



Software tool SIPHON for energy efficient siphon well operation

Challenges to siphon systems

- Water is abstracted and piped to a central collector caisson without a permanent energy input using gravitational flow (Figure 1)
- Numerous large scale siphon systems were constructed in the mid- to late-19th century in Germany, Poland, Czech Republic and Hungary abstracting up to 100,000 m³/d
- Nowadays, siphon systems are “out of fashion” for two main reasons:
 - Increasing water demand in many countries required increased pumping rates and caused greater drawdown, which impeded further operation of the wells through siphon pipes
 - No precise calculation tools were available to design and verify the productivity of siphon systems, which were historically designed and built by expertise and experience.

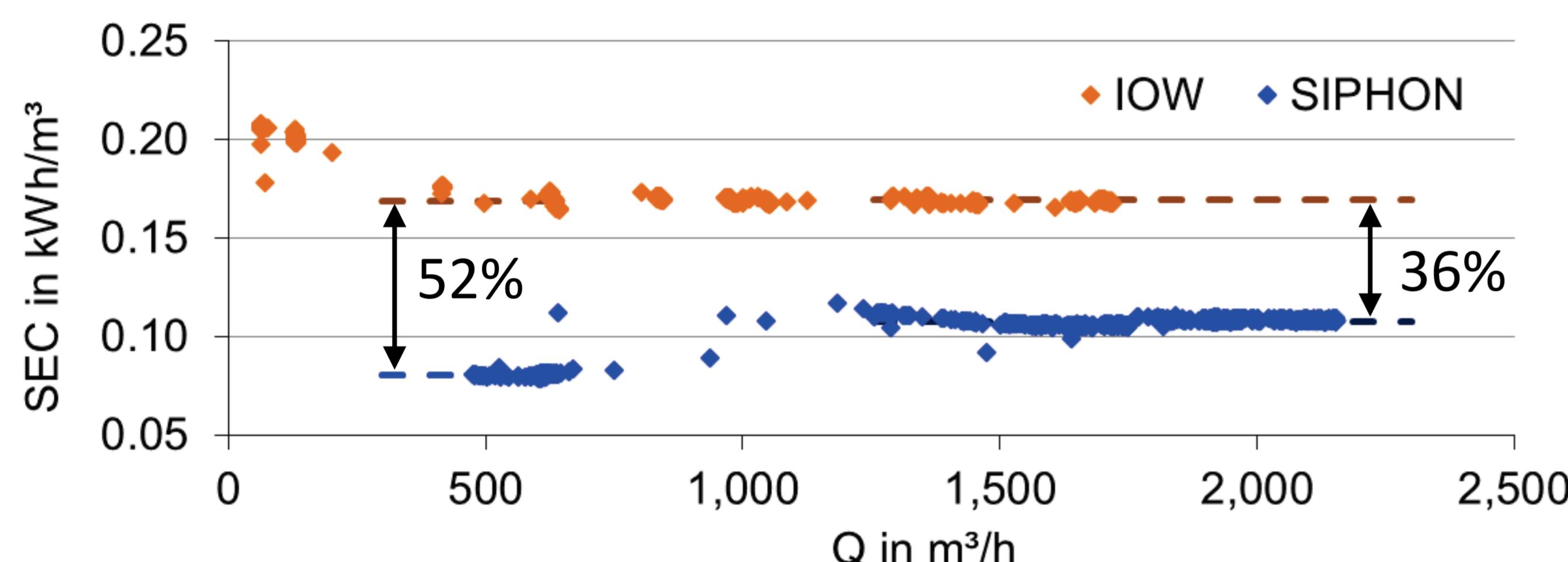


Figure 3. Comparison of measured specific energy consumption of individually operated wells (IOW) with submersible pumps and siphon wells in Dresden (AquaNES demo site 2).

