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PRECAST FOR INFRASTRUCTURE

Shaft & Tunnel Linings

Macrete Ireland Ltd is one of the UK's foremost precision precast concrete manufacturers. From our design and manufacturing facility in Northern Ireland the company supplies innovative bespoke products and structures to the construction industry's main contractors throughout Britain and Ireland. Since 1979 the company has developed sustainable long-term strategic partnerships with our client base and our range of reinforced and pre-stressed materials and bespoke coastal protection components can be found in many of the UK's most prestigious railway, civil engineering, water, utility, marine and sports stadia projects and schemes.

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Pictured: **Stroud FAS 25.00m universal shaft linings and corbel segments**

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Pictured: **Springburn FAS 25.00m shaft universal segments and corbel segments**

Our previous experience indicates the skills and experience that we can bring to any contract.

Through early contract involvement with our customers we can benefit the overall scheme, for example:

- Cost savings can be achieved.
- Responsiveness can be increased through economies of scale and the availability of more resources.
- Increased capacity and expertise mean that more can be achieved for less.
- Waste can be reduced by better decision making.

By promoting a culture of honesty and integrity, through collaborative working processes we can assist both our customers and us in gaining a competitive advantage in the marketplace.

By developing a common understanding of our combined aims and objectives, we believe we can assist our customers in bringing innovation to the works that we would deliver together.

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Pictured: **Warrenpoint 10.5m shaft linings**

Our ethos of continuous product development and innovation has resulted in the company bringing to market a range of patented technologies such as universal shaft linings and the vacuum-flush retention tank system.

Segmental shaft construction offers a cost effective, efficient, and safe method for the creation of below ground chambers.

There are two main methods of shaft construction: -

In the caisson method, where ground conditions are soft or weak, a shaft can be constructed by using a cutting edge at ground level (either a concrete cutting edge or a steel cutting edge) and building rings of segmental shaft linings on top of the of the cutting edge, such that the shaft is then pushed down from ground level as the underground material is excavated from the inside. As the shaft is pushed down, additional rings of shaft linings are added until the required depth is achieved. In this way, each ring is built at or near ground level and the rings can be securely bolted together from the back (extrados) of the shaft wall. Bolting from the back removes the need for installers to be inside the shaft, removing the risk of falls.

In the underpinning method, where ground conditions prevent the use of cutting and pushing the shaft down, a ground level collar ring is constructed and then the area within the shaft is excavated from the inside.

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Additional rings are then installed underneath the collar ring and further excavations are carried out to allow the next ring to be fitted and so on until the required depth is achieved. This form of construction only allows for the rings to be bolted together from the front (intrados) of the shaft wall.

Typically, shaft sinking operations usually commence with caissoning the shaft until such times that hard ground is reached which forces a change to underpinning to complete the work. Traditionally this would have meant a change in the bolts and fittings required however with the invention of our patented universal shaft lining the segments can be bolted from both the back or the front without the need to change fittings.

I.D	O.D	Width (m)	O	T	Key	Volume	Weight (tons)
2.44**	2.74	0.610	3	2	1	0.745	1.862
3.05**	3.35	0.750	4	2	1	1.131	2.828
3.35**	3.66	0.750	4	2	1	1.237	3.093
3.66**	3.96	0.750	4	2	1	1.347	3.368
4.00	4.36	1.000	5	2	0	2.360	5.900
4.50	4.86	1.000	6	2	0	2.646	6.616
5.00	5.36	1.000	7	2	0	2.930	7.330
5.50	5.90	1.000	8	2	0	3.580	8.950
6.00	6.45	1.000	10	2	0	4.400	11.000
6.50	6.95	1.000	10	2	0	4.754	11.885
7.00	7.45	1.000	12	2	0	5.107	12.768
7.50	7.95	1.000	12	2	0	5.460	12.600
8.00	8.50	1.000	10	2	0	6.460	15.120
9.00	9.50	1.000	14	2	0	7.265	18.163
10.50	11.10	1.000	12	2	0	10.180	25.450
12.50	13.15	1.000	16	2	0	13.100	33.520
15.00	15.75	1.000	14	2	0	16.870	42.175
17.50	18.25	1.000	16	2	0	22.500	56.250
20.00	21.00	1.000	22	2	0	32.200	80.500
25.00	26.00	1.000	26	2	0	40.055	102.542
27.00	28.00	1.000	28	2	0	43.140	112.160

***Diameters ranging from 2.44m to 3.66m are internally bolted smoothbore rings.*

Diameters ranging from 4.00m upwards are EPDM gasketted universal shaft linings meaning that that they can be bolted either internally or externally with no need to change segments or bolt fittings.

