



**GSHP**  
**association**

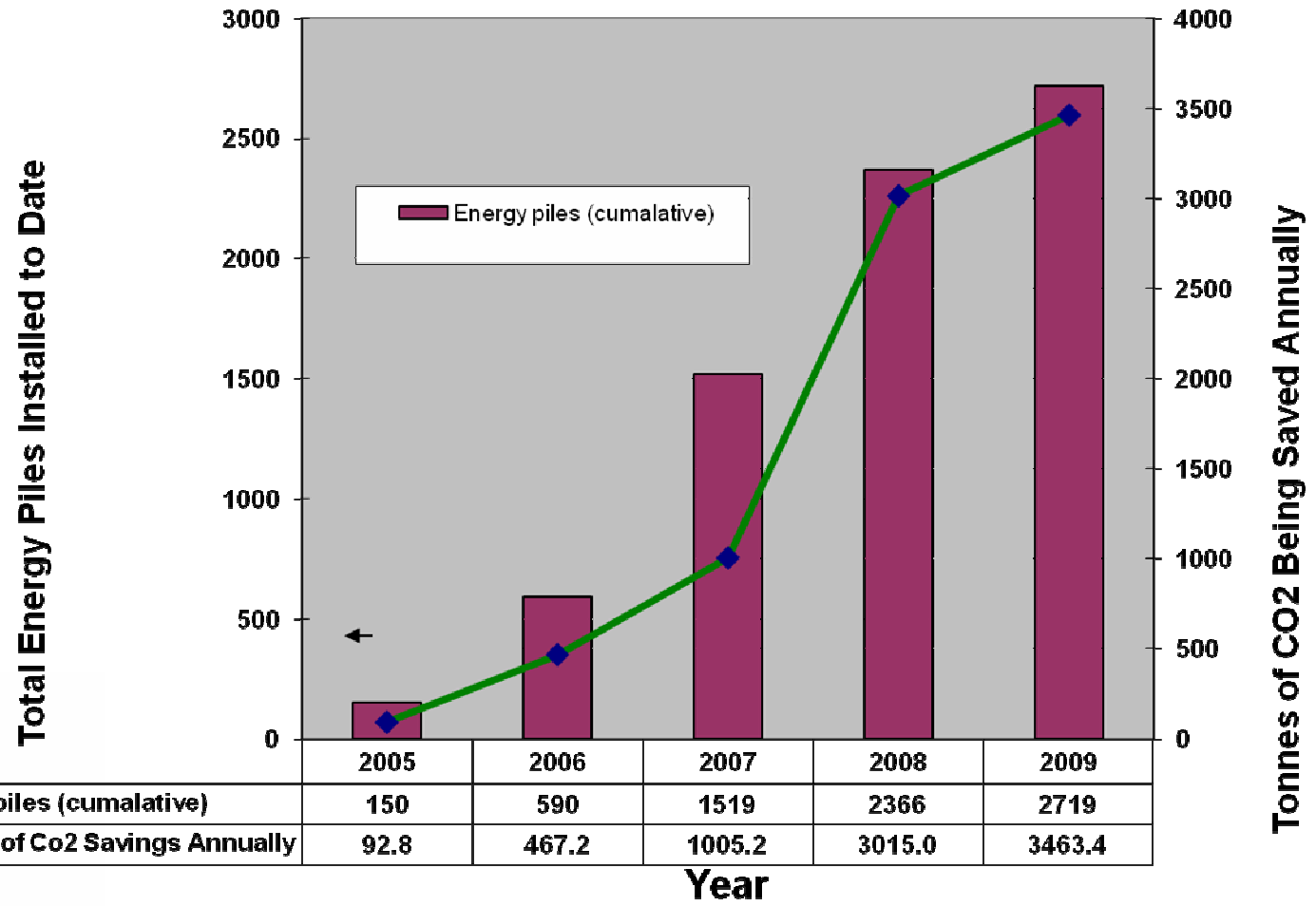
***Research Seminar  
Current and Future Research  
Into Ground Source Energy  
Thursday - 21st January 2010,  
Energy Piles & Diaphragm Walls***



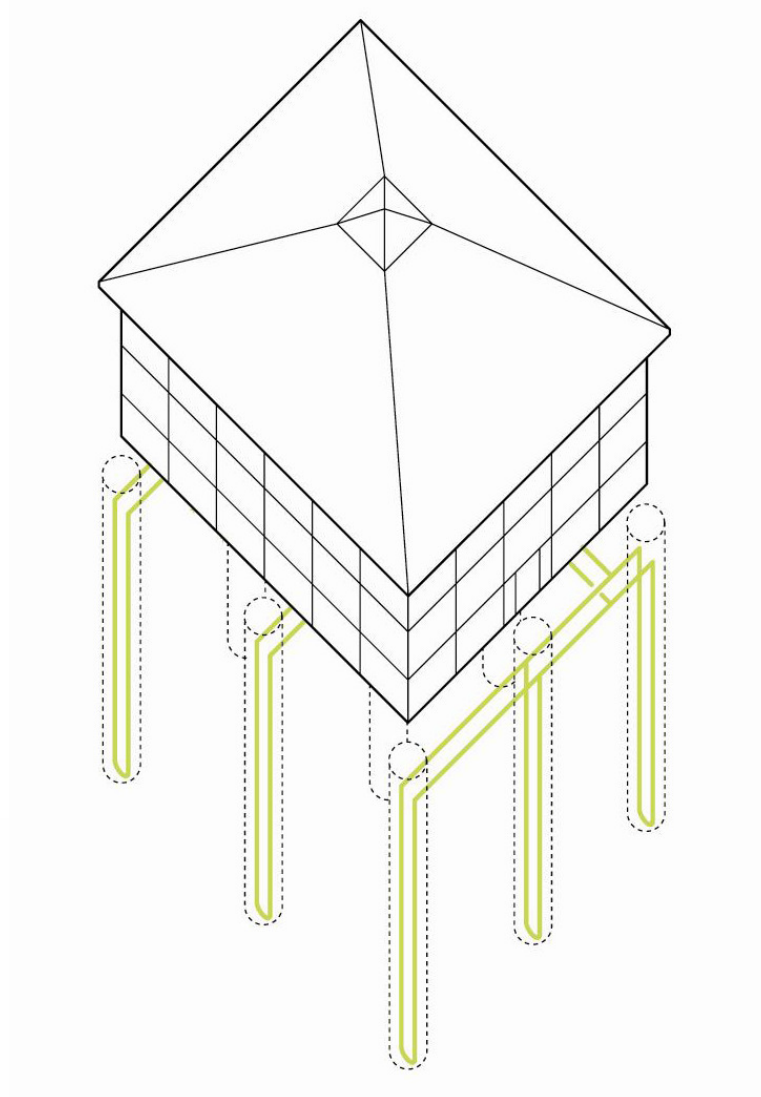
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# EnergyPiles® Installed in the UK to Date



# Energy Piles®



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# Benefits of using EnergyPiles®

- Low extra over cost for geothermal installation
- Minimal impact on piling program
- Using building piles as thermal mass
- Heat recovery between seasons
- Makes excellent Value Engineering sense
- Provides a Stable & Sustainable energy source

