How we would build the proposed storm relief sewer

We would build the proposed Counters Creek storm relief sewer using the most advanced construction methods and we would minimise disruption where possible.

The new storm relief sewer would consist of one main tunnel drive and two smaller and shorter tunnel drives.

- We plan to use a tunnel boring machine (TBM) for the main tunnel between the site at Cremorne Wharf Depot, Lots Road, Chelsea and the site at Tesco Superstore car park, Shepherd’s Bush Road.

- We would use a second TBM for the smaller branch tunnel from the Maclise Road car park and woodland adjacent to Kensington Olympia Station site to the site at Holland Villas Road.

- We would construct a ‘pipe jack’ connection tunnel at the Maclise Road car park and woodland adjacent to Kensington Olympia Station site, between the two shafts that we plan to build at this location.
How we would build the proposed storm relief sewer

The different types of site

We would need several different types of construction sites to:

- Put tunnel boring machines (TBMs) into and take them out of the ground (Drive and reception sites)
- Connect into existing sewers (Interception sites)
- Access the new tunnel (Access sites)
- Construct a pumping station.

We plan to minimise the impact from the work as much as possible and we would use other logistics sites to help us with handling our equipment, materials and waste.

Drive site

At a drive site a tunnelling machine is lowered into the ground and starts building the tunnel. Our main tunnel would be driven from the Cremorne Wharf Depot site. The branch tunnel would be driven from the southern shaft at the Maclise Road car park and woodland site. The pipe jacking machine for the small tunnel between the two shafts at the Maclise Road car park and woodland site would also be launched from the southern shaft at this site.

Reception site

At a reception site the TBM is removed from the ground when the tunnel is complete. Our main tunnel TBM reception site would be at the Tesco Superstore car park site, while our branch tunnel TBM would be received at the Holland Villas Road site. The pipe jacking machine at Maclise Road car park and woodland would be received in the north shaft at this site.

Interception site

At an interception site, flow from an existing sewer is collected and transferred into the new storm relief sewer. Our proposed storm relief sewer would directly connect into three existing stormwater sewers, while two further stormwater sewers would be connected into at the Cremorne Wharf Depot site. At interception sites, we would need to connect the existing sewer to a drop shaft, which would lower the collected flows into the new storm relief sewer.

Access site

At an access site we provide safe access into and out of the new storm relief sewer for long term operation and maintenance. Access would also be available at each interception site, but where these access points are far apart we would need to provide an access point between sites. We plan to construct a simple circular shaft at the Land adjacent to the Talgarth Road and Trevanian Road site to provide access.

Pumping station site

We plan to build a temporary pumping station at the Cremorne Wharf Depot site which would be at the southern end of the new storm relief sewer. This pumping station would allow us to pump the collected flows back into the sewer network, or as a last resort into the River Thames, if the new storm relief sewer becomes full before the Thames Tideway Tunnel is complete or if it is unavailable for any reason. The temporary pumping station would be below ground with some small above ground structures.

What is a tunnel boring machine (TBM)?

A tunnel boring machine excavates a circular tunnel using a rotating cutterhead, while simultaneously creating a tunnel wall using concrete segments. As it excavates it also transports material backwards via a conveyor belt or pump, which is progressively extended as the machine moves.

What is ‘pipe jacking’

Pipe jacking is often used for shorter and smaller diameter tunnelling work and where tunnelling can be mostly in a straight line. Large hydraulic jacks are used to push specially designed precast concrete pipes into place, while excavation is taking place at the front of the pipes. This would involve using a similar but smaller tunnel boring machine to the other tunnels.
How we would build the proposed storm relief sewer

The main sewers in this area of London:

1. Cremorne Wharf Depot, Lots Road, Chelsea
2. Land adjacent to Talgarth Road and Trevanion Road, Hammersmith
3. Maclise Road car park and woodland, adjacent to Kensington Olympia Station
4. A section of the car park at Tesco Superstore, Shepherd’s Bush Road
5. Holland Villas Road at its junction with Lower Addison Gardens

Figure 1 - Our five preferred construction sites and proposed tunnel route.
How we would build the proposed storm relief sewer

Ventilation of the storm relief sewer

We would also need ventilation for the operation of the storm relief sewer. During heavy rainfall, when the storm flows start to fill the new sewer, displaced air would need to be vented in a controlled way to release pressure from inside the sewer network.

We would use a system of both active and passive ventilation to manage the air transfer into and out of the sewer network.

We would use active ventilation to remove air from the new sewer to create airflow along its length and passive ventilation to draw air into the new sewer, changing the air within the system. The system would provide one air change per day.

Storm water flows within the proposed storm relief sewer would be heavily diluted by rainwater and therefore we do not expect any odour impacts. However as a precaution, any air vented from the proposed sewer will pass through a carbon filter.

As part of the ventilation system we would need an above ground active air management building at the Maclise Road car park and woodland adjacent to Kensington Olympia Station site. This building would include a ventilation column that would be 2.5m in diameter and approximately 10m high.

