



Integrated bio-solutions for treatment of Landfill Leachate

Performance update from a
restored site in
Donegal, Ireland

Con McLaughlin
Senior Engineer
Donegal County Council

22nd May 2019



Northern Periphery and
Arctic Programme
2014–2020



EUROPEAN UNION

Investing in your future
European Regional Development Fund



WATERPRO

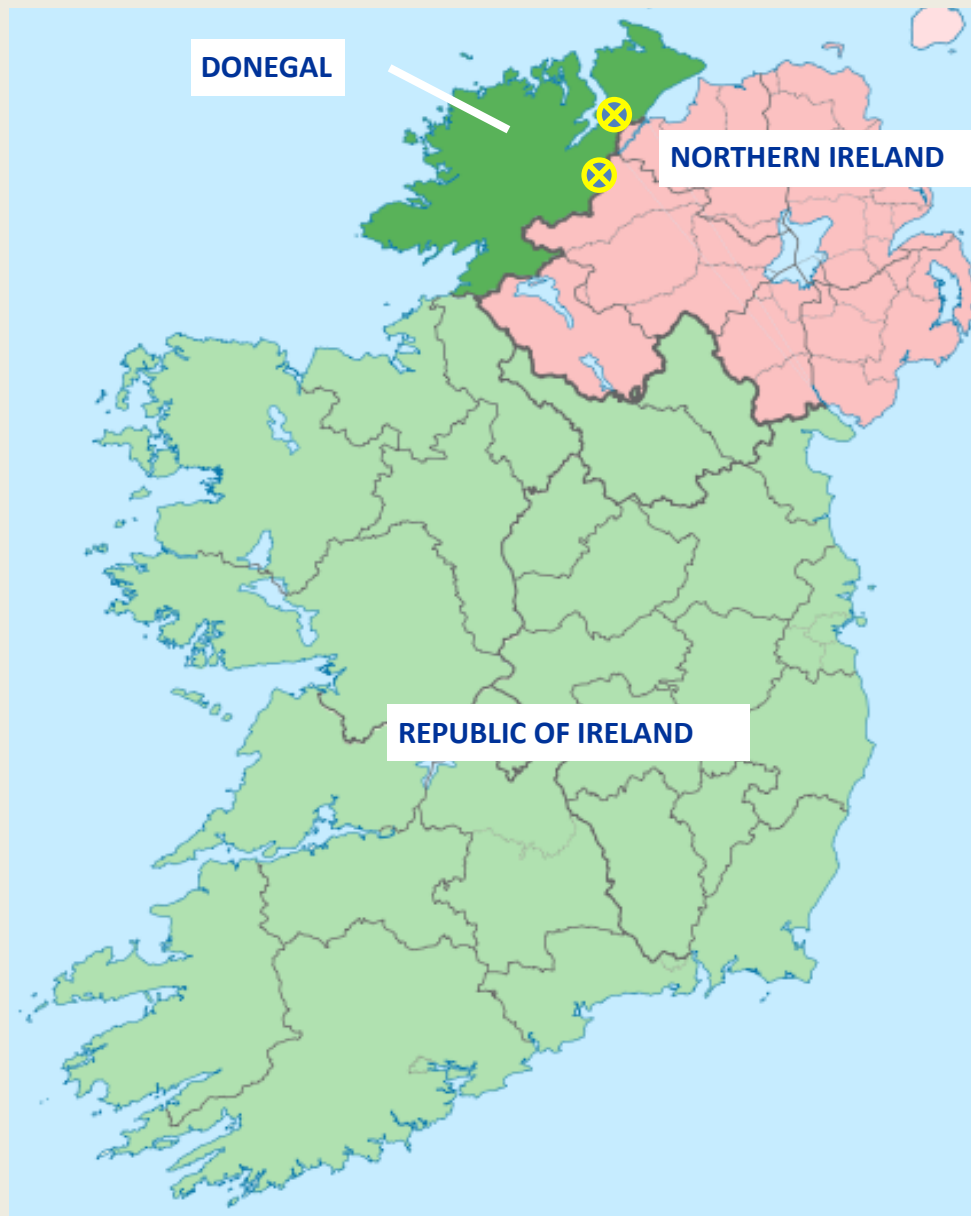
Items covered in today's presentation . .

- Previous works using willows for treatment of wastewater effluent
- A combined willows & integrated constructed wetlands (ICW) approach to deal with landfill leachate
(similar to runoff from agriculture / mining industries)
- **WaterPro** - has allowed for further development of the site including detailed weekly monitoring of performance
- **WaterPro** - performance update and summary outcome



Location of Donegal on the island of Ireland

- Northern most county in Ireland.
- Border of 140km with Northern Ireland and 9km with the Republic
- Population – 159,192 (Census 2016)
- Approx 73% of people in Donegal live in rural areas



WaterPro Team, Donegal Co Council

With support from . .

