

# GeoBubble™ Light Blue

## What is GeoBubble™ technology?

GeoBubble™ is the geometric bubble design, developed specifically to improve the performance and lifespan of floating swimming pool covers. Traditional bubble covers have offered little design innovation since first being introduced to the swimming pool market. It is common for a traditional bubble cover to exhibit excessive thinning in the bubble profile, resulting in a material that is susceptible to premature degradation and with a significantly reduced useful lifespan.

The unique shape of our patented GeoBubble™ Technology eliminates these weak points, presenting a bubble profile that is 50% thicker at its thinnest point vs conventional bubble covers. Inclusion of a larger air cell and supporting structural arch allows GeoBubble™ products to better withstand bubble collapse and allow greater room for internal air expansion. This means that the expected lifespan of GeoBubble™ products are up to 25% longer than any existing equivalent material incorporating a traditional bubble design.

## GeoBubble™ Light Blue Benefits:

- Eliminates water evaporation by 98%+
- Reduces debris contamination
- Increases pool temperature by up to 3°C
- Reduces chemical consumption of your pool
- Reduces energy consumption
- Saves money & reduces the pool's carbon footprint
- With GeoBubble™ technology
- Available from 400 to 600 micron

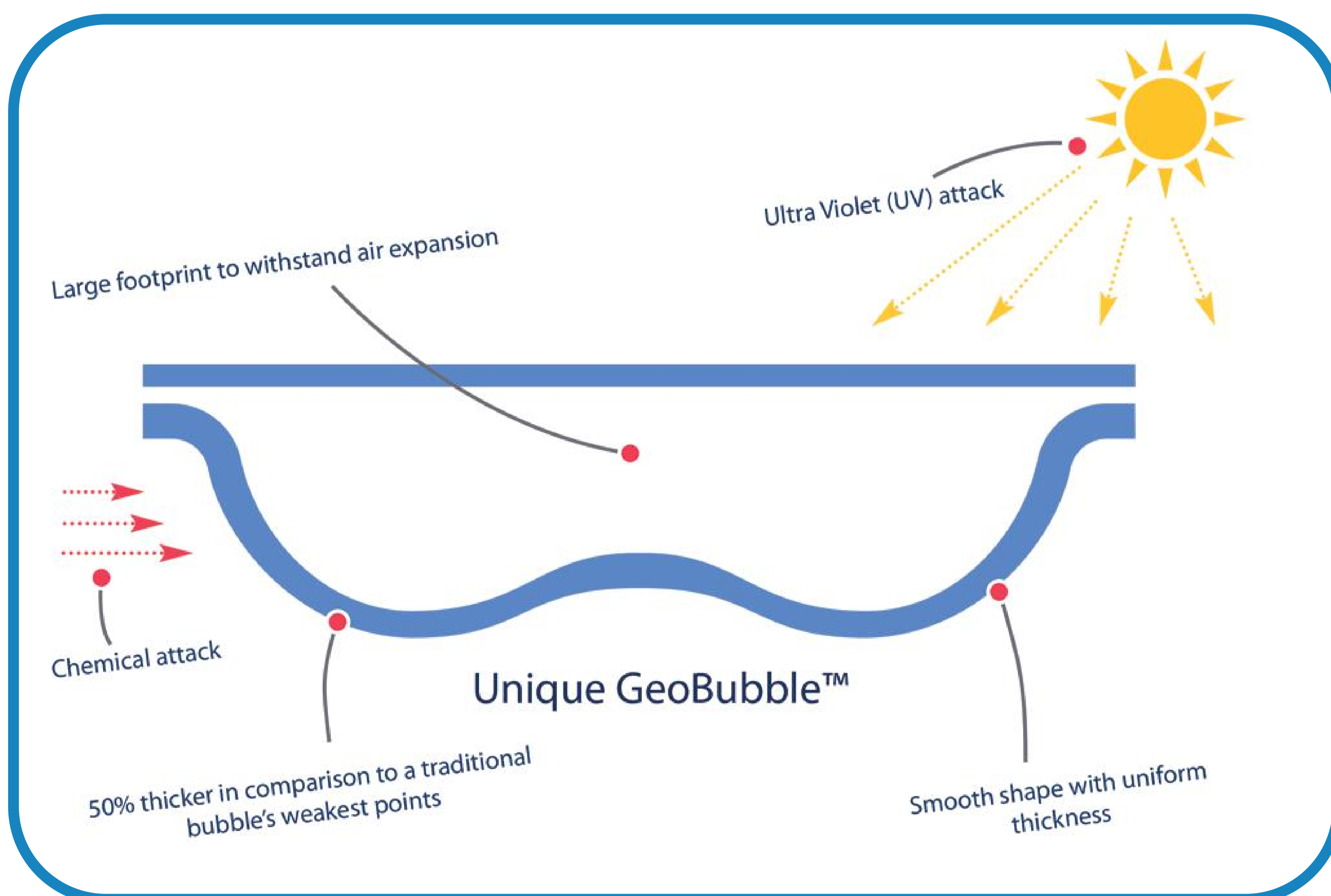


Figure 1. Patented GeoBubble™ Technology cross-sectional illustration

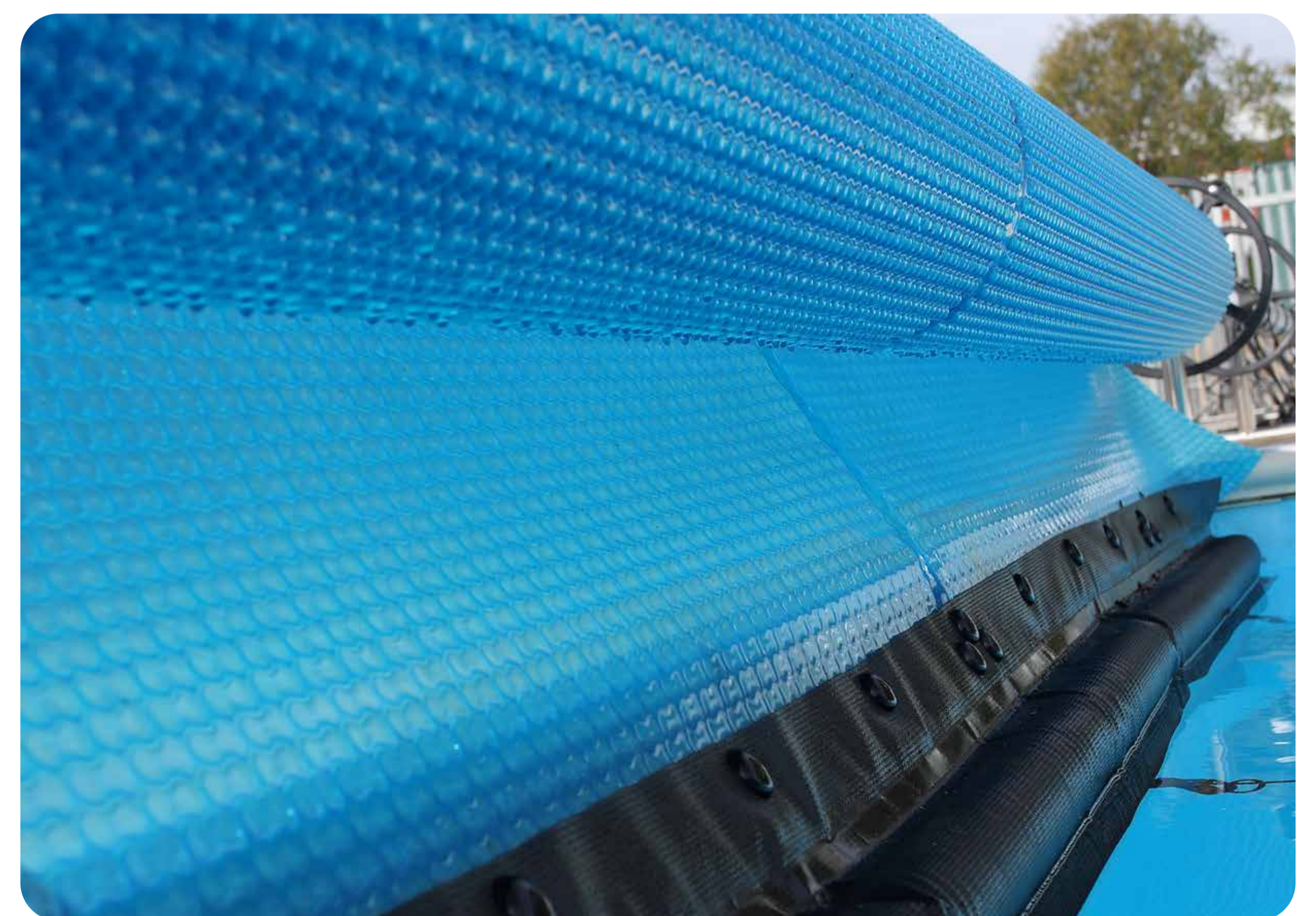


Figure 2. Standard GeoBubble™ Light Blue Material

## What is the GeoBubble™ Standard Range?

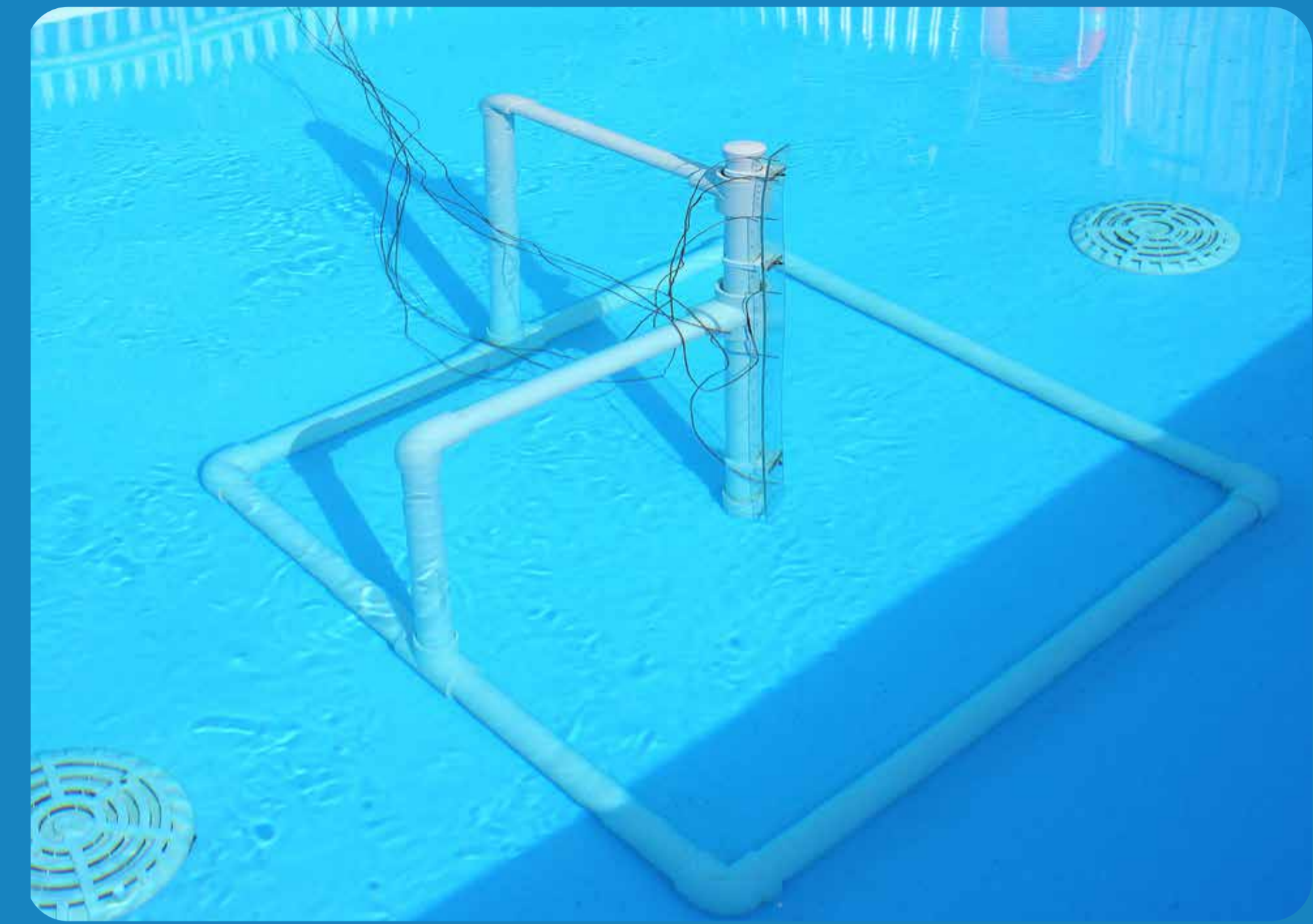
The GeoBubble™ standard product range is comprised of a variety of traditional colour options incorporating the innovation of our patented GeoBubble™ technology offering 25% longer lifespans than the traditional packaging bubble design. We divide these products into 2 categories based on their characteristics and how they work on your pool. Firstly, our transmission covers (Light Blue, Dark Blue, French Blue) are designed such that they transmit a large proportion of the visible and IR radiation from the Sun, utilising it to heat the water and basin of your pool. Our own testing has shown that our Light Blue material is capable of increasing the temperature of your pool by up to 3°C in the UK. Our other class of standard product are opaque covers. Opaque covers do not heat your pool via transmission of solar energy, instead they transfer energy by absorption and heat the water's surface. Opaque covers do not heat a pool as efficiently as transmission covers; however, they are advantageous that they are highly efficient at inhibiting algae growth.

## Experimental Procedure



**Figure 3.** Bespoke testing facility, Plastipack Ltd, Hastings UK.

All test pools at our facility are unheated and measure 8m X 4m with a 1.3m depth, having been designed to be representative of an average sized, privately owned pool. The pools have a volume of 41,600L and each contain an array of 6 type-T thermocouples at their centre, continually logging water temperature at incremental depths and calculating average water temperature.