At our other preferred construction sites we would need below ground passive ventilation structures, which would be approximately 6m long, 4m wide, and 3m deep. We would also need above ground ventilation columns that would be no greater than 1.5m diameter and up to 6m high.

Main tunnel connections

We would need to connect the four main interception sites and also transfer the collected stormwater flows to the Cremorne Wharf Depot site, where they would be directed into the new Thames Tideway Tunnel to prevent overflows into the River Thames.

We would also connect into two sewers at Cremorne Wharf Depot. We would need a deep and large diameter tunnel, which would collect all the flows when the existing network fills up during storms. This tunnel would be five kilometres long, four metres in diameter, and approximately 40 metres below ground level at its deepest point.

The tunnels would be constructed to connect the interception shaft sites which would divert the storm flows from the existing stormwater sewer network into the new storm relief sewer.

Table 1 below shows the type of site and the sewers that would be connected into, for each of our preferred construction sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Type of site</th>
<th>Intercepted sewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tesco Superstore car park</td>
<td>Main tunnel TBM reception Sewer interception</td>
<td>Hammersmith Storm Relief Sewer Brook Green Branch</td>
</tr>
<tr>
<td>Maclise Road car park and woodland adjacent to Kensington Olympia Station</td>
<td>Sewer interception TBM drive to Holland Villas Road Pipejack TBM drive between the two shafts</td>
<td>Hammersmith Storm Relief Sewer (Duplication Branch)</td>
</tr>
<tr>
<td>Holland Villas Road at its junction with Lower Addison Gardens</td>
<td>Sewer interception TBM reception from Maclise Road</td>
<td>Existing Counters Creek sewer</td>
</tr>
<tr>
<td>Land adjacent to Talgarth Road and Trevanion Road</td>
<td>Main tunnel access point</td>
<td>Access only</td>
</tr>
<tr>
<td>Cremorne Wharf Depot, Lots Road, Chelsea</td>
<td>Sewer interception Main tunnel TBM drive Temporary pumping station</td>
<td>Walham Green Sewer Low Level No.1 Sewer</td>
</tr>
</tbody>
</table>

Table 1 - Key information about our five preferred construction sites
construction sites. Table 2 shows details of each of the three tunnel sections we would need to build the proposed storm relief sewer.

<table>
<thead>
<tr>
<th>Section</th>
<th>Length</th>
<th>Diameter (internal)</th>
<th>Construction method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Tunnel</strong></td>
<td>5000m</td>
<td>4m</td>
<td>TBM drive, segmental lining</td>
</tr>
<tr>
<td>Cremorne Wharf Depot to Tesco Superstore car park, Shepherd’s Bush Road via Talgarth Road and Maclise Road car park and woodland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Branch Tunnel</strong></td>
<td>350m</td>
<td>2.85m</td>
<td>TBM drive, segmental lining</td>
</tr>
<tr>
<td>Maclise Road car park and woodland to Holland Villas Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maclise Road Connection Sewer</strong></td>
<td>100m</td>
<td>1.8m</td>
<td>TBM drive, Pipe jack</td>
</tr>
<tr>
<td>Maclise Road southern shaft to Maclise Road northern shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 - Details of each of the three tunnel sections

Example drive site layout at Cremorne Wharf Depot

![Example drive site layout at Cremorne Wharf Depot](image)

- Offices and welfare over entrance
- Electrical equipment
- Acoustic building
- Tower crane
- Compressors, air receiver and emergency generator
- Stores
- Workshops
- Main tunnel works conveyor
- Material deliveries and intermediate spoil barge
- Acoustic shrouding
- Main tunnel spoil removal barge

*Roof omitted from acoustic building for illustrative purposes only.*
How we would build the proposed storm relief sewer

What is a shaft?
Shafts are vertical openings (generally circular structures) we would use for accessing the new tunnel. These shafts would be used to transfer the flows to the new tunnels and to provide access to these during operation and maintenance.

Work at a drive site
Work at the tunnel drive sites will include the following:

Shaft construction
At all of our sites we would need to build one or more shafts. The size and depth of the individual shafts would vary depending on:

• The size and depth of the tunnels that would be connected into the shaft
• The structures that would need to be constructed within the shaft to deal with the flows

Tunnelling preparations
Before we begin tunnelling, we would need to prepare the site with the necessary equipment and temporary work and bring the TBM to the site, assemble it, and lower it into the bottom of the drive shaft. This would involve a large crane.

Driving the Tunnel Boring Machine (TBM)
The TBM would be used to dig the tunnel from the drive shaft to the reception shaft, and uses a slowly rotating cutterhead fitted with teeth to cut the ground. With the cutterhead rotating, the TBM pushes itself forward against the tunnel lining. Once a set distance has been mined (typically 1m to 1.3m), a new section of tunnel lining is put into place using precast concrete segments which are bolted together.

The material removed by the TBM is taken back down the tunnel by a train on a temporary construction railway running in the new constructed tunnel. This train then returns to the TBM with the concrete segments required for the next advance.

