Mixed foundations utilising micropiles in urban redevelopments

Mike Turner

Applied Geotechnical Engineering

Redevelopment of urban sites:

- Often utilise piled foundations
- Often heavily or partly obstructed
- Granite or masonry dock basins, walls, locks, wharves
- Often undergone redevelopment in their working lives
- ‘Conventional’ pile layout often has to be redesigned, including ground beams

One solution:

- Utilise mixed pile foundations
- ‘Conventional’ piling in unobstructed areas, or where obstructions can be removed
- Drilled micropiles where obstructions can not be economically removed

Intention:

- Review examples of two projects which utilised mixed pile foundations
- Located in East London docklands
- Utilised drilled micropiles and continuous flight auger (CFA) (screwpiles) or driven precast or cast in-situ piles

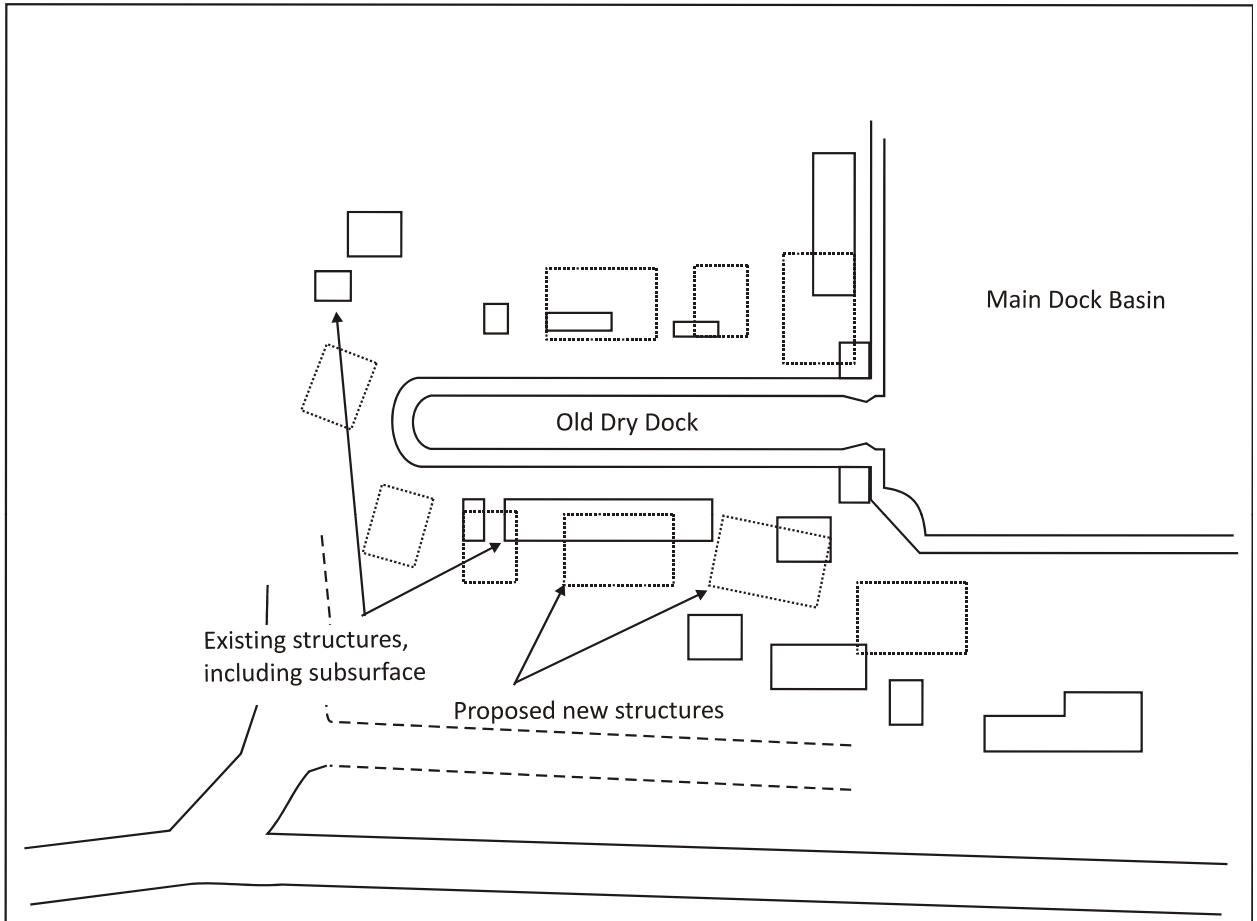

Figure 1: General site layout

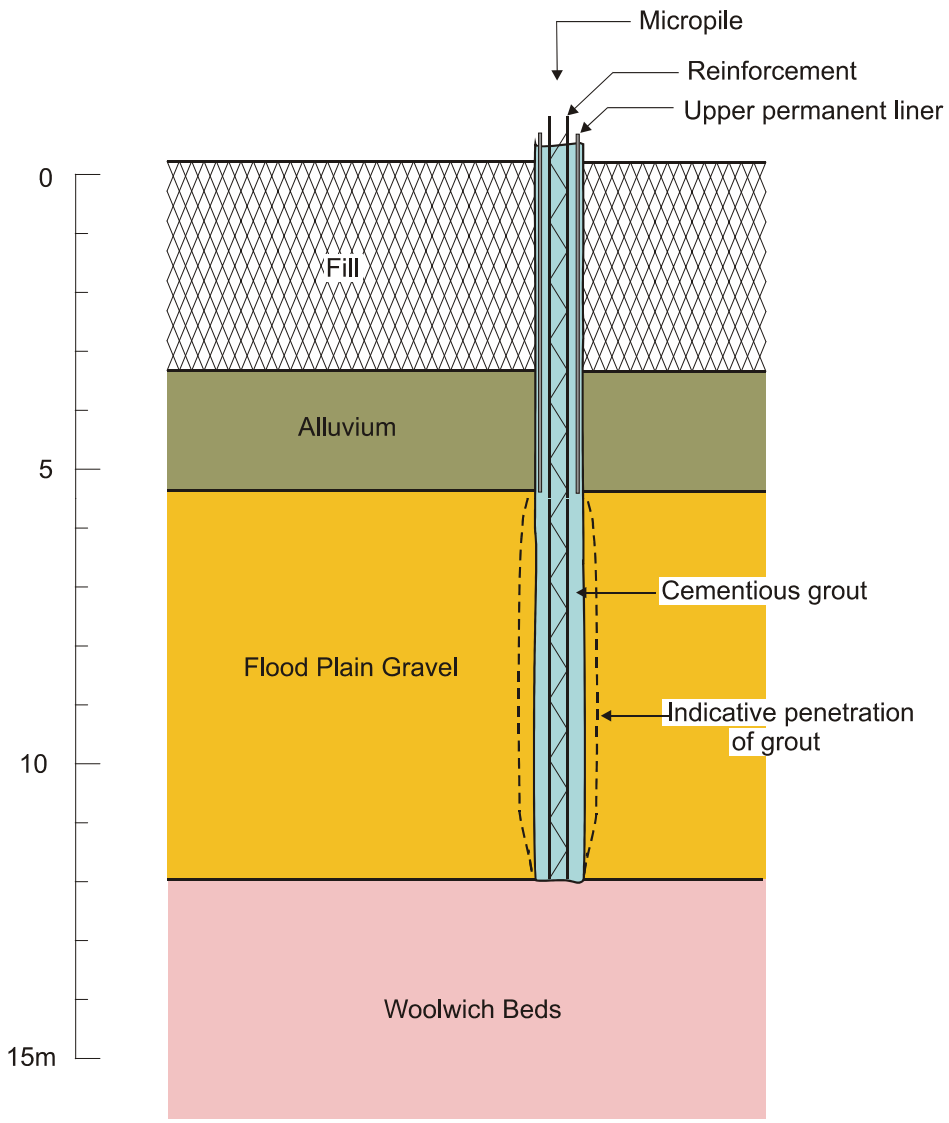

Figure 2: Illustrative cross-section of 254mm and 178mm micropiles

Pile design:

- *Ultimate bond stress, T_{ult}*
- *In Flood Plain Gravels:*
  - $T_{ult} = K.\pi.\ D.\ L\ \sigma_v'.\ tan\varphi'$
- *In Stiff Plastic Clays:*
  - $T_{ult} = \pi.\ D.\ L.\ \alpha.\ C_u$

Test piles:

