

## The Borehole Project – Haddenham Allotment's journey to provide their watering needs using solar power

About five years ago, we first started getting concerned about the use of water on our Parish Council allotments in Haddenham, Bucks. We have quite a big site of 11.5 acres with 10 water troughs dispersed around the site. The troughs were supplied with mains water by underground pipes. The bills for mains water were going up and this cost had to be split between the Parish Council and a levy on plot holders. Moreover it seemed wasteful to use treated water for watering plants. It seemed to make more sense if water could be found underground to use it.

After all, allotments near the river in Oxford use shallow wells to supply water and wells were common in our area in years gone by. A book written by local craftsman Walter Rose indicates that these wells were typically 15 to 20 feet deep.

There's no electricity supply on our site, but why couldn't we use hand pumps or a wind pump to raise the water?

We were told that there wasn't enough wind to operate a wind pump and we would need a lot of hand pumps in order to meet demand. So we started investigating the possibility of having a solar powered pump to raise water from a borehole drilled on site. Solar power is ideally matched to irrigation; the peak demand for water comes in the summer months when the power available from solar panels is at its highest. So this is the way we went.

The project was full of surprises. For starters, we could not find specific information about any other allotments that had done this. Solar-powered pumps are used in many hot countries, but we couldn't find anyone who could offer experience here in the UK. There were people who could drill boreholes; there were people who sold solar panels and pumps, but no-one could tell us how to design it or how to put it all together.

First things first, we needed to find out if there was a reasonable prospect of finding water on our site. In June 2013 we obtained a grant from a Local Area Forum to have a bespoke report done by British Geological Survey. This told us that there was a high likelihood of finding water and we would need to drill a borehole to a depth of 16-19 metres to exploit the full saturated thickness of the aquifer.

We didn't have a blueprint but we did have an incentive. As a result of a plot holders meeting we soon had a volunteer project manager too— hooray!

Then there was the cost. Initially the estimates we had been able to obtain were in the region of £16,000. Whether this would meet our needs and where the money would come from was less clear. We started on a rather long merry-go-round of getting quotes for the various items (drilling, pump, solar panels etc.), applying for grants on the basis of these, not getting the grants before the quotes ran out, and then starting again.

Amongst allotment plot holders we managed to raise a significant sum of money ourselves. Whilst our venture was not without its inquisitors, there was sufficient support to raise money from voluntary contributions, a fund raising BBQ and quizzes. But it wasn't enough.

Then we had two great strokes of luck. Firstly, among the allotment holders there was a hydraulic engineer who could fill in the gaps in our knowledge and, secondly, with increased confidence that the project would succeed, and after an additional donation from a local business, Haddenham Parish Council agreed to put up funding for the balance. Savings from the water bills would now be paying them back and the project could now go ahead.

Our project manager and technical expert busied themselves with the 'how to's, the 'where from's and 'how long's. The results showed that it should be possible to implement the project between the end of the summer watering season and the beginning of the growing season the following spring. And forecast costs were lower than our original estimates, albeit incorporating an amount of DIY along the way.

It was clear that the tasks involved would be too much for two individuals. A group of volunteers was needed and a plea went out for any plot holders who could offer their time or experience for an hour or two a week. An ad-hoc working group emerged with varying experience ranging from cardiology to health and safety. The old adage that many hands make light work was proved again but with added benefits of maintaining morale and momentum. There seemed an awful lot to do.

By the way, am I making this sound too easy? Let's look at what actually happened, because life has a habit of tripping you up, especially if you are finding your way in new territory!

1. Borehole drilling by a specialist contractor. What we had not anticipated was the amount of liquid clay that would be displaced during the drilling and this inundated one poor plot holder's allotment. It was a hard and sticky job for our volunteers to rectify the situation.
2. Digging trenches and manholes. Fortunately our drilling contractor had machinery that was able to dig out and install the chambers to access the borehole and join new pipes to the existing network. This would have been an immense task if we had had to do it by hand.
3. Installation of a cabin to house the pump control box and support the solar panel array. This cabin served several roles; as a secure store during construction, as protection for the electrical controls and shut-off valves and as an elevated location for a header tank. The cabin was second-hand but very solidly built from steel. It arrived on a hefty lorry fitted with a crane. Unfortunately the lorry was unable to negotiate through the gateway and had to crane the cabin over the hedge (and under the telephone wires) It was now far from its intended location and a worrying few weeks were spent trying to figure out how to move it.

Then one contact led to a solution. A local farmer had a tractor big enough to lift it and transport it onto its intended foundations.

4. A lot of things had to be lifted onto the roof of the cabin – strengthening beams, header tanks, solar panel support frame and solar panels. This is where the many hands, many steps and many planks of wood came in handy. Being out of reach made it a safe haven

for wires and valves that might otherwise have been a temptation to be tampered with. When finished the entire roof space was jam packed.

5. Plumbing using MDPE plastic fittings does not require specialist skills. Our technical expert had come up with a solution that would enable the submersible pump down the borehole to supply directly to the troughs or when they had been filled, pump up to the header tanks. This arrangement had to be followed as well as incorporating a water meter, pressure sensors and drainage points. The number of parts needed had become quite mind boggling!
6. Electrics was one aspect for which there was a ready prepared set of instructions. The pump, controller and solar panels had all come from one supplier, together with a manual on how to connect all the parts, phew!
7. Painting – do exactly what it says on the tin. We chose a suitably horticultural green for the cabin. One of our talented plot holders offered to paint us a mural and now depicts beautiful vegetables, flowers and nature.
8. The final piece in the jigsaw was to attach the electric pump onto the end of a 25-meter length of stiff blue pipe and lower it on a chain down into the depths of the earth. When you see that depth measured out along the surface of the ground it seems a very long way!

Spring 2017 arrived and the bulk of the work was done. Would all our trust, hard work and perseverance be rewarded? I would like to say that from the first flick of a switch it worked. Not quite. Something had been connected back to front so it took a frustrating week to find the fault and correct it. Then our long awaited water emerged; cloudy, gushing water, spinning the dial of our water meter and filling up our troughs and tanks. The cloudiness caused some anxious calls to our contractor but we were told that that is normal when a borehole is first pumped.

The great news is that all the tentative predictions were borne out. The borehole yielded our required quantity of water and the pump ran automatically when needed, even when the sun was not shining directly on the panels.

But (there always has to be one), last year, 2017, there was a very hot spell very early in the growing season – everyone wanted to water their seedlings. The volume of water needed was still well within the capability of the borehole system but after 7pm there was not enough light to run the pump and by 8pm the header tanks were empty too. So this year, the volunteers are back again, installing two back-up water containers and an extra trough so there will be enough supply, even for any latecomers.

All in all, the project came in under budget. The final price was £10,982. There was an eye to cost at each stage – a bargain snapped up for the cabin, re-cycled water containers. And, such a lot of the hard work was done by a wonderful group of volunteers.

It feels like a real achievement. We still want to practise water conservation and harvesting, but we are no longer using treated water on our plots and we are free to use as much of our

own water as we can produce. By the end of 2017 that figure stood at over a quarter of a million litres!

Anyone wanting further information, please contact Haddenham Parish Council on [haddenhampc@btconnect.com](mailto:haddenhampc@btconnect.com)