Project Manager

Con McLaughlin
Senior Engineer

Project Officer

Joanne Holmes
Assistant Engineer

Water Pro Technician

Fionnula Bonner

Laboratory Manager

Dr Joe Ferry, Senior Exec Chemist

Landfill Manager

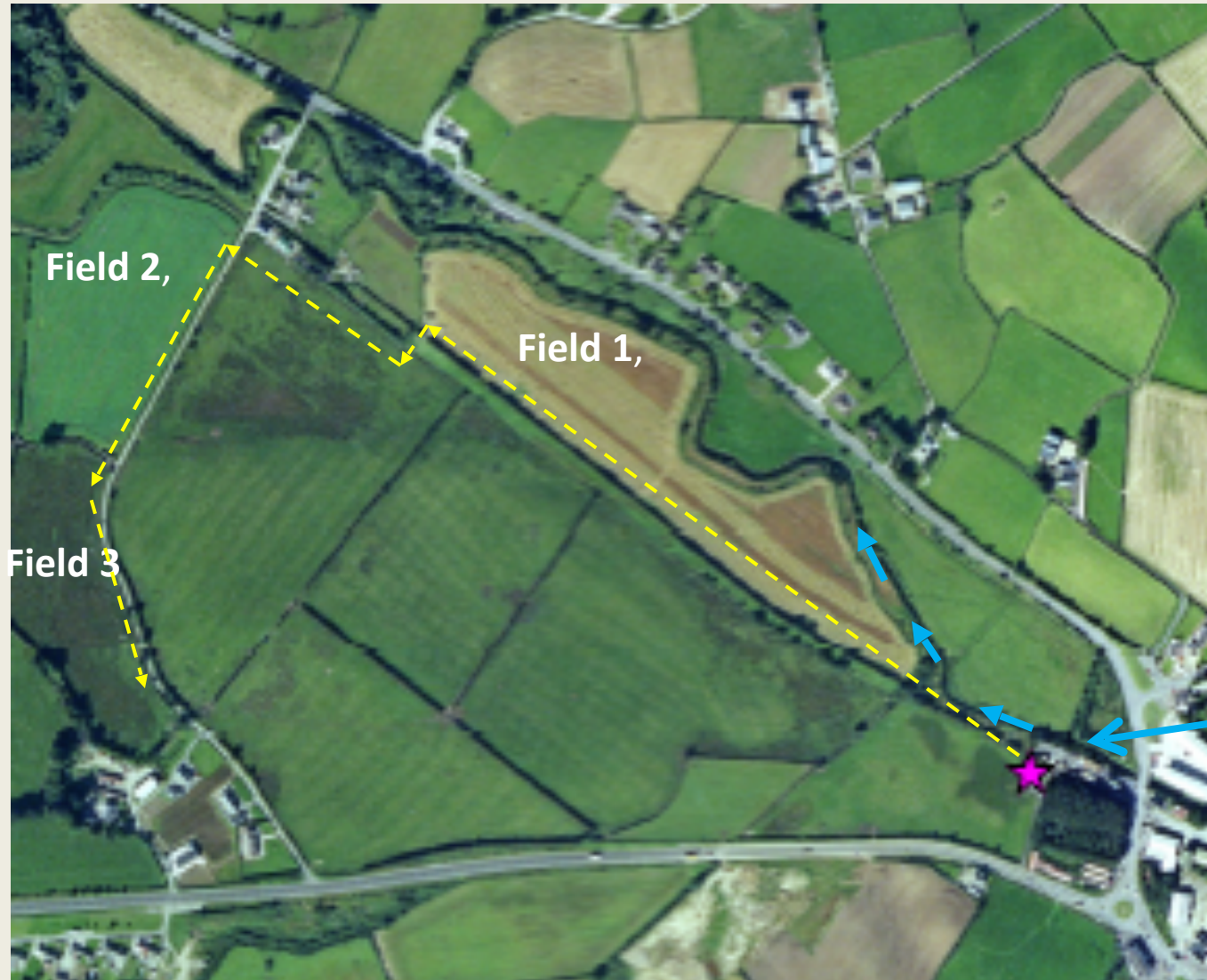
Julie McMahon, Executive Engineer



- Drinking water quality
- River catchments
- Lake water & Bathing waters
- Waste Water & Leachate

This journey began with a 'proof of concept' using willows as part of Bridgend Wastewater Treatment Works

(ANSWER Project, Interreg 4A)



