

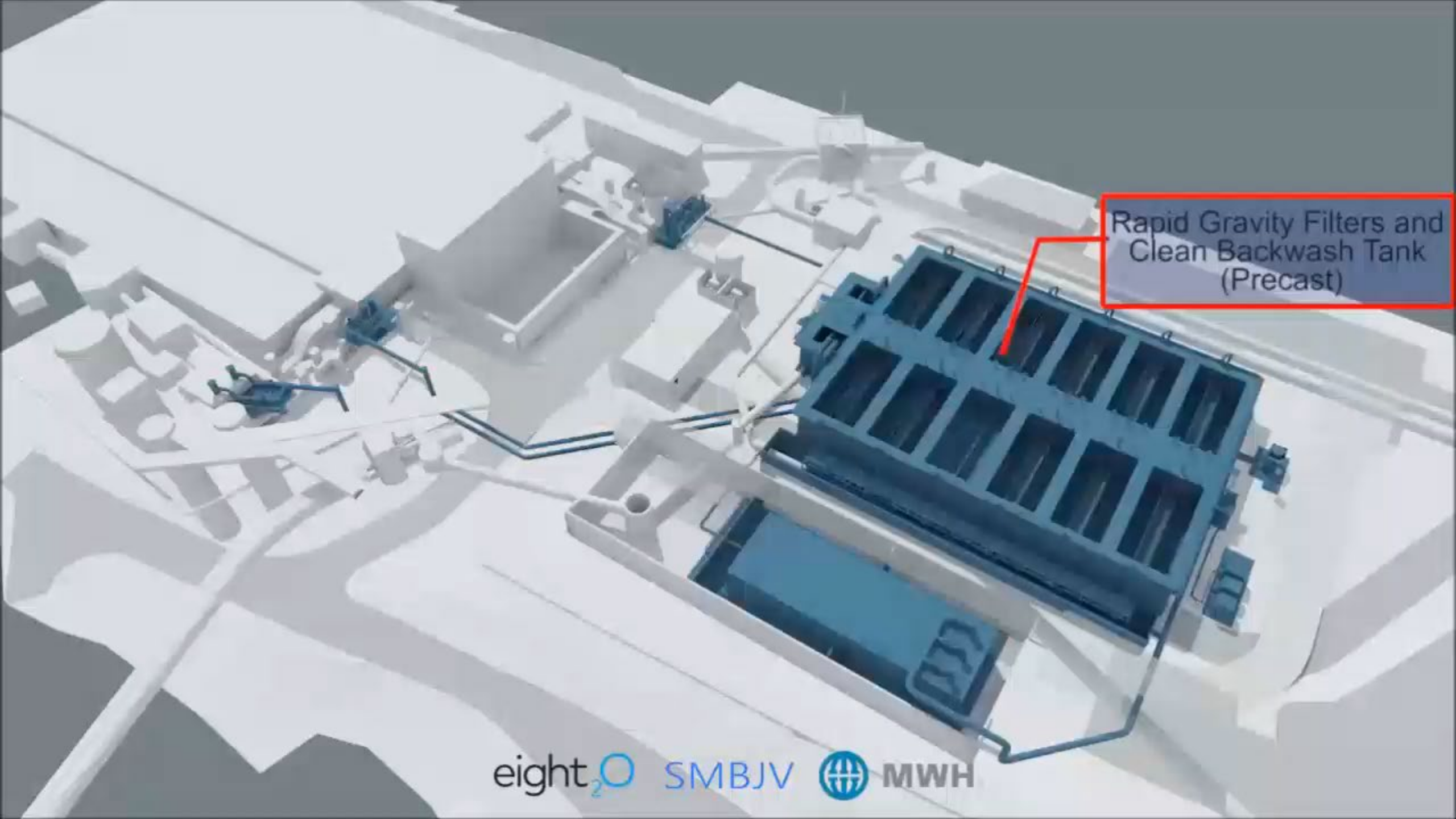
# Coppermills RGF

Digital Innovation & Offsite Build

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Jonathan May  
March 2021



A 3D architectural rendering of a water treatment facility. The scene shows a large, rectangular, precast concrete structure with a grid of dark blue slats on top, representing the rapid gravity filters and clean backwash tank. This structure is connected to a network of pipes and other smaller tanks. A red callout box with a white border points to the main structure. The background shows other parts of the facility, including smaller tanks and piping, all rendered in a light grey/white color. The overall scene is set against a dark grey background.