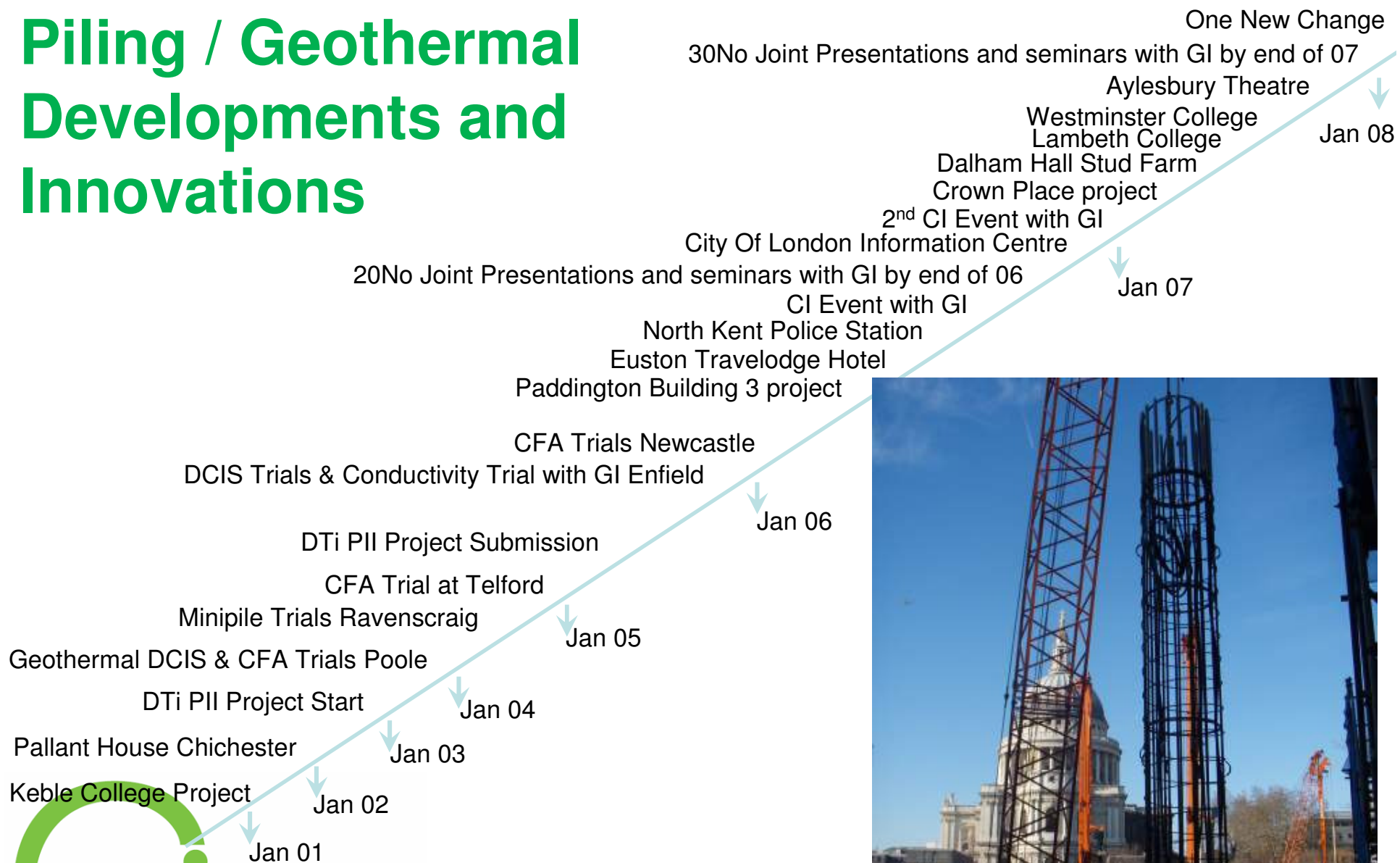


# First Energy Pile® & Wall Project in the UK Keble College – Oxford 2001

- EnergyPiles®
  - 29 Wall  
750mm dia  
Rotary Piles  
12.5m
  - 61 450mm  
dia bearing  
Piles 5m
- Heating 85kW  
Cooling 65kW
- Completed:
  - 2002 and  
reported  
performing  
well

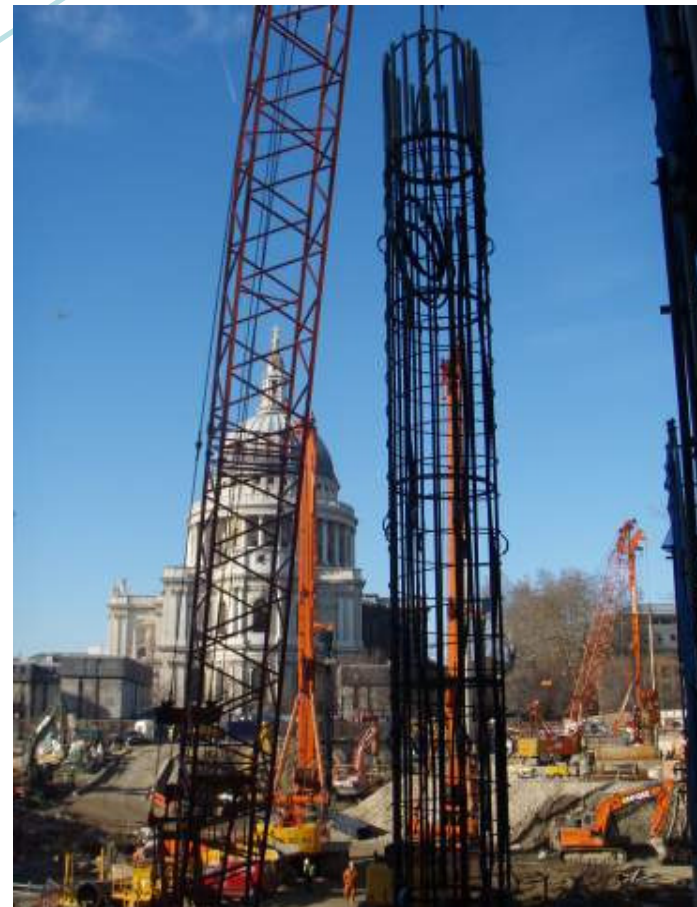


# Piling / Geothermal Developments and Innovations



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# Paddington Building 3, London

- System:
  - EnergyPiles®
- Size:
  - 210kW Heating
  - 85kW Cooling
- Collector type:
  - 54 Piles
  - Depth 25m
- Completed:
  - July 2006
- Install Cost £520/kW



# Canterbury University

- System:
  - EnergyPiles®
- Size:
  - 120kW Heating
  - 120kW Cooling
- Collector type:
  - 137 CFA Piles  
depth 15m

