approach’
Adapted from Network Rail Drainage Challenge Statements

LAND BOUNDARIES & EARTHWORKS

- Interception
- Overspill
- Cuttings / Ditches
- Herringbone
- Counterfort / Cascade
- Crest drainage

RAIL ASSETS & STRUCTURES

- Tunnels
- Tunnel portals
- Bridge abutments
- Wingwalls
- Back of wall
- Confined spaces

TRACK & TRACKSIDE DRAINAGE

- Upgrades
- Repairs
- 6ft, cess and channels
- Catch pit optimisation
- Channel blockages
- Interface trackside

TRACK BED & FORMATION

- Wet beds
- Maintain water table levels below base of ballast
- Standing water
- Third rail drainage

TDS400 PROVEN TRACK RECORD IN RAIL

Pill Tunnel (Network Rail): Mark Howells Wales & Western Route
Contamination of fishponds by silt from track outfall.

Incidents of regular contamination not reported post TDS400 install.

Alstone Siding 10ft trial (Network Rail): Mark Howells Wales & Western Route
A 40 metre trial installation of TDS400. An arrangement of 3 layers of drainage panel units were installed, sandwiched together, up on tip-end, without pipe and with a modified catchpit functioning as a silt trap connected into the main track drainage system.

TDS400 installed at the rate of trench excavation. No flooding issues reported at the installation location, which has previously had flooding issues.

Central Rail Systems Alliance (Crewe) Up Manchester Struts:
Installation to carry drainage surcharge over the top of intermittent struts that were blocking the 'normal route' of the drainage path.

TDS400 a crucial element to uphold drainage functionality in location.



**NETWORK RAIL PADS APPROVED:
CERTIFICATE OF ACCEPTANCE PA05/07347**



RailTech Europe
2021



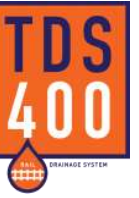
THE PWI THE INSTITUTION FOR RAIL
INFRASTRUCTURE ENGINEERING

Climate Change Adaption & Decarbonisation
2022



Supplier and Contractor Excellence
2023

TDS400 PROVEN TRACK RECORD IN RAIL



TDS400 Drainage System



Cost Benefit Analysis

- Installation of TDS400 to trench comfortably keeps pace with excavation.
- Cost savings are dependent on methods of excavation.
 - **RRV** approx. 30% cost savings against traditional
 - **Ballast Vac** up to 50% cost savings against traditional

Has added ease of mid-week possessions able to achieve significant drainage installations:

- > 1m deep, 255mm wide trench excavated and multiple drainage panels installed.
- > Excavated and install avg. 50m per hour for approx. 2.5hrs during 5.5hr midweek shift.

(Total: 125m TDS400 per shift with Ballast Vac)

TDS400 Drainage System



Evidenced Benefits of TDS400

- Workforce activities to remediate 650 metres of trackside drainage can be reduced from 33 shifts to only 7 shifts.
- Possession productivity is increased, with major cost savings forecasted for projects that use TDS400. £1.25M per 650 metres in the remediation example evidenced from the results at Tuffley.
- The system has a proven track record of being highly-effective and capable of being installed at the rate of trench excavation. It can halve possession times, increase productivity and deliver estimated cost savings of between 30% - 50% per metre of drainage installed, compared to traditional - dependent on excavation method used.
- It has demonstrated the potential to save many millions of pounds each year across the network, by decarbonising drainage and maintenance activities and by greatly increasing the efficiency of this challenging work.
- TDS400 will play an important part in decarbonising our railway, while increasing the core resilience of its infrastructure and assets in the fight against climate change.

TDS400 Drainage System

RAIL KEY BENEFITS SUMMARY

Install simultaneously with excavation, fully compatible with rail plant, enhancing the rate of installation.

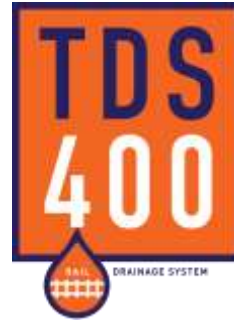
Deliver significant capital and whole-life cost savings, extending asset life and reducing overall expenses.

Reduced trench sizes drive Safety by Design, minimising risks and ensuring robust drainage installations.

Contributing to Net-Zero goals and reducing carbon footprint.

Evidenced to lower the frequency of maintenance and repair, saving time and resources in the long run.

De-risk drainage projects, increase possession productivity and reduce the number of required shifts, as demonstrated in our rail case studies.