Rapid Gravity Filters and  
Clean Backwash Tank  
(Precast)

# The Challenge...

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## Original Estimate

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**Direct Cost &  
Risk**

£20,992,559

**Pre-Lims**

£10,687,425

**Risk**

£2,811,812

**Design & PSC**

£2,260,209

**Fees & Overhead**

£5,649,788

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**Affordable Cost**

£42,049,368

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**3 Years**

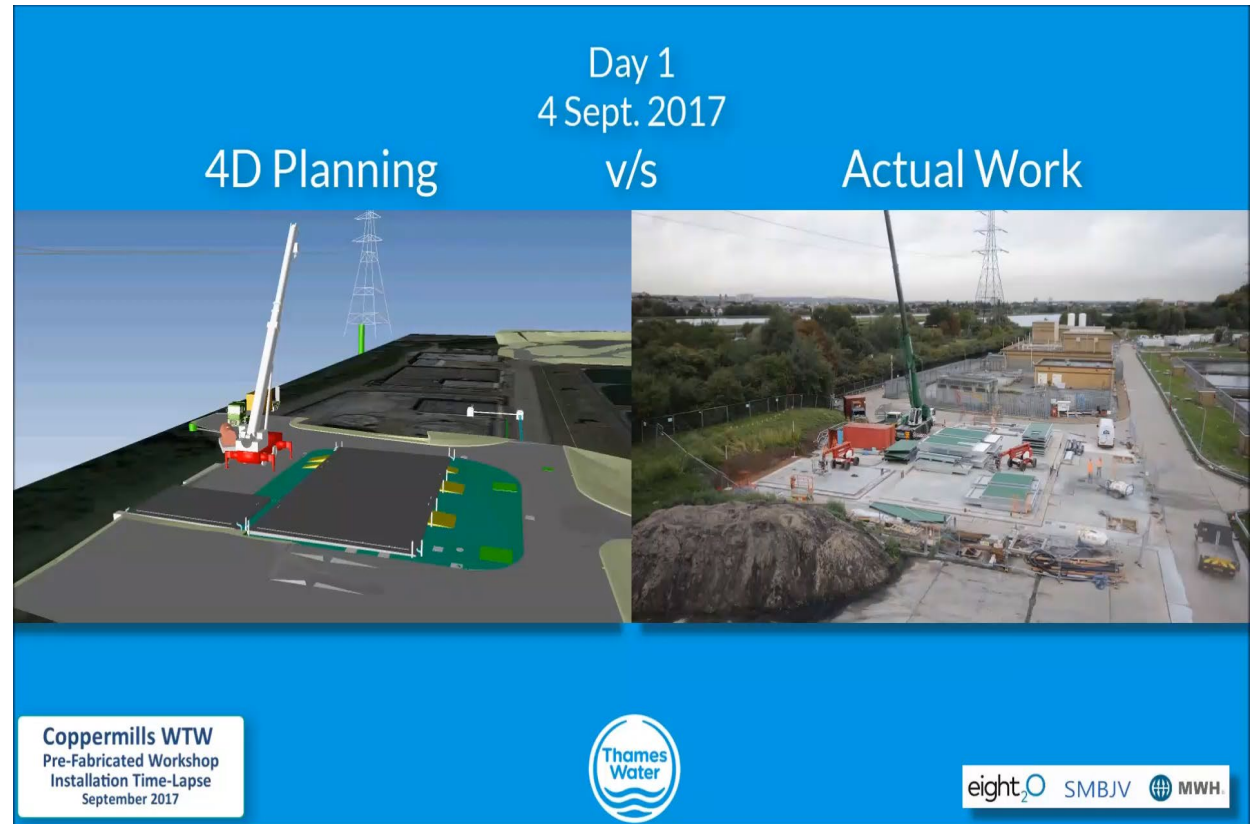
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# The Coppermills Digital-DfMA Journey