- Static Load Tests – Maintained Load Test to 2x DWL
- 254mm piles 600kN SWL, 1200kN test load
- 178mm piles 500kN SWL, 1000kN test load

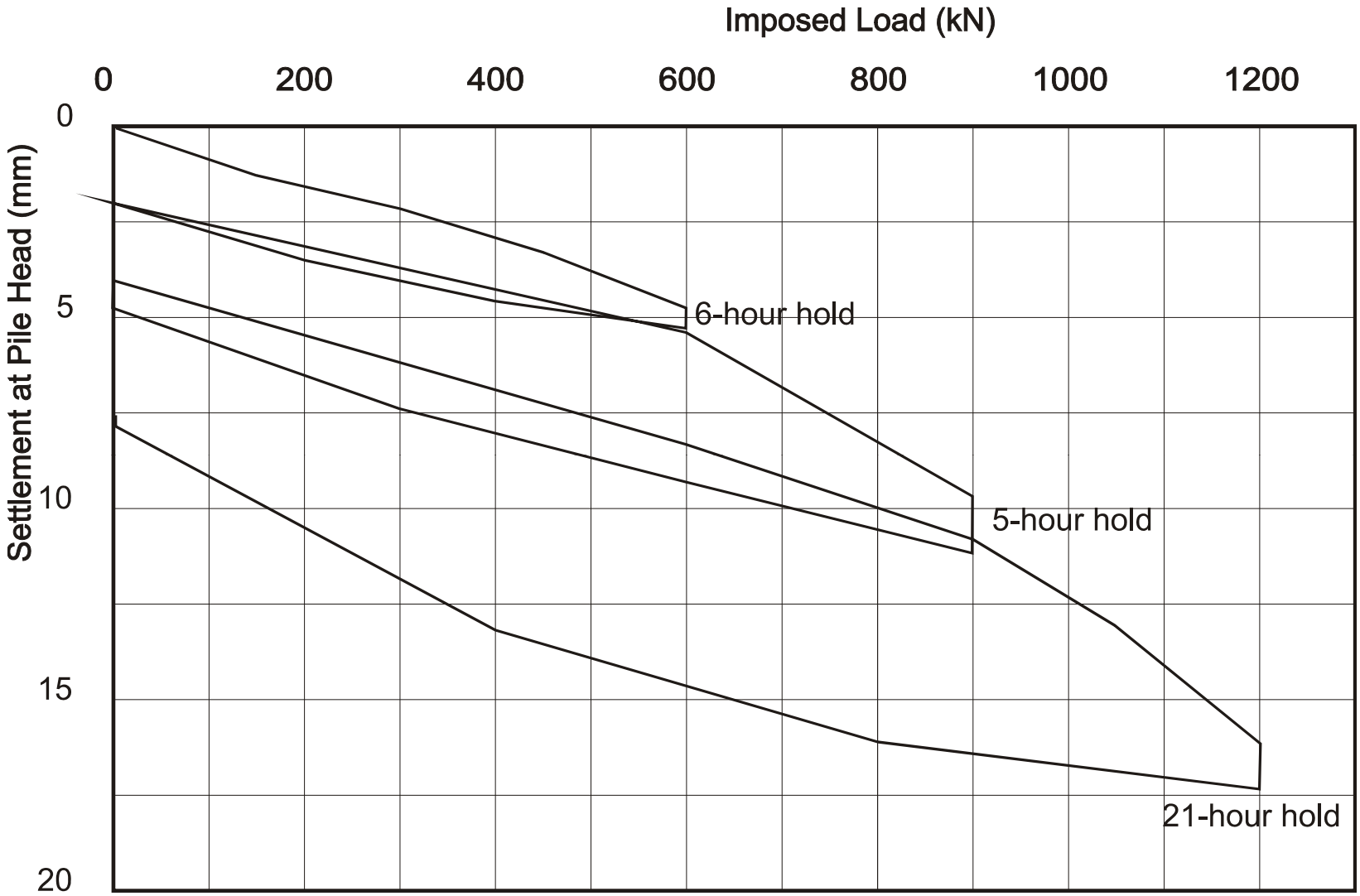

Figure 3(a): 254mm nominal diameter micropile: 1200kN test load

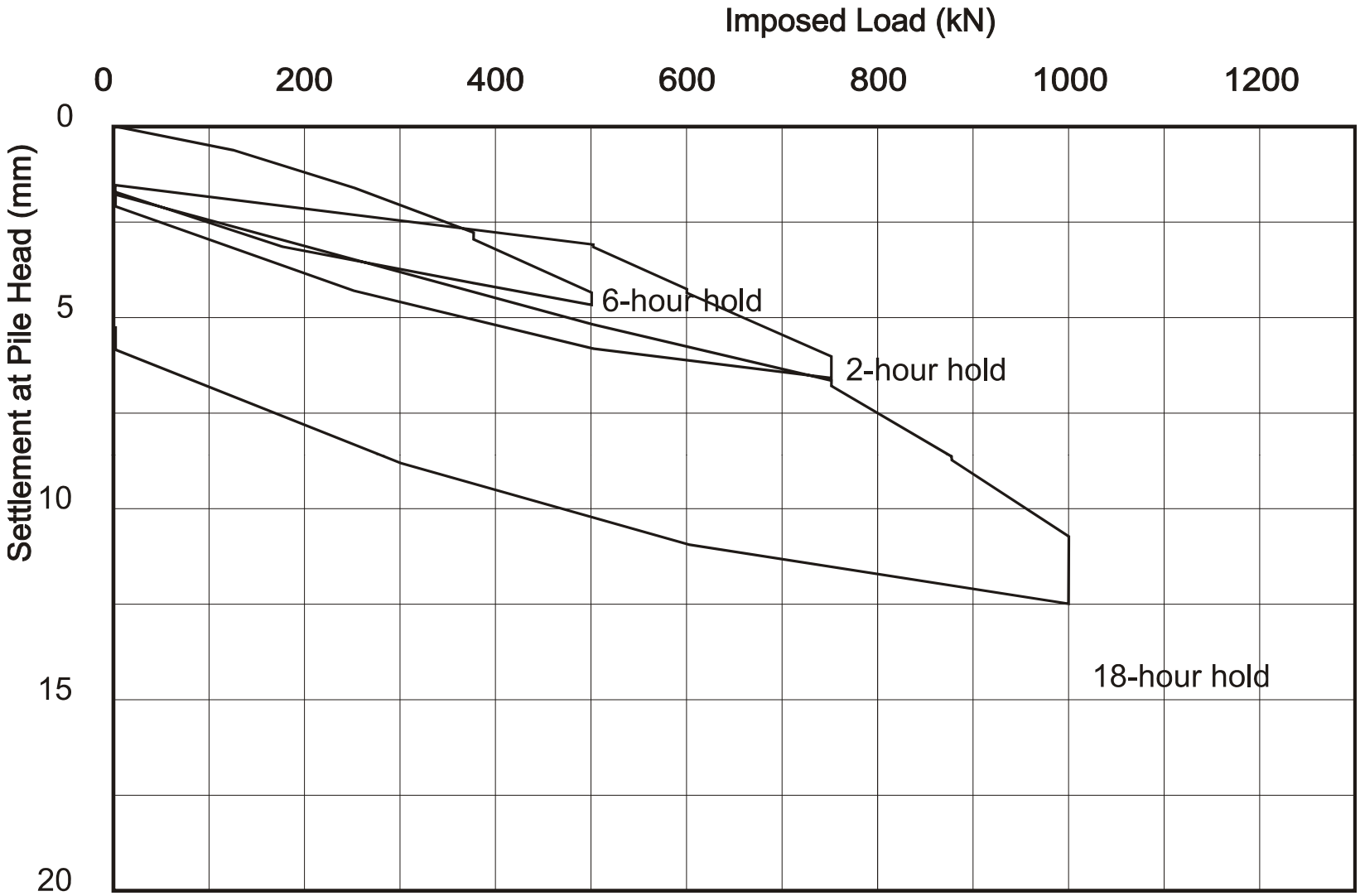

Figure 3(b): 178mm nominal diameter micropile: 1000kN test load

Chosen solution:

- 254mm micropiles
- 400kN SWL
- Chosen so that pile head settlements at working load were similar to those of the conventional (driven cast-in-situ) piles

Second site: Wapping E1

- Similar ground conditions to Isle of Dogs, but with London Clay beneath gravels
- 178mm drilled micropiles
- 250kN SWL (2 for 1)

