Moneymore & Coagh WwTWs

re-use and upgrade of existing assets for a 2017 interim design horizon

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Moneymore is located in County Londonderry, close to Lough Neagh, and Coagh village is located on the border between Counties Tyrone and Londonderry. The Moneymore WwTW was constructed in the 1970s south of the town centre; Coagh WwTW was first commissioned in the late 1950s/early '60s at the northern boundary of the village between farming land and the Ballinderry River. Both plants struggled to cope with existing and projected flows. One of Northern Ireland Water's (NIW) project objectives was to re-use the existing assets where possible, whilst still providing effective and reliable treatment. This article describes the process of identifying a solution to the issues facing existing assets, and design development for these two sites in Northern Ireland.

Moneymore WwTW- Rotating Biological Contractors *Courtesy of MWH*

Initial investigations

Investigations carried out prior to solution development included a flow/load study, condition assessment and process capacity assessment. The project drivers for the 2 sites were:

- The existing process is under capacity to treat current and future population.
- New Registered Discharge Standard (RDS).
- Urban Wastewater Treatment Directive.
- Freshwater Fish Directive.
- Northern Ireland Water Strategic Aims and Objectives.
- Current Health, Safety and Environmental Standards.

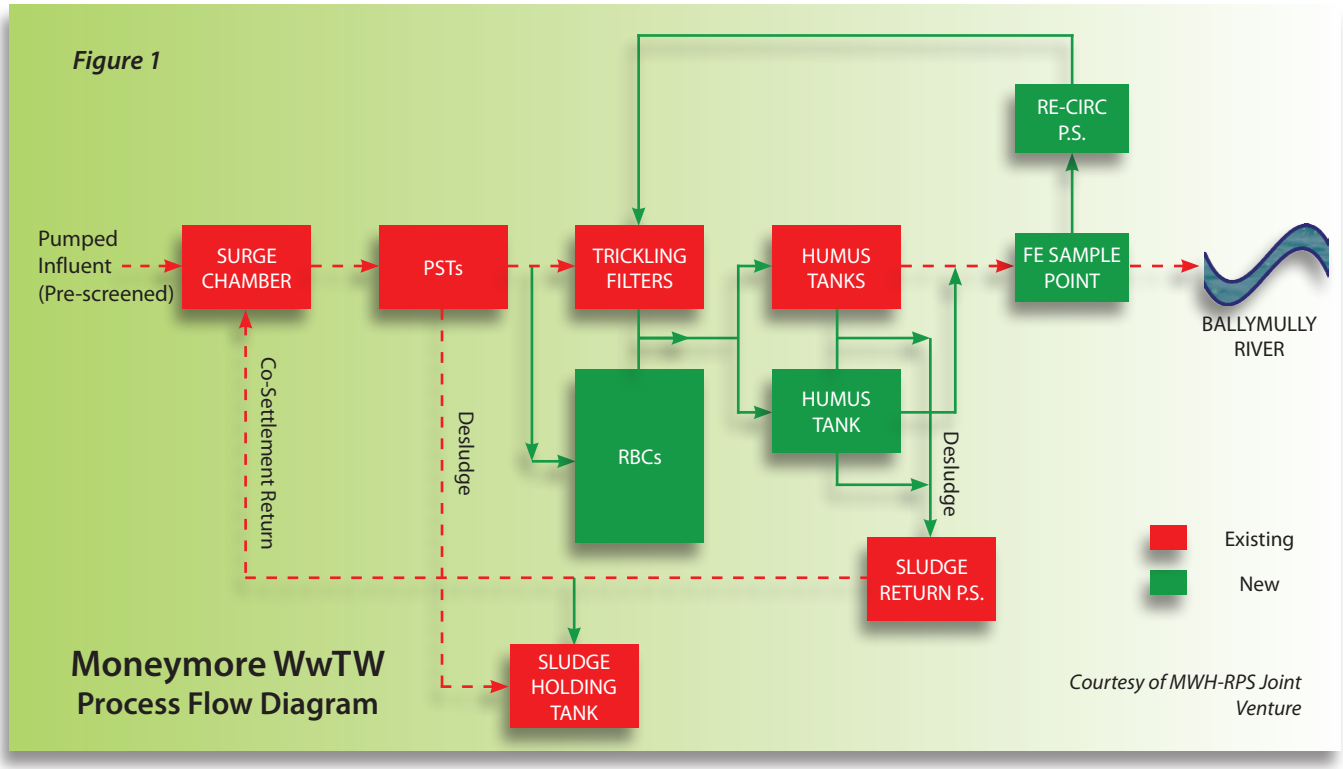
Project team

The team appointed to deliver both the Moneymore & Coagh WwTW projects consisted of an MWH-RPS Joint Venture and the Shearwater Consortium, which combines the services of Enpure Ltd (Process & MEICA), GEDA Construction (Civil Construction) and Atkins (Civil Design). The MWH-RPS JV provided both Project and Technical Management services on behalf of Northern Ireland Water, whilst the Shearwater Consortium provided detailed design, construction and commissioning.

