EVOQUA WATER TECHNOLOGIES

CoMag® and BioMag® Systems Treating More with Existing Assets

Embrace Gravity. Defy Convention.

Presented by Simon Radford/Jim Goodwin

TRANSFORMING WATER. ENRICHING LIFE.

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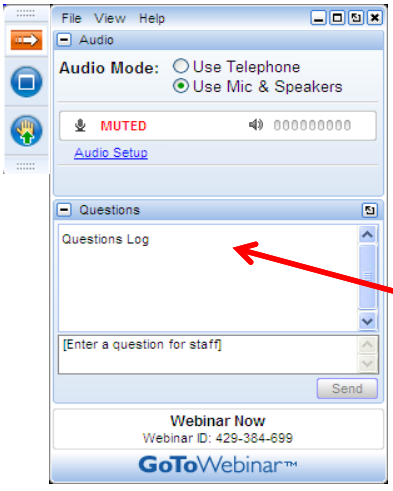
How to Participate Today



- **Audio Modes**
  - Listen using Mic & Speakers
  - Or, select "Use Telephone" and dial the conference (please remember long distance phone charges apply).
- **Submit your questions using the Questions pane.**
- **A recording will be available for replay shortly after this webcast.**

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Webinar Speakers

Jim Goodwin – Evoqua UK Applications Manager
A chemical engineering graduate (Aston University) with over 30 years experience in a wide range of industrial and municipal water and waste water treatment technologies. Latterly leading the process design function at Evoqua Water Technologies, concentrating on ultrafiltration processes and ballasted settlement technologies.

Simon Radford – Evoqua UK Sales Manager
A chemical engineering graduate (Leeds University) with over 30 years experience in water treatment with experience in ion exchange, reverse osmosis, ultrafiltration, membrane bioreactors and wastewater treatment. Currently responsible for the portfolio of unique process technologies that Evoqua supply to the municipal market place.

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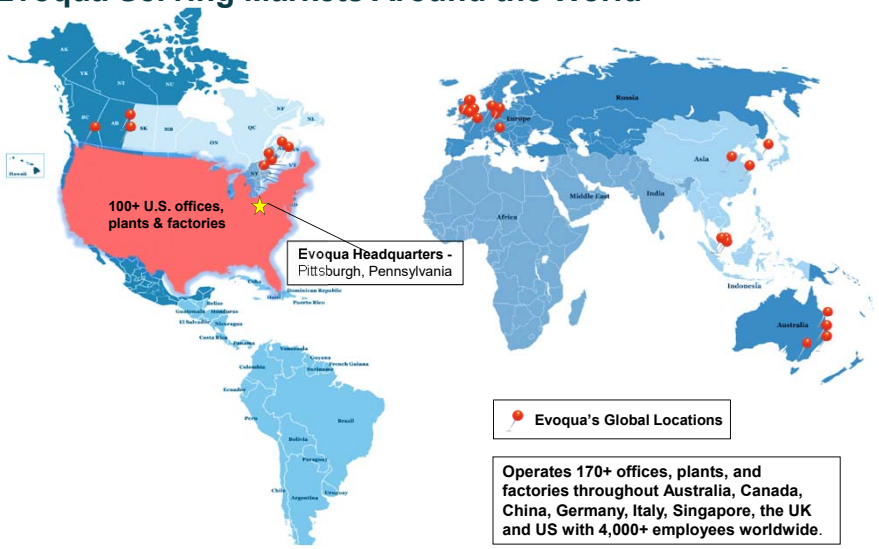
Evoqua Serving Markets Around the World



Operates 170+ offices, plants, and factories throughout Australia, Canada, China, Germany, Italy, Singapore, the UK and US with 4,000+ employees worldwide.

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WHAT'S THE PROBLEM?
SOLID/LIQUID SEPARATION WITH A FILTRATION BARRIER

What if we could remove the physical barrier and maintain or improve effluent quality?

