Town & Gown Utility Tunneling

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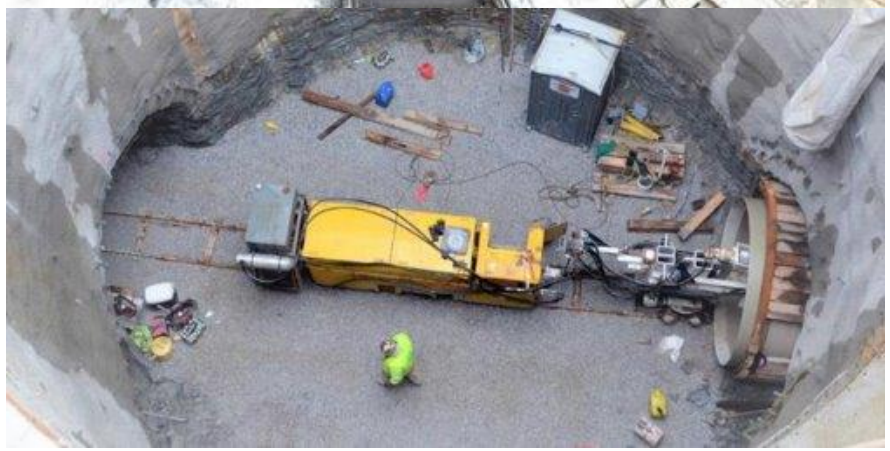
Utility Installation - Trenchless Methods

- **Horizontal Directional Drilling – HDD**
  - < 60-inch Outside Diameter
  - Steel, DI, HDPE and FPVC Pipes
  - Typically, less than 7,000 ft. Drive
- **Microtunneling – MT**
  - < 144-inch Outside Diameter
  - Steel, RCP, GFRP, PC
  - Typically, less than 3000 ft. Drives
  - Line and grade Accuracy
- **Conventional Tunneling**
  - > 84-inch Outside Diameter
  - Various for initial support (segments, rib and lag
  - Typically, Two-Pass method
  - Length based on Diameter (several miles)

One Or Two Pass Tunnelling

One Pass	Two Pass
Direct construction/installation of the final carrier pipe by trenchless methods or as a tunnel **Typically:** • RC segmental liner rings in larger tunnels > 2.5 m e.g. CSO tunnel • RC, PC, VC, GFR & steel Jacking pipes in smaller diameters < 3 m primarily for gravity sewers and steel, HDPE and FPVC as pressure lines by HDD and DP	• Construction of a tunnel by a suitable method for the ground conditions, length and diameter required to allow the carrier pipe to be inserted/sliplined into the tunnel and the annular space grouted. • Installation of a casing pipe typically steel or RCP by trenchless methods and the carrier pipe is inserted through the casing pipe and grouted in place • Used for rail and major highway crossings and potable water steel pipes