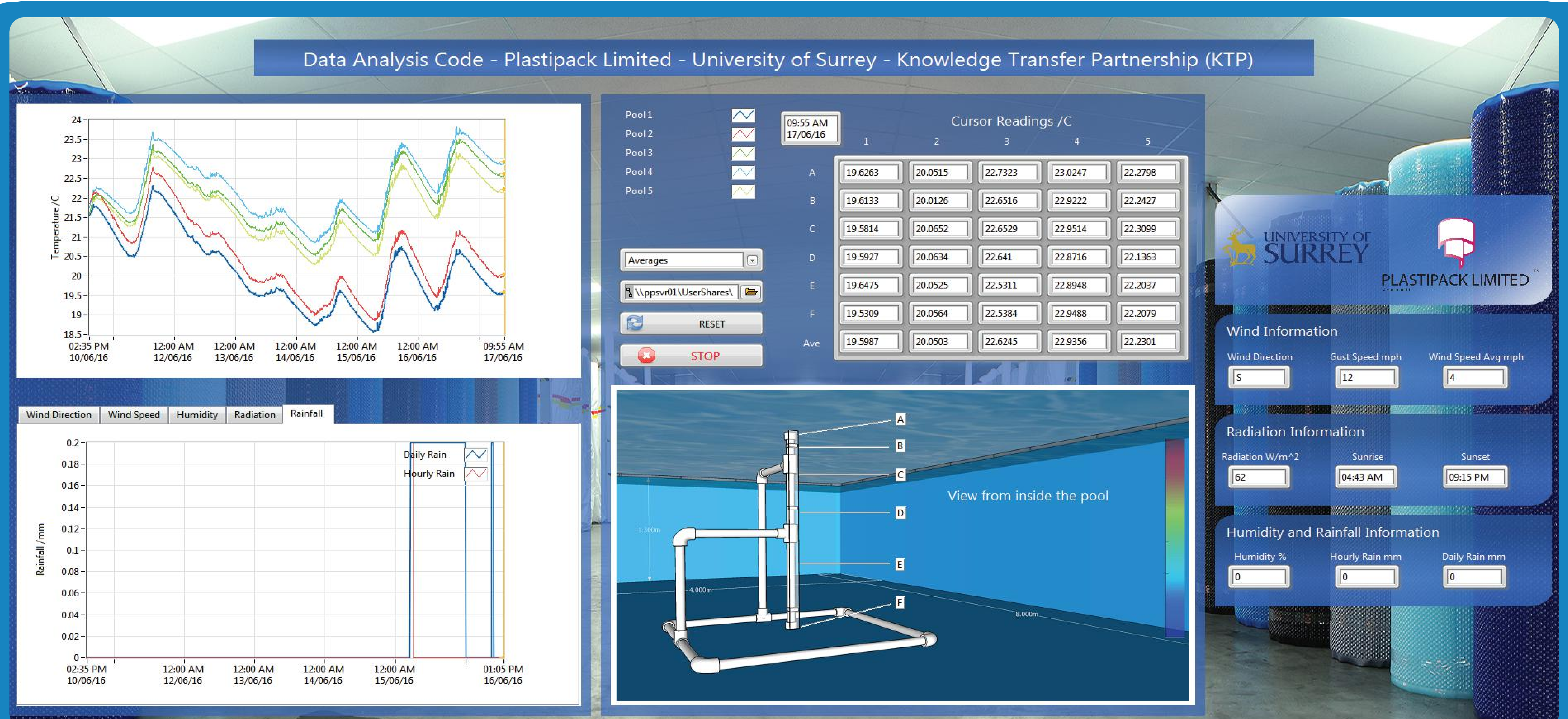


**Figure 4.** Type-T thermocouple array used in test pools.

Logging and compilation of the temperature data is completely autonomous, maximising accuracy and reproducibility of results. A bespoke computer programme was developed to achieve this and was coded using specialist LabView™ software. This programme was designed by Plastipack engineers in close collaboration with experts at the University of Surrey.

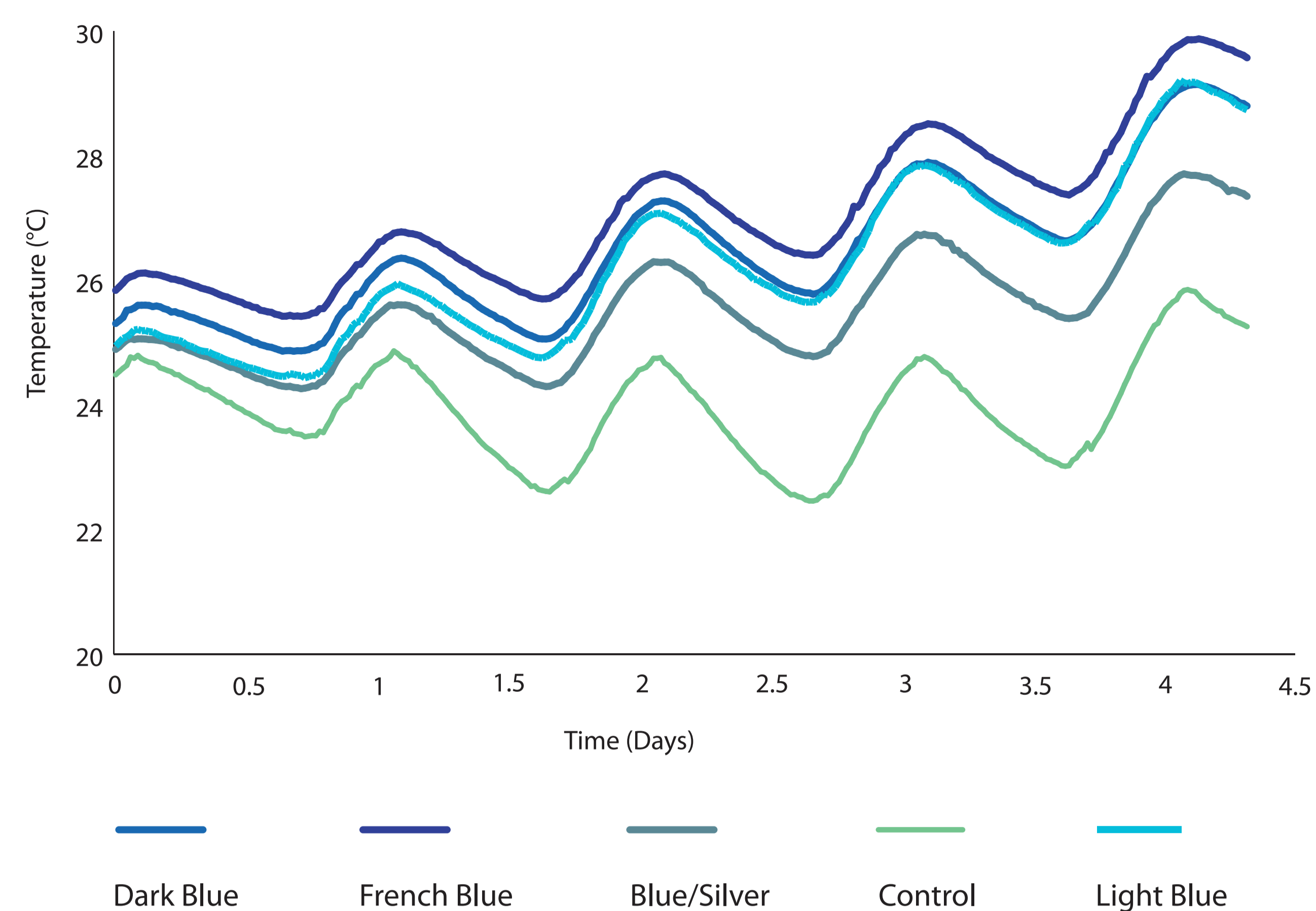
Each pool is serviced by its own 0.75hp filtration pump running for 8 hours each day (6 hours during the day, 2 at overnight), a pattern commonly accepted as best practice for filtration efficiency within the industry. Water samples were taken every other day to ensure that chemical concentrations remained within the accepted industry standard pH, free chlorine and combined chlorine concentrations of the pool water were logged manually using a specialist photometry device. Any chemical additions required to restore and rebalance water chemistry to within the acceptable limits were recorded. These records were used to build a detailed dosing regimen for each test pool to allow for comparison of 'chemical consumption'.