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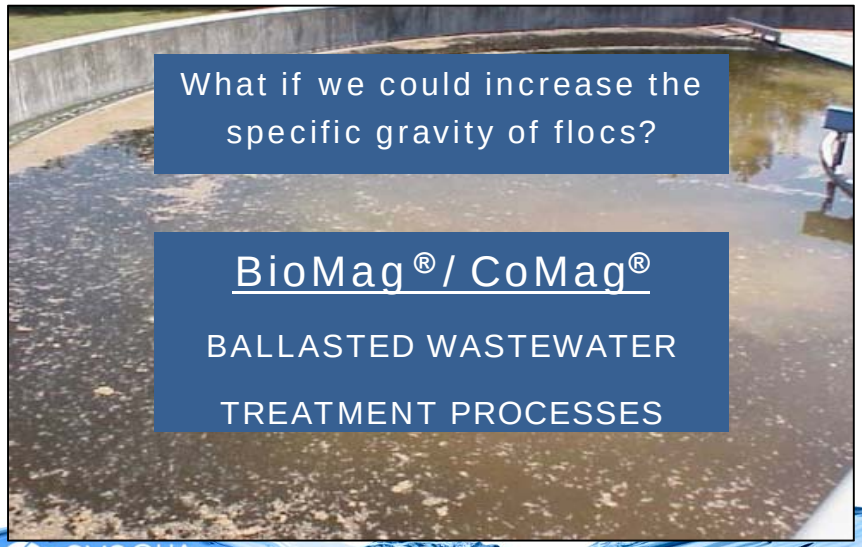
What's the problem? Low specific gravity of the flocs



What if we could increase the specific gravity of flocs?

BioMag®/ CoMag®

BALLASTED WASTEWATER TREATMENT PROCESSES

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BioMag® and CoMag® System Technologies Accomplish More… with Less

These systems can:

- Increase capacity
- Improve final effluent quality
- Improve stability
- Reduce footprint
- Reduce capital costs

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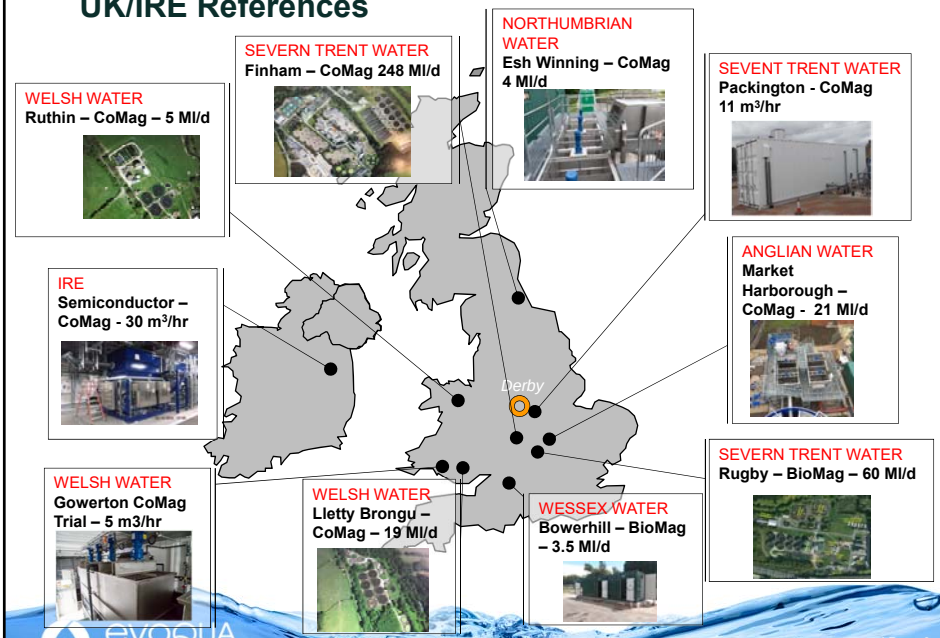
UK/IRE References



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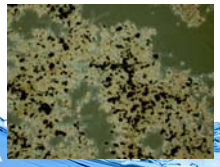
Magnetite as a Ballast

Magnetite: Fe_3O_4

- Fully oxidized iron ore
- Mined
- Wide range of applications
- Readily available from multiple sources



Six compelling properties

- Completely inert
- Specific Gravity: 5.2
- Readily embeds in floc
- Magnetically retrievable
- Non-abrasive
- Inexpensive

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Introduction to the CoMag® System

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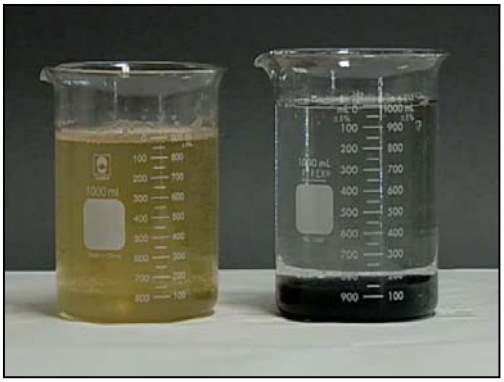
CoMag® System – What can it remove?