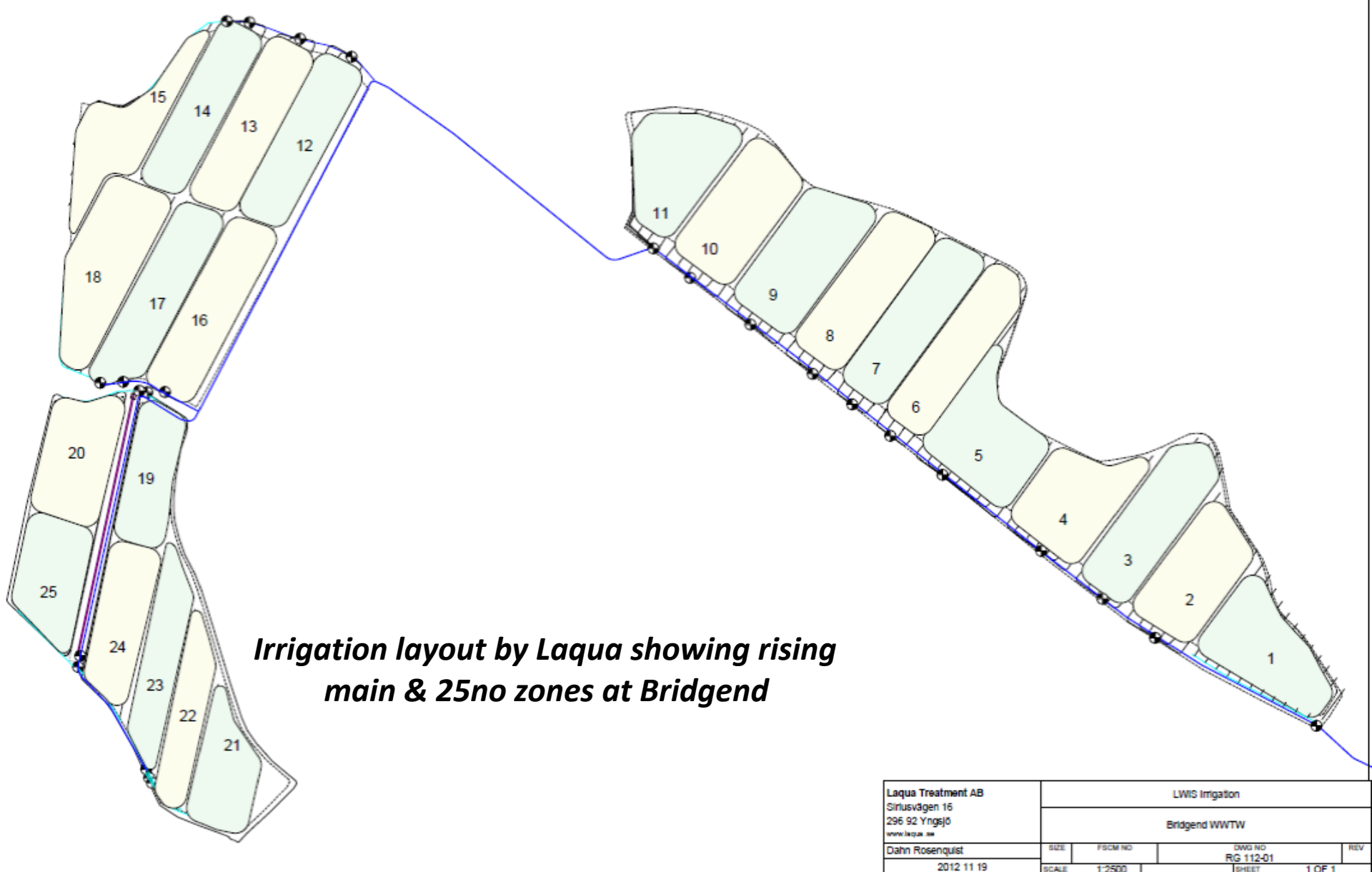
Bridgend
WWTW



Low pressure
pumping of
effluent to
willow
plantations



Stream



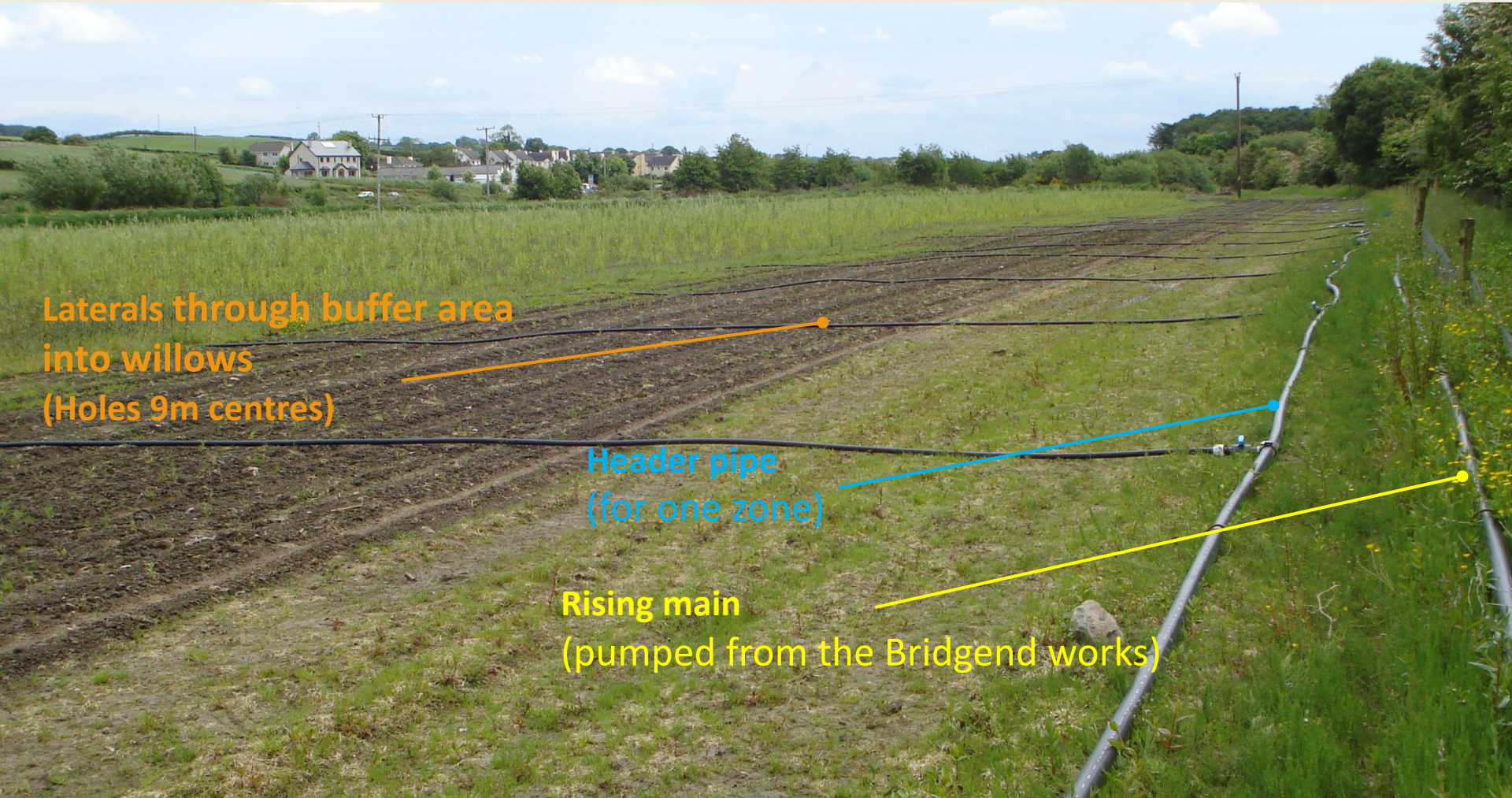
Irrigation zones at Bridgend

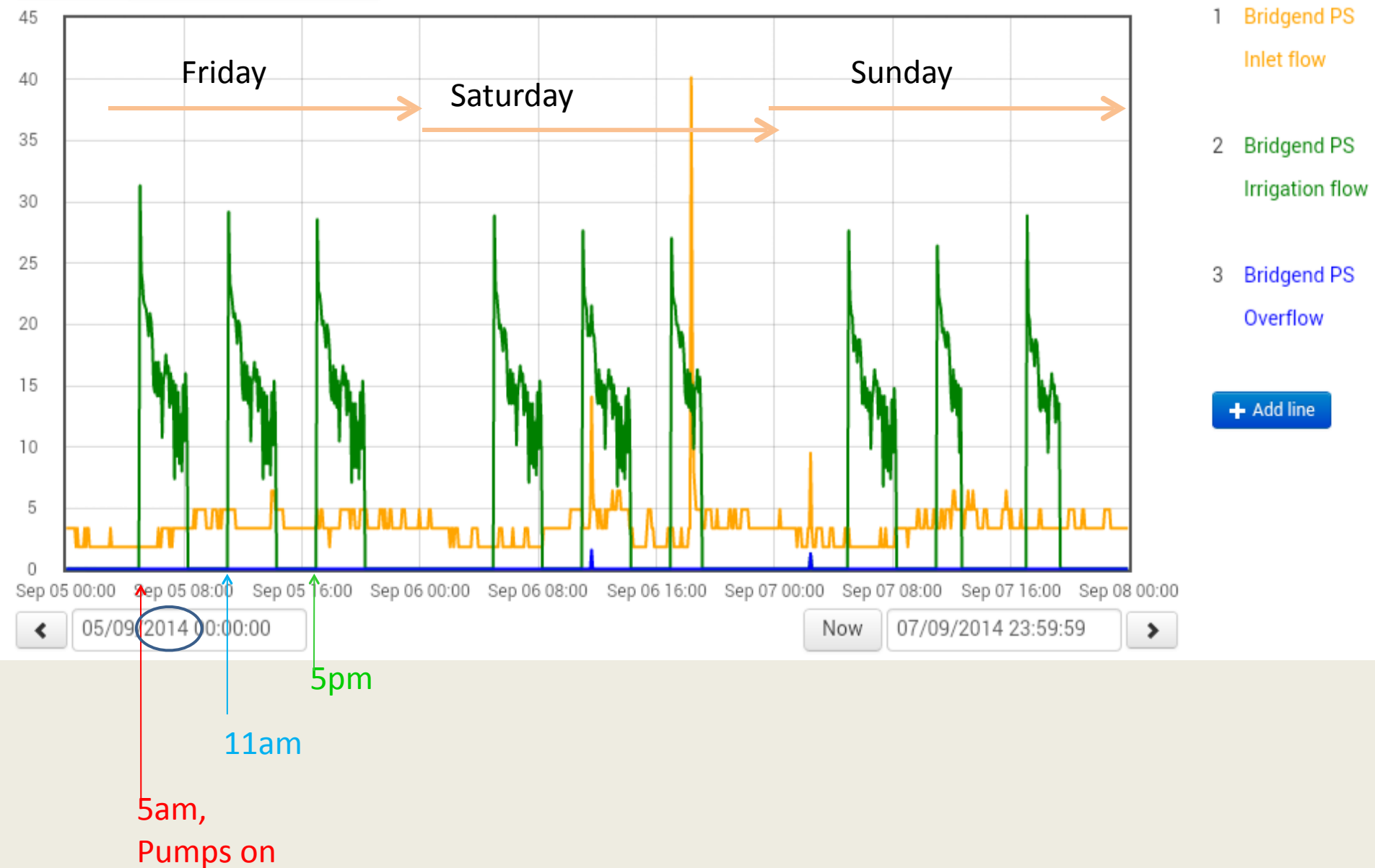


25 zones each with a valve wired back to an irrigation controller

Irrigation system at Bridgend Wastewater Treatment

(emerging src willows in background)





All data trended and available online, this example (2014) showing inlet flow, irrigation flow and no flow to river

Moving on to Churchtown Landfill Project, the aims of that were . .