Further testing was conducted to determine the effects of GeoBubble™ products with respect to controlling evaporation from the surface of a pool. A test was devised whereby two unheated tanks, with a surface area of 1m x 1.5m were each filled to a depth of 0.435m. One tank was subsequently covered with a 400 Grade standard GeoBubble™ product, and the other left uncovered before being positioned outdoors in direct sunlight for 3 days during summer time. At conclusion of the test the water depths of both tanks were measured and used to calculate the water remaining in each tank. Percentage water lost by evaporation was subsequently calculated for comparison.



**Figure 5.** Bespoke temperature analysis programme (Screenshot).

## Results and Discussion

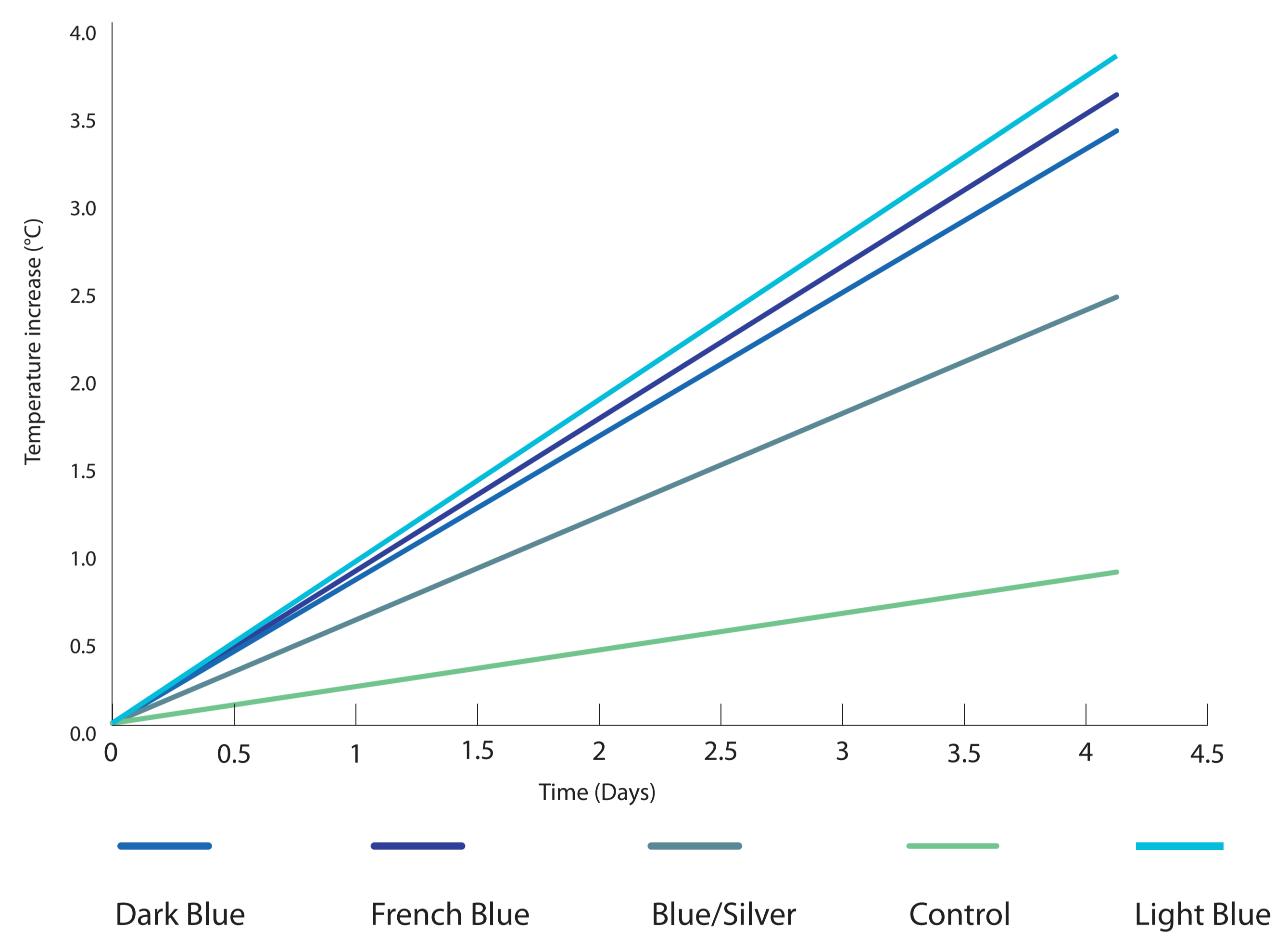


**Figure 6.** Average water temperature of test pools over 5 days (June 2018).

Figure 6-7. show that the observed daily temperature gain was greatest in the pool covered with the Light Blue material. The Light Blue pool was 2°C warmer on average than the control, with a peak temperature variance of +3.3°C after 5 days. By better retaining heat overnight and by maximising solar gains throughout the day, the Light Blue pool saw an average daily temperature gain of approximately 1°C. Despite the French Blue pool being warmest after the 5 days, it did not perform best. The French Blue pool was almost 1°C warmer than any of the other pools at the start of the test.