- Phosphorus
- Particulate solids
- Colloidal suspensions
- Heavy metals
- Colour
- Pathogens
- Algae



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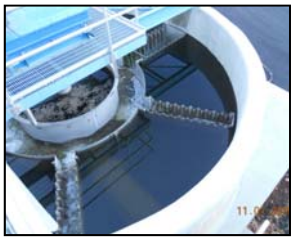
CoMag® System Applications

- Tertiary Treatment
- Fixed-film secondary clarification
- Ultra-low phosphorus treatment (<0.05 mg/l)
- Various industrial applications

Also

- Storm water treatment
- Drinking water treatment



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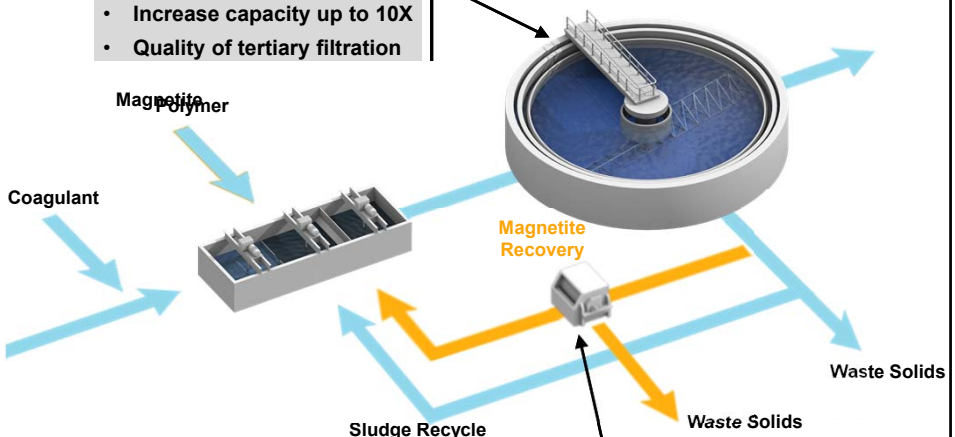
CoMag® System – How is it applied?

- Clarifiers 90+% smaller
- Increase capacity up to 10X
- Quality of tertiary filtration



- Reduces chemicals
- Promotes solids-contact

99.5% magnetite recovery from waste stream

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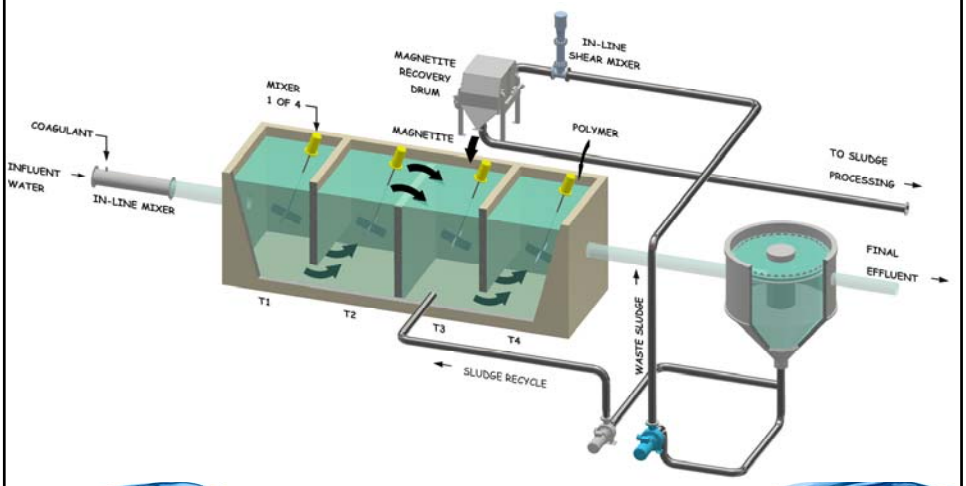
CoMag® Process Flow Diagram



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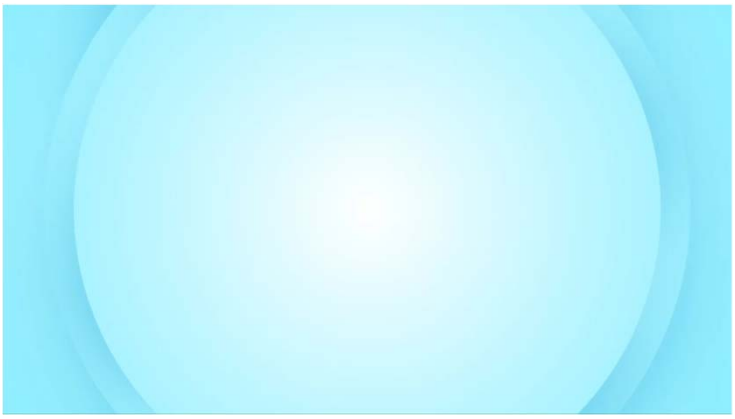
CoMag® System Video