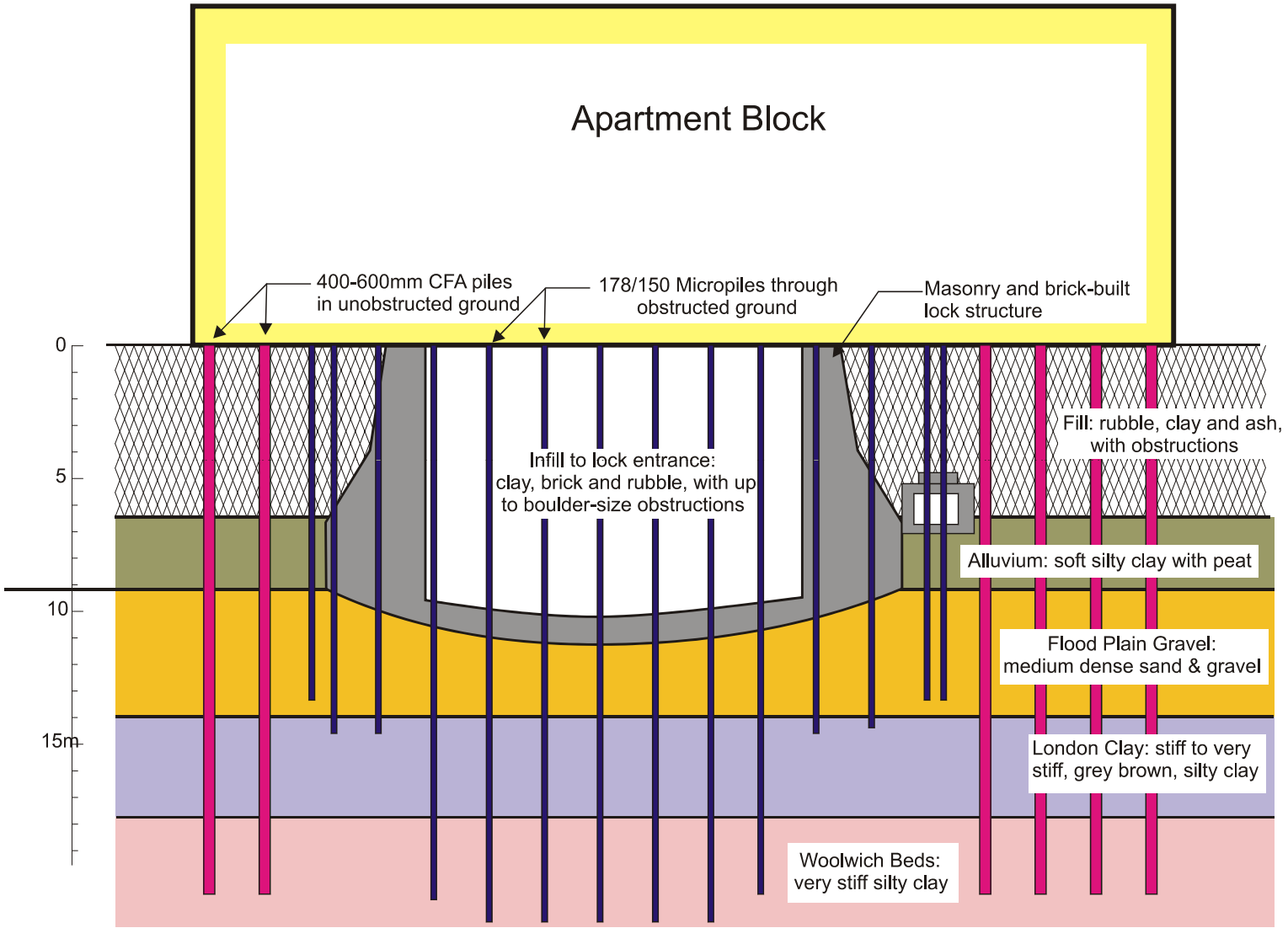

Figure 4: Typical cross-section through Dockland site

A couple of lessons:

- Regardless of geology or sub-surface obstructions, the Developer will always choose the most sellable layout
- Always respect the skill and ingenuity of our Victorian Engineer forebears