# The Solutions – DFMA (Design for Manufacture & Assembly)

## 1. Pre-Fab New Workshop – Modular Building



# The Solutions – DFMA (Design for Manufacture & Assembly)

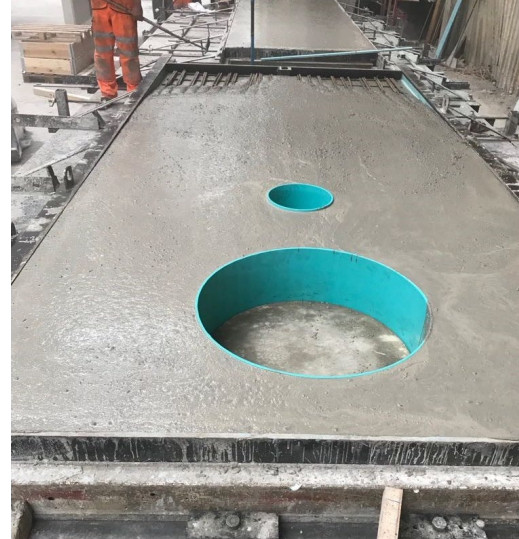
1. Pre-Fab New Workshop
  - Modular Building
2. Pre-Fab 2000m<sup>2</sup> RGF base
  - Pre-fabricated reinforcement cages



# The Solutions – DFMA

(Design for Manufacture & Assembly)

1. Pre-Fab New Workshop
  - Modular Building
2. Pre-Fab 2000m<sup>2</sup> RGF base
  - Pre-fabricated reinforcement cages
3. Pre-Cast RGF Structure & Backwash Tank
  - Dutchland post-tensioned pre-cast system



# The Solutions – DFMA

## (Design for Manufacture & Assembly)

1. **Pre-Fab New Workshop**
  - Modular Building
2. **Pre-Fab 2000m<sup>2</sup> RGF base**
  - Pre-fabricated reinforcement cages
3. **Pre-Cast RGF Structure & Backwash Tank**
  - Dutchland post-tensioned pre-cast system
4. **Pre-Fab 12No. Distribution channels**
  - Pre-fabricated from stainless steel





# The Solutions – DFMA

## (Design for Manufacture & Assembly)

1. **Pre-Fab New Workshop**
  - Modular Building
2. **Pre-Fab 2000m<sup>2</sup> RGF base**
  - Pre-fabricated reinforcement cages
3. **Pre-Cast RGF Structure & Backwash Tank**
  - Dutchland post-tensioned pre-cast system
4. **Pre-Fab 12No. Distribution channels**
  - Pre-fabricated from stainless steel
5. **Pre-Fab Inlet/Outlet pipework modules**
  - Including all flowmeters, valves, actuators, walkways, lighting, pre-wiring and electrical distribution boards



# The Digital Approach

1. **Laser Scanning of Site** – for Design Certainty.
2. **Live 3D Model** – updated throughout delivery from as-built scans & site markups.
3. **Augmented Reality OPMAN Reviews** – addressed issues early.
4. **Digital Installation Simulations** – facilitated collaborative planning and optimise DFMA delivery.
5. **AI Validation** – to verify build & manage interfaces
6. **BIM 360 Field** – advanced applications for fast, quality controlled QA checks for handover