Tuffley, W2BG Project, TDS 400 Drainage System, BGL2, 94m0220y – 94m1408y

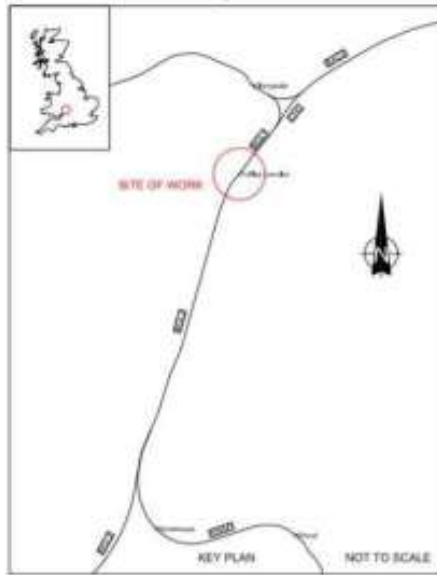


**Mark Dennis Howells, BEng (Hons) IEng MPWI MIAM
Network Rail Senior Asset Engineer (Drainage & Lineside) Western Route**

TDS400 Drainage System



Network Rail Line Speed Enhancement Project: Westerleigh and Barnt Green at Tuffley



Location of Tuffley Yard

Date - 13 April 2019 (Now 4.5 Years Post Install)

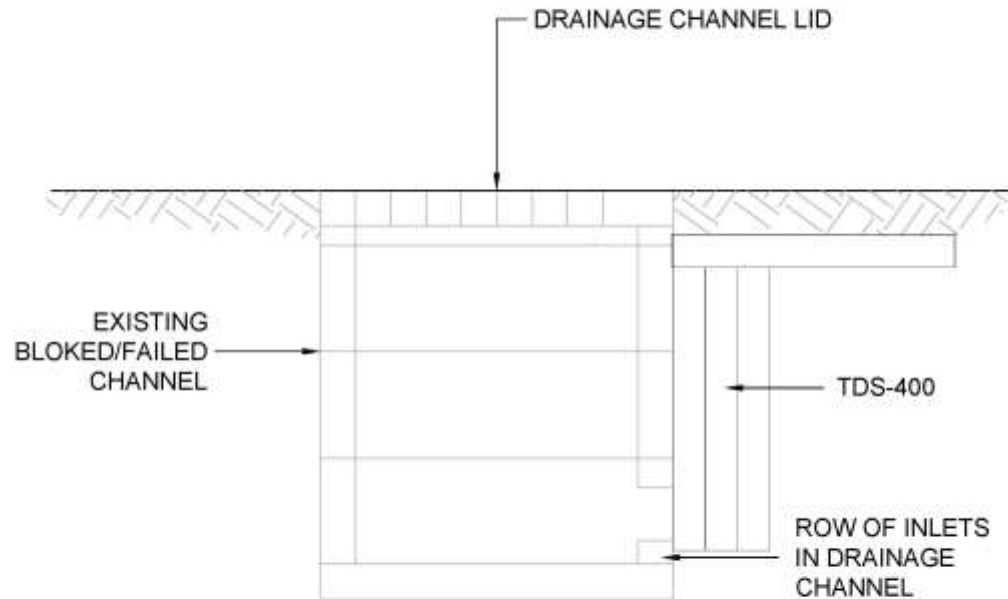
Conducted by - Civil Water Management Limited and Mark Dennis Howells BEng (Hons) IEng MPWI MIAM, Senior Asset Engineer (Drainage & Lineside) Network Rail.

Location - Tuffley Yard BGL1/BGL2 6ft interval, 94m0220y to 94m1408y

TDS400 Drainage System



Cross-Section Drawings



TYPICAL SECTION - THROUGH DRAINAGE CHANNEL

TDS400 Drainage System



Installation Photographs



TDS400 Drainage System



Installation Photographs



Tuffley – Before Works with Civil Water Management (TDS400) 30th June 2017

[-2.2436093,51.8417292] -> BQL2-94M+1399.9 [-2.2435819,51.8417141] 2.5
30 Jun 2017, 14:04:11