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Severn Trent Finham STW - CoMag® Plant in Numbers

Parameter		Value	Units	Notes
Flow				
	Minimum	43,200	m^3/day	
	Average	139,057	m^3/day	Including returns
	Maximum	**250,714**	m^3/day	Including returns
Inlet Quality				
	TSS (95%ile)	14	mg/l	
	Ortho P (95%ile)	1.3	mg/l	
Effluent Quality Guarantee				
	TP (average)	**< 0.18**	mg/l	
	Fe (average)	< 2	mg/l	
	TSS (average)	< 7	mg/l	
Chemical dose				
	Coagulant (Ferric Sulphate)	**5**	ppm	Subject to jar test
	Polymer	**0.6**	ppm	Subject to jar test

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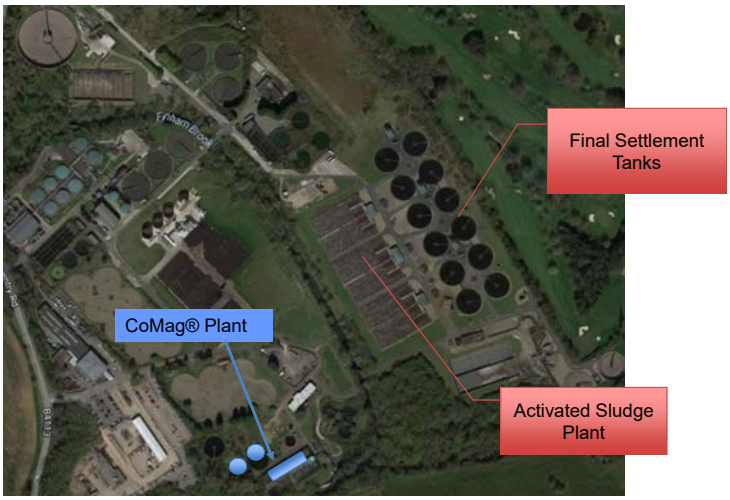
Severn Trent Finham STW – Overview



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CoMag® Clarifiers - Finham STW

10 Standard Clarifiers

=

1 CoMag® Clarifier

Treating more… with less

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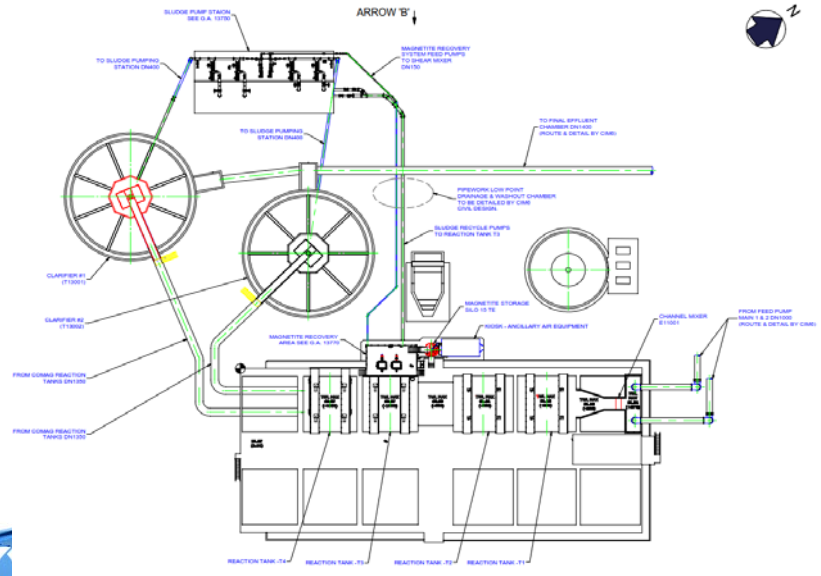
Finham STW – Process Layout