# Digital Transformation



# Coppermills Digital Aliens



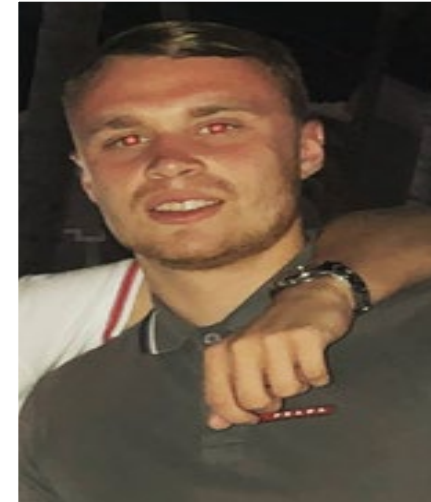
# Coppermills Digital Transformation



Tools



Training



Digital Natives



# Coppermills Digital Aliens >>> Digital Residents



Digital Diary  
Demon



Glue Guru



'Synchro'  
Steve



Checksheet  
Champion



# Pre-Cast Case Study





**BE SAFE**  
LOOK OUT FOR OTHERS  
CREATE VALUE

Hours	12.5m
2019	8.2m
455	
455	

welcome to

EP10 KOU

BF06 HCJ

LK18 ZFM

DK12 SXL

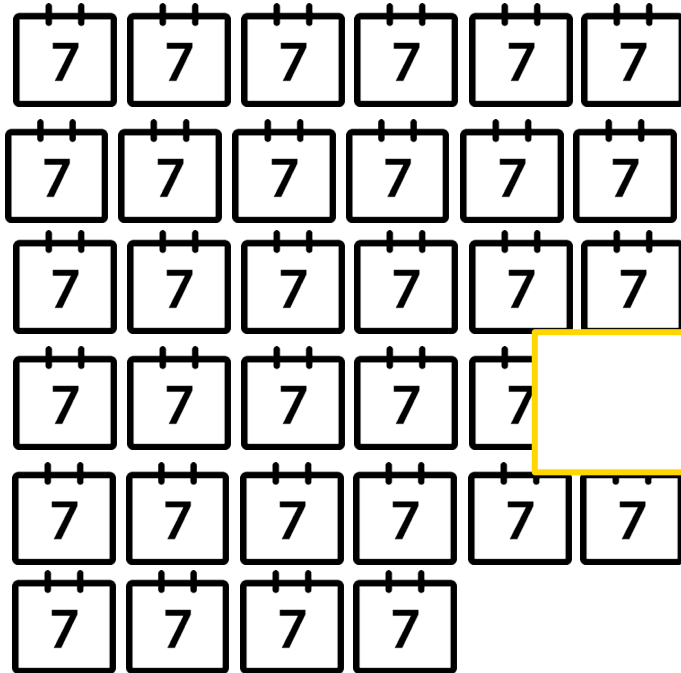
YF66 YGW

PX08 YNU