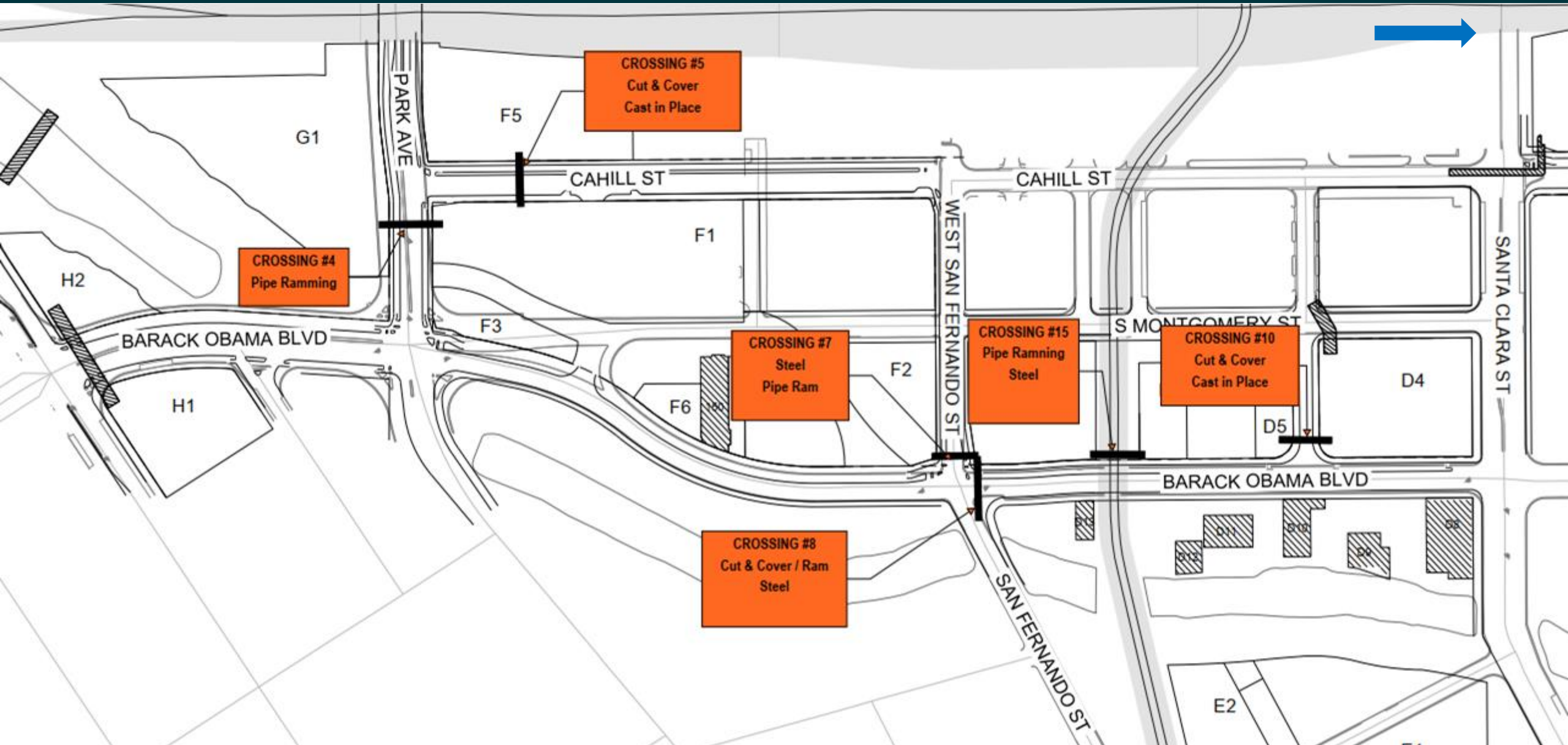
Recent HDD Projects

- Dominion Energy Norfolk VA HDD Crossing of the Elizabeth River by HDD for power cable conduits 1800 LF of 10-inch HDPE Pipe
- 2,000 LF of 20-inch HDPE force main crossing at the Intracoastal Waterway (ICW) at Madeira Beach at minus 75 feet to avoid the Tom Stuart Causeway Bridge piles
- 3,000 LF 30-inch HDPE water main crossing of the Manatee River at Fort Hamer
- 3,500 LF of 20-inch HDPE water main crossing of the ICW at Cortez Road
- 7, 043 LF of 12-inch steel pipe for gas, spanning the Ohio River Valley, using the intersect method
- 3,900 LF of 10-inch steel pipe gas main with two curves and very tight tolerances across the Detroit river between USA and Canada
- 600- 7000 LF for 20 HDD Crossings between 10 and 16 inches for the Falcon Pipeline project across PA/OH and WV for Shell Pipeline