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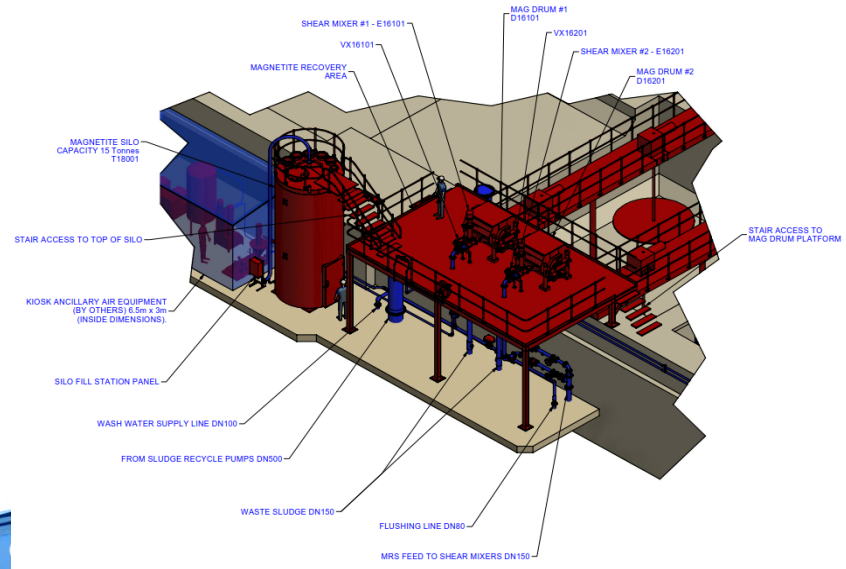
Magnetite Recovery and Feed System



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Current Installation of Finham STW Plant

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CoMag 'Low P' Schemes - Numbers

Parameter	Units	Site A	Site B
Minimum Flow	m^3/day	8994	2059
Average Flow	m^3/day	14420	2947
Maximum Flow	m^3/day	18525	4967
Average Feed TSS	mg/l	35	45
95% Feed TSS	mg/l	65	75
Average Feed T-P	mg/l	1.5	1.2

Parameter	Units	Site A	Site B
Average T-P Permit	mg/l	0.5	0.25
95% Effluent TSS	mg/l	8.0	5.0
95% Effluent Fe (as Fe)	mg/l	4.0	4.0
Average Effluent TSS	mg/l	5.0	2.5

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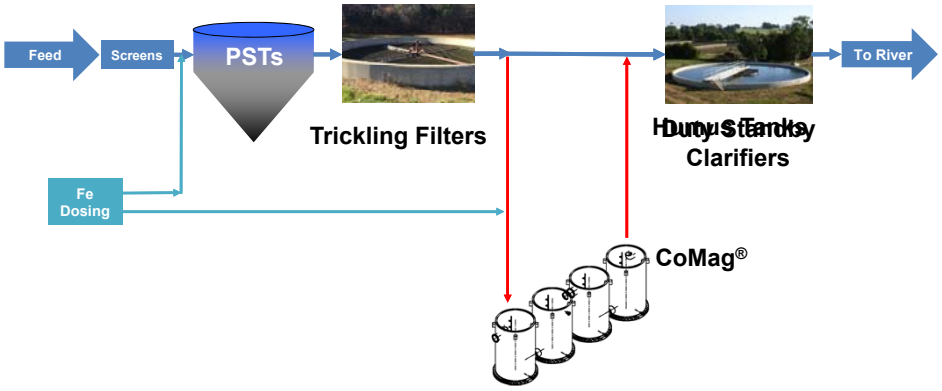
CoMag 'Low P' Schemes using the existing site infrastructure



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CoMag® System Summary

- High rate ballasted clarification process
- No physical barrier to "clog", much more robust under stress than filters
- Achieve TP < 0.05 mg/l
- For P removal, can be applied as 2° or 3° system
- Very small footprint

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BioMag® Systems – Applications for Activated Sludge Processes

- Conventional ASP
- High Rate
- Extended Air
- Oxidation Ditch
- Multistage
- SBR

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Clarifiers are the Limiting Factor in ASP Process

BioMag® system:

- Relieves bottlenecks
- Enhancing clarifier performance

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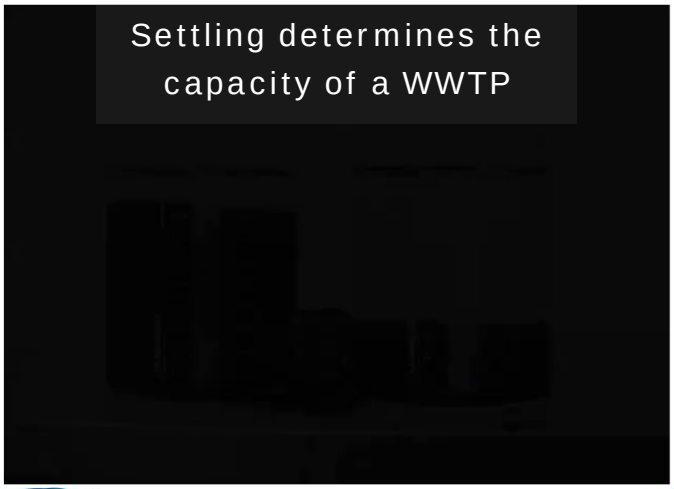
BioMag® Mixed Liquor Comparison