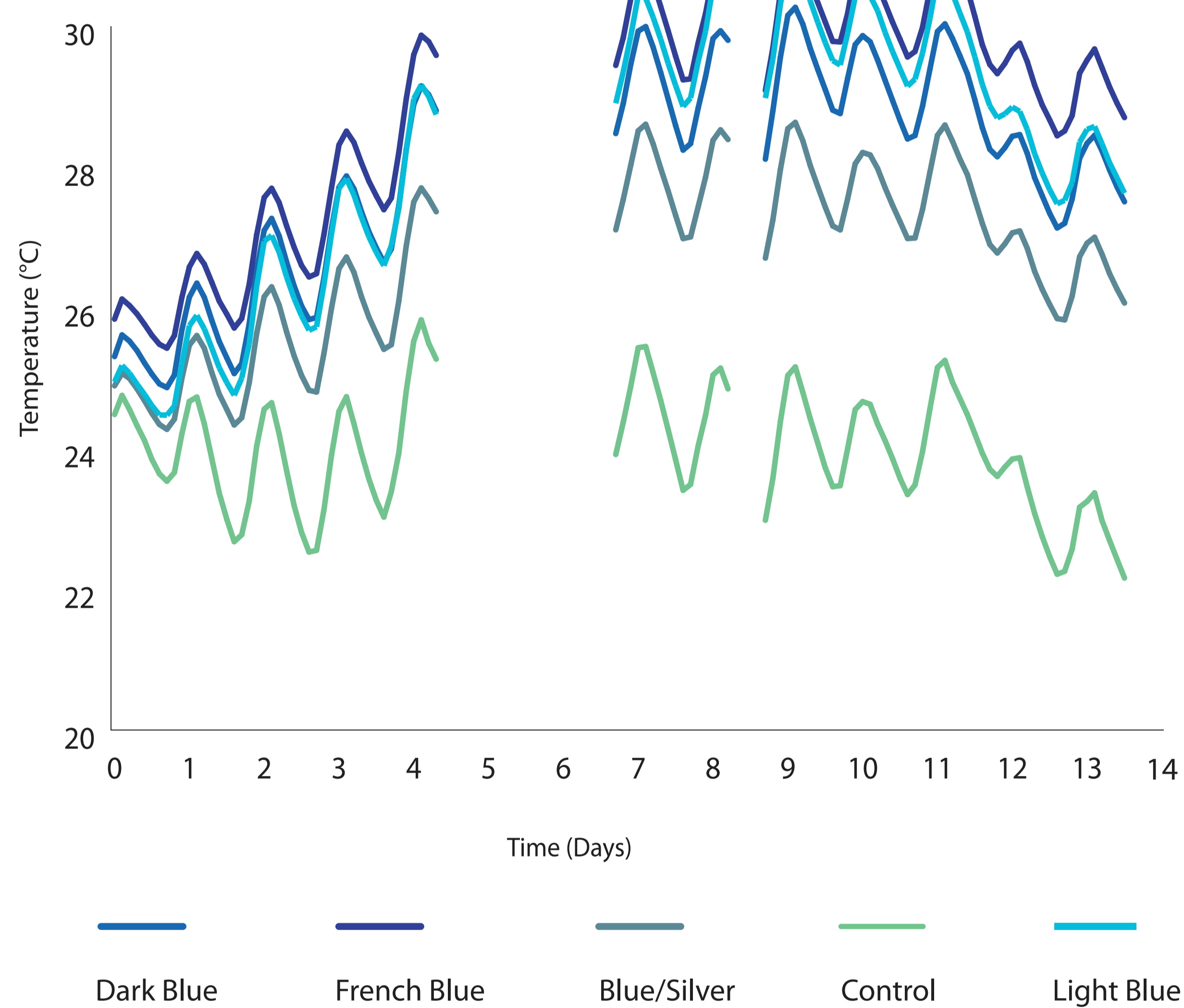
### Solar Gains

Experimental data was gathered from our testing facility over the course of 14 days in June 2019 (British Summer Time). Figure 6. shows that over the first 5 days of testing, all of the pools covered with standard GeoBubble™ products were consistently warmer than the uncovered control pool. These temperature gains were achievable thanks to the combination of solar heating and the insulating effects of the large air cells present in GeoBubble™. The rate and extent to which that solar heating occurs is directly determined by the transmission properties of the covering material. Light Blue GeoBubble™ being the most transmissive of our standard products is therefore the best performing solar heating material of the range.



**Figure 7.** Accumulative temperature increase of test pools over 5 days (June 2018).

Figure 8. shows that the Light Blue, French Blue and Dark Blue GeoBubble™ all demonstrated similar solar heating performance. This is because the optical properties of all three materials allow significant transmission of solar energy through the cover to directly heat the water. The Blue Silver performed with less efficiency. This is due to the optical properties of the cover. The metallic pigmentation within the bubble layer reflects a large portion of the Near Infrared wavelengths of the sun's available energy. This limits the cover's performance and is a clear demonstrator of how aesthetic choices can impact efficiency and ultimately the running costs of a pool. However, when compared to the control pool the impact of evaporation control is clearly indicated by the Blue/Silver's ability to maintain a higher temperature. It can be also be seen in Figure 8., the temperature of the pools covered with the Light Blue, French Blue and Dark Blue GeoBubble™ peaked in excess of 30°C. On the same day and under the same ambient conditions, the control pool was almost 6°C cooler.