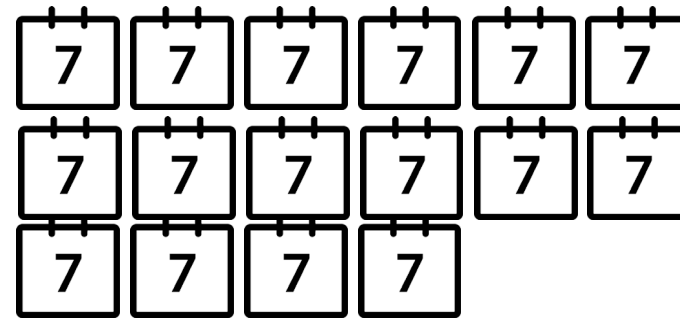


# RGF Structure: Pre-Cast

**In-Situ: 39 Weeks**



**DfMA: 18 Weeks**



**55% Reduction**

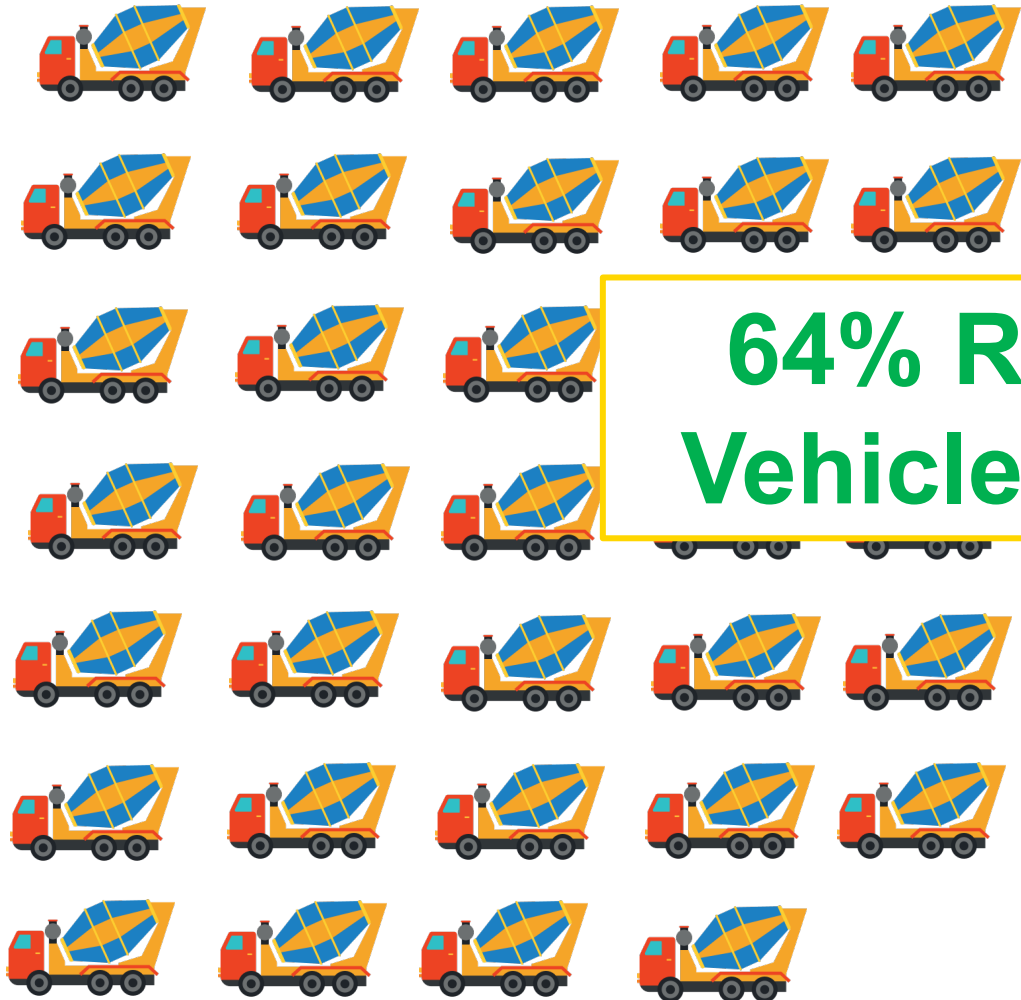
## Key

 Indicates 1 Week

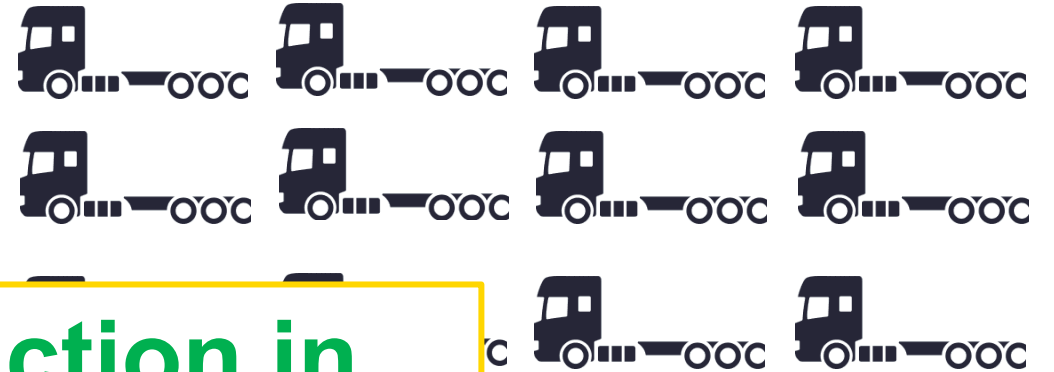
\*Source: Senior General Foreman Estimate 

# Pre-Cast RGF Structure

In-Situ: 342 Concrete Loads\*



DfMA: 124 Pre-Cast Deliveries



64% Reduction in Vehicle Movements

## Key



Indicates 10 deliveries



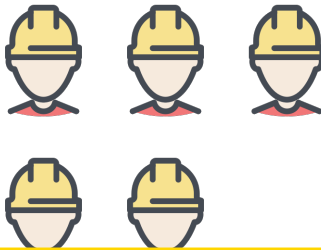
\*Source: Volumetric Concrete Calculation