A range of cutter rings, choker rings, combined cutter choker rings, recessed rings and corbel rings are also available upon request. For diameters above 7.50m we recommend that a steel cutting edge is used as opposed to a concrete cutting edge option.

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Pictured: **Kildare 15.00m Shaft using universal linings**

We also provide a range of tapered trapezoidal tunnel linings: -

I.D	O.D	Width (m)	O	T	Key	Volume	Weight (tons)
2.44	2.80	1.000	6	0	0	1.482	3.700
2.85	3.21	1.000	6	0	0	1.713	4.280
3.05	3.41	1.200	6	0	0	2.192	5.480
3.65	4.10	1.000	6	0	0	2.739	6.847

Other diameters are available upon request.

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Pictured: **MANTrunk 3.65m tapered trapezoidal tunnel linings**

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General Specifications for Tunnel & Shaft Segments

1. Design

All segments are designed and manufactured in accordance with The Specification for Tunnelling (3rd Edition) and Quality Management System BS EN ISO 9001:2015.
Segments also comply with CESWI 7, especially Section 2: Materials and Section: 2.103 PRECAST CONCRETE SEGMENTS FOR TUNNELS AND SHAFTS.

2. Concrete

A C50/60 concrete mix of CIIB-V+SR cement combination is used for manufacturing segments.
The concrete is produced in accordance with BS 8500-part1:2006 and BS EN 206-1:2000.
Furthermore aggregates, cement and PFA complies with the following standards.

- Aggregates: BS EN 12620 • Cement: BS EN 197 • PFA: BS EN 450-1, Fineness Category N, LOI Category B.

3. Reinforcement

A steel reinforcement cage is used to assist with the handling of the units. Steel reinforcement complies with BS 4449.
A minimum 30mm cover to steel reinforcement is provided; this can be increased upon request.
Segments using 30kg/m^3 steel fibre reinforcement are also available upon request.

4. Durability

Our segments under XC3/ XC4/XD1/XS1/XS2/XF4 exposure classes are suitable for at least 100 years, in accordance with BS8500-part1 Table A.5 & A.9.
Segment units comply with Design Chemical Class DC4, in accordance with the criteria specified in BRE Special Digest 1, Table D2.
Segments are manufactured using 25% cement replacement with PFA in concrete mix, and therefore, complies with sulphate resistance requirements as defined in BRE Special Digest 1, Table D3: Cement and Combinations.
Alkali content (Na2O content) of concrete is 3.48kg/m^3, complies with recommended limit specified in BRE Digest 330 Part 3.
Chloride Class is Cl 0,10 as per BS EN 206-1:2000.
Total sulfate contents of concrete (Acid Soluble Sulfate as SO3) are 2.34< 4.0%
(Ref: SHW Series 1700, Clause 1704.5).

5. Lifters

A stud spherical head lifting anchors are used for handling and placing of the segments. Refer to data sheets and technical information provided at **www.pct.uk.com** for further details.

6. Gaskets

Segments from 4m ID upwards are supplied with EPDM sealing gaskets manufactured to BS-EN-681-1.

7. Fittings

M16 Tie rods, grade 8.8, zinc plated to ISO 4042, allowable torque 214Nm.
M20 curved bolts, grade 8.8, sherardised to BS 4921, allowable torque 220Nm.