- Compliance with Waste Management Act 1996 and the waste Licence for the site
- Capital and Energy saving cost
- Passive Treatment system
- Facilitate Biodiversity and reanimation of habitats
- Develop an innovative sustainable Leachate Treatment systems

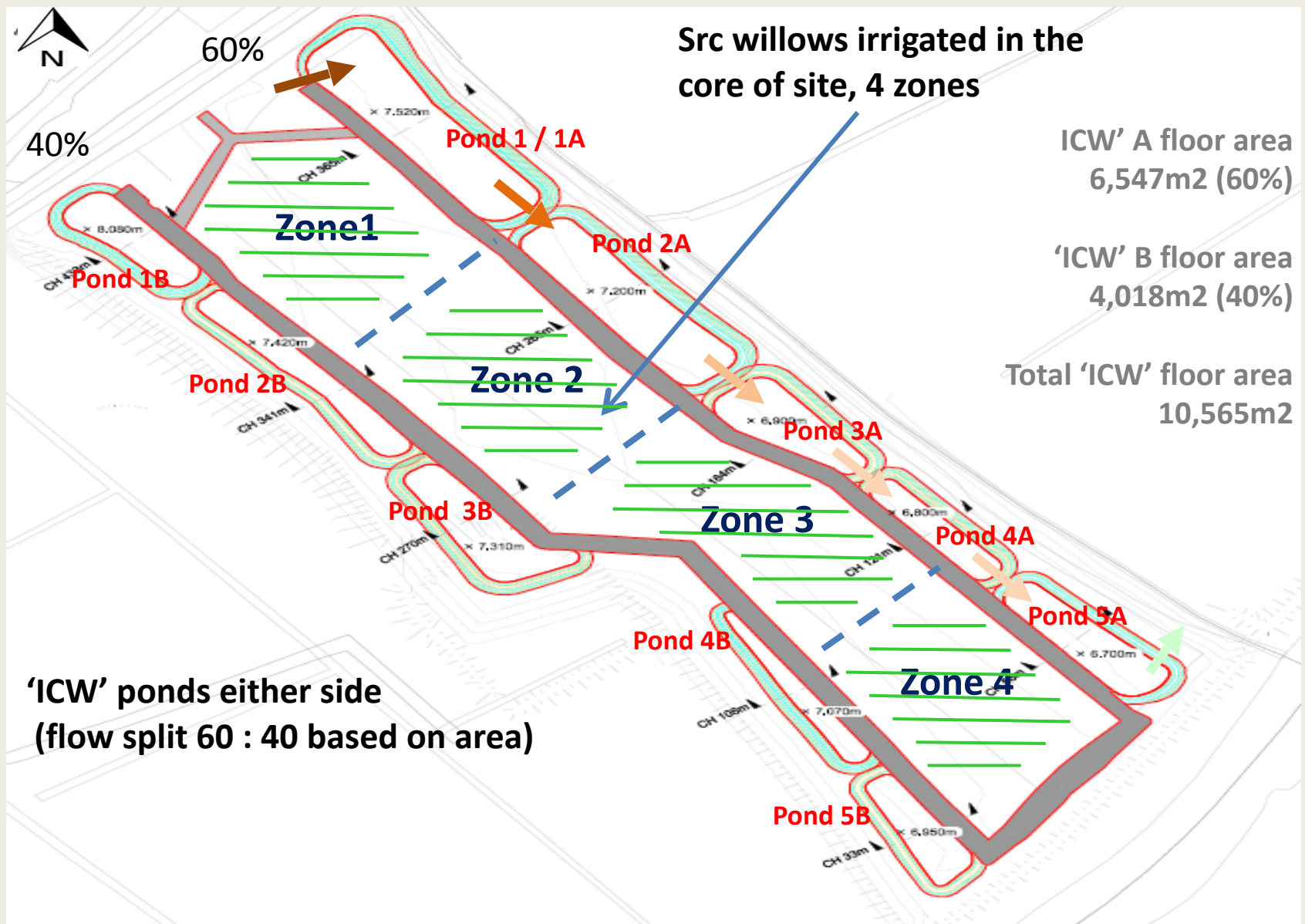
Churchtown Landfill site



Restoration works financed by :

- **Department of Environment, Community & Local Government**
- **The ANSWER Project (Interreg 4A)**
- **Construction managed by David Robb, Executive Engineer**