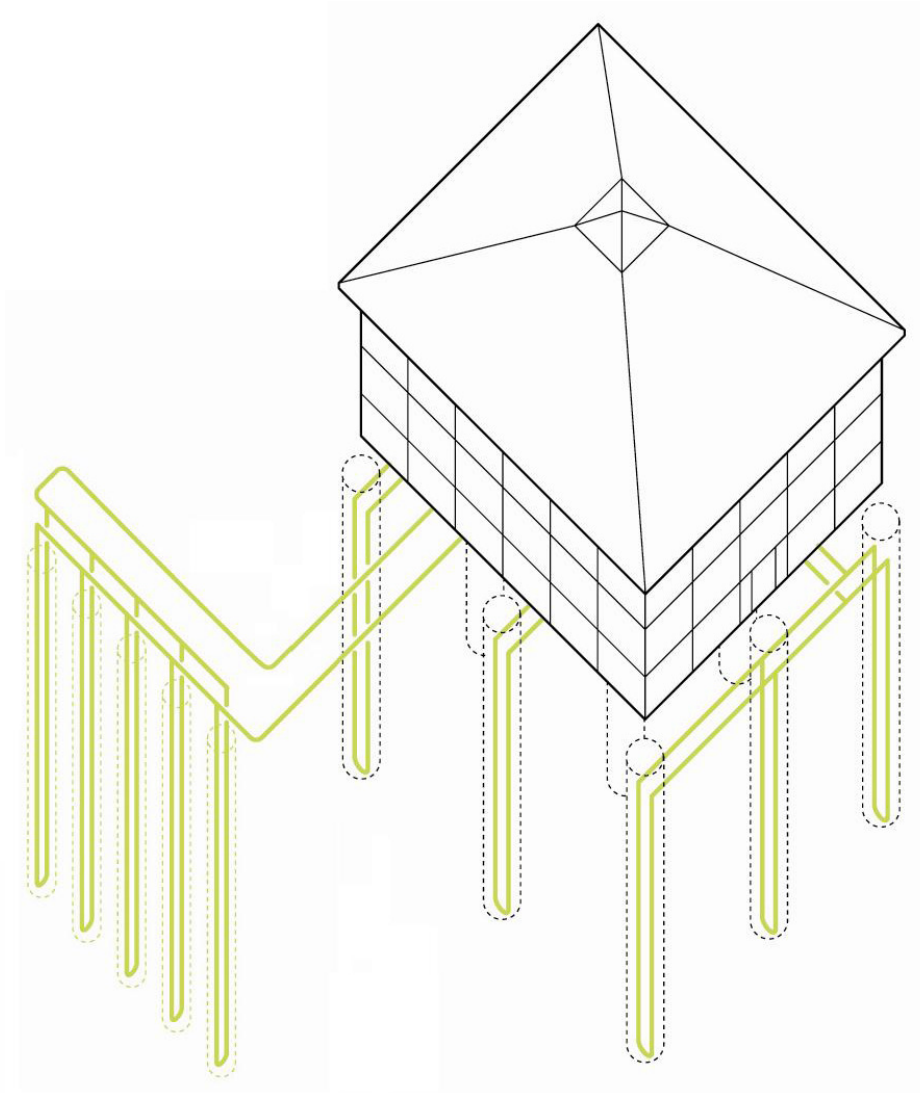
Project completed June 08



Cementation  
**SKANSKA**



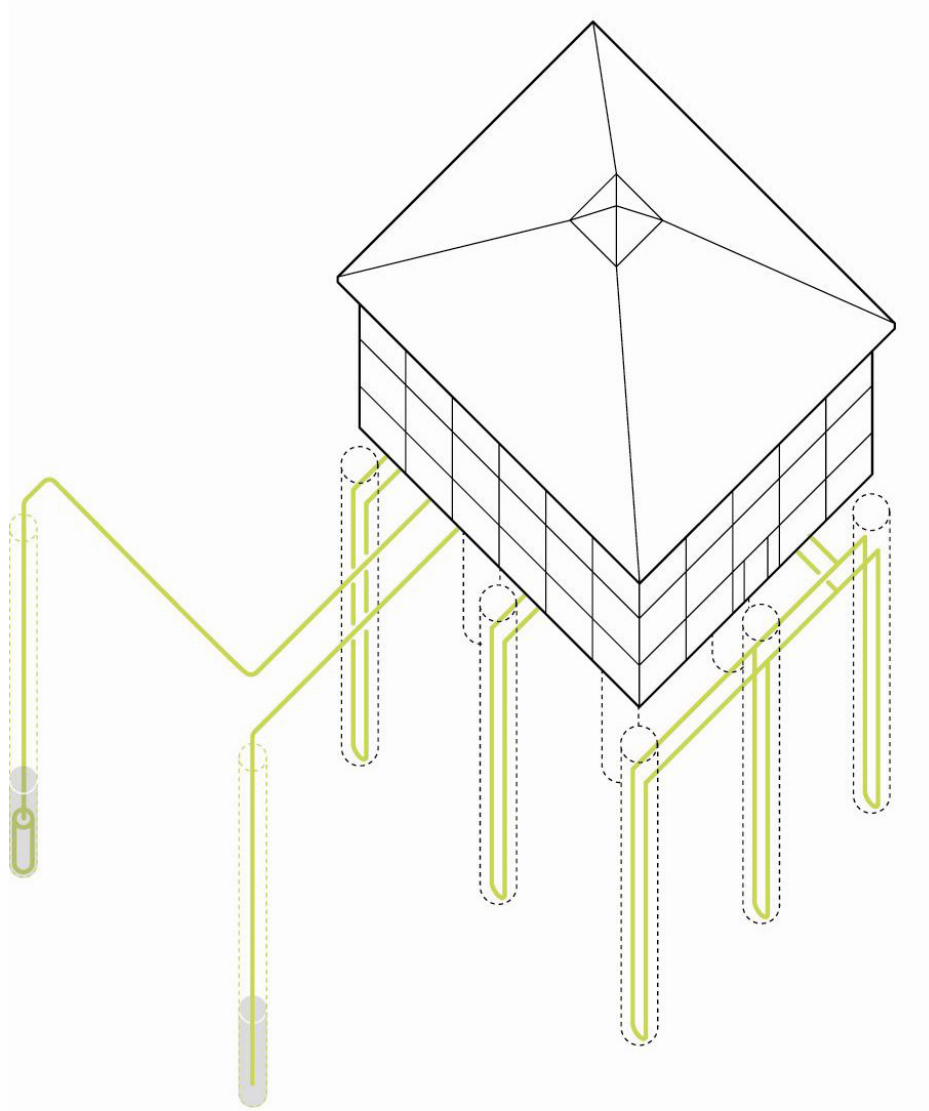
# Energy Piles<sup>®</sup> & Closed Loop



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# Energy Piles<sup>®</sup> & Open Loop



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# One New Change, London, Largest Energy Pile<sup>®</sup> Project in UK

- System:
  - Piles & Open Loop
- Size:
  - 1,638kW Heating
  - 1,742kW Cooling
- Collector type:
  - 219 Energy Piles
  - Open Loop Wells
- On Site:
  - Piling complete 2008
  - Headering up Complete
  - Plant room installation underway



