(**A**gricultural **N**eed for **S**ustainable **W**illow **E**ffluent **R**ecycling):

An EU funded project to encourage the use of SRC willow for bioremediation.

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Agenda

- The Challenges
- The Principle
- SRC Willow production systems
- Irrigation System and Control
- Data and system management
- Results - Nutrient Management
- Regulation
- Informing Policy!
- Landfill leachates

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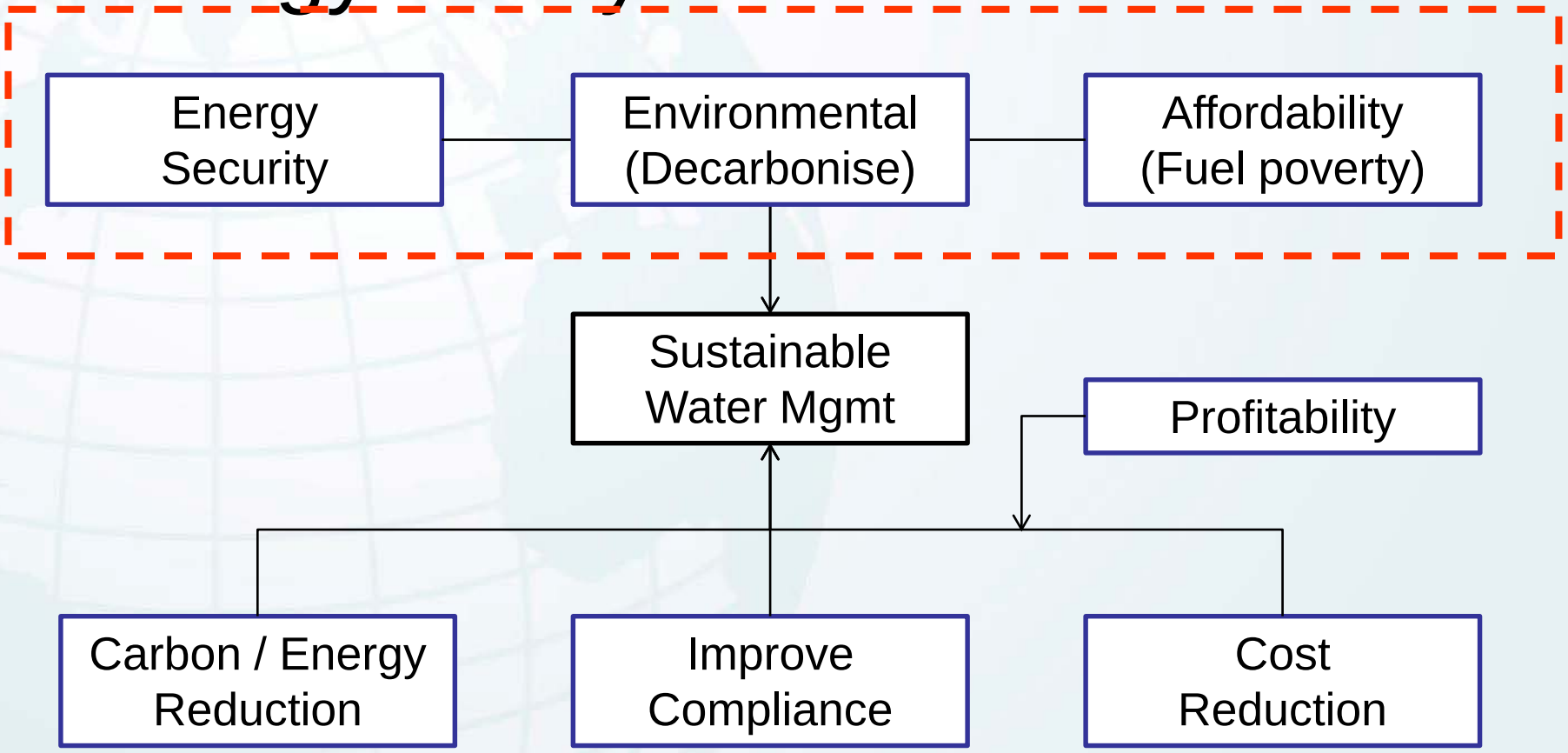
The challenges !
Energy Policy & The Environment



Are there Holistic Solutions to Delivers Multiple Wins!!!

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Project Aims

- To provide scientific evidence on the effectiveness and sustainability of using SRC willow, for the management of waste water effluents.
- To establish FIVE effluent recycling schemes:
  - Bridgend, 14 ha (Donegal Co Co)
  - Clontibret, 7 ha (Monaghan Co Co)
  - Knockatalon, 5 ha (Monaghan Co Co)
  - Dromore, 15 ha (NIWater)
  - Ballinacarrick Landfill, (Donegal Co Co)
  - Churchtown Landfill, 4 ha (Donegal Co Co)
- Investigate GIS mapping, clonal fitness for effluents and leachates, pathogen survival, biodiversity and overland flow.

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Why SRC Willow?

