C360 Crossrail Intermediate Shafts and Headhouses
Mile End and Eleanor Street London, UK
Costain-Skanska Joint Venture (CSJV)

BIG Biodiversity Challenge Award category: **Medium Scale Permanent Award**

Project overview

The £60 million C360 civils project comprises construction of Crossrail intermediate shafts and headhouses at Mile End and Eleanor Street (including associated enabling works), and the construction of headhouses at Fisher Street, Stepney Green, and Limmo Peninsula. The latter three sites were awarded to C360 after the project had commenced.

The intermediate shafts at all sites provide access to the running tunnels for firefighting, emergency access/egress and general maintenance. At Eleanor Street and Stepney Green, the shafts host fans for tunnel ventilation and a drainage system. Mechanical, electrical and public health services will be provided in each shaft to enable these primary functions to operate effectively.

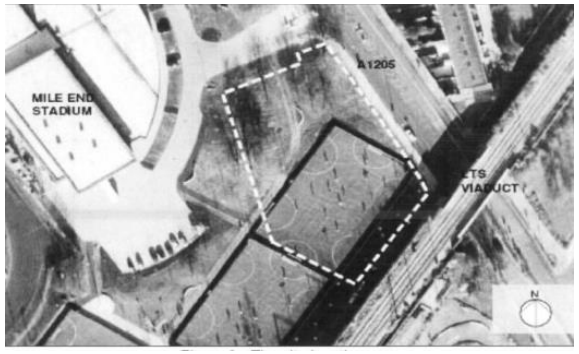
Eleanor Street and Mile End Sites are based in the densely built-up zone 2 of inner East London and cover areas of 12,500m^2 and 6,725m^2 respectively. Over 700 members of staff from Costain-Skanska (principal contractor), Crossrail (client), and various subcontractors have been involved so far.

What were the biodiversity conditions on site, prior to the enhancement?

Mile End: hardstanding (1,675m²), artificial sports pitch (1,530m²), introduced shrub (150m²), amenity grassland (2,470m²) & scattered trees in amenity areas (800m²).
Eleanor Street: buildings and hardstanding (11,230m²), introduced shrub (350m²), ephemeral/short perennial (20m²) & scattered trees in amenity areas (900m²).

Were there any specific reasons that led to this project?

Mile End site abuts Mile End Park, one of very few green spaces available to local residents. The park helps local mental and physical health by reducing stress, improving feelings of well-being and providing fitness opportunities. These are essential to maintain due to the high levels of socio-economic deprivation in the area. Eleanor Street site is an urban environment providing limited habitat. Whilst Crossrail and CSJVs principles are to continuously push for sustainable improvements in construction, complex construction designs and space restrictions left limited scope to mitigate biodiversity loss. However, the aforementioned conditions created an intensified need to protect and enhance biodiversity and support the surrounding communities.



Mile End Site (above) and Eleanor Street Site (below) pre construction.

What were the biodiversity measures taken?

A wildflower grassland mound covering the headhouse with climbing plants covering the wall at Mile End, incorporation of a sedum covered green roof on the headhouse and planting of trees and wildflower grassland at Eleanor Street

Mile End mound was formed using Lytag - an aggregate manufactured from coal power station waste. The wildflower meadow mix comprised 35 different species. 3 trees of moderate value were felled during enabling works. CSJV engaged with London Borough of Tower Hamlets (LBTH) Park Development Officer to ensure the location and species of replacement trees were in line with the park's design and LBTH Biodiversity Action Plan (BAP). 5 native *Franz Fontaine* and 2 pollinator encouraging fruit trees (*Malus Elstar*) were planted.

19 low growing, self-regenerating, and drought resistant sedum species on top of a substrate comprising of recycled crushed brick, topsoil and composted recycled material made up the green roof at Eleanor Street. The substrate stored rainwater for plant growth and helped alleviate flooding. As hawthorn, is a target species in the LBTHs BAP, this is used for security planting between the head house and local road.

This project increases two of LBTH's BAP priority habitats (open mosaic via green roofs and neutral grassland via wildflower turf roof) as well as encouraging birds, invertebrates including Brimstone butterfly, Common Blue butterfly and every species of bumblebees, the latter three of which are listed as priority species in LBTH BAP.
The rooftops recycle CO_2 into O_2. They lock up airborne pollutants which improves air quality and generate a healthy micro-climate around the building for colonisation by neighbouring flora and fauna. The mass on the green structures have sound-absorbing properties to create dramatic dB reductions, provides aesthetic benefits including adding natural colour to the local area and encourages the public to understand wildlife value. Finally, CSJV aimed to return Mile End Park to its original character and maintain any green corridors, footpath and cycle connections.

Green Roof at Mile End Site. Taken by John Zammit.

Green Roof at Eleanor Street Site. Taken by John Zammit.

How would you best describe the project?

Enhancement

Further information

At Mile End, the grass roof comprises a drainage layer above a waterproof layer. Pre-seeded turf mats containing foliage, growth media and principle root zone were installed on top. At Eleanor Street, the green roof comprises a waterproof membrane, moisture retention/protection mat, drainage layer, filter membrane and growing medium. Pre-seeded sedum turf mats were installed on top, perpendicular to the slope of the roof.

C360 faced issues with birds lifting up the corners of the newly laid turf of the sedum roof. This prevented the roots from binding to its substrate and stops the roots from establishing. Removable turf clips were installed in the corners to stop this. If we were to install a green roof again, we would recommend considering bird deterrents as early as possible to give the roof the best chance of establishing.

One aim of this project is to achieve no net loss of biodiversity. Assessments were carried out using the DEFRA tool to quantify this. 88% and 62% increase in biodiversity post-construction for Mile End and Eleanor Street respectively, thus exceeding the project aim.

The lessons learnt have been shared amongst Crossrail, Costain, Skanska and the wider business to support current and future projects. The wildflower roof will be replicated at C360s Limmo site. Stepney Green site intends to replace all trees lost with priority species from LBTH BAP along with additional areas of wildflower grassland, swales and shrubs. The designs are fully replicable across any size site. The low maintenance requirements for all sites are included in the operations and maintenance manual for the future operators.

What was your personal motivation for carrying out the enhancement?

Having recently moved to London, I pass these sites on a daily basis. The limited amount of green space in the surrounding area is very noticeable and any way of increasing green areas can only be beneficial. The wildflower mix at Mile End and green roof at Eleanor Street offers a valuable oasis amongst the concrete and tower blocks.

Mile End Shaft green roof installation (above) and Eleanor Street green roof installation (below). Taken by John Zammit.