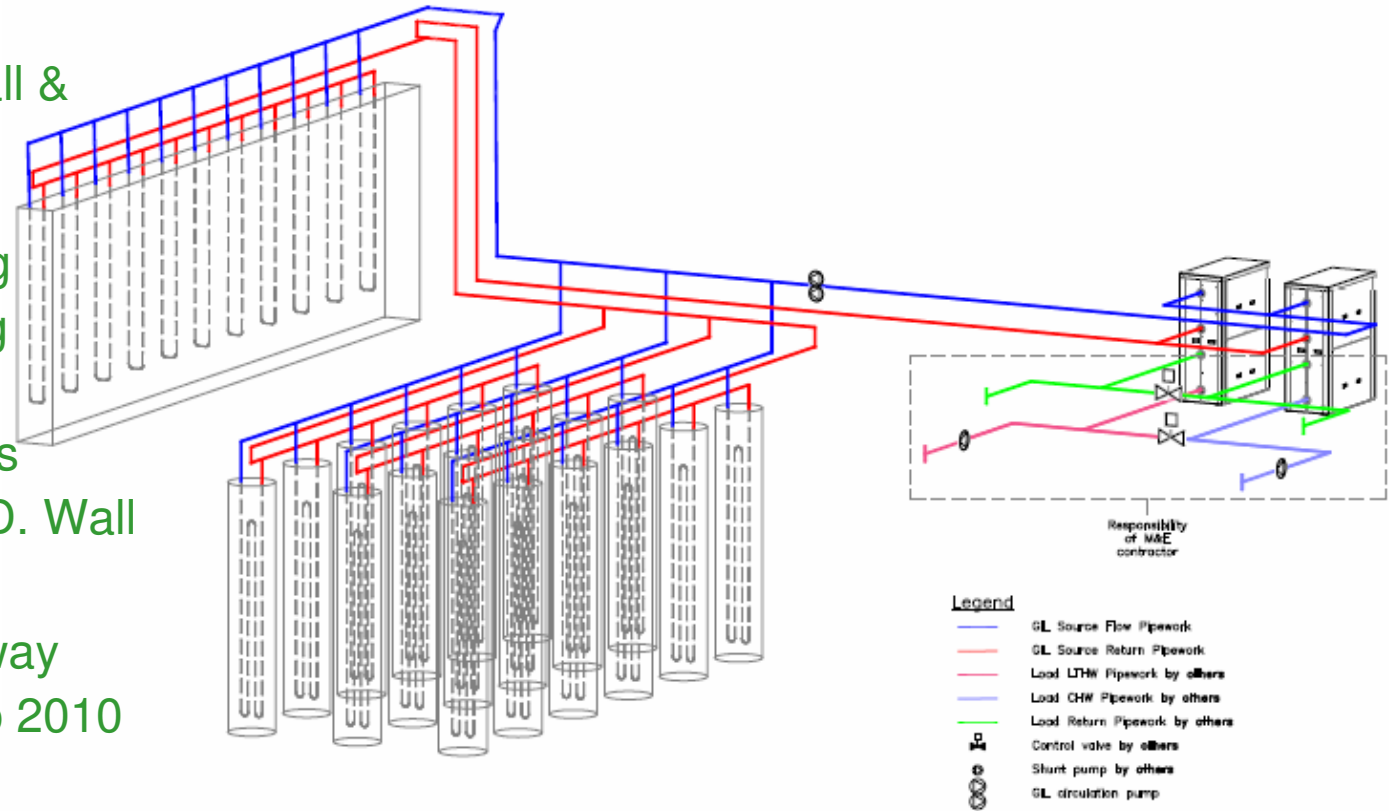


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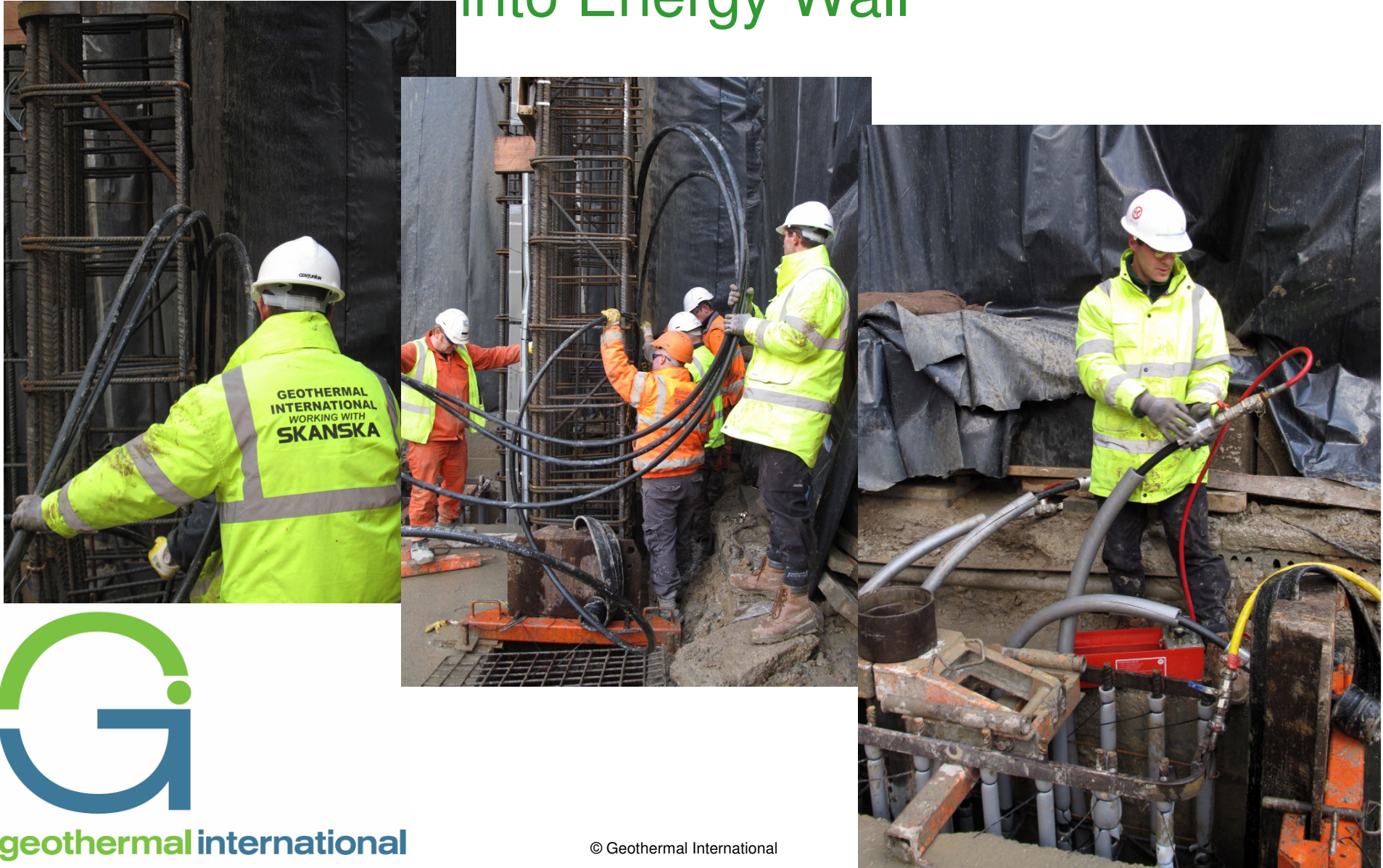
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# Knightsbridge Palace Hotel First Energy Diaphragm Wall Project in UK

- System:
  - Diaphragm Wall & Energy Piles®
- Size:
  - 150kW Heating
  - 150kW Cooling
- Collector type:
  - 50 Energy Piles
  - 150m Energy D. Wall
- On Site:
  - D. Wall underway
  - Piling start Feb 2010



# Knightsbridge Palace Hotel - Loop Installation into Energy Wall



# What are the issues

- What are the effects of transferring heat into piles / diaphragm walls to provide cooling
- What are the effects of cooling piles / diaphragm walls to provide heating

# Key Energy Pile® / Wall Research to date

- **Brandl 2006** – reported on several projects across Austria concluded that shaft resistance, base pressure and bearing resistance of soil are not affected by heat absorption and that temperature induced settlement or heave negligible
- **Laloui 2006** – Identified that the heating-cooling process of the building foundations induces significant modifications in the soil-structure leading to additional stresses in the piles, decrease of the lateral friction and the possibility of a gap between the pile and the soil
- **Bourne Webb et al 2009** - temperature change in piles leads to increases and decreases in shaft resistance and axial load. Working stresses in pile should be kept low, and maintain high factor of safety on shaft to withstand heating and cooling loads





# Energy Piles

13:10 Energy Piles – Codes of Practice

13:55 Energy piles – Design & Modeling

14:35 Coffee Break

14:50 Energy Pile – Monitoring

15.50 Questions





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*Current and Future Research*  
*Into Ground Source Energy*  
*Thursday - 21st January 2010,*  
Energy walls  
Knightsbridge Palace Hotel