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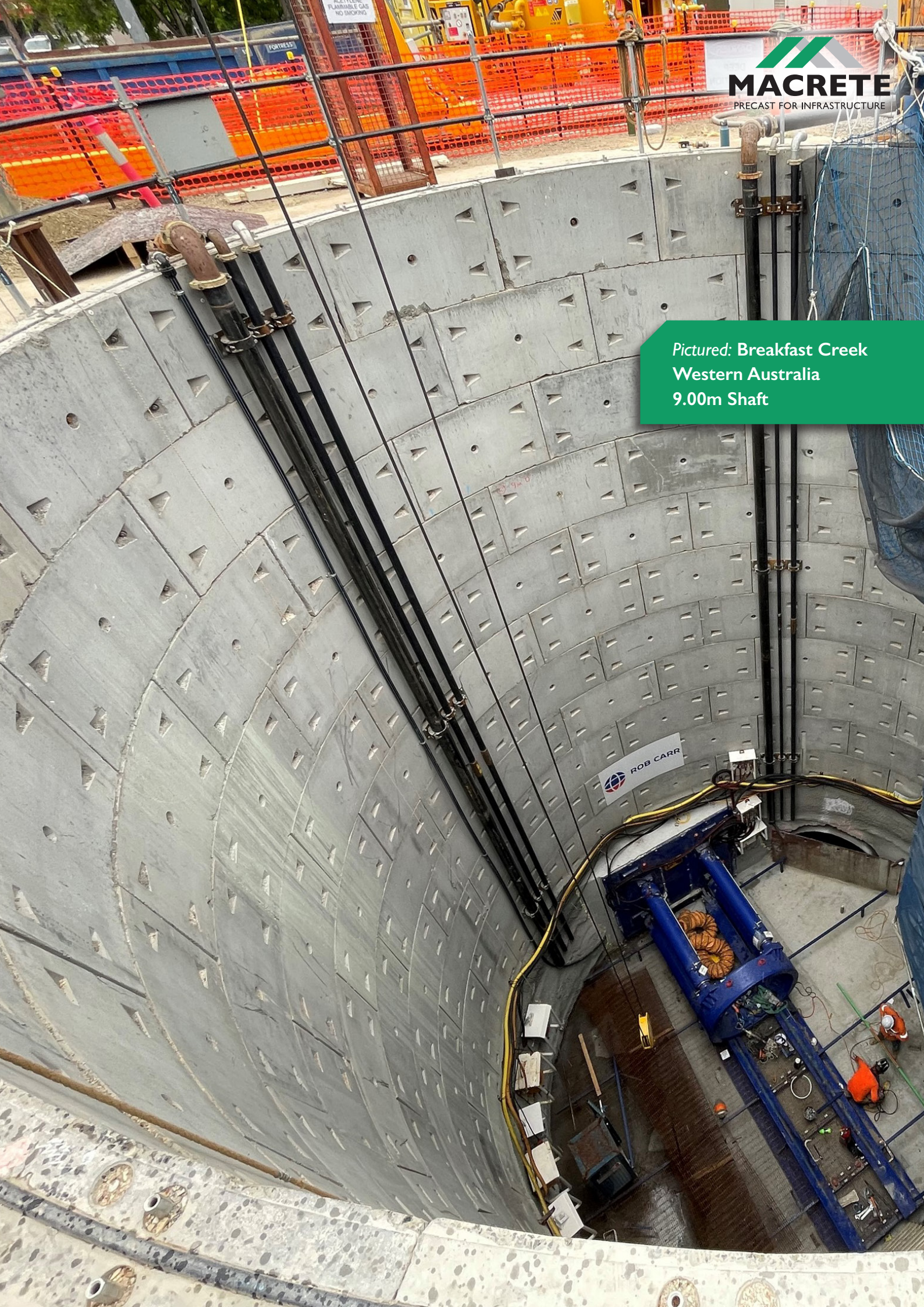

Pictured: **Breakfast Creek**
Western Australia
9.00m Shaft

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Pictured: **Crosby Vacuflush column**

We can also supply our patented vacuum flush column system should it be required.

This system can be employed inside water storage / detention tanks. Once the excess water stored in the tank is returned to the wastewater system sediment and detritus often remains on the floor of the storage tank. In order to flush such matter from the tank, the patented vacuum flush column pumps, lifts and retains under pressure a column of water from the main body of water stored. When this column of water is released as the tank nears empty level, a vortex of water is generated which flushes the floor of the tank clean. This also removes any time needed to be spent by workers in confined spaces.

As the column is constructed from sectional precast rings, the column can be manufactured to any height needed and is safe and efficient to install.

A full range of cover slab options is also available.

