1.0 Introduction & Background

This note has been produced in order to provide an overview of a greywater recycling system for the PBSA Student Accommodation for Jamestown Road.

The PBSA element of the build is multi-story building with basement level. The PBSA consists of 155No students' units each with an en-suite toilet.

The integration of a greywater recycling system in buildings such as the PBSA at James Town Rd, can help reduce water consumption aligning with development sustainability strategies, however, in some instances the installation of these systems is not technically, practically or commercially viable.

This note seeks to carry out a high-level assessment of the viability of installing Grey Water Recycling system for the PBSA.

2.0 Grey Water Recycling

2.1 General Overview

Grey Water recycling systems are used to collect, store and distribute greywater from sanitaryware such as showers and wash hand basins and re-use this water for non-potable purposes, such as irrigation, toilet flushing, and in some cases, clothes washing.

Typically, a three-stage treatment approach is adopted for greywater recycling systems. Dedicated greywater drainage pipework is provided which would be directed through a coarse filter to remove large dirt particles (hair etc.) before entering a dedicated pre-treatment storage tank. The filtered water would then be passed to an aerobic treatment buffer tank where it is aerated.

Finally, the water would be taken through a membrane filter and into a clear water storage tank. The treated greywater would then be pumped to suitable appliances. In most instances, greywater recycling plant is located above ground due to the extent of equipment which requires maintenance access.

For greywater recycling systems, grey water drainage (wastewater from baths, showers etc,) must be separated from black water drainage (wastewater from WCs); similarly, a potable and non-potable water distribution network must be provided. This inherently doubles the costs and spatial requirements associated with the public health services installation.

The Grey Water Recycling System must comply with British Standard BS EN 16941-2.

The table below summarises the key considerations for greywater recycling at the Jamestown Road project:

Advantages	Disadvantages
▪ Could offset a percentage of total non-potable water use across the site.	▪ Large plant area and relatively extensive treatment system required. ▪ Additional infrastructure and independent local water-services distribution systems would be required to separate potable and non-potable systems. ▪ The system would require on-going maintenance and management. ▪ Potential risks associated with crossed drainage connections in the future would need to be carefully monitored and managed.

Table 2.1 - Key Considerations for Greywater Recycling

2.2 Grey Water Recycling System Calculation

Based on the calculation methodology outlined in BS EN 16941-2, the below estimates the non-potable demand and grey water yield available at St James within the PBSA.

Assumptions:

- WC eff. Flush volume: 4.5 litres (6/4 litres)
- WC usage: 4 times / person / day
- Shower flow rate: 6 litres / minute
- Shower usage: 1 time / person / day for 5 minutes
- WHB flow rate: 5 litres / minute
- WHB usage: 4 times / person / day for 10 seconds
- Occupancy: 1 person per studio

WC Demand:

- 155 x 4 x 4.5 litres / day = 2,790 litres / day

Grey Water Yield:

- Showers: 155 x 30 litres / day = 4,650 litres / day
- WHBs: 155 x 3.33 litres / day = 516 litres / day
- Total: 5,166 litres per day

As per above calculation grey water yield is larger than the non-potable demand.

2.3 Plant Space Requirements

Based on the system calculations the minimum plantroom footprint will be 35m2 considering dimensions as 8.5mx4.2mx3.5m (LxWxH). For the PBSA most of the plantrooms are based within the basement. With the limitation of the available site size and space available with the basement level introducing another plantroom for the grey wate recycling system would be difficult to accommodate.

2.4 Practical Considerations

The inherent requirement for duplicate water services distribution and drainage systems, when considering the inclusion of a grey-water system would provide an additional spatial constraint for both horizontal and vertical services distribution.

Introducing non-potable distribution and grey water pipework would also require careful coordination with the pre-manufactured pod bathroom solution proposed.

Further the inclusion of separate non-potable water services distribution would increase the risk of poor water turnover within the potable system; this would need to be carefully managed at site level and could require additional flushing to void units in order to manage water quality once he building is fully operational.

2.5 Costs and Savings

Cost of the water treatment plantroom would be estimated at £45k for the equipment, however this does not include the additional booster pump set, dual drainage pipework system and distribution pipework to WCs as well as system maintenance and repairs.

However, assuming the operational days to be 360, the system could save 360 x 2,790 litres / day = ~1,004m3 per year.

The cost for water in London (Thames Water) are roughly £3/m³ (2024 charges - it costs £1.9145 per m³ for clean water and £1.1537 per m³ for wastewater - source:

https://www.thameswater.co.uk/help/account-and-billing/understand-your-bill/metered-customers.

The water cost savings based on the above would be approximately £3000 per year.

Over a ten-year period, the expected savings could be in the region of £30,120; the payback period is therefore estimated to be in the region of 15-years purely based on primary plant capex. However, the payback period would be considerably higher than this when considering the additional cost requirement for duplicate distribution, & drainage systems as well as on-going maintenance over the life of the system.

There could be potential support from Thames Water with around £2,500 per unit when applying Grey Water Recycling system.

3.0 Discussion & Conclusion

Considering the high expected payback period, spatial limitations across the site and potential risks associated with management of water quality (in potable systems), greywater recycling systems have been discounted for the proposed development. The key limitations have been listed below:

- **Space Limitations:** system requires significant space for storage tanks and filtration units, which is a challenge to accommodate in the proposed site. Using greywater would require additional pipework to run through the building which has proven difficult to coordinate in the proposed buildings as space for accommodation has been given priority.
- **Maintenance Requirements:** Regular maintenance is essential to ensure the systems operate efficiently and safely. In urban areas, access for maintenance can be difficult and costly.
- **Water Quality Concerns:** Greywater contains contaminants that require thorough treatment before reuse.
- The benefits of these systems are reduced given the urban location of the proposed development, additionally given the location and site footprint.

Considering the factors above, alternative water-saving measures have been recommended as a more practical and cost-effective solution to achieve low water demand in the proposed development. These are detailed in the energy strategy.