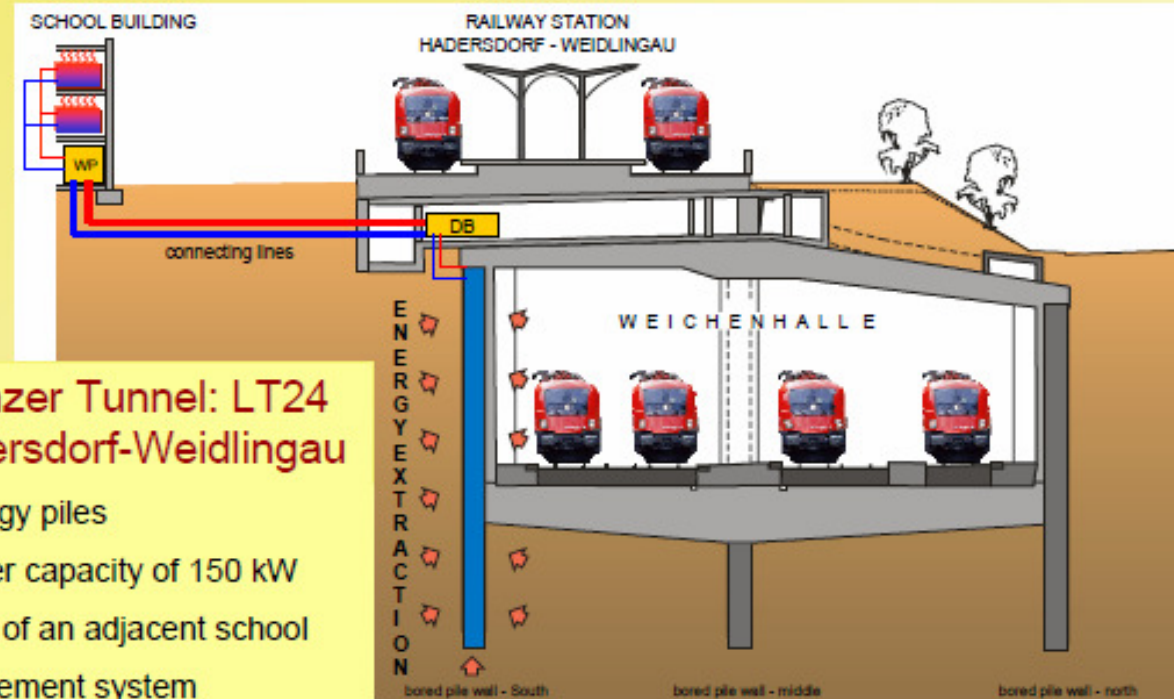


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# Energy Walls

## Case History – Cut and Cover Tunnel



### Lainzer Tunnel: LT24 Hadersdorf-Weidlingau

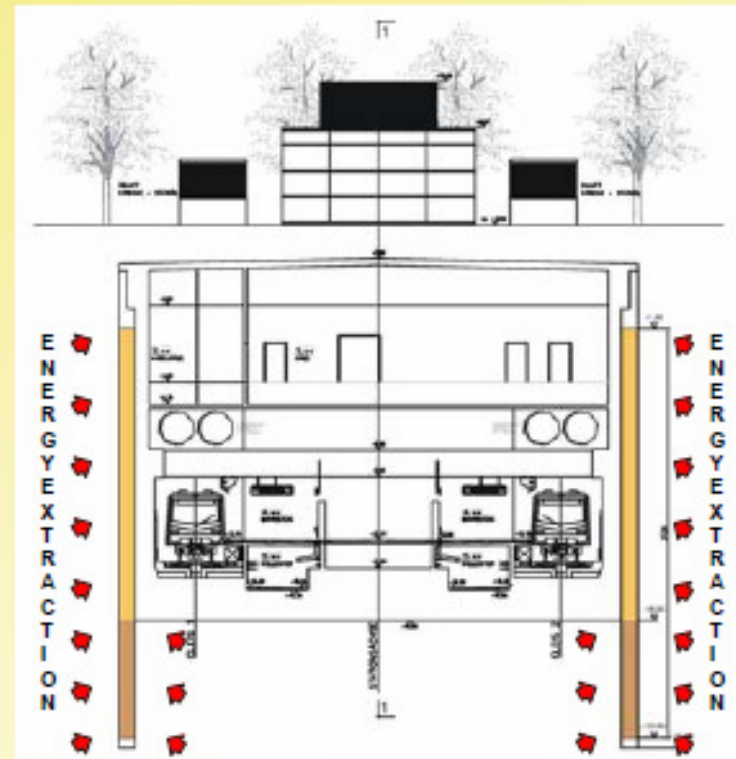
- 59 energy piles
- absorber capacity of 150 kW
- heating of an adjacent school
- measurement system



# Energy Walls

## Case History – Cut and Cover Tunnel

subway line U2 in Vienna  
(under construction)