- Energy Crop
  - Enhanced energy Security
  - Displacement of fossil fuels
  - Zero Carbon renewable fuel - Reducing GHGs
- Enhanced soil Carbon Sequestration
- Improved Biodiversity
- Rural Employment
- Profitable agricultural crop
- *Compliant and sustainable Waste Management*
  - *Improved environmental water quality*

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The Willow Production System






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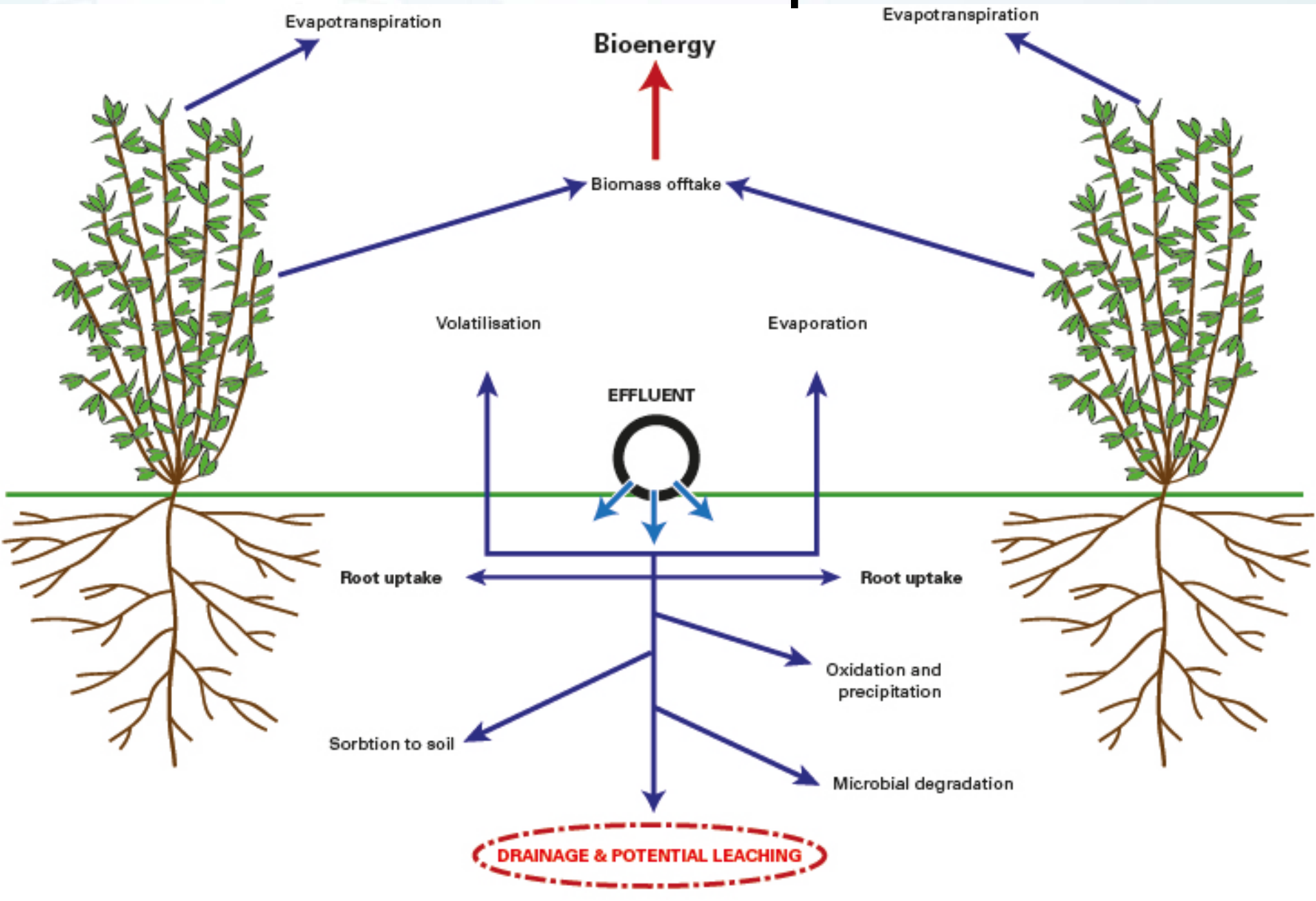
The Principle



Irrigation System Construction

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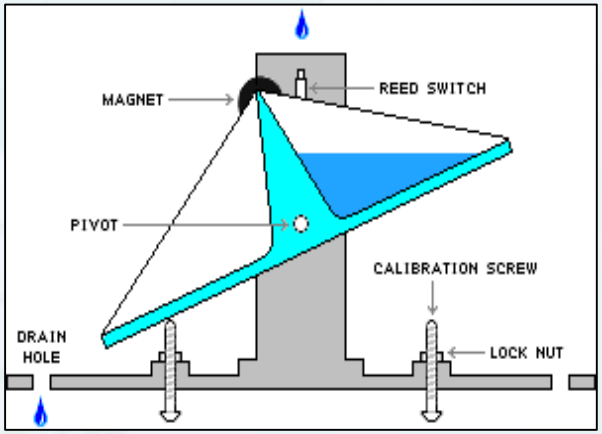
Irrigation System Control