Settling determines the capacity of a WWTP



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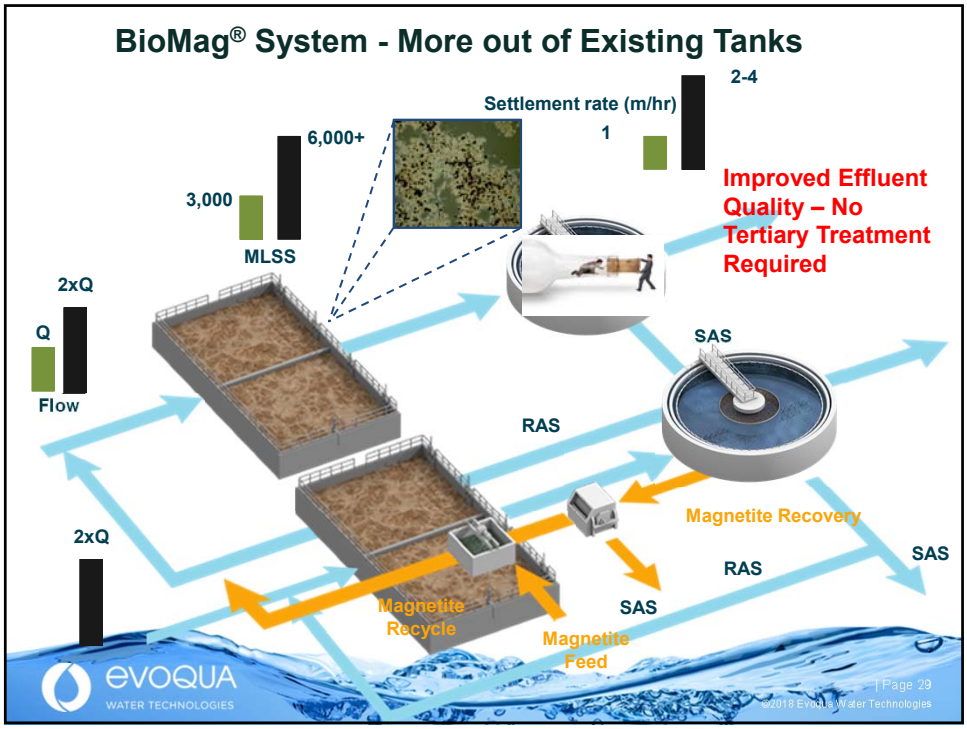
BioMag® System - More out of Existing Tanks
Settlement rate (m/hr)
2-4
1
6,000+
3,000
MLSS
Improved Effluent Quality – No Tertiary Treatment Required
2xQ
Q
Flow
SAS
RAS
Magnetite Recovery
2xQ
RAS
SAS
Magnetite Recycle
SAS
Magnetite Feed
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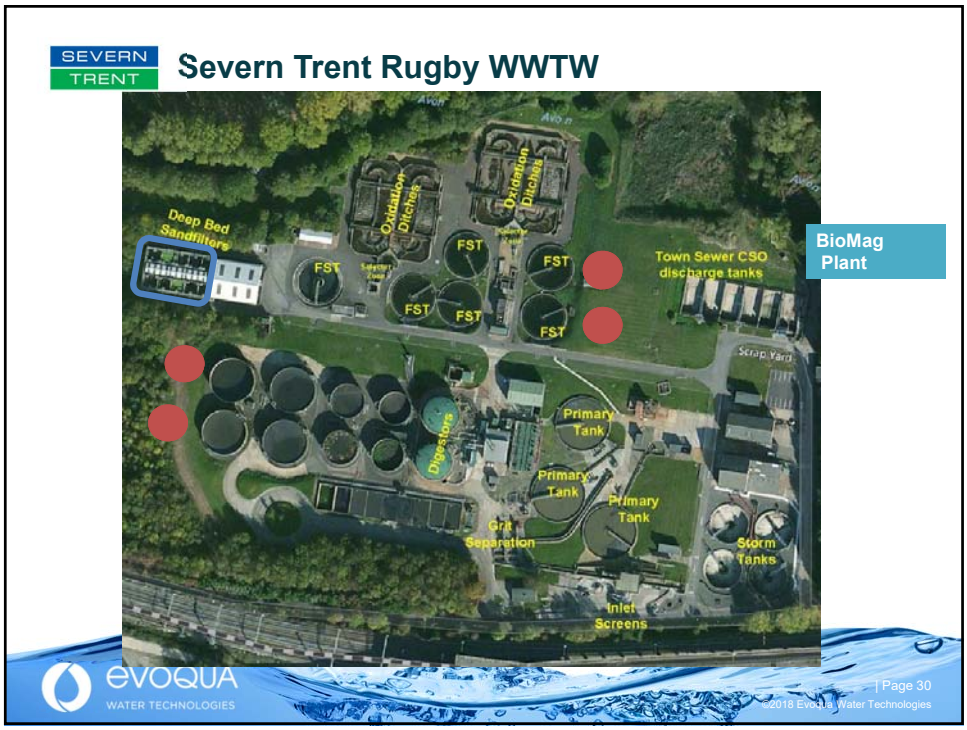
SEVERN TRENT
Severn Trent Rugby WWTW
Deep Bed Sandfilters
Oxidation Ditches
Oxidation Ditches
FST
FST
FST
FST
FST
FST
Town Sewer CSO discharge tanks
BioMag Plant
Scrap Yard
Digestors
Primary Tank
Primary Tank
Primary Tank
Grit Separation
Storm Tanks
Inlet Screens
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Severn Trent Rugby BioMag® - Plant in Numbers