**Figure 8.** Average water temperature of test pools over 14 day (June 2019).

This demonstrates how effective transmission GeoBubble™ products are at maximising the transfer of solar energy into a pool. Following this warm spell and as ambient temperatures returned to normal, the pools covered with standard GeoBubble™ products were better able to retain heat and resultantly were 5°C warmer on average than the control pool when testing was concluded. This variance in temperature would represent a significant energy saving for heated pool users. By maintaining a comfortable water temperature for longer, covering a pool with GeoBubble™ products can extend the pool season significantly. Under standard weather conditions in the UK, Light Blue GeoBubble™ can be expected to raise the temperature of your pool by between 2-3°C.

## Chlorine Consumption

Chemical additions to the test pools were closely monitored over 2 weeks at the end of June, during the heatwave of 2019. This allowed the performance of the standard GeoBubble™ product range to be assessed with respect to chemical savings. Pool water samples were taken on alternating days and stabilised chlorine was added accordingly to balance the water concentration to within industry standards (2-4 PPM). The chemical 'consumption' of each pool was assessed by recording the additions of stabilised chlorine each pool required to remain within this range. During this test, chlorine was added if water concentrations dropped below 3.5PPM.

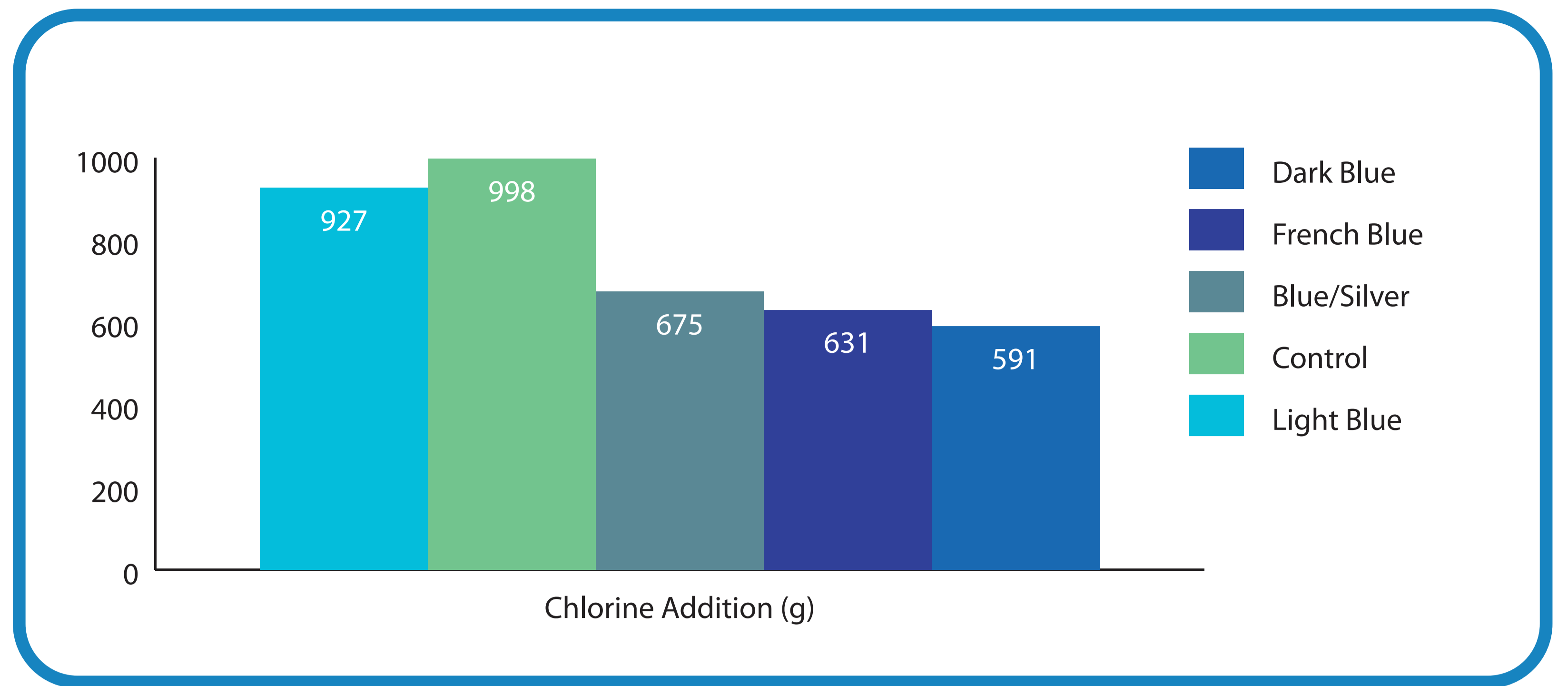


Figure 9. Total chlorine addition to test pools over 14 days (June 2019).

Figure 9. shows that over the duration of the test, all of the pools covered with the standard GeoBubble™ range saw a reduction of chlorine additions vs the uncovered control pool. By acting as a physical barrier, the GeoBubble™ products prevented the chlorine from being as easily consumed. Typically, a standard GeoBubble™ cover has the potential to reduce chlorine consumption by between 30-40%. Over the 2 weeks that the test ran, the Light Blue pool used considerably more chlorine more than the other GeoBubble™ covered pools. With respect to chemical savings more opaque materials provide higher savings due to the lower temperatures and reduction of light entering the pool reducing biological growth. Although they do not offer such substantial solar gains, chlorine is consumed much more slowly in less energetic environments.