Pressure equalised & Dose Irrigation system

Controlled by

- PLC,
- Timer



Environmental stimuli

- Temperature
- Rainfall
- Irrigation history
- Soil moisture

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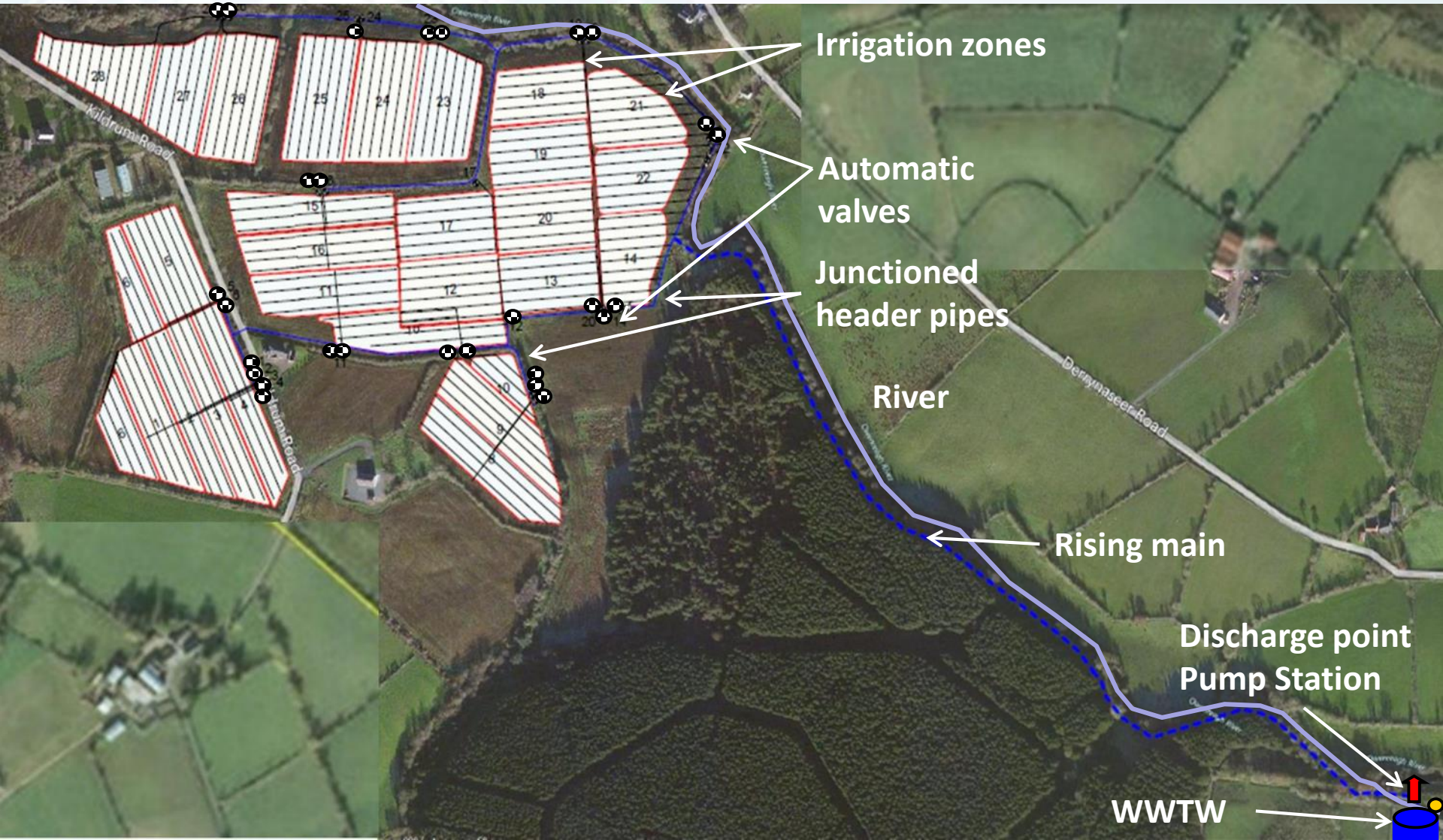
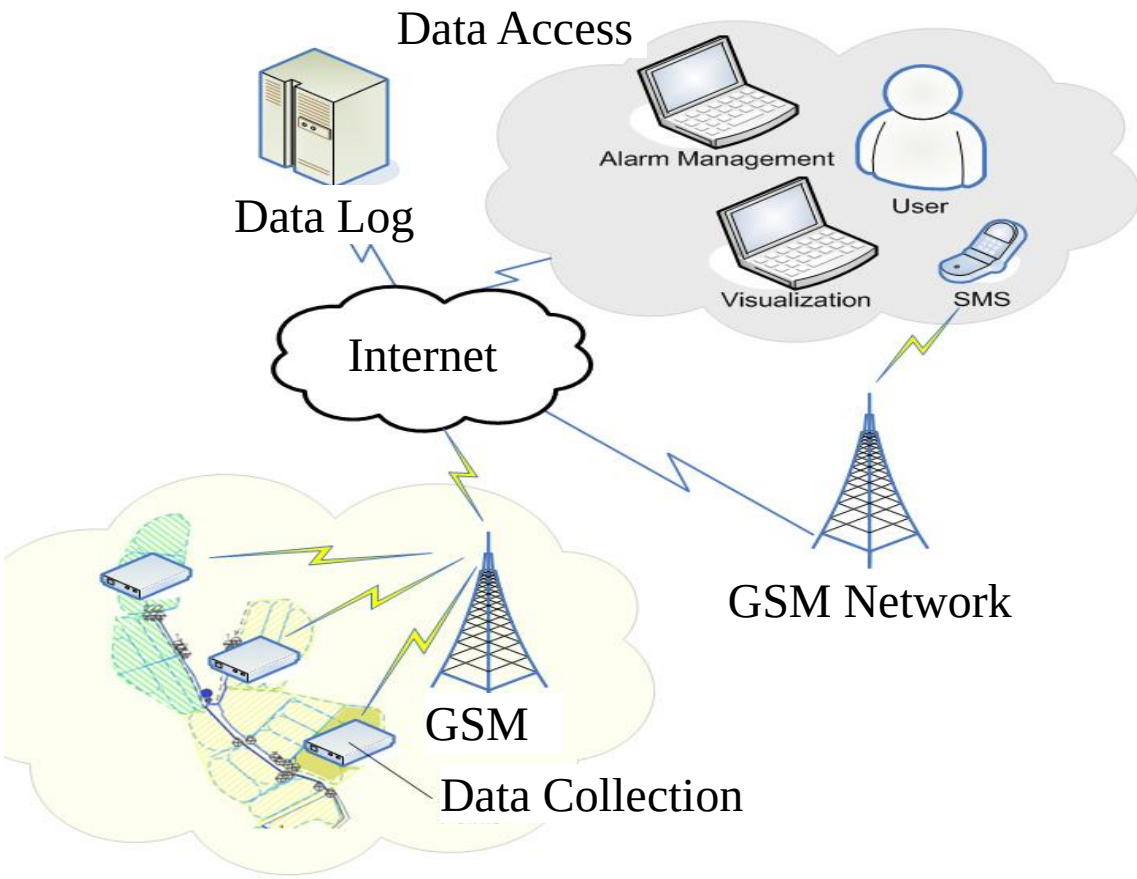
Zoned 15 ha SRC Plantation Area



Data Collection / Presentation

- Data acquisition
  - Frequent SMS
  - Real time SCADA
- logging, recording
  - Temp
  - Rainfall
  - Volume irrigated
  - Volume in-flow
  - Zones Correlation
  - Web Application.