Item	Parameter	Value	Units	Notes
PE	2020	107,975		
	2028	122,682		14% Increase in Load
Flow				
	DWF	21,761	m^3/day	
	Average	28,324	m^3/day	12% Increase in Av Flow
	Maximum (FFT)	59,962	m^3/day	25% Increase in FFT
Effluent Quality				
	TP (average)	< 0.32	mg/l	
	TSS (95%ile)	< 11.2	mg/l	
Chemical dose				
	Coagulant (Ferric Sulphate)	10 + 5	ppm	2 point dosing (subject to trial)
	Polymer	0.5 – 1.0	ppm	Subject to jar test

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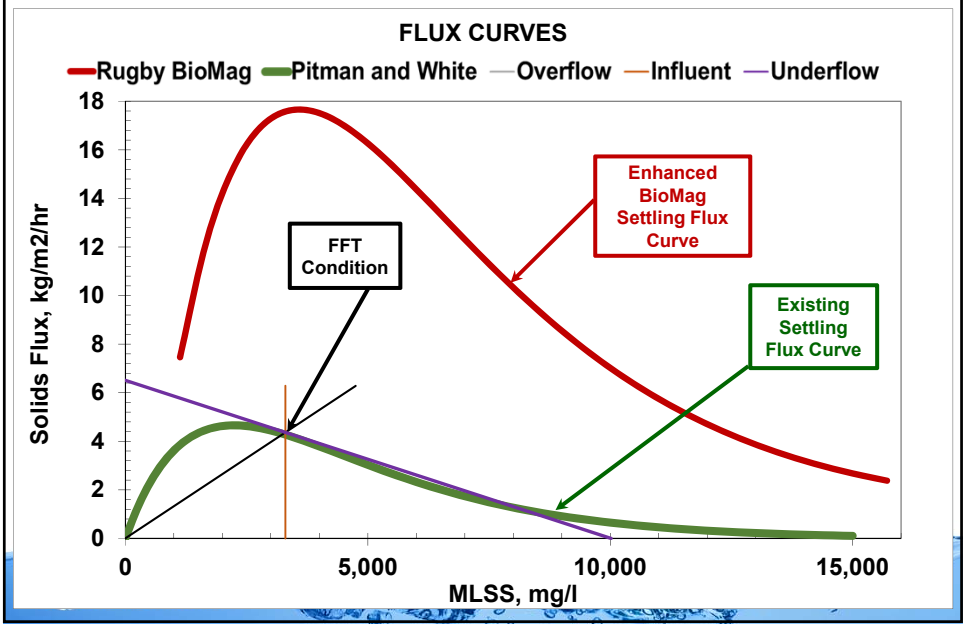
Rugby State Point Analysis



