**WATER SUSTAINABILITY AT WMT (WIMBORNE MODEL TOWN & GARDENS)**

**(reducing dependance on Mains Water)**

Summary

WMT is embarking on an ambitious multi-phase programme to reduce the dependance of the Model Town and Gardens on mains water. Previously mains water was exclusively used to supply the model river system and for plant irrigation.

The programme is intended to have environmental benefits through its approach to sustainable water use and provide an educational platform, on a number of levels, to inform our visitors on topics like: the eco-system created; the technology utilised; the sustainability benefits; cost savings; and so forth.

It has been decided to undertake the programme in phases so as to cause minimal disruption to WMT as a visitor attraction and to align the affordability of our overall goal to the budgetary constraints of the charitable trust that runs it

How Things Were

Mains water was used exclusively to fill the river system as the start of each season and to top it up when its water level dropped below that necessary to maintain a minimum water flow.

The river system itself suffered from a number of problems:

1. Water flow was low.
2. There was no water filtration
3. There was excessive algae growth
4. Water quality was poor
5. Water was lost due to numerous leaks
6. Maintaining correct water levels needed excessive manual intervention
7. Any excess water, from rainfall, was lost when the rivers capacity was exceeded.

While some attempt was made to harvest some rainwater from building roofs, which was fed into the river system in an uncontrolled way, any rainwater beyond the rivers capacity to hold it was lost as overflow into soak-aways.

A water butt was utilised in the plant potting area, but for general irrigation there was no alternative but to use hoses connected to mains water. The number and location of mains water taps was also an issue for the gardeners.

The Proposals

Phase 1

The river system is an important part of the model town attraction, both as a scale representation of Wimborne’s River Allen and as a natural habitat for our frogs, toads and newts plus numerous insect species. Therefore it was decided that this should be the starting point for our programme.

The issues identified above were analysed and proposals put forward to address them.

1.1 The river system was surveyed and all visible cracks and holes identified. These were then filled with appropriate caulking material. It has been recognised that cracks will inevitably re-occur due to the natural movement of the soil so ongoing, periodic, inspection and remedial action will be required into the future.

1.2 An existing dam in the river was removed to address an imbalance in the flow between the two arms of the system. The original intent behind the need for and positioning of the dam has been lost but it was clear that it was negatively impacting water flow rates.

1.3 The low water flow was looked at and its cause put down to an excessively convoluted plumbing solution and the use of a pump that was meant for flood clearance and not continuous operation. It was decided to rationalise the plumbing solution, re-using existing hardware as and where appropriate and to minimise the number of joints and sharp bends. A new pump was purchased; the new pump being of variable speed so allowing the volume of water pumped to be varied. It is rated for continuous operation and its peak electrical power consumption is lower than that of the old pump.

This first phase will deliver improved water flow rates and in so doing discourage the growth of algae, which thrives in slow moving and stagnant water. As a side benefit the reliability of the system will be improved and electricity consumption reduced.

This phase addressed issues A, E and partly C identified above.

Cost of Phase 1 – Pump £180

Plumbing £170

Sealant £63

Phase 1 Total £413

Phase 2

The second phase of our programme is to address the water quality issue. The existing river system does not have any filtration built into it so the same water was constantly re-circulated, along with any debris small enough to pass through the pump (the old flood pump could move particles up to 20mm in diameter). Leaves and other debris naturally fall in to the river are carried into the sump, where it rots down leading, over time, to the water becoming nutrient rich and an ideal place for algae to grow.

Various solutions were considered, including treating the water chemically. This was rejected as our aim is to preserve and encourage a health ecosystem not produce a sterile waterway.

The adopted solution is in three parts:

2.1 A filter cage at the inlet of the pump to prevent larger debris from getting into the pump impeller.

2.2 A natural water filtration system in the form of a bog garden that would mechanically and biologically condition the water passing through it.

Mechanical filtration - The debris in the water flowing into the bog garden is trapped by a gravel bed and clean water flows out.

Biological filtration - The debris in the water comes from leaves, vegetable matter, and from resident and visiting wildlife. Bog plants together with tiny organisms and insects that co-exist with them feed and digest the debris residue cleaning the water at the same time.

The bog garden will also create a new eco-system within WMT, with the opportunity to grow plant varieties that were not present before, and also provide our frogs and newts with an ideal living environment.

2.3 A pre-sump filter to sift out the larger debris from the river, before it reaches the pump.

This phase addresses issues B, C and D identified above.

Cost of Phase 2 – Filter cages (pre) £102

Gravel £160

Sleepers £108

Underlay £ 76

Pond liner £209

Stainless chutes £103

Pipework, valves, etc £100

Planting and soil £238

Phase 2 Total £1,096

Phase 3

The third phase of the programme will address the management of water flows and levels and the storage and retention on any excess water (from rainfall).

It is proposed to locate water butts in an under-utilised space, close to the river system’s sump and to pump any excess water from the sump to the butts for storage. When required the stored water can be returned to the sump to make up for any shortfall. It is envisaged that the head of water in the butts should be sufficient to allow the water to return to the sump without needing to be pumped.

3.1 Install piping between sump and butts

3.2 Install water butts. It is currently planned to use 5 off 210 litre re-cycled food grade containers (ex-olive shipping containers) as the primary water storage reservoir.

3.3 Utilise the pump that originally worked the river system to move water from the sump to the water butts and a simple tap to control the flow back.

This phase addresses issue G identified above and provides the basis for addressing issue F.

Cost of Phase 3 - Pump £0

Butts x 5 £50

Piping / tap £25

Concrete blocks x 10 £15

Phase 3 Total £90

Phase 4

This phase will address the automation of the control of the river system flow, the level of water in the sump and the water transfer to and from the primary storage reservoir.

The intention is to provide programmable fully automated control for all aspects of the river system; the ability to manually override, under computer supervision, via GUI (Graphical User Interface) any control; and as a final fall back to manually manage the system.

4.1 Capture requirement

4.2 Develop high level design

4.3 Develop solution, etc.

4.4 Provide educational displays plus TV

This phase addresses issue F identified above.

Cost of Phase 4 - Computer system (including Phases 5 & 6) £100

Valves, sensors, measuring, etc. £300

Education - displays £300

TV (free) £ 0

Phase 4 Total £700

Phase 5

This is to provide water, held in the water butts, for use by gardeners to irrigate plants. This will be by controlled release of water into soaker hoses in the vicinity of the water butts.

Cost of Phase 5 - Flexible hose pipe £0

Soaker hoses x 2 £40

Control £50

Phase 5 Total £90

Phase 6

The purpose is to increase the amount of water harvested from WMT building roofs by locating water butts at convenient and appropriate locations, routing water through downpipes into them.

The best places where irrigation points should be located will be agreed with gardeners.

The water butts and irrigation points will be connected.

The automated control system to manage and balance harvested water availability across the site will be extended.

Cost of Phase 6 - Butts x 20 £200

Downpipes £50

Piping / valves £200

Control £50

Paving slabs & blocks £100

Phase 6 Total £600

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