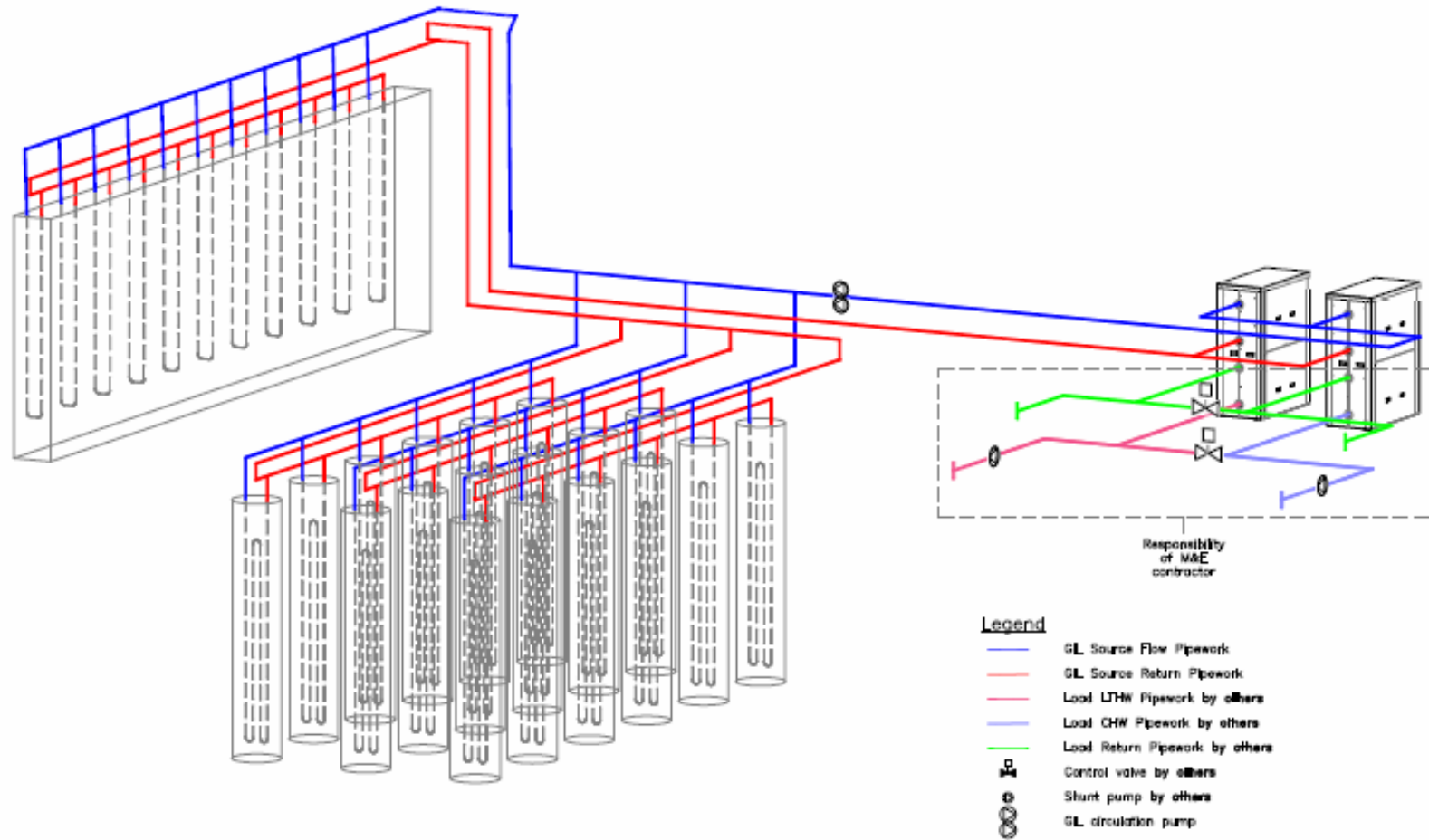


# Knightsbridge Palace Hotel First Energy Diaphragm Wall Project in UK

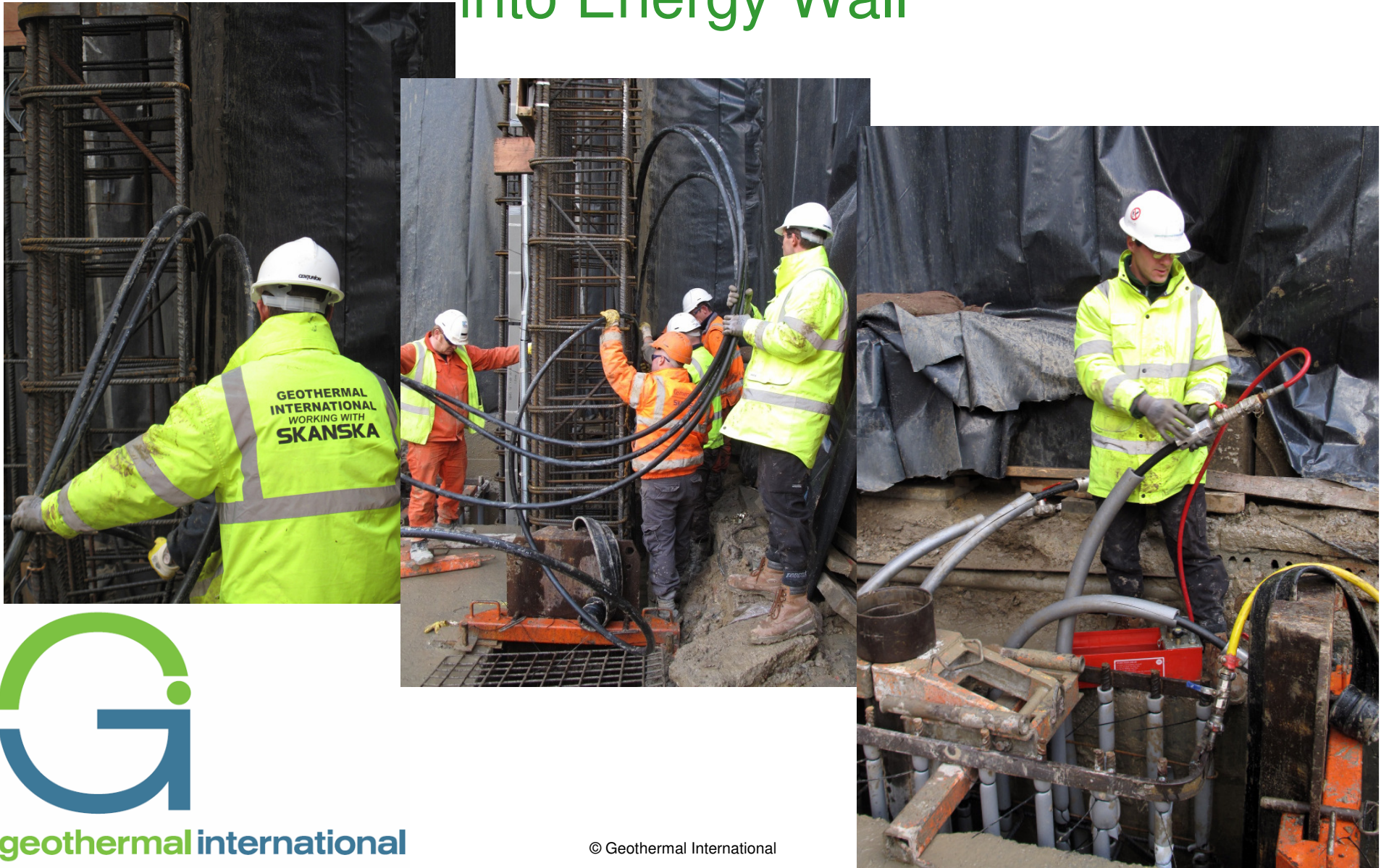
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# Knightsbridge Palace Hotel Schematic



# Knightsbridge Palace Hotel - Loop Installation into Energy Wall



# Opportunities For Crossrail

1km of Diaphragm wall or piles - 40m deep could provide..

- 500kW of Peak Heating
- 500kW of Peak Cooling
- Save 350 tonnes of CO2 per Annum
- Reduce Energy Bill by approx £90k per annum when compared against conventional systems