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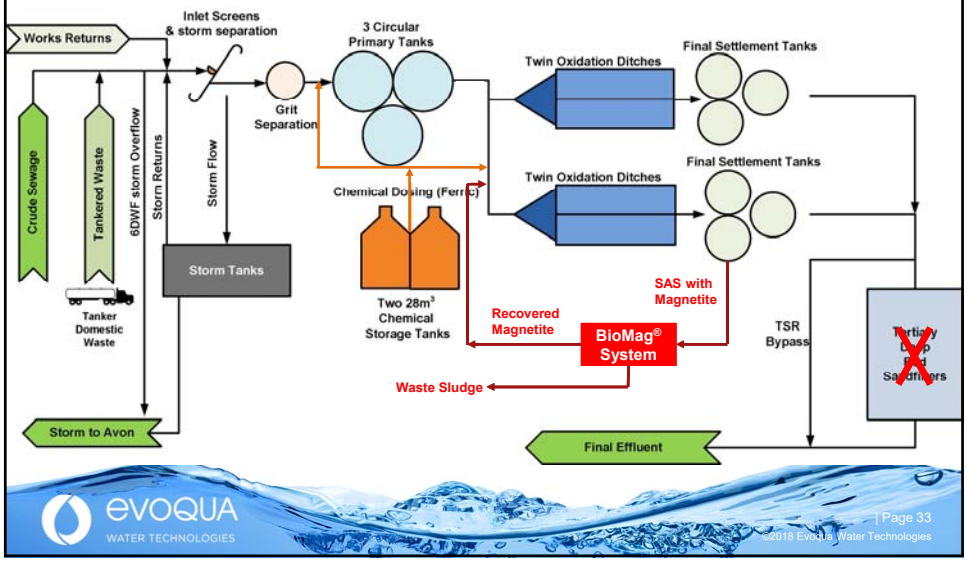
Rugby STW: Process Flow



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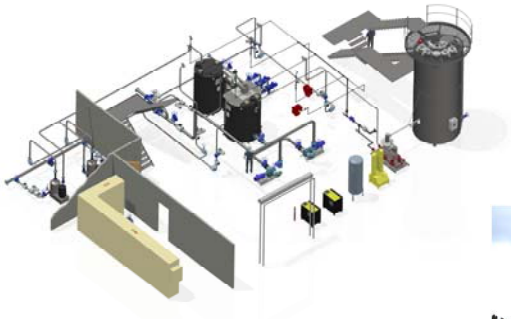
BioMag® System Layout at Rugby WWTW



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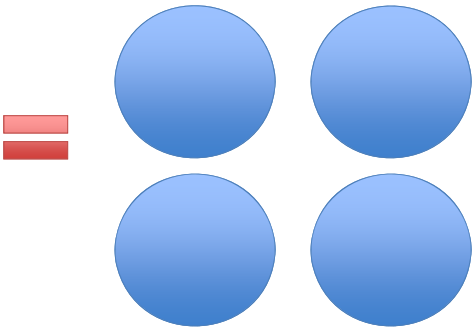
Rugby – BioMag® System Footprint vs FST's



BioMag Footprint Area of 252 M2 Versus 1385 M2

≈ 20% of Conventional Footprint

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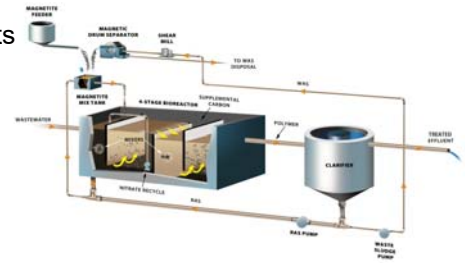
Where to Use BioMag® System

- Capacity expansions
- Achieve tight nutrient limits **without** Tertiary Treatment
- Improve storm flow capacity
- Improve process reliability by overcoming poor settling sludge
- Sites with footprint constraints
- Upgrades with budget constraints
- New plant Construction



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Thank You

Any Questions?

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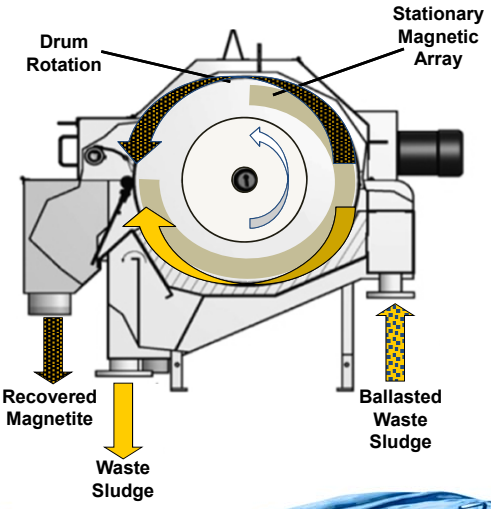
Magnetite Recovery Drum – How it works



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