Results - Nutrient and hydraulic loadings

- Sustainable Nutrient Recycling!
  - SRC Willow fertilisation
- In line with nutrient management and recommendations
  - Ref. Fertiliser Manual (RB209) 8th edition *(ref. extra recognition)*
  - Independent AFBI data

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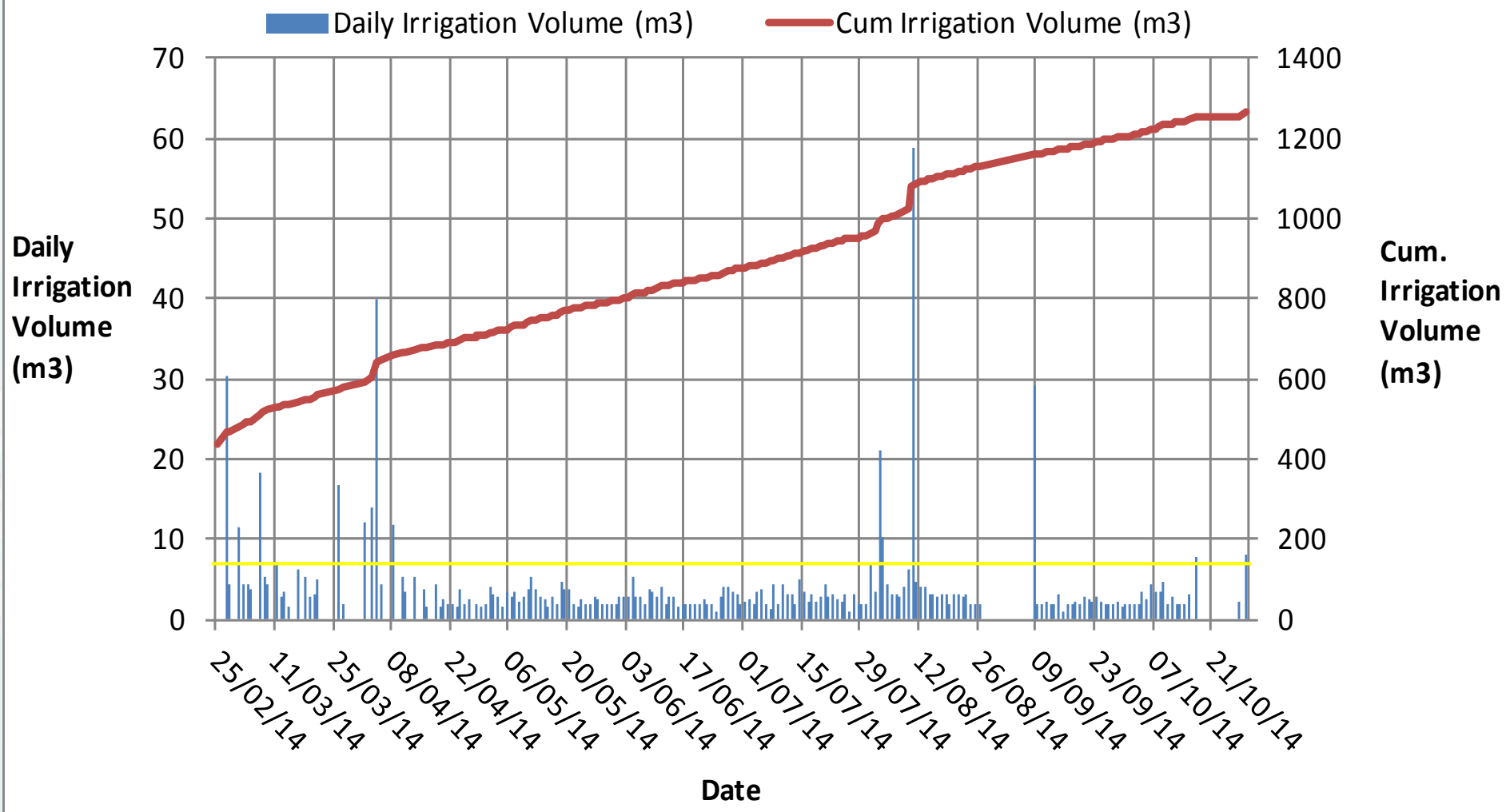
Drumkee Flow Data



Irrigated	-	1264 m^3
Discharged	-	3 m^3 (<0.5%)
Nitrogen	-	72 kg/year
Phosphorus	-	9 kg/year