MONEYMORE WwTW

Design Horizon (Year)	2006	2017	2030
Population Equivalent (PE)	2380	2810	3309
Flow to Full Treatment	13l/s	16l/s	19l/s
Registered Discharge Standard (BOD:SS:NH4)	25:40	25:45:4	25:45:4

The catchment flows, mainly domestic raw sewage, gravitate to a pumping station, which provides screening (6mm 2D) and storm storage. The flow to full treatment (FFT) flows are then pumped



400m to the main Wastewater Treatment Works for primary and secondary treatment. Primary treatment is achieved by settlement and secondary treatment is performed by combination of percolating filter and humus settlement. Final Effluent is discharged by gravity along a 300m outlet pipe to the Ballymully River.

Identification of solution (see Figure 1 above)

Investigations revealed that the existing Primary Settlement Tanks (PSTs) were only suitable for 2017 horizon flows at FFT. A study of the percolating filter revealed that the theoretical BOD loadings (2017) would equate to three times the allowable limit for that filter. In addition to this, the filter's minimum wetting rate was not achievable. The existing humus tank was only capable of treating approximately 40% of FFT (2017 design horizon). As a result of these findings the following design brief was developed:

- Design horizon to be set at an interim of 2017.
- Provision of a secondary treatment side stream process to reinforce the existing treatment regime.
- Rotating Biological Contactors (RBCs) to provide biological treatment.
- Include provisions for future upgrades to suit the 2030 design horizon flows/loads.
- Integration of existing and new process streams to provide operation flexibility.
- Provision of an effluent recirculation pumping station to wet percolating filter.
- Provision of a FFT measurement.
- Provision of auto desludging for PSTs and humus tanks.


Moneymore WwTW- New Humus Tank Courtesy of MWH

The specification was written by the MWH-RPS joint venture, who subsequently issued an Invitation to Tender (ITT) to the Integrated Wastewater Framework (IWWF) Contractors.

Challenges and risk mitigation

The most notable design risk was the potential for surcharging the existing treatment stream after the new side steam had been connected. During design development reviews, numerous risks were removed or mitigated; the more significant being:

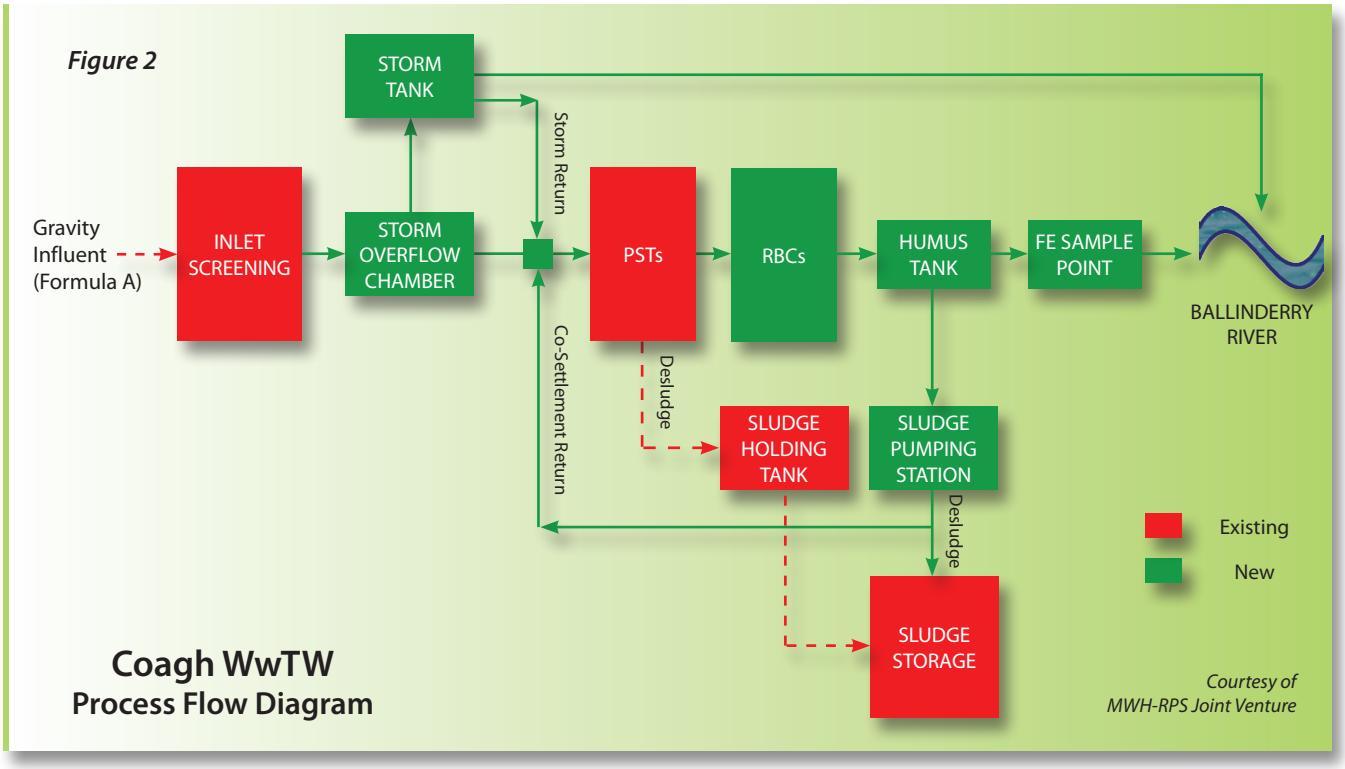
- Risks of flooding the existing works (through interconnection of new side stream) were mitigated by conducting extensive site investigations and providing increased safety margins in hydraulic calculations.
- Relocation of the transformer pole to remove the risk to crane operators from overhead power cables.
- The height of the RBCs was lowered to reduce Health and Safety risks to Operation and Maintenance personnel.
- Provision of a 3-way sludge return valve to divert sludge to the holding tank (instead of to the works inlet) during periods of high loading or high sludge production.