# RGF Structure: Pre-Cast

**In-Situ: 65 Labourers\***

**DfMA: 5 Labourers**



**92% Reduction in Site Labour Force**

**Key**



Indicates 1 labourer

*\*Source: Senior General Foreman Estimate*



# Pipe Modules Case Study



# Pre-Fabricated Channels & Pipe Modules



6No “Plug in & Play” Modules – containing all valves, actuators, flowmeters, electrical wiring, backboards, lighting & walkways, each delivered in 2No Sections



# Pre-Fabricated Channels & Pipe Modules

## 1. Interface Design Verification



## 2. 4D & Collaborative Planning



# North Pipe Gallery and H-Flume Installation Simulation



eight<sub>2</sub>O

SMBJV



Prepared By  
Jonathan May and Rakesh Saka





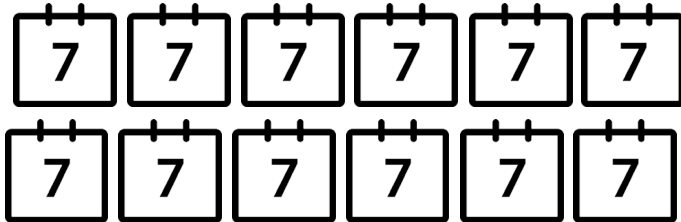
# Pipe Modules: Direct Cost Comparison

	<b>Traditional</b>	<b>Outturn (DfMA)</b>	<b>Difference</b>
<b>Mechanical Manufacture</b>	£370,000	£703,107	<b>£333,107</b>
<b>Mechanical Installation</b>	£500,000	£232,492	<b>£267,508</b>
<b>Additional Split for Electrical Installation</b>	N/A	£132,244	<b>£132,244</b>
<b>Lifting</b>	£80,000	£50,000	<b>£30,000</b>
<b>Total</b>	<b>£950,000</b>	<b>£1,117,844</b>	<b>£194,843</b>