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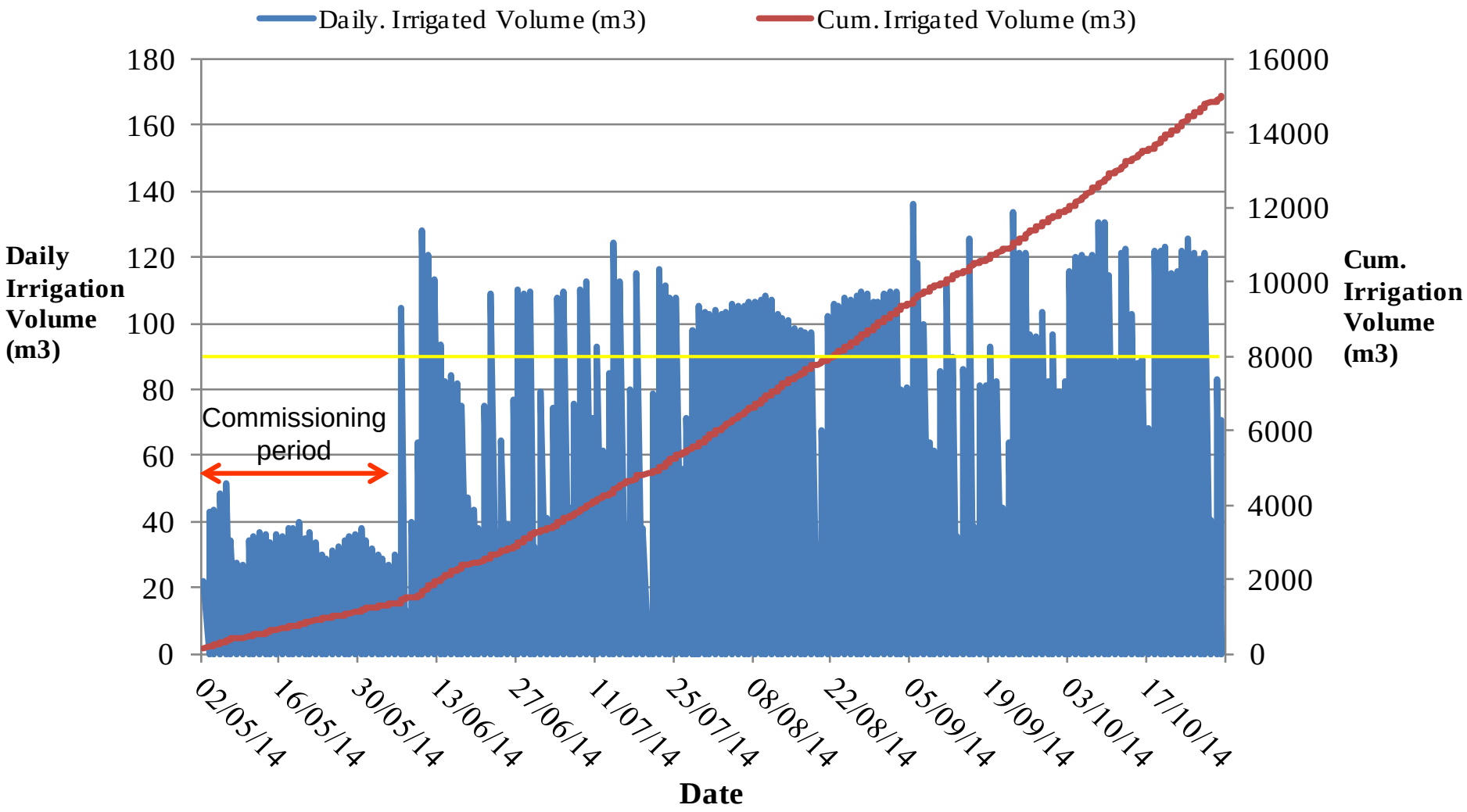
Bridgend Flow Data



Irrigated	-	15,022 m^3
Discharged	-	3,052 m^3 (20%) – *with set overflow trigger*
Nitrogen	-	1,314 kg/year (94 kg/ha)
Phosphorus	-	61 kg/year (4.5 kg/ha)

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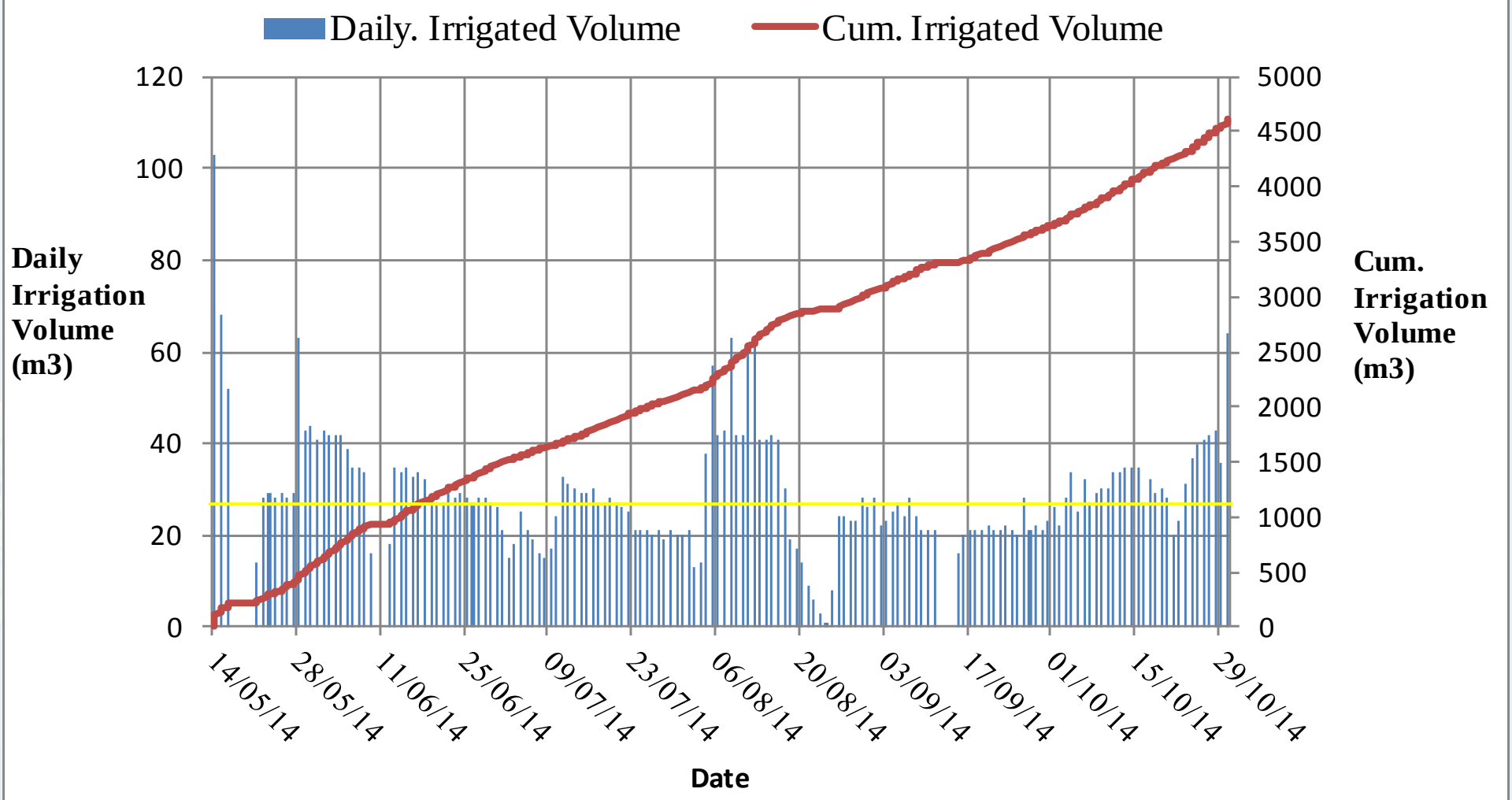
Clontibret Flow Data