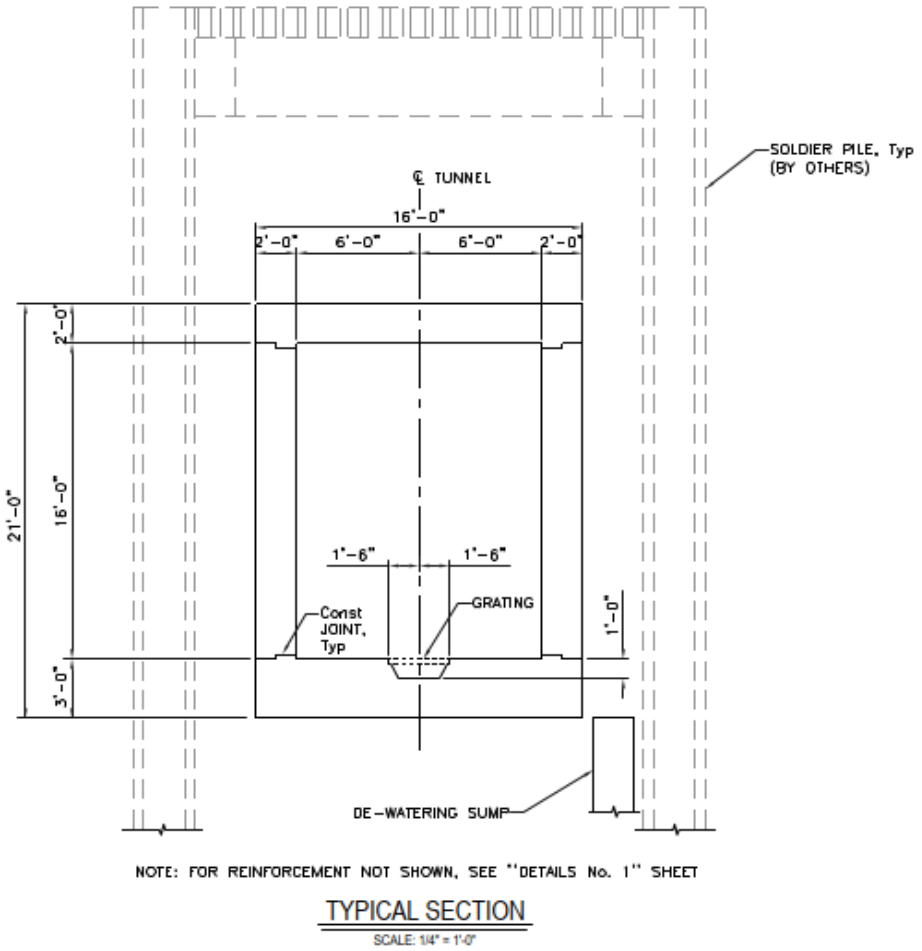
Disney Utilidor

- Built in the Late 60s
- A series of large underground tunnels mainly cut and cover
- Used to house utilities
- Used as walkways for people to move around the facilities
- Used for transport of goods