Operational benefits to Northern Ireland Water

In addition to meeting the driver objectives set at the start of the project, operations staff at NI Water have benefitted from additional improvements. These include a significant reduction in manpower due to automation of both new and existing processes, and the provision of telemetry to monitor the site remotely. Additionally, there is now the provision of process redundancy should operators need to take a unit offline for maintenance (i.e. humus tank or RBC).

COAGH WwTW

Flows from the catchment area gravitate towards the WwTW. Two pumping stations are provided within the network, whilst a combined storm overflow (CSO) is provided upstream of the site boundary to spill flows greater than Formula A to the Ballinderry River. Flows of domestic raw sewage (up to Formula A) gravitate into the works and are screened to 6mm 2D. Following screening,



the flows are settled in primary tanks, before receiving biological treatment and finally humus settlement. Final effluent from the treatment works discharges to the adjacent Ballinderry River. The works also comprises sludge storage tanks and sludge drying beds which act as emergency sludge storage.

Design Horizon (Year)	2006	2017	2030
Population Equivalent (PE)	2380	2810	3309
Flow to Full Treatment	13l/s	16l/s	19l/s
Formula A	20l/s	21l/s	23l/s
Registered Discharge Standard (BOD:SS)	60:75	60:40	60:40

Identification of solution (see Figure 2 above)

Investigations revealed that the existing PSTs were only suitable for 2017 horizon flows at FFT. The existing inlet screens, sludge storage tank and sludge pumping station had sufficient capacity for 2017 and 2030 design horizon flows.

A study of the percolating filter revealed that the theoretical BOD loadings (2017) would equate to three times the allowable limit for that filter. In addition, the filter minimum wetting rate was not achievable. The existing humus tank was only capable of treating approximately 30% of FFT (2017 design horizon).

As a result of these findings, the following design brief was developed by the MWH-RPS JV, who subsequently issued an Invitation to Tender to the IWWF Contractors:

- Design horizon to be set at an interim of 2017.
- Limit flow to FFT and spill excess to river.
- Provide storm storage capacity sized for 2 hours at 3DWF.
- Retain the existing inlet works, sludge storage tanks and sludge return pumping station.
- Demolish existing filter and replace with duty/duty Rotating Biological Contactors.
- Include provisions for future upgrades to suit 2030 design horizon flows/loads.
- Provide FFT measurement.
- Provision of auto desludging for PSTs and humus tanks.

Challenges and risk mitigation

Coagh WwTW presented a number of notable challenges. The site footprint is small, leading to construction and commissioning problems. The lower portion is prone to flooding (the site lies within a 1:100 year flood plain) and is overgrown with giant hogweed and Himalayan Balsam.

Detailed design revealed that the new humus tank had insufficient hydraulic head to allow gravity desludging, and with the introduction of auto desludge valves for the PST, there was now an increased risk of site flooding to the downstream sludge pumping station (should the valve fail to close).

To overcome these challenges, during design development reviews, risks were removed or mitigated, with the more significant being:

- Coping levels of the new assets were set above the 1:100yr flood level.
- Construction was split into two phases to ensure works compliance whilst demolishing the existing filter and humus tank.
- A humus sludge pumping station was provided as gravitational de-sludging was not feasible.
- Coping levels of the existing sludge pumping station wet well was increased to equal that of the PST, preventing site flooding should the new auto-desludge valves fail to close.


Coagh WwTW - Humus and storm tanks Courtesy of MWH

Coagh WwTW- Rotating Biological Contractors *Courtesy of MWH*

Operational benefits to Northern Ireland Water

Additional benefits include a significant reduction in manpower due to automation and the provision of telemetry to monitor the site remotely. Additionally, the introduction of an automatic co-settlement routine reduces the volume of sludge sent to the sludge storage tanks.

Conclusion

Both the Moneymore and Coagh WwTWs were successfully commissioned and handed over to NIW in October 2010 and both are built to meet the design horizon requirements of 2017.

Additionally at Moneymore the new side stream has been hydraulically designed to handle 2030 flows and provisions have been made so that a fourth RBC can be added at a later date. The RBCs (supplied by Ovivo Water Technologies) were some of the largest of their kind in Northern Ireland, each with a diameter of 4.5m. At Coagh, the new assets have been hydraulically designed to handle 2030 flows, and provisions have been made so that a third RBC can be added at a later date.

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