Irrigated	-	4,687 m^3	
Discharged	-	66 m^3 (1.4%)	
Nitrogen	-	401 kg/year	(57 kg/ha)
Phosphorus	-	57 kg/year	(8 kg/ha)

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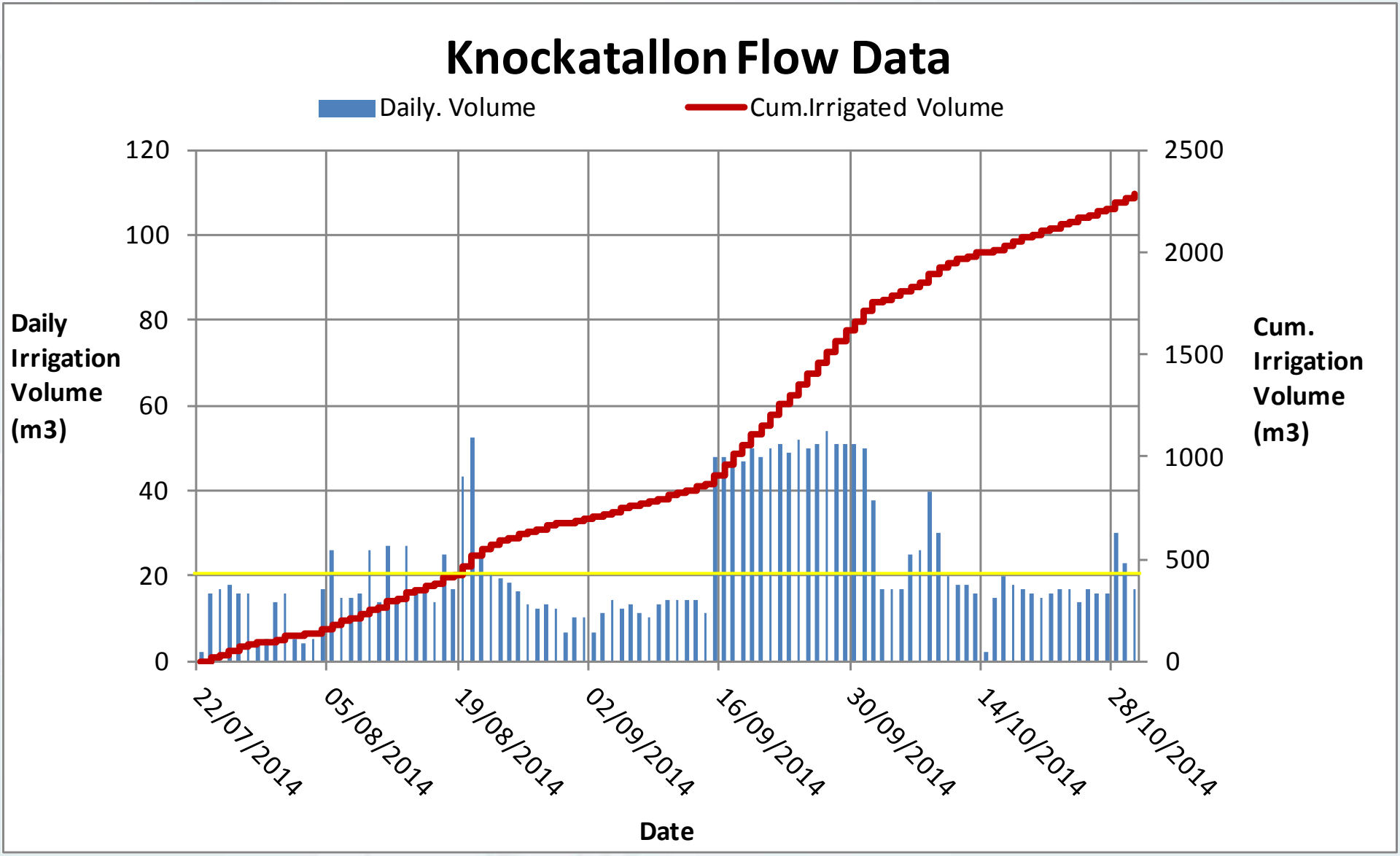

Irrigated	-	2,282 m^3
Discharged	-	173 m^3 (7.5%)
Nitrogen	-	177 kg/year (35 kg/ha)
Phosphorus	-	35 kg/year (7 kg/ha)

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Regulation

- NI - (DOE) consent to the discharges of waste water to the environment in accordance with the Water (*Northern Ireland*) Order 1999