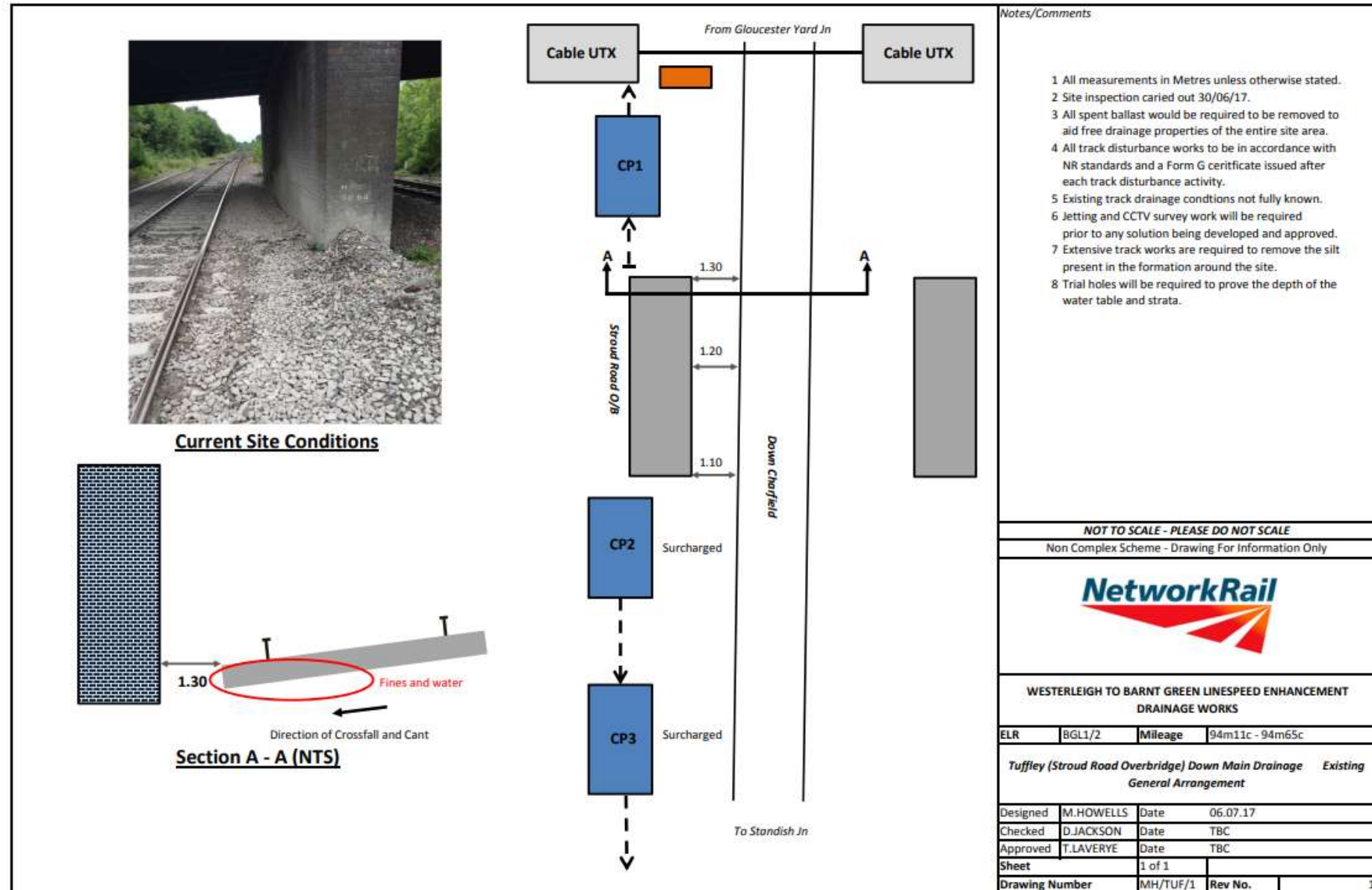
Silt, weeds and fines settled on the 6ft rail of the Down Charfield

[-2.2435948,51.8416415] -> BQL2-94M+1407.2 [-2.2436458,51.8416695] 4.7
30 Jun 2017, 14:05:58



Visible slack under Stroud Road O/B, note excessive wet bed spoil around the area

Tuffley – Existing General Arrangement 30th June 2017



Tuffley – After Works with Civil Water Management (TDS400) 18th October 2023

2023/10/18, 3:24:51
GPS: 51.84177403674834 N, -2.2434818660472455 W
ELR: BGL2 94Mi 1385Yd (2yds away)



2023/10/18, 3:17:55
GPS: 51.84186345996227 N, -2.243385407188912 W
ELR: BGL2 94Mi 1374Yd (1yds away)



Tuffley – After Works with Civil Water Management (TDS 400) 18th October 2023

- Following completion of track works at Christmas 2018 no further ballast or track works have been completed at this site.
- The standard deviation (SD) values have remained in the good band for WT35 and WT70 following track works and the installation of TDS400 in the 6ft to provide a conveyance pathway to the existing drainage system.
- No interventions have been undertaken to the track or drainage system since Christmas 2018 with no reported or observed loss of performance. Obviously, intervention works will be required in the future!

TDS400 Drainage System



What We Achieved

- The conveyance water into the 6ft drainage system was immediately increased.
- TDS400 was straightforward to install and has provided a clean and non-contaminated pathway for water to enter the track drainage system in the 6ft at this location.
- This has helped to ensure the long-term stability of both tracks at this location and led to reduced track work interventions in comparison to traditional drainage maintenance and refurbishment methods, which includes fixing drainage and cleaning components.

TDS400 Drainage System

Summary

- TDS400 passively releases large volumes of water from rail infrastructure.
- It keeps that crucial pathway open and removes the resistance for water to be conveyed.
- And, unlike a perforated pipe, it is constantly releasing water.

TDS400 Drainage System

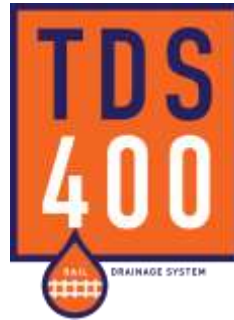
Summary

- The team at Civil Water Management are passionate about playing their part to tackle climate change and support the decarbonisation of rail infrastructure.
- TDS400 can assist in decarbonisation by enhancing the value and efficiency of the methods and technologies used by drainage designers and engineers, while facilitating the recovery and recycling of polymeric waste.
- Academic professors have been commissioned alongside eminent railway engineers to collaborate in the vision of Civil Water Management to develop this groundbreaking drainage technology.

“Drainage, drainage and more drainage” - Thomas Telford.

TDS400 Drainage System

Thank You



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