Tunnelling would take place 24 hours a day, 7 days per week at our main tunnel site at Cremorne Wharf Depot, so we would use noise and dust protection to minimise any disruption.

For our main tunnel, at Cremorne Wharf Depot we plan to use barges instead of lorries to transport the removed material away from this site.

We would also need to make grout on site. Grout is a mixture containing cement, sand, water and other additives, which is used to fill the small gap between the outside of the tunnel segments and the soil around it. The component parts of the grout would be delivered to and stored on site.

Work at a reception site
We would have three TBM reception sites: one at Tesco Superstore car park for the main tunnel, one at Holland Villas Road for the branch tunnel from Maclise Road car park and woodland, and one at the north shaft of Maclise Road car park and woodland for the connecting pipe jack tunnel. The work at a reception site would include the following:

Reception shafts
At each site we would need to build a reception shaft, which would be a rectangular chamber at Tesco Superstore car park and a circular shaft at each of the other sites. The size and depth of the structure would vary depending on:

• The size and depth of tunnels that would need to be connected into the shaft
The proposed Counters Creek storm relief sewer will be driven as a 5 km, 4m internal diameter tunnel from Cremorne Wharf Depot in the south to Tesco Superstore car park in the north, via shafts at the Land adjacent to Talgarth Road and Trevaion Road and Maclise Road car park and woodland sites. There will be an additional branch tunnel connecting the Holland Villas Road site to the main sewer at the Maclise Road car park and woodland site. Short connection sections via pipe jacking and open cut work will be used at the individual sites to create connection structures to the main tunnel.

We will be using the most advanced best practice methods of construction across the project in order to deliver the proposed storm relief sewer by the safest means and with the minimum disruption feasible.

The structures that would need to be constructed within the shaft to deal with the intercepted flows

TBM removal
When the TBM arrives at the reception structure we would take it apart, lift it out of the shaft and then remove it from the site. This would require a large mobile crane and a series of lorries.

Work at the pipe jack connection site
At the Maclise Road car park and woodland site we would construct two shafts: A north interception shaft for connecting into the existing sewer at this site and a south connection shaft to collect the flow at this site and the flow coming from Holland Villas Road, and connect these to the main tunnel. Between the interception and connection shafts, we would build a 1.8m diameter tunnel using the pipe jacking method.

Piling work
We would drive piles into the London clay to support the soft soil and to cut off the ground water. The driving method can vary but we plan to drive the piles using vibratory techniques wherever possible, instead of the more disruptive percussive or impact techniques. This would avoid introducing excessive vibration into the ground.

We would use piled cofferdams (closed piled structures) in the construction of the shafts and chambers as well as the air management chambers and connection culverts at all of the sites.

Sewer interception works
The sewer interception work would require some work within the sewers (working from existing access points), to prepare the connections. Wherever possible we would complete work within and around the sewers in dry weather conditions to minimise any necessary flow control to ensure a safe working environment. We would put flow monitoring in place, to give an early warning of high flows and allow enough time to safely evacuate workers in the event of a storm.

Open cut work
Open cut work involves digging surface trenches. Even though we plan to minimise any surface disruption, we would still require some short open cut sections to connect some of our new structures together. These include structures connecting the chambers with the shafts and culverts connecting the air management chambers with the shafts. We have designed the sites to minimise the extent of this work.

Once we have finished all of the work, we will landscape or reinstate the site. We are committed to reinstating areas we use during our work back to their original condition or as close as practically possible.

Some changes may be necessary where we need to leave equipment on site permanently or where we need to meet a planning condition. Where changes have to be made, we would agree the reinstatement in principle with the land owner or we would pay compensation.

Our work would be subject to planning permission, which will require that we provide a detailed mitigation strategy, including a planting schedule for all shrubs and trees. Where plant and tree removal is necessary, we would make every effort to replace them with like for like plants and trees. We would consult owners on the planting requirements prior to starting work.
Related documents
The following documents are available at our drop-in sessions and to download from the document library on our website - www.thameswater.co.uk/counterscreek

Phase 1 consultation and engagement process
- Feedback from our phase 1 consultation and engagement process
- Phase 1 Consultation and Engagement Process Feedback Report

Project information
- Being a good neighbour
- Environment
- Getting planning permission
- Have your say
- How we chose our preferred sites
- Transport
- Timing
- Tunnel drive strategy
- Why we need the Counters Creek storm relief sewer

Site information
- Cremorne Wharf Depot, Lots Road, Chelsea
- Land adjacent to Talgarth Road and Trevanion Road, Hammersmith
- Maclise Road car park and woodland adjacent to Kensington Olympia Station
- Holland Villas Road at its junction with Lower Addison Gardens
- Tesco Superstore car park, Shepherd’s Bush Road

Site Suitability Reports
- Cremorne Wharf Depot, Lots Road, Chelsea
- Land adjacent to Talgarth Road and Trevanion Road, Hammersmith
- Maclise Road car park and woodland adjacent to Kensington Olympia Station
- Holland Villas Road at its junction with Lower Addison Gardens
- Tesco Superstore car park, Shepherd’s Bush Road

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