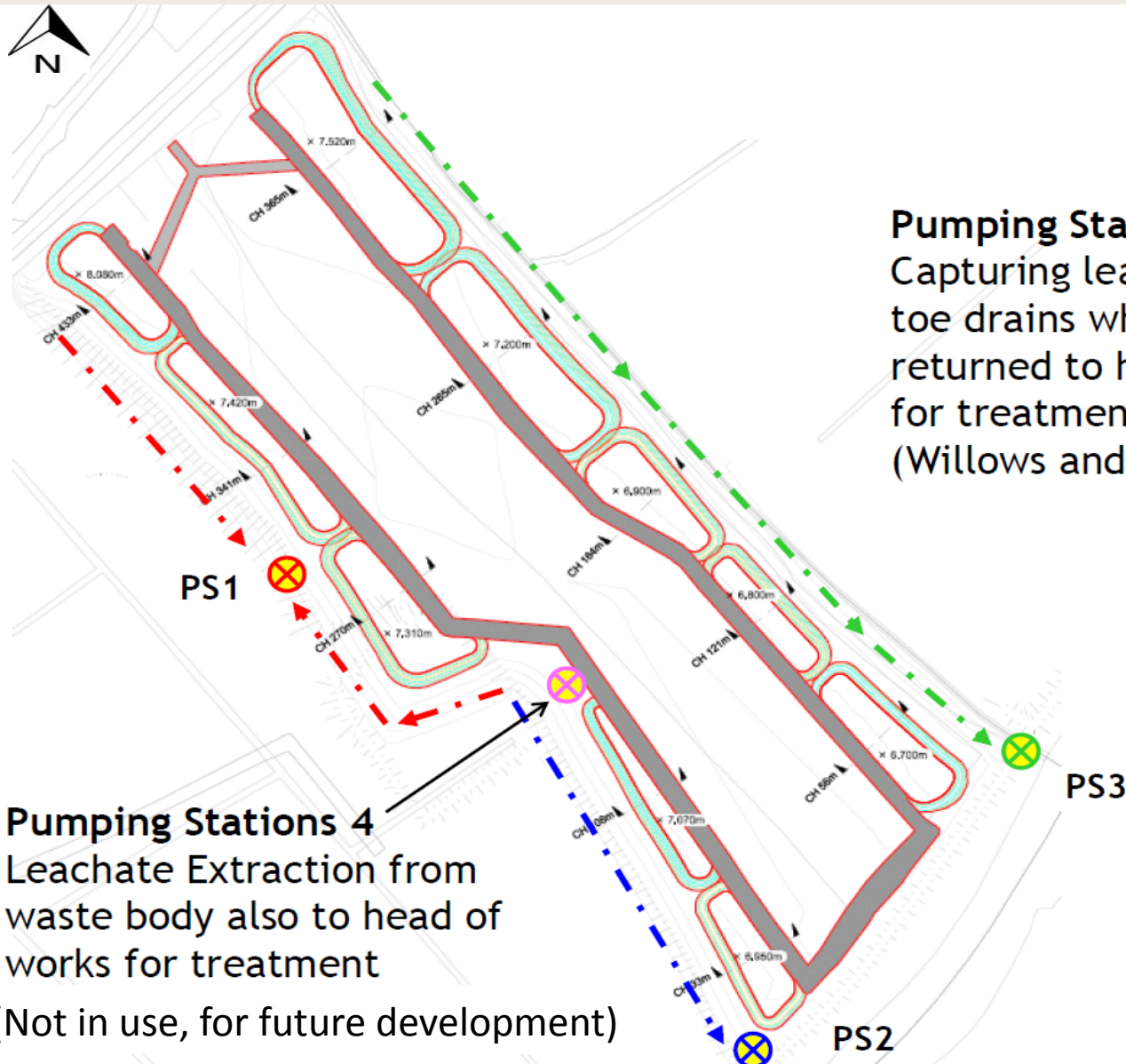
Churchtown Landfill Site Plan



Leachate Collection Design

Pumping Stations 1, 2 & 3
Capturing leachate from
toe drains which is
returned to head of works
for treatment
(Willows and / or ICW's)

Pumping Station 4
Leachate Extraction from
waste body also to head of
works for treatment
(Not in use, for future development)



Aerial Images of Churchtown Landfill



WaterPro Project – detailed monitoring of the site ...

The WaterPro project has facilitated detailed monitoring of the site, including all leachate treated through the willows & ponds and the surrounding environment.

Performance to date has been very positive

During drought periods additional leachate from another restored landfill is imported to this site for treatment.

Additional flow meters added at discharge to storm drains from the final two ponds (initial plan was to meter all ponds)

All data linked to a SCADA system



Image dated Oct 2014

WaterPro – compliments quarterly monitoring of the site for the following parameters . . .

Parameter

- ☐ Flow
- ☐ Biochemical Oxygen Demand
- ☐ Chemical Oxygen Demand
- ☐ Temperature
- ☐ Ph
- ☐ Dissolved Oxygen
- ☐ Suspended Solids
- ☐ Ammonia (NH_4) as N
- ☐ Nitrate as N
- ☐ Nitrite as N
- ☐ Total Phosphorus (as P)
- ☐ Ortho-phosphate (as P)
- ☐ Conductivity
- ☐ Copper
- ☐ Zinc
- ☐ Phenols
- ☐ Chloride