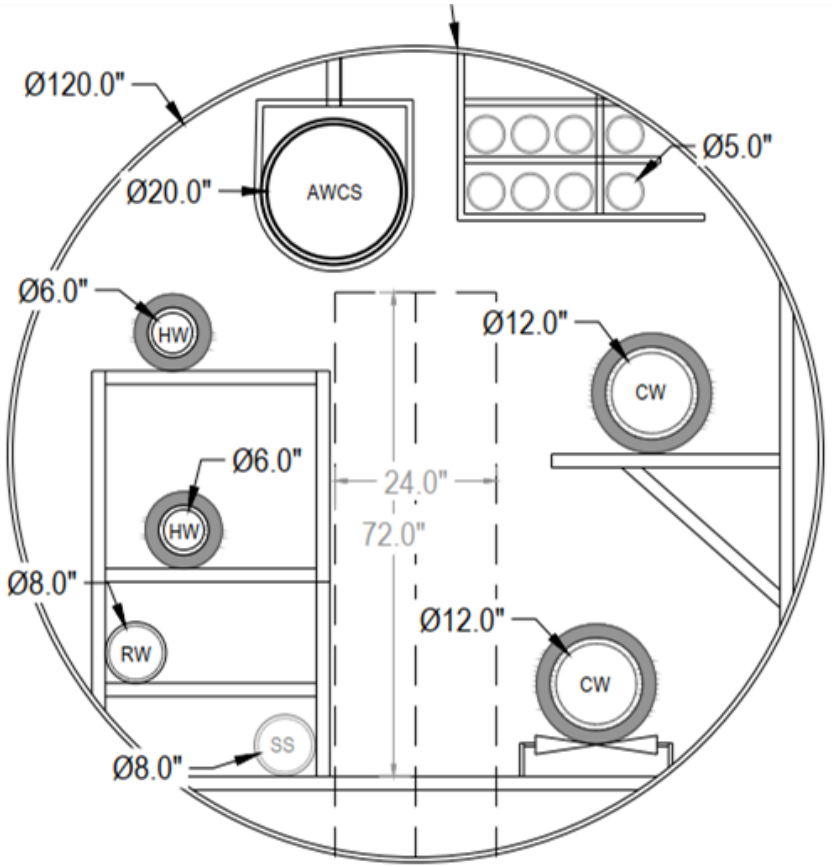
Utilidor Map



Utilidor - Tunnel Types



Cast In Place



Circular Steel Section