SIPHON - a free Excel-based design tool for siphon wells

- SIPHON can be used to plan the rehabilitation of an existing siphon system or to design a completely new one (Figure 2)
- Available online together with the documentation:
 - www.htw-dresden.de/heber (German and English language)
 - tools section of <http://dss.aquanes.eu/> (English language)

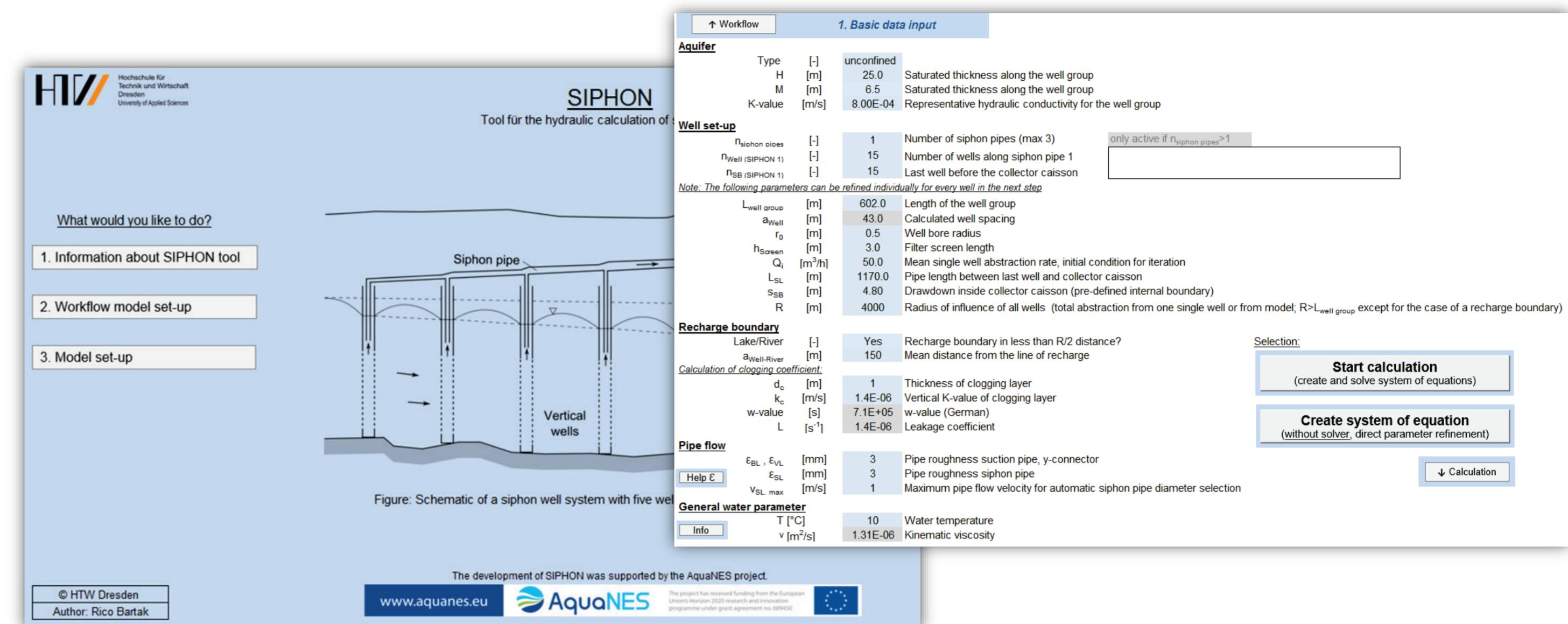


Figure 2. Starting page and input tab in SIPHON.

Benefits of siphon wells

- high operational safety in floodplains (no electricity supply)
- lower maintenance costs due to a reduced number of pumps
- easier accessibility and maintenance of the dry mounted pumps
- absence of harmful pressure surges (air vessel)

Siphon systems can save energy (Figure 3)

- Real energy data from two investigated riverbank filtration sites indicate savings up to ≈70% (Bartak & Grischek, 2018)
- 30-50% energy savings potential can be achieved by rehabilitating old siphon wells instead of an alternative equipment with submersible pumps

Bartak, R., Grischek, T. (2018) Groundwater Abstraction through Siphon Wells - Hydraulic Design and Energy Savings. *Water* 10(5), 570. doi: 10.3390/w10050570.