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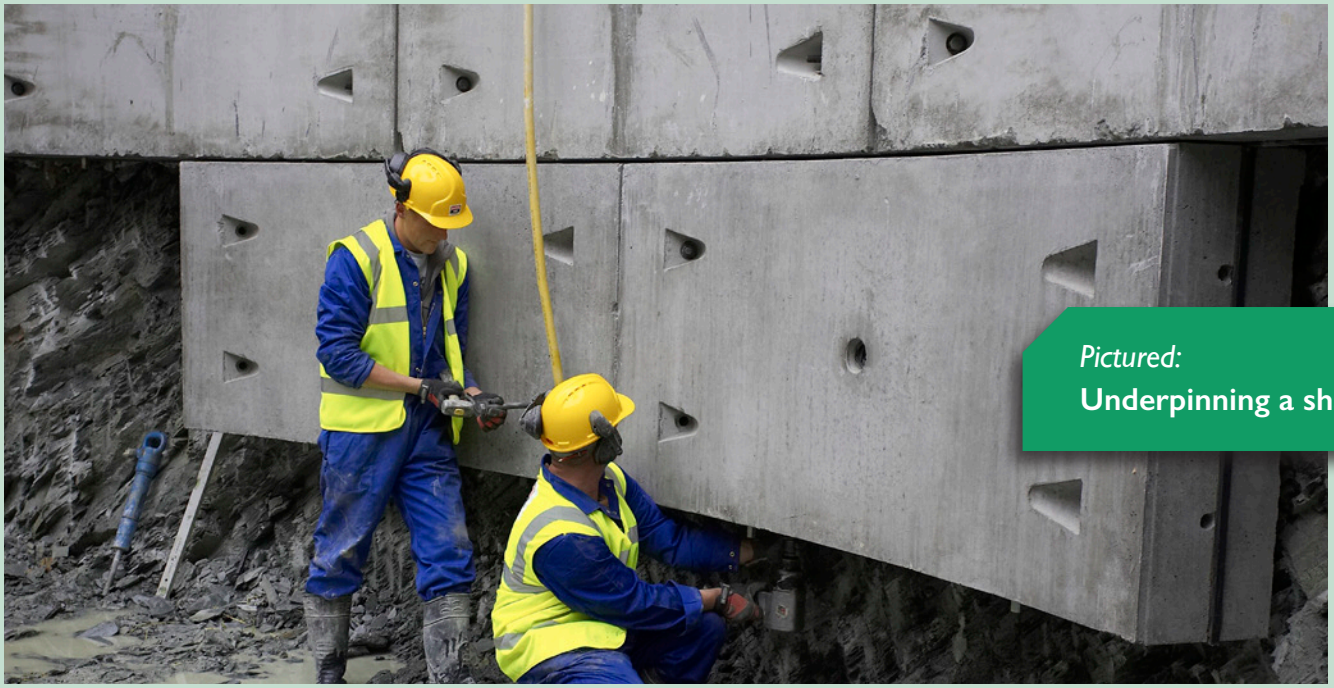
The environmental impact of our business operations

Our core strategic objective is to be recognised as a major provider of precast concrete technology, products, services, and solutions. At the same time, we recognise the environmental impacts arising from our business activities and are committed to reducing these through effective environmental management.

We are committed to a policy of effectively managing environmental performance to minimise the impact of our business processes on the natural environment and the community at large. This commitment extends to all workplaces, employees and others affected by our operations. We assess the environmental impact of our operations during planning, design, and implementation phases to prevent pollution of the external environment.

We comply with all relevant environmental legislation as a minimum and, where practical, approved codes of practice and other requirements such as those specified by our clients. At all times, where possible, we incorporate sustainable environmental considerations into our manufacturing practices having regard to energy and water consumption, use of low environmental impact materials, designing out waste and reusing materials. We also take reasonable and appropriate measures to ensure that our supply chain provides us with FSC/PEFC certified timber /timber products. We work to implement standards for good practice in reducing waste, recycling more, and increasing the use of recycled and recovered materials.

We continue to look at reducing the impact we have on the environment because of our operations - through innovation and a proactive attitude to energy reduction we decreased our carbon emissions by commissioning a wind turbine and solar PV array to produce around 50% or our electricity requirements. We hope to increase this approximately to 75% in the next 18 months. We are aware of alternative fuel developments and continue to assess their potential commercial capabilities and economic viability.



Pictured:
Underpinning a shaft

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Pictured: **Gloucester Flood Relief 20.00m Shaft**

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