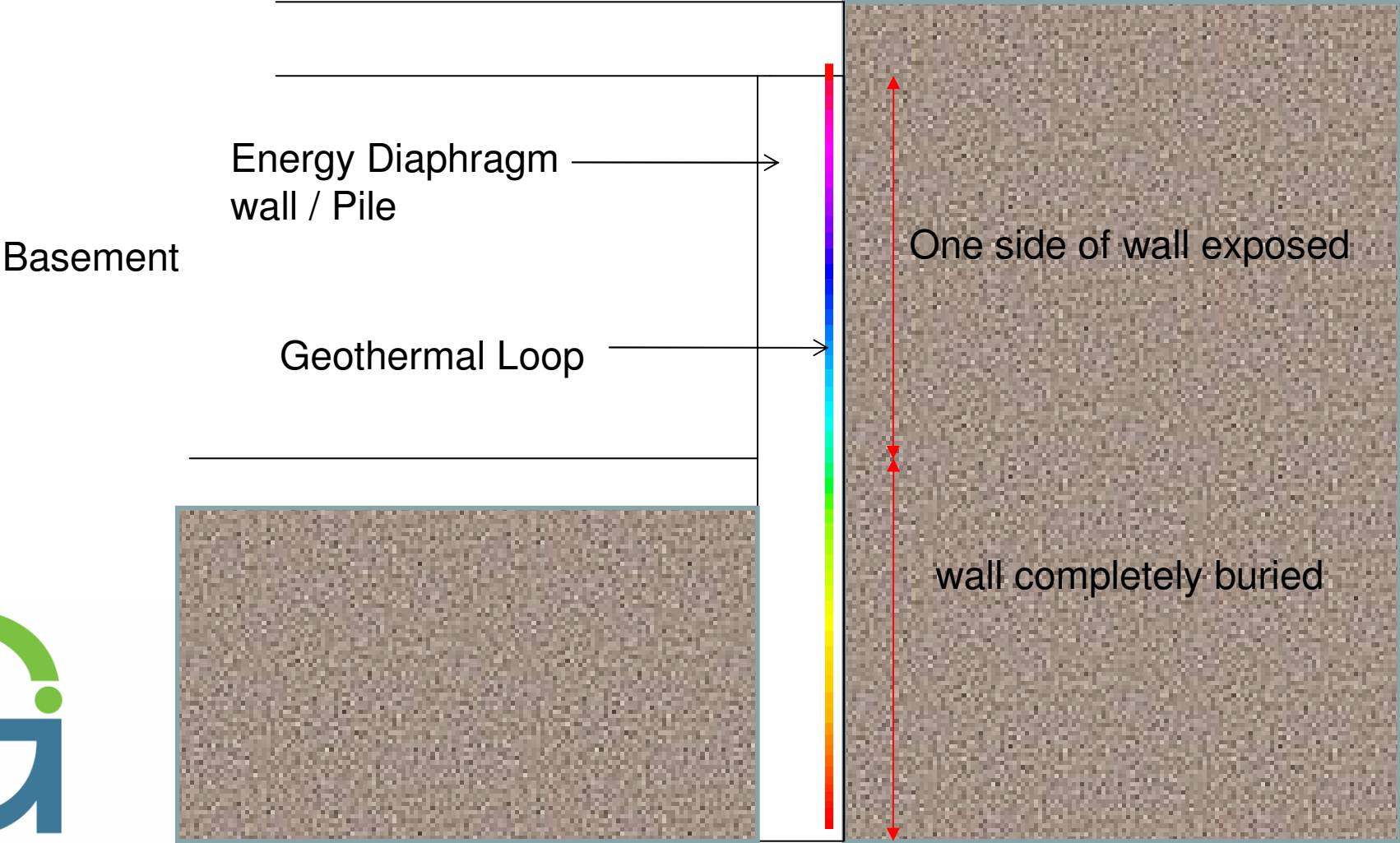


# What are the issues with installing loops in wall piles and diaphragm walls

- What are the effects of transferring heat into piles to provide cooling?
- What are the effects of cooling piles to provide heating?
- What are the thermal effects of removing soil from one face to form basement?



# What conductivity values should be used in ground loop design?

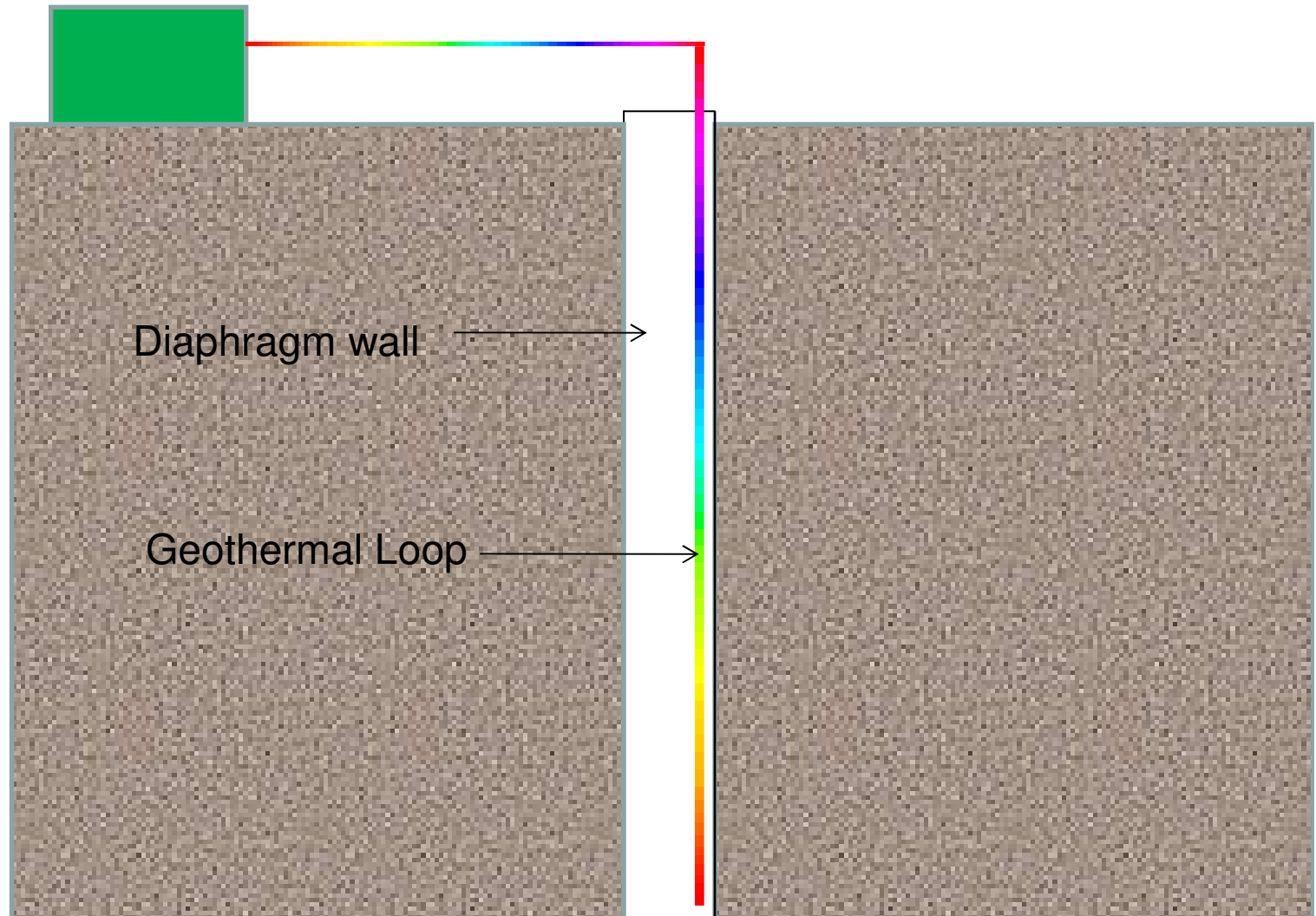


# Geothermal International Research & Development at Knightsbridge Palace Hotel

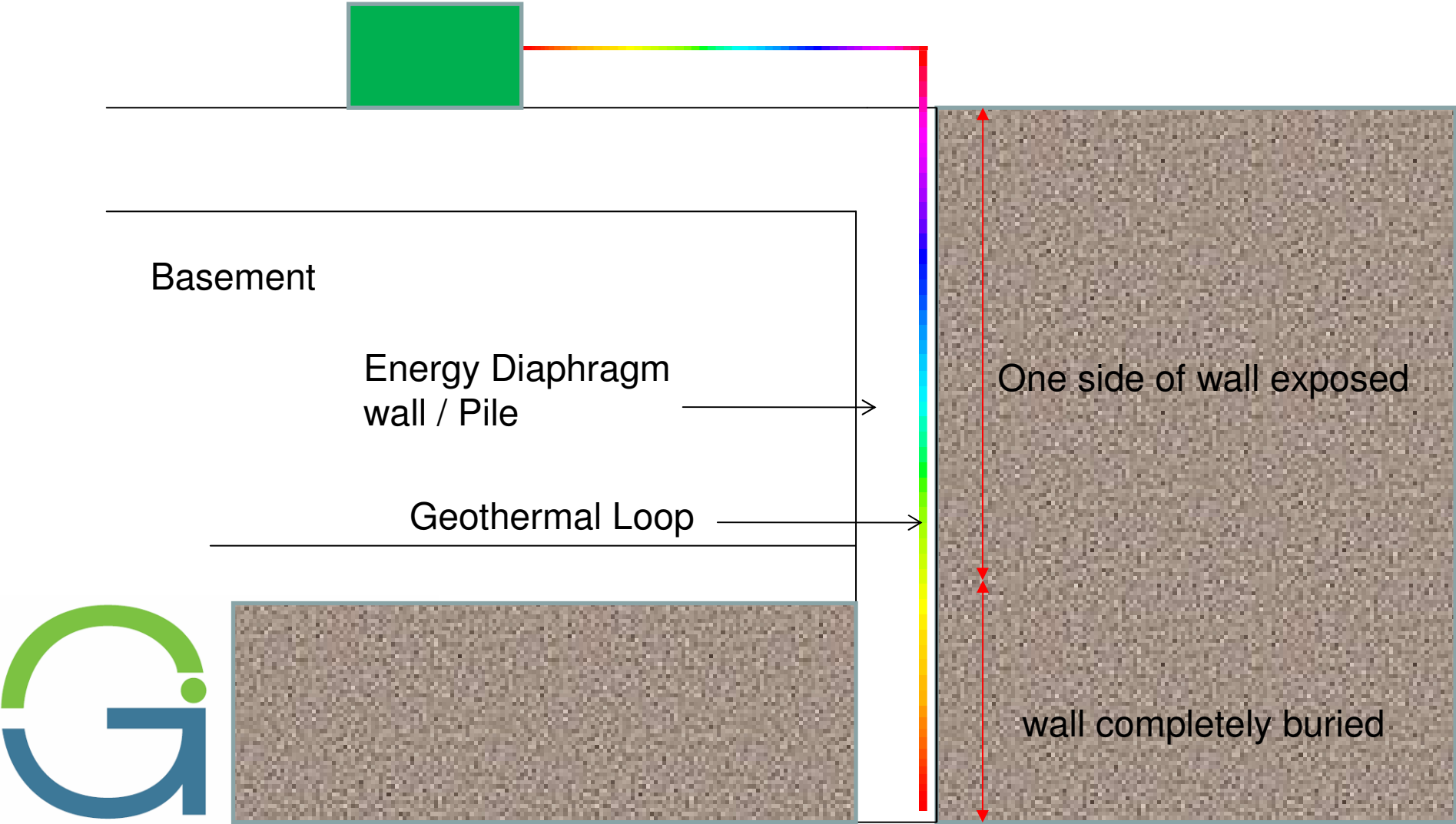
Stage 1: Installation of loops in diaphragm wall - completed