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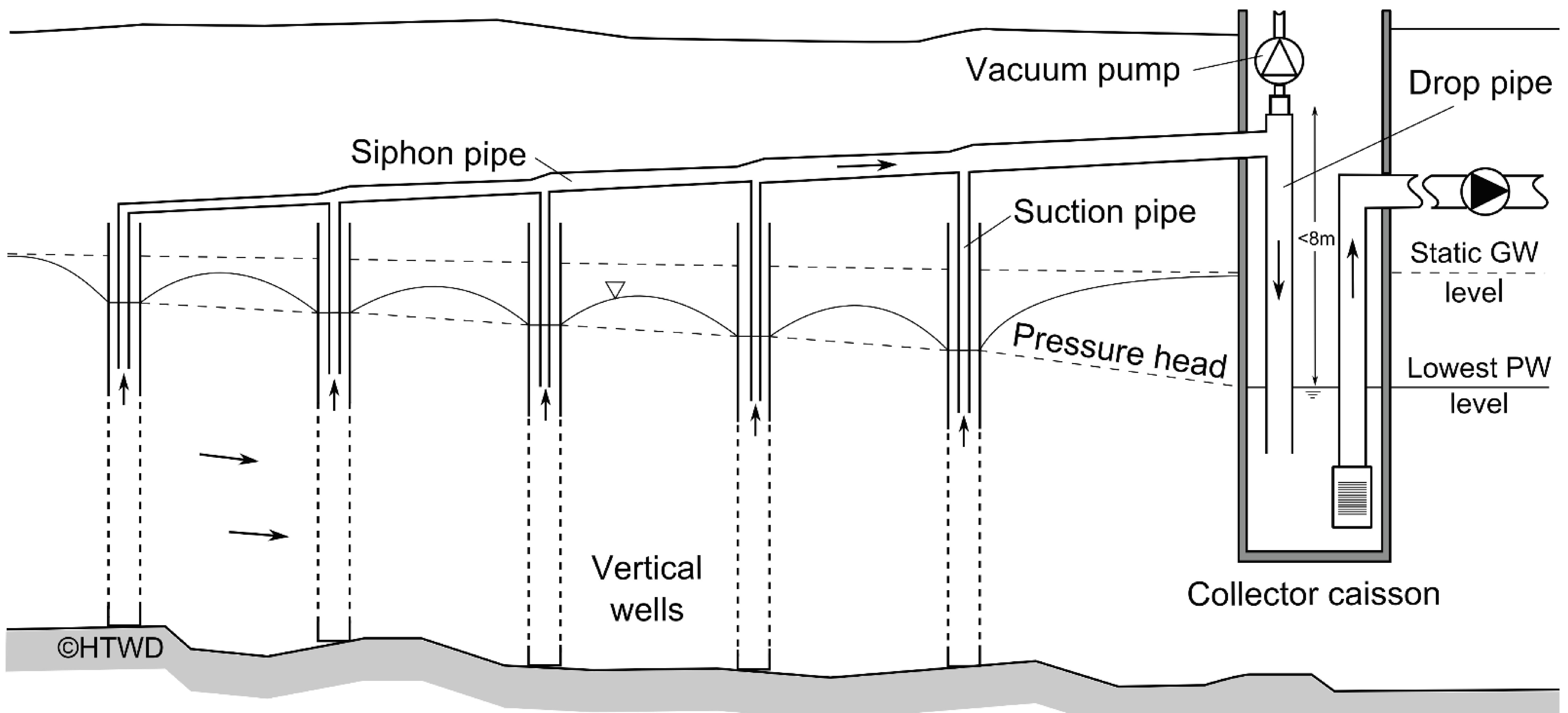


Figure 1. Schematic of a siphon system.