WaterPro Monitoring at Churchtown Landfill

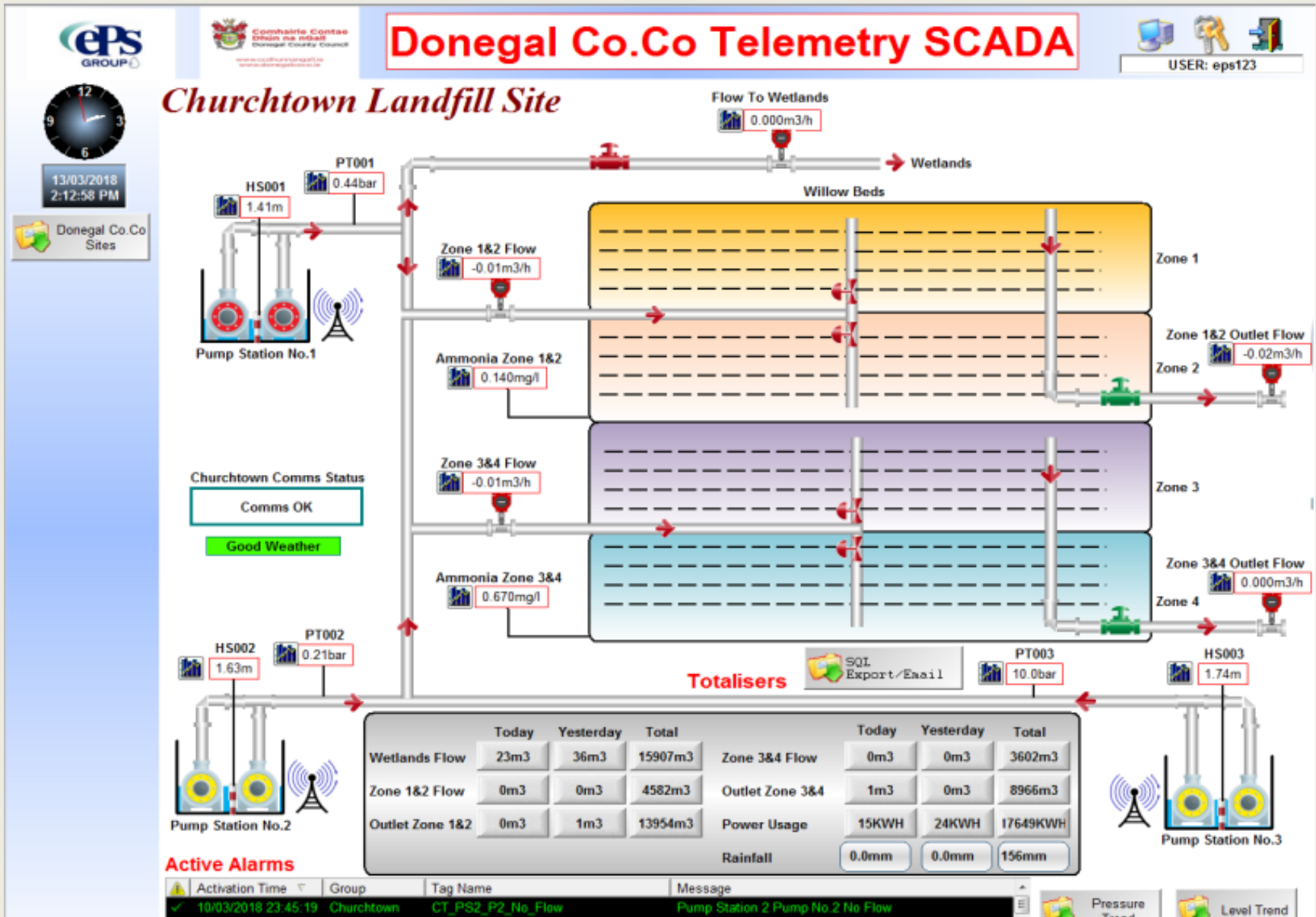


-  Pond outlet
-  Surface water
-  Collection sumps
-  Ammonia analyser

WaterPro (2016-19) – has contributed to development & monitoring at Churchtown Landfill . .

- ✓ Commissioning of the automated controls on site;
- ✓ Ongoing monitoring and reporting to prove the treatment systems and obtain optimum treatment performance;
- ✓ The **WaterPro** project built on the platform created during the restoration of the site, i.e. further development and monitoring the performance of the on-site treatment of nutrients prior to discharge to receiving waters

SCADA (Supervisory control and data acquisition)



Performance - Extract from monthly monitoring (January 2019)

Parameter	Limit
pH	6-9
BOD	20mg/l
Suspended solids	30mg/l
Total P (as P)	2mg/l
Total Ammonia (as N)	3mg/l

Table 1. Emission Limits Values

Emission Limit Values – as referenced in the approved Specified Engineering Works Report July 2014.

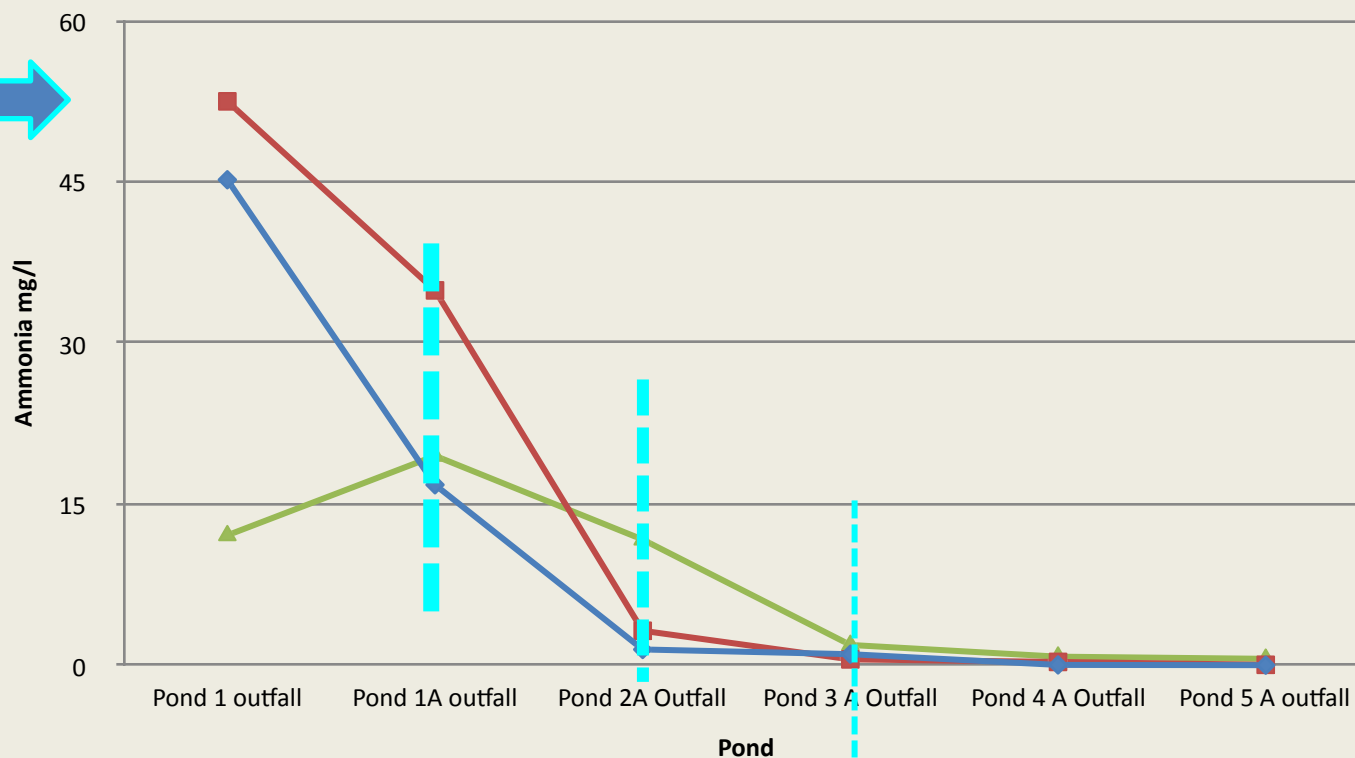
Location	Parameter	Peak concentration for month	Compliance with proposed ELV's	Length of time Non - Compliant	Comments
ICW – Pond 5A Discharge	Ammonia mg/l	0.6	Yes	N/A	No issues
ICW – Pond 5B Discharge	Ammonia mg/l	0.009	Yes	N/A	No Issues
Willows -Northern Discharge	Ammonia mg/l	0.06	Yes	N/A	No Issues
Willows - Southern Discharge	Ammonia mg/l	0.45	Yes	N/A	No issues

Table 2. Peak Concentrations of Ammonia from the four discharges.