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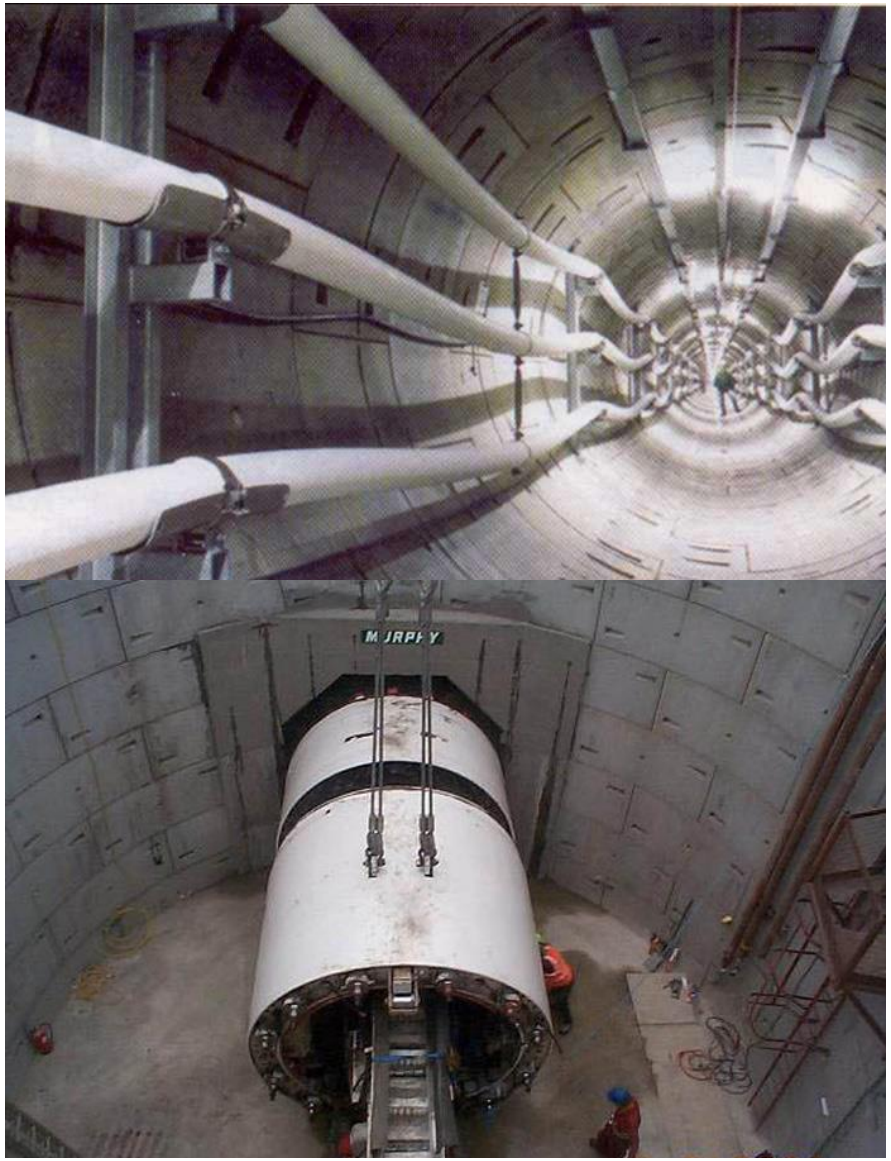
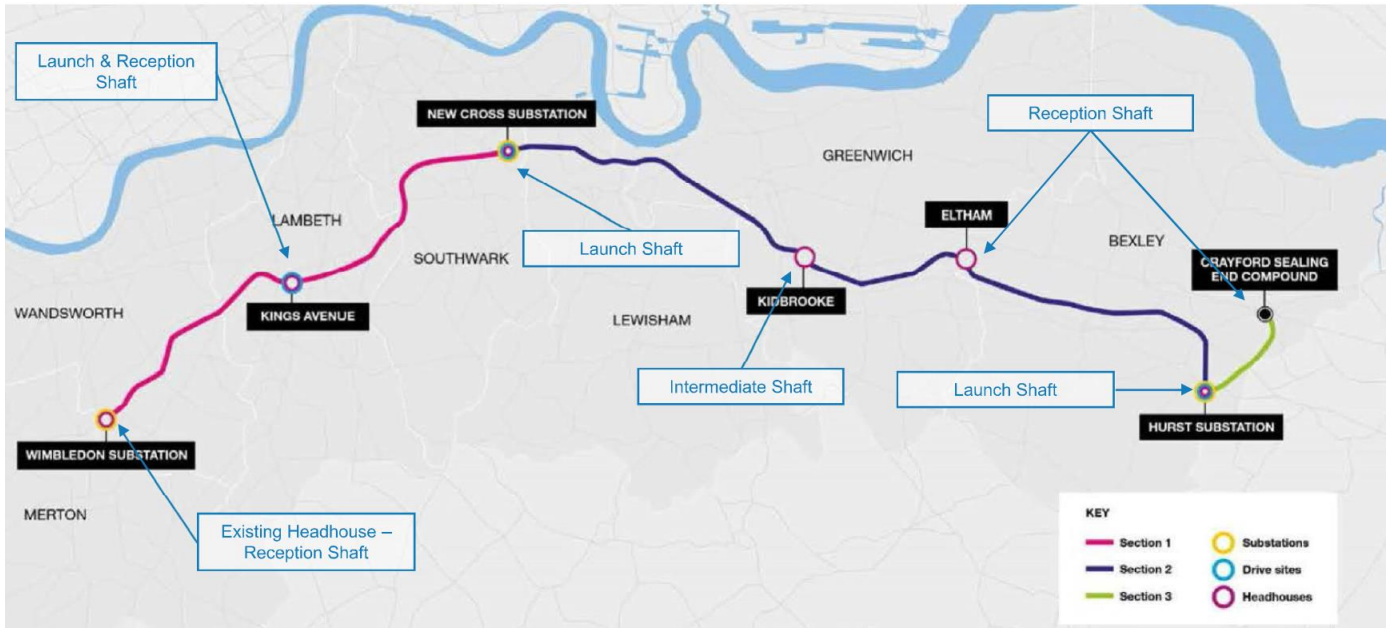
Elstree to St. Johns Wood Cable Tunnel