- RoI Equivalent

- Subject to many conditions inc. Compliance with
  - Quality Conditions of Waterway
  - Conditions of Discharge
  - Conditions for Application
  - General Conditions' and a 'Self Monitoring Regime

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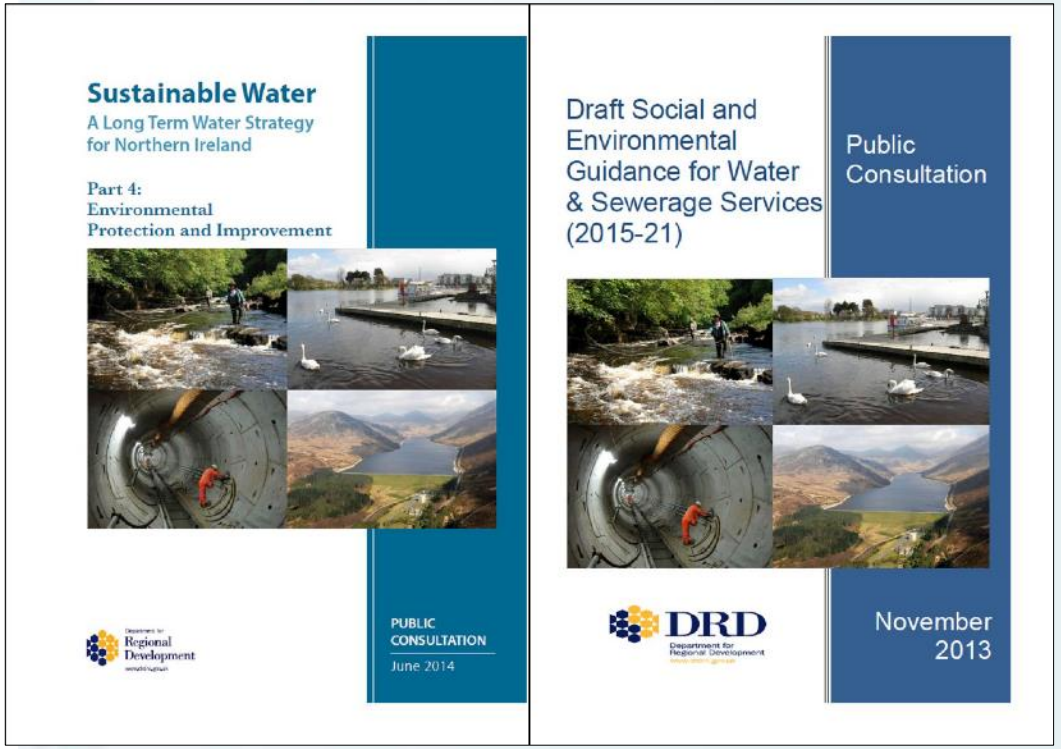
Informing policy!

"Should …

- NI Water incorporate more sustainable treatment technologies to help manage future operating costs?"
- We adopt a more sustainable approach to environmental regulation
  - reduce administrative burdens
  - promote 'low energy' protection of our inland and coastal waters?"



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Potential to manage landfill leachate

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Landfill Leachate

1. Ballynacarrick Landfill site (12 Lysimeters irrigated under 4 irrigation regimes)



2. Churchtown Landfill site (EPA required the council to take action.)

- Uniquely constructed and within the site footprint.
- In conjunction with an ICW.
- Cap engineered and planted with 3 ha SRC Willow.
- Irrigation commencing Spring 2015