Churchtown Landfill Monitoring January 2019

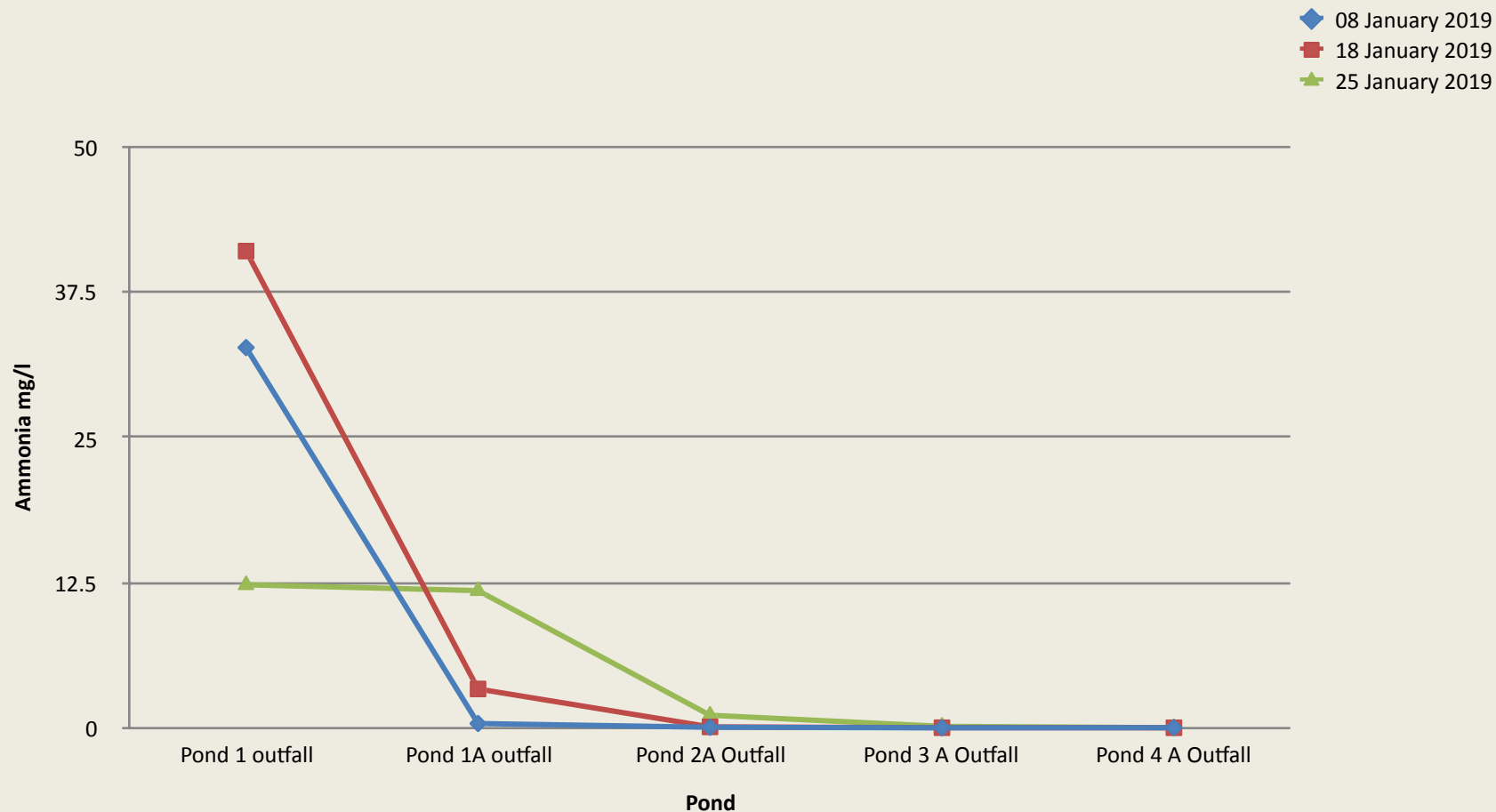
"A" series ponds

- 08 January 2019
- 18 January 2019
- 25 January 2019



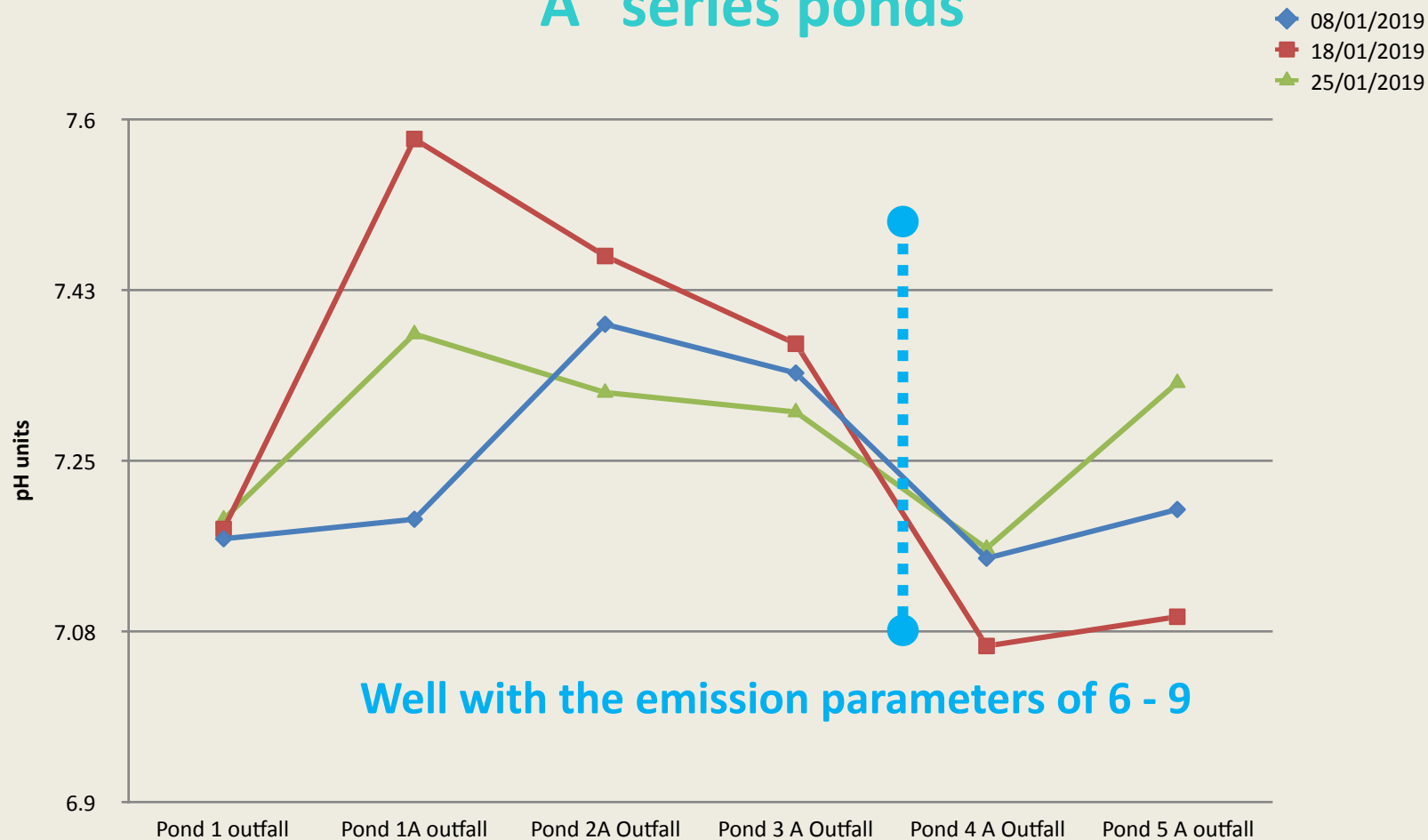
Churchtown Landfill Monitoring January 2019