Despite this, the Light Blue pool still saw a reduction in chemical consumption of over 7% vs the uncovered pool. The Dark Blue pool exhibited the largest reduction in chemical additions, requiring almost 60% less free chlorine than the control to maintain water concentration within the acceptable limits. This highlights the extent to which standard GeoBubble™ products can help control chemical maintenance costs.

## Evaporation Prevention

It was found that the covered tanks exhibited a 98% reduction in water loss over the course of the test, when compared to the uncovered tank. This means that for an average sized pool of 4m x 8m in the UK, covering it with GeoBubble™ equates to a water saving of approximately 32,000 litres per year versus leaving it uncovered. This saving is greater in hotter climates or regions subject to high winds.

A GeoBubble™ pool cover eliminates almost all evaporation (98%) by acting as a physical barrier. Evaporation is a resource and an energy consumptive process responsible for 70% of the total heat loss from an outdoor pool. Covering the pool removes this energy deficit reducing the workload required by heating systems and holding the energy within the pool.

Water is a strained resource around the globe vital for humanity. By covering a pool whenever it is not in use pool owners can enjoy an aquatic leisure activity while minimising water waste, reducing energy consumption and sustaining chemical levels. This ultimately reduces the running cost and the carbon footprint of the pool while preventing waste of a vital resource.

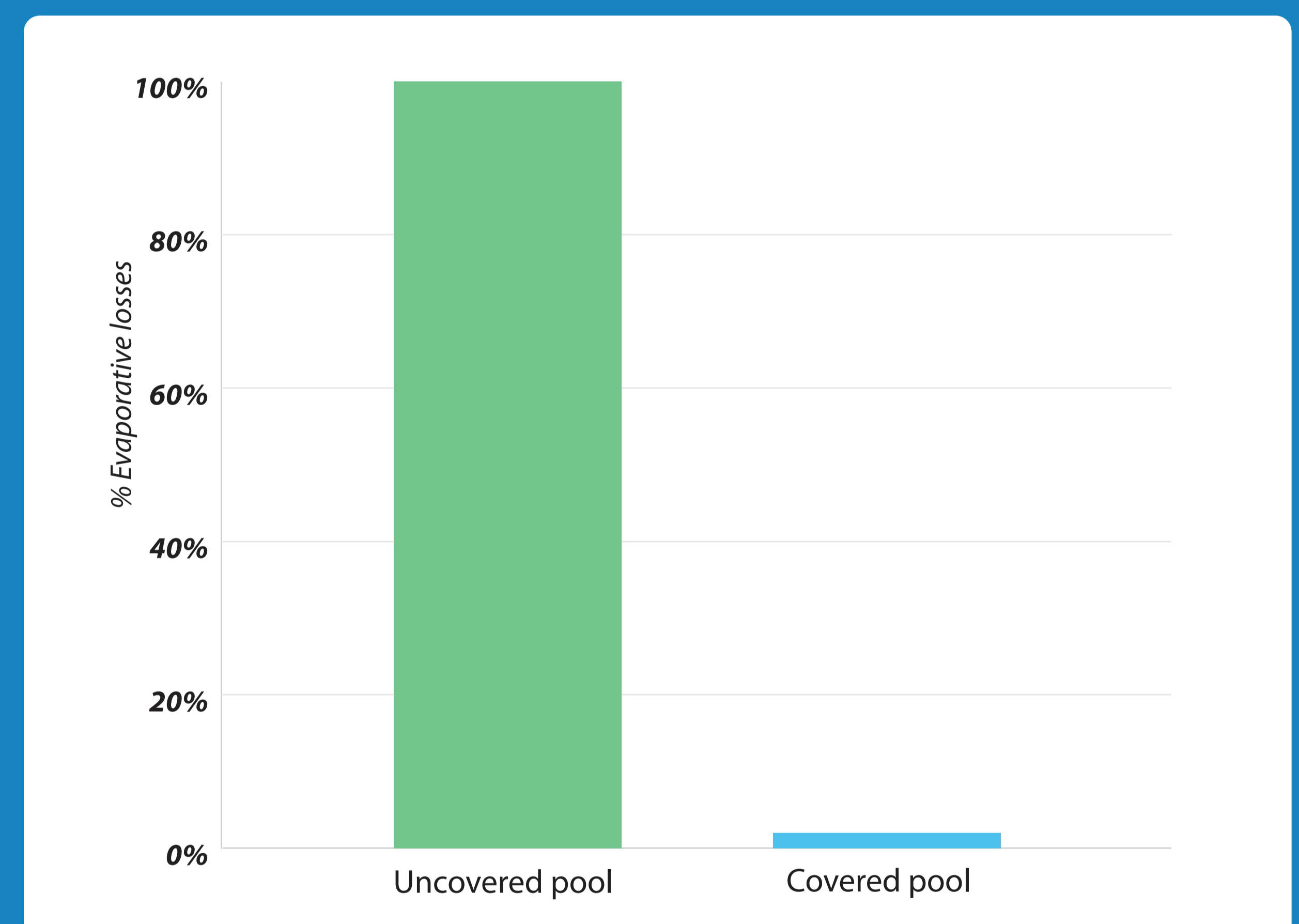


Figure 9. Evaporative losses from covered vs uncovered pool

For more information on our standard products and our premium Guard product range, please visit [www.geobubble.co.uk/products](http://www.geobubble.co.uk/products) or to find out where you can buy a GeoBubble™ cover, please go to [www.geobubble.co.uk/where-to-buy](http://www.geobubble.co.uk/where-to-buy)

