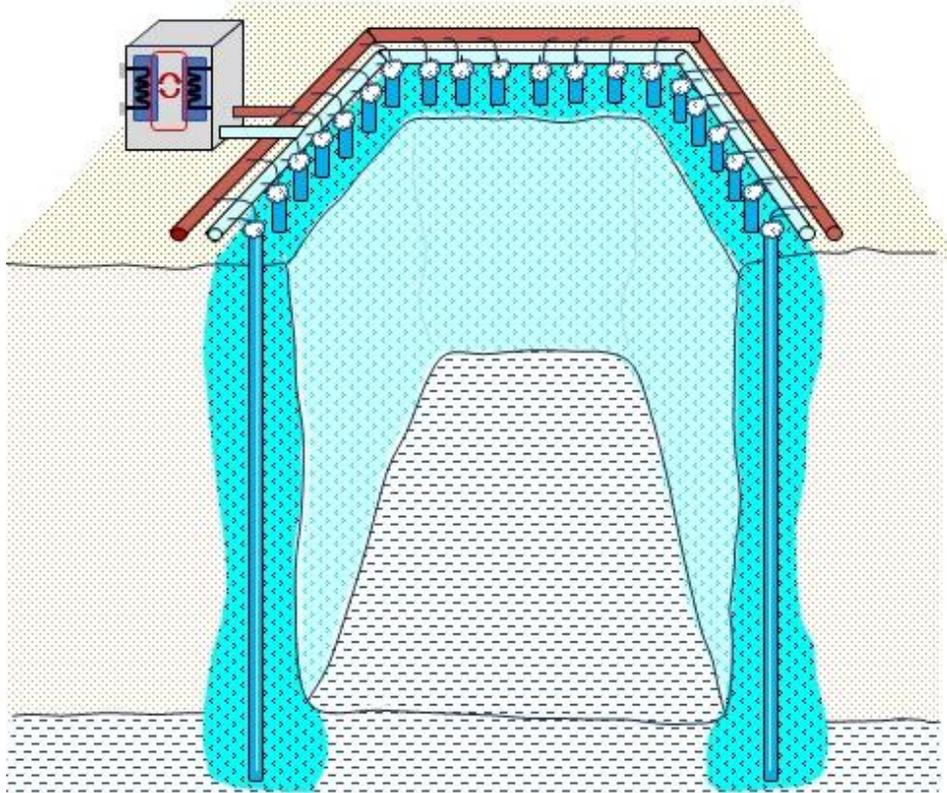


## Artificial Ground Freezing (AGF)



## What is Artificial Ground Freezing?

Artificial Ground Freezing (AGF) is a ground improvement process that changes liquid soil pore-water to ice. AGF fuses the soil particles together, greatly increasing soil shear strength, creating a bearing wall of frozen ground. It can be used as an effective non-pumping method of groundwater control with the creation of a groundwater cut-off. A closed loop AGF operation involves the use of refrigeration plant (chillers) and cooled brine solution that is pumped through a series of freeze pipes. Temperature monitoring points are installed as part of the AGF system.

## Does AGF provide soil support?

AGF creates a strong frozen soil wall around an excavation or soil zone. The frozen wall is an economically viable alternative to other shoring methods. In homogenous ground conditions, ground freezing can be achieved within weeks and can be effective in the most difficult of soil conditions, where other shoring methods may not be feasible.

## Do I need groundwater control too?

AGF can provide a complete groundwater cut-off, to horizontal groundwater flow and with sufficient depth or being toed into an impermeable bed, can cut-off upward groundwater flow (as with secant or sheet-piled wall method). Residual groundwater is removed by controlled sump pumping.

## Does AGF require a permit from environmental regulators?

AGF is a non-pumping groundwater control method so does not require environmental groundwater abstraction or discharge licences. With the consent to abstract groundwater currently taking 6-9 months, the use of AGF can be used to improve construction programme where groundwater is an issue.

## Can AGF be used in soil or groundwater contamination remediation?

Yes, subject to groundwater condition AGF can contain contaminated soil and groundwater within a frozen wall. Contaminated soil and groundwater can then be removed and disposed of without the need of expensive on-site pump and treat systems.

## Is AGF environmentally friendly?

AGF is a safe and environmentally friendly ground improvement technique. The process does not require the injection of any chemicals into the open ground. Cooling agents in a confined system reduce the temperature of the ground without being exposed to it. Where possible, a significant amount of the equipment and materials are reused. AGF provides temporary ground support and groundwater control without the need to permanently install unnecessary amounts of concrete and steel.

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## Is AGF expensive?

Ground freezing can save time and money on a project. AGF can be undertaken without the need for environmental groundwater and discharge permitting (saving on construction programmes) and can be quickly deployed and installed on site.

AGF is perceived as expensive due to the high initial hire and materials cost of the system. However, when it is considered that AGF is a ground improvement technique that often eliminates the need for other ground improvement techniques (such as piling) and reduces the need for dewatering - it is a one-stop solution that eradicates the need for other excavation techniques.

## Stuart Wells Design and Implementation of AGF in the UK

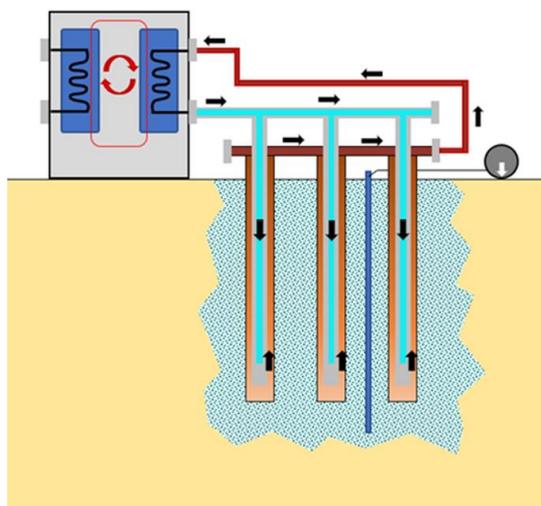
Stuart Wells offers a one-stop, in house AGF service for; design, installation, maintenance, implementation and monitoring of AGF systems.

Stuart Wells offers :

- Initial consultancy and review for AGF feasibility with projects and initial design;
- Full design of AGF systems and AGF monitoring systems;
- Installation and commissioning of AGF systems;
- Hire of all equipment required to undertake AGF; and
- The ongoing management and monitoring of the freezing process.

Stuart Wells AGF systems comprise a closed loop operation that involves the use of refrigeration plant (chillers) and cooled brine solution, which is pumped through a series of freeze pipes, creating a frozen soil wall around an excavation or soil zone.

**Stuart Wells are the only UK based dewatering company offering AGF.**



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