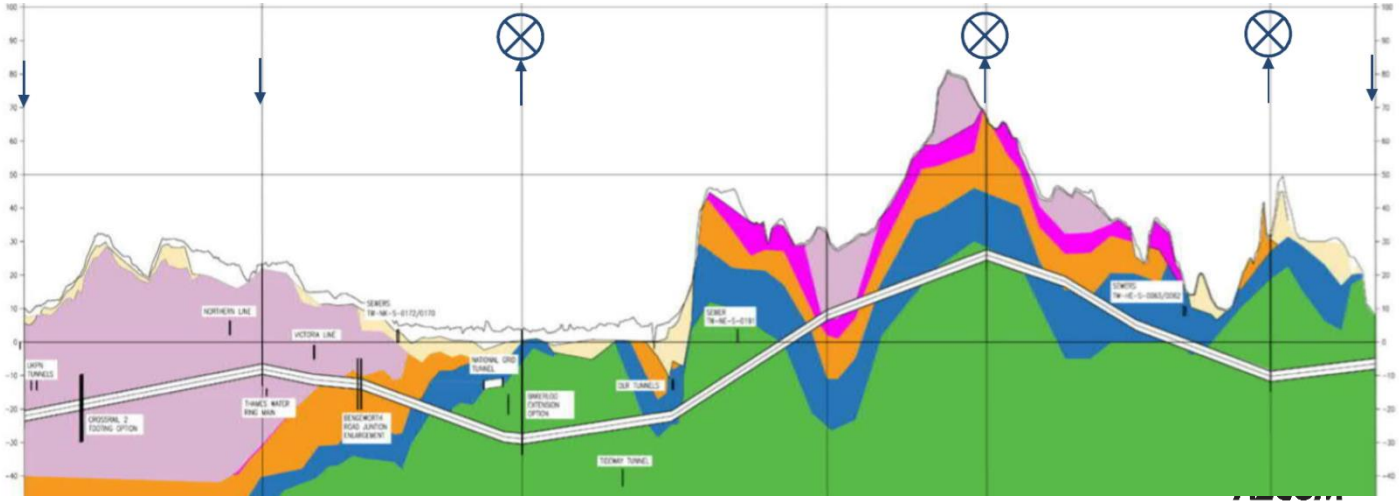
- 12 miles of 10-foot ID Tunnels (wedgeblock and trapezoidal linings).
- 3x TBM tunnel drives (inc. 2 no simultaneous tunnel drives from a single shaft at Cricklewood.
- 7 no. shafts (up to 35 feet ID) constructed using underpinned precast concrete segments.
- 7x headhouses.



London Power Tunnels 2: Route Plan

- 20 miles of tunnels
- 5 Active Headhouses
- 2 Passive Headhouses





Cable Installation

- Installation within Tunnels
- Supporting Steelwork in Shafts
- Interfaces with Shaft and Headhouse Layouts

No DIG Policy – Putrajaya Malaysia

Common Utility Tunnel for Putrajaya Development

In line with the "No Dig" policy for Putrajaya, SMHB was commissioned to develop and carry out detailed engineering design of a Common Utility Tunnel (CUT) for the Putrajaya Core Island. The tunnel will house:

- *power and telecommunication cables*
- *potable water supply pipes*
- *gas pipes*
- *telemetry cables*

Utilidor Tunnel - Malaysia

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Utilidors - Singapore

In the early 2000s, Singapore embarked on a new method to lay underground utilities. Known as the Common Services Tunnel (CST), this tunnel system conveys telecommunication cables, power lines and potable water to buildings in the Marina Bay financial district. The CST also houses pipes that supply chilled water to buildings for their air-conditioning needs as well as pneumatic tubes for refuse collection.

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Utilidors - Conclusions

- Cities or private developers generally drive the use of utilidors
- Higher initial capital cost for construction of tunnels - causes delay in adoption
- Shared initial capital costs between utility providers (ie, water, gas, electric) is difficult
- Some dated regulations and “ tradition” are used to stop the development of utilidors
- Overseas development of utilidors shows the way forward

Advantages to Utilidors

- Lower O&M cost
- No weather-related issues
- Easy to coordinate between different utilities
- Easy access for maintenance, upgrades and expansion of utilities
- Reduced future road maintenance costs
- Lower public disruption
- Reduced impact from outages due to easy access – increased maintenance speed
- Reduced excavation and labor costs

Thanks.

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