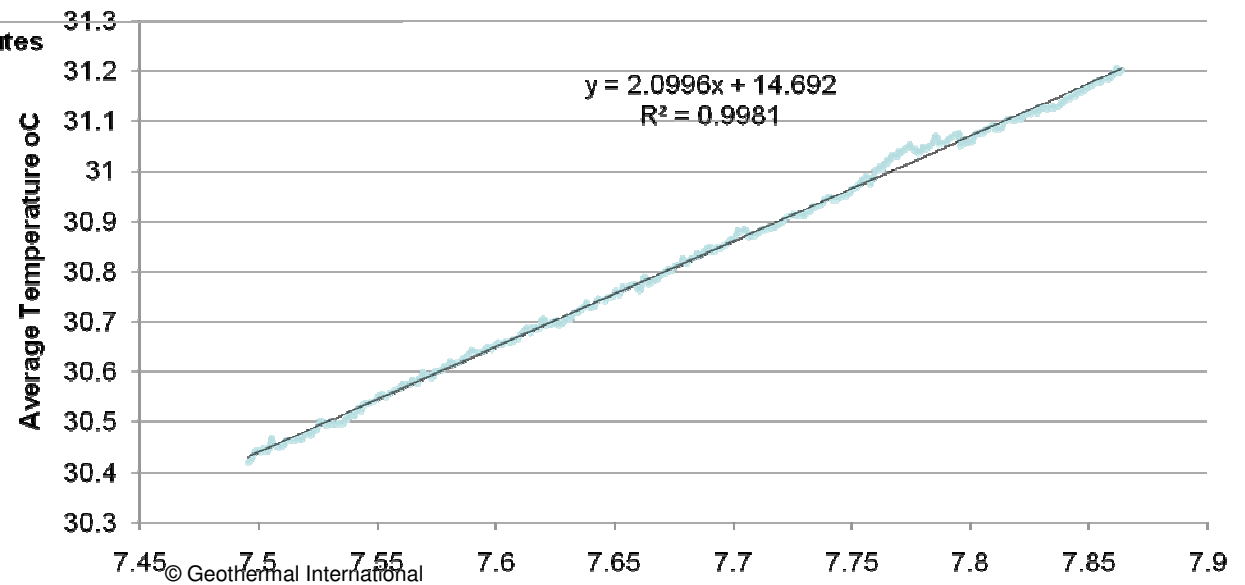
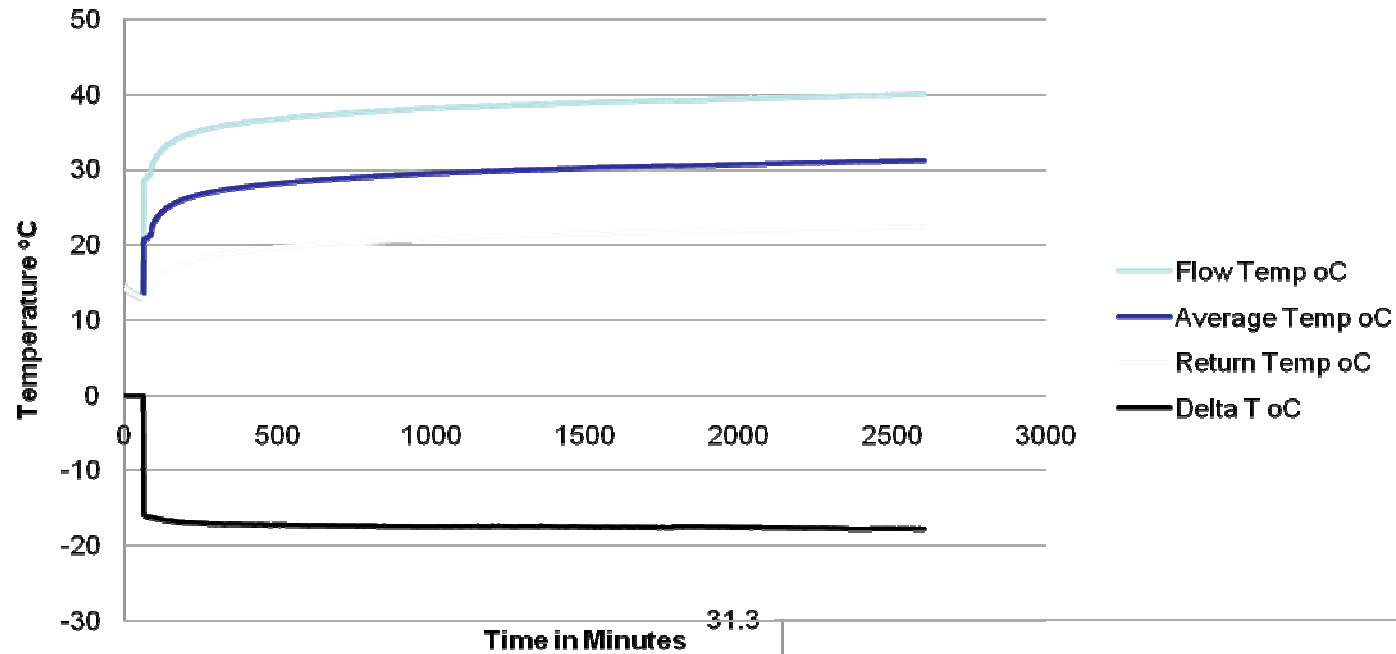
## Stage 2: Undertake conductivity test prior to excavation – February 2010



# Stage 3: Undertake second conductivity test once excavation complete – September 2010



## Stage 4: Report Results End of 2010



# Thanks For Listening

For More Information on Ground sourced heating and Cooling Systems Go To [www.geothermalint.co.uk](http://www.geothermalint.co.uk)

Or

Contact Tony Amis at [ta@geothermalint.co.uk](mailto:ta@geothermalint.co.uk)



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