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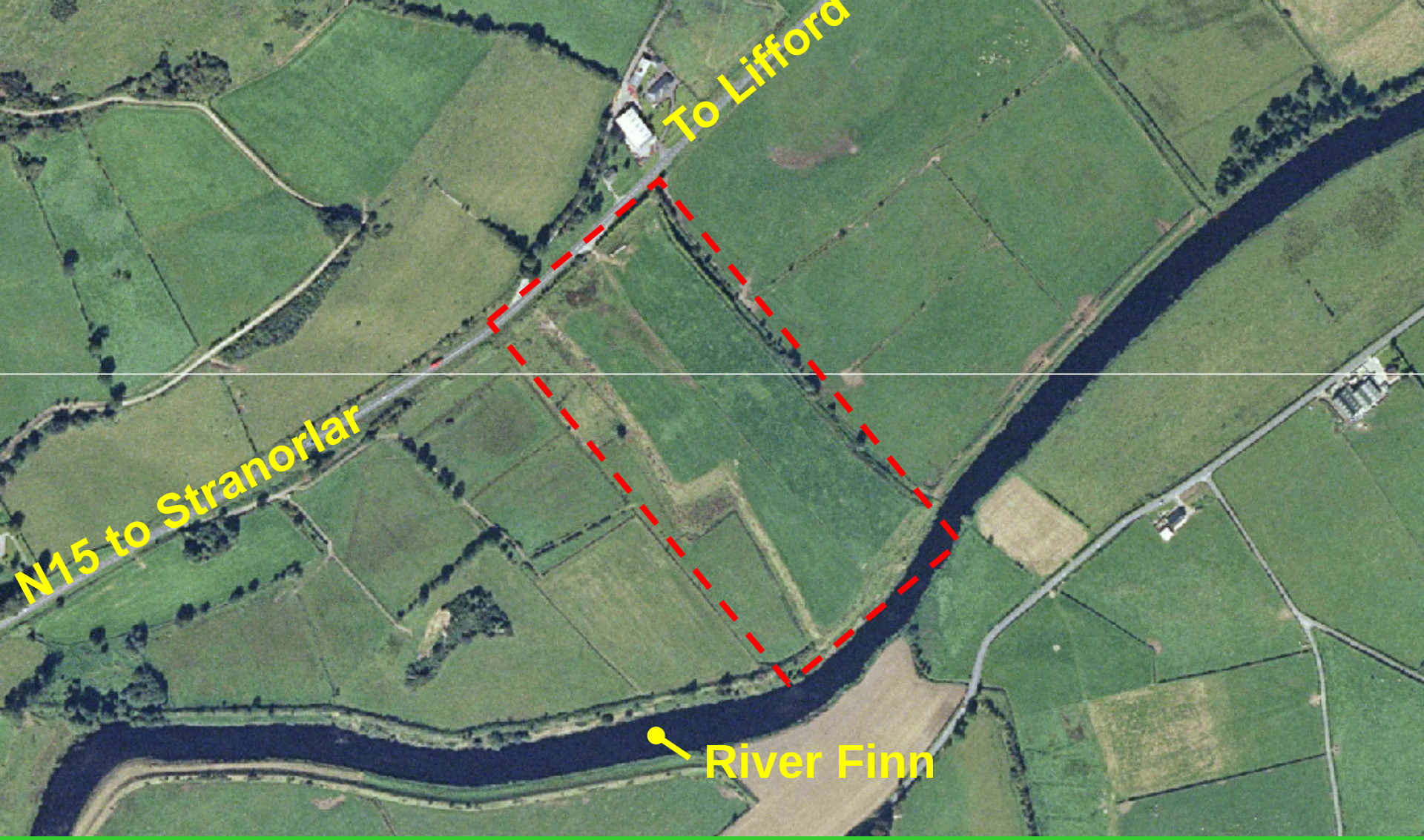
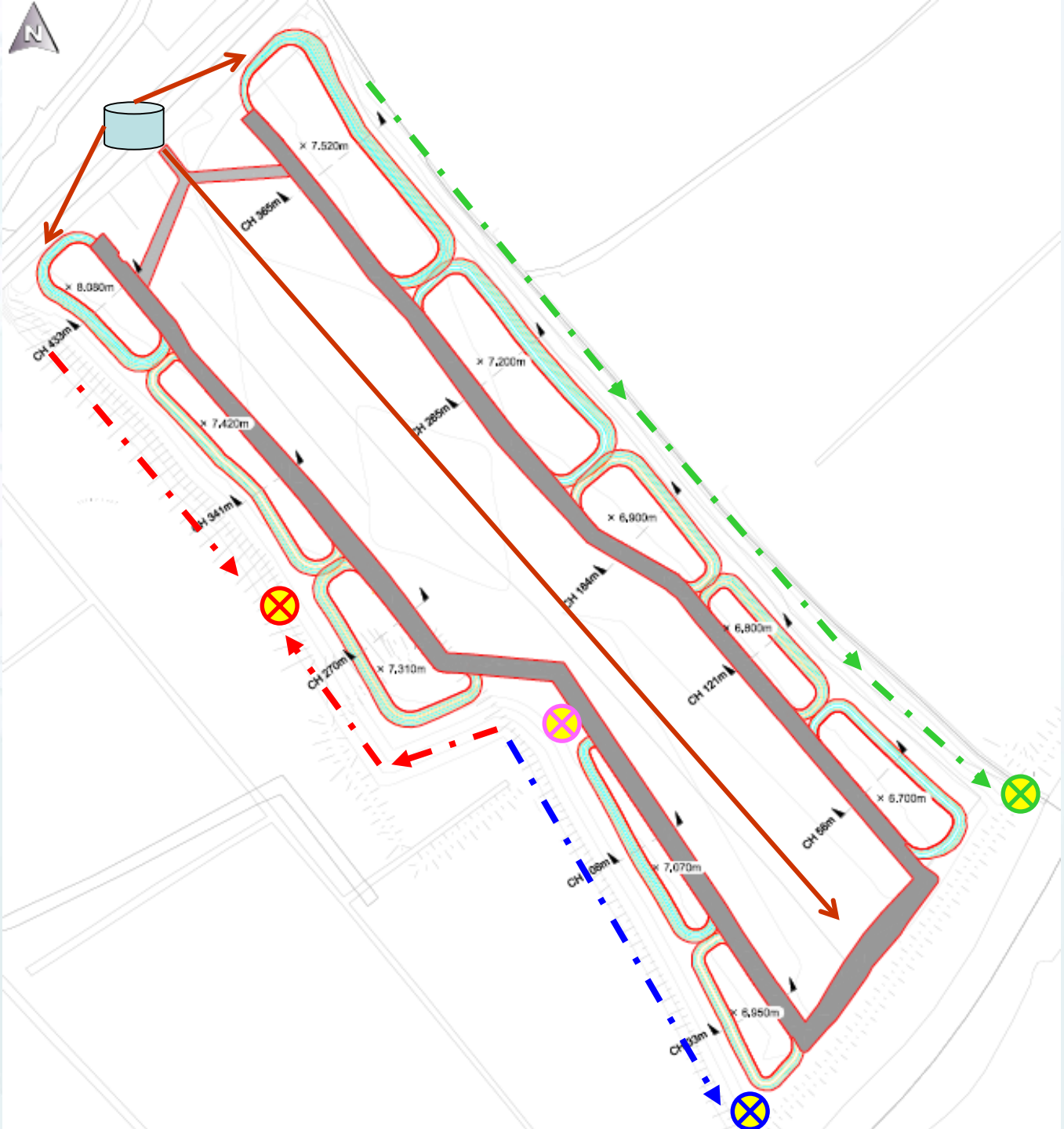


Churchtown Landfill, Lifford– situated between N15 Road and River Finn

Lifford Landfill - 3rd October 2014



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Conclusion

- Benefits for many government departments
  - Environmental benefits / Compliance
  - Agriculture / Land diversification
  - Waste water infrastructure / Compliance
  - Reduced energy costs
  - Renewable energy targets / Security
  - *Sustainable systems*

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