# Pipe Modules: Programme Comparison

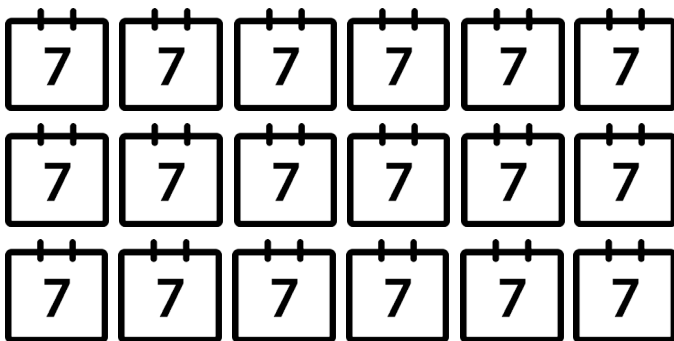
**On Site Mechanical: 12 Weeks**



**DfMA: 2 Weeks**



**On Site Electrical: 18 Weeks**



**90% Reduction**

**£1,080,000**

**Pre-Lim Saving**

**Key**

 Indicates 1 Week

*\*Source: Senior General Foreman Estimate*



# Testimonies



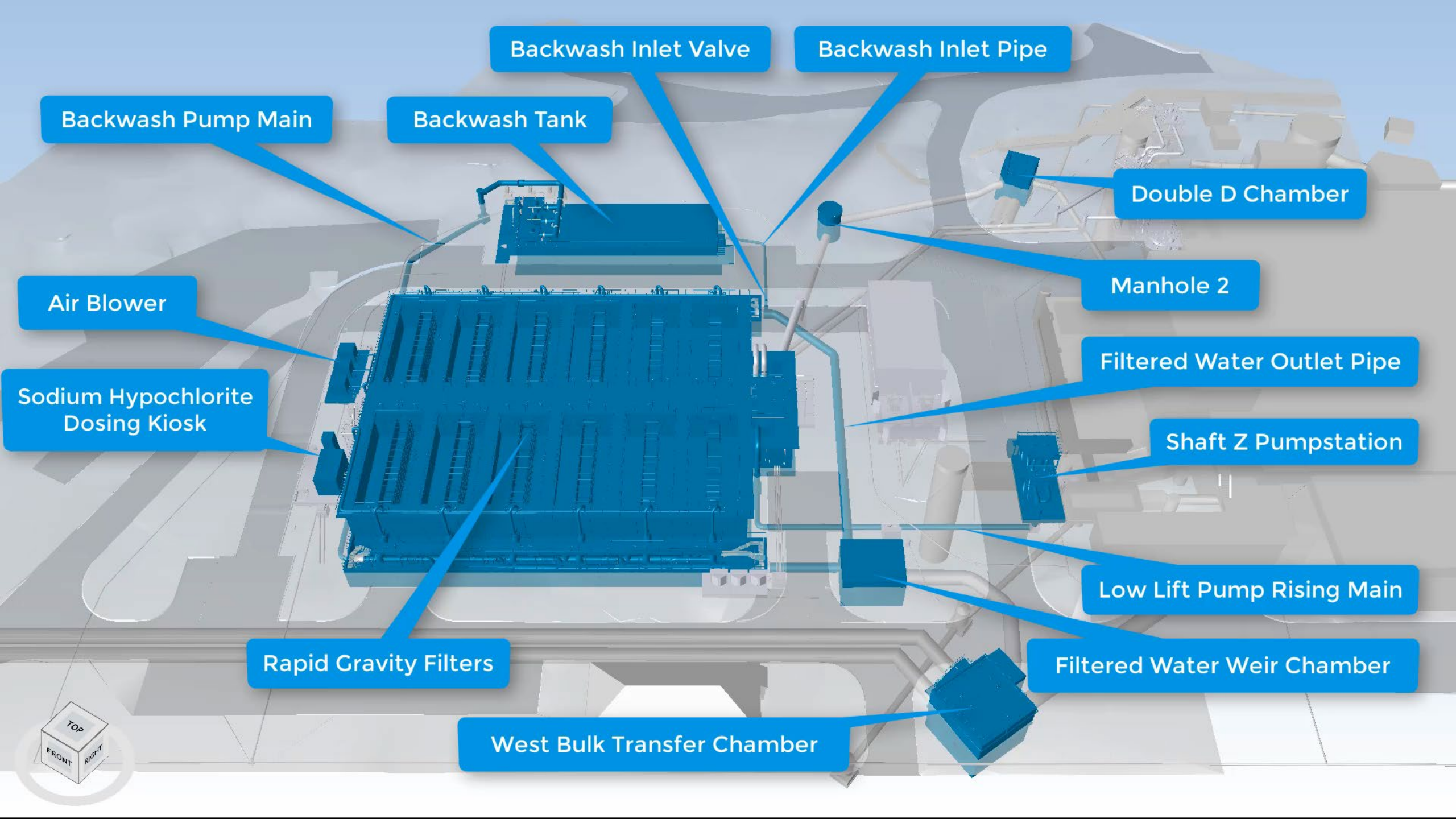
*“There was no panic during the installation – when you’ve modelled the interfaces in 3D from scanned data, digitally rehearsed the installation, and tested fully in the factory, you simply know that it will go smoothly”*

- Tom Fitzgerald, MEPS



# Digital Approach to Operations Engagement





Backwash Inlet Valve

Backwash Inlet Pipe

Backwash Pump Main

Backwash Tank

Double D Chamber

Air Blower

Manhole 2

Sodium Hypochlorite  
Dosing Kiosk

Filtered Water Outlet Pipe

Shaft Z Pumpstation

Rapid Gravity Filters

Low Lift Pump Rising Main

Filtered Water Weir Chamber

West Bulk Transfer Chamber

TOP  
FRONT  
RIGHT

# Digital – DfMA Approach – Summary



# The Coppermills Journey

1. Agreed digital delivery philosophy early
2. Engaged supply chain partners & operations team early
3. Digitally facilitated collaborative approach throughout
4. The Right Team – embraced tools
5. DFMA Maximised



# RGF Structure: Pre-Cast



- ✓ 90% Reduction in Height working:
  - Zero Wall & Roof Shuttering
  - Zero Wall Steel Fixing
  - Zero High-Level Support Steelwork
  - Pre-Fitted Handrail
- ✓ 40% Carbon Reduction
- ✓ Reduced Waste
- ✓ Zero Temporary Works
- ✓ Zero Site curing Time
- ✓ Zero Coring – Pre-Cast Orifices
- ✓ Zero Accidents





Thanks for  
your time.