"B" series ponds



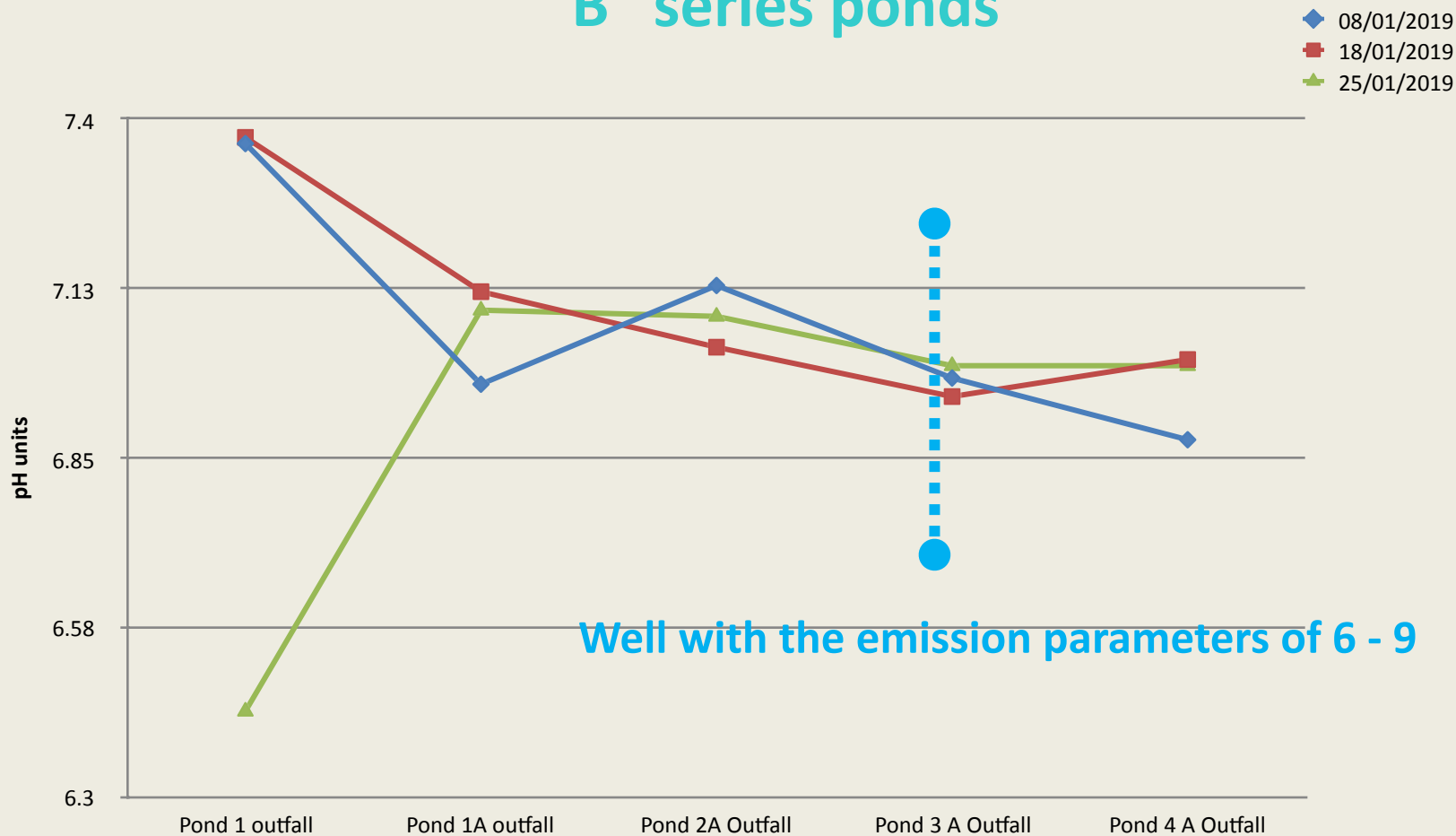
pH Monitoring (January 2019)

"A" series ponds



pH Monitoring (January 2019)

"B" series ponds



Summary performance . .

- The combined system of onsite treatment using src (*short rotation coppiced*) willows and integrated constructed wetlands (ICW's) has performed very well during the WaterPro project period
- In 2018, **11,606m³** of leachate has been collected on site and treated through the combined willows + ponds system
- At prolonged dry periods, leachate from another landfill site has been tankered to Churchtown Landfill for treatment
In 2018, **2,400m³** of leachate was imported to site for treatment
14,000m³ or approx . . .
- Onsite treatment at Churchtown eliminates the need for any transportation of leachate from the site. - €200K pa
- Resulting savings in haulage costs **x 470!**
- Income from harvesting willow crop will offset some of the site Opex.



Where to from here . . .

- Future? – we need greater recognition that these technologies are fit for purpose
- Their treatment efficacy, coupled with their sustainable, environmental and ecological benefits and low operational costs set them apart from conventional treatment systems



‘It is important that this type of sustainable technology is actively encouraged in today’s environmentally aware and financially constrained climate’

Mr. John McMillen, Former Chief Executive, NIEA

- Finally, a further performance related ICW reference to share with those challenged with run-off from the mining industry . . .

The attached 2018 paper on the **Galmoy Mines tailings restoration** (in Ireland) was presented at an international conference in South Africa

Received from our ICW designer, VESI Environmental Ltd

https://www.google.com/search?q=Former+Galmoy+Mines+tailings+restoration&rlz=1C1GCEU_enIE821IE821&oq=Former+Galmoy+Mines+tailings+restoration&aqs=chrome..69i57.2243j0j8&sourceid=chrome&ie=UTF-8

Thriving pond plants & willows on left . .





Thank you

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