CASE STUDY

Sleaford

Anglian Water

Project
Sleaford WRC

Location
Sleaford, Lincolnshire

Project Type
Re-engineering and installation of ARMStorm™ system

Wastewater Type
Stormwater

Treatment Process
ARMStorm™ Saturated Vertical Flow (SVF) treatment wetland with Forced Bed Aeration (FBA™)

Need

Combined Sewer Overflows (CSO's) and stormwater discharges are becoming an increasing source of surface water pollution, currently being recognised as one of the most significant contributors of receiving watercourses failing to achieve a good ecological water quality status. Increased awareness and monitoring indicates that the frequency and volume of spill events is rising due to: catchment pressures, increasing population growth and global climate change resulting in increased storm intensity and frequency. This places additional pressure on ageing sewage conveyance systems and infrastructure, which along with an historical lack of investment results in increased surface and groundwater infiltration and subsequent burden on end of pipe centralised sewage treatment capacities.

Sleaford WwTW is owned and operated by Anglian Water and treats wastewater within a process flow path including a screen, primary settlement tank, secondary trickling filters and tertiary nitrifying sand filters. The sites hydraulic capacity was 119l/s however this needed to be increased to 160l/s to satisfy regulatory requirements, meet the demands of increasing catchment growth, and prevent stormwater flows from discharging to the environment without treatment. Three existing passive Horizontal Subsurface Flow (HSSF) reed beds were operating as stormwater treatment beds, however they did not have sufficient capacity to treat the additional flow and load requirements and to achieve the 95$^{th\%}$ile final effluent permit limits of 20mg/l TSS, 10mg/l BOD_5 and 3mg/l NH_4.



The ***ARMStorm™*** *system during construction and initiation of flows post commissioning.*

natural wastewater treatment

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CASE STUDY continued

Sleaford



The ***ARMStorm™*** *system following planting.*

Solution

To treat the additional flow and load, Anglian Water favoured a Nature Based Solution (NBS) that utilised the existing area occupied by the passive HSSF stormwater treatment beds. The formations were re-engineered to increase the bund elevations allowing the media depth, volumetric storage capacity and treatment capacity to be increased. The process and configuration were upgraded to three Saturated Vertical Flow (SVF) **ARMStorm™** cells of 0.84ha in total, complete with a Forced Bed Aeration (FBA™).

Screened crude flows >119l/s are conveyed to a new primary settlement tank and splitter chamber before discharging via gravity to the **ARMStorm™** cells for treatment.

The system is hydraulically sized to treat 40 l/s plus 15 l/s to take the strain off the existing processes, totalling a maximum instantaneous spill volume of 55 l/s. The system also has the capacity to receive emergency flows from the main treatment processes for a period four hours in the event of a power failure, providing resilience and time for the operator to reinstate power or establish a backup supply.

Benefits

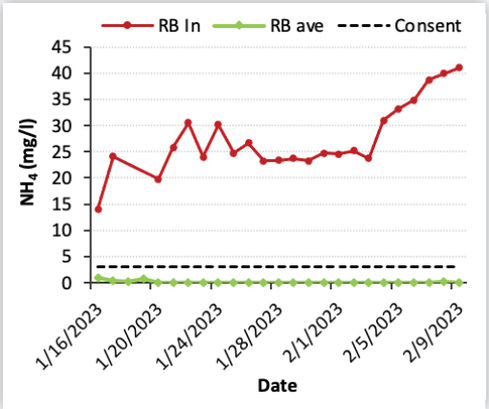
The **ARMStorm™** solution is an innovative development of Saturated Vertical Flow (SVF) aerated wetland technology incorporating the use of surface freeboard storage and optimisation of the aeration operation to allow management of large stormwater volumes. The technology is designed to produce water quality of the highest standards to achieve the most stringent regulatory permit limits and environmental quality standards (EQS) at the same time delivering multiple co-benefits:

- **Protect the environment** – through enhanced water treatment
- **Create environment and biodiversity** – through simulating a natural wetland ecosystem
- **Amenity value** – excellent aesthetics that can be integrated into the surrounding landscape
- **Sustainable alternative** – principally natural materials and ecosystem based processes
- **High Natural Capital Value** – significantly higher than mechanical treatment alternatives
- **Few mechanical moving parts** – can operate by gravity
- **Low lifetime costs (TOTEX)** – due to low maintenance and power requirements
- **Robust operation** – because there are few or no moving parts
- **Sludge and shock load management** – due to high working volume

Summary of average concentrations and removal efficiencies during an independent 28-day post commissioning survey

PARAMETER	INLET (MG/L)	[a] OUTLET (MG/L)	REMOVAL (%)
BOD_5	100	2.5	97.5
NH_4	27.4	0.2	99.4
TSS	85.2	4.8	94.4

[a] average of the three ARMStorm™ beds



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