Crossrail 2 | Asset Portal
A 3D analysis of assets below the surface of London

Lisa Bowman
GIS Analyst | ARUP
Arup is the creative force at the heart of many of the world's most prominent projects in the *built environment* and across industry.

- **+14k** staff
- **35** countries
- **89** offices worldwide
- **+14k** projects across 146 countries
The Advanced Digital Engineering group is a centre of excellence for digital in Arup. We combine Arup’s traditional engineering and design strengths with advanced digital expertise in data, models, analytics, and user-centred design.
By 2030 London’s population is set to grow from 8.6 million to 10 million;

Crossrail 2 (running North-South) will reduce the pressure on London’s transport infrastructure;

The 30km route runs across London will provide opportunity for:
- 200,000 new homes
- Increase London’s rail capacity by 10%
- Additional daily capacity for 270,000 more passengers
Crossrail 2 - Asset Portal Introduction

Route covers thousands of assets across London
- Buildings
- Utilities
- Rail assets

The Asset Portal (AP) is a web-based tool for gathering and identifying potential obstructions to the proposed tunnel route

AP serves the central source of truth for all asset information

Users can view, add, edit and manage data in one application
Architecture

Users

ESRI Generated 3D Map Web app

2D Map(s)

Tabular View

<table>
<thead>
<tr>
<th>Buildings</th>
<th>Utilities</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
</tr>
<tr>
<td>Value 4</td>
<td>Value 5</td>
<td>Value 6</td>
</tr>
<tr>
<td>Value 7</td>
<td>Value 8</td>
<td>Value 9</td>
</tr>
<tr>
<td>Value 10</td>
<td>Value 11</td>
<td>Value 12</td>
</tr>
</tbody>
</table>

ESRI Portal (Web App)

ESRI ArcGIServer

RDS: PostgreSQL

Geo-spatial database

Single source of truth

AWS
• Information about each assets
• Updated by engineers
• Website data entry form
• Controlled data format
• Links to supporting information in ProjectWise
• User history / audit trail
• Clash risk and clearance values
• Address of buildings 1-to-many
• Building structure and foundation info
• Geology information
3D Map
3D Map - ArcGIS Pro

ArcGIS Pro (Extrusions) → ESRI Multipatch format → ESRI Portal → ESRI Web App Builder
• Interact with assets in 3D viewer

• External user access

• Above and below ground exploration

• Helps engineers plan new routes away from known clashes
Tunnel Alignment
Tunnel Alignment

- Alignment is designed in CAD by Arup alignment team and converted to GIS
- Alignment is stored in the AP as a 3D Linestring
- All past alignment strings are stored in the database for comparison
- Alignment string is used for clash detection
Buildings
Buildings

- Buildings are stored as 2D footprints (using Ordnance Survey data)
- Buildings are extruded upwards based on height (Lidar)
- Building piles are extruded down based on pile depth (calculated)
- Ground level is used as a starting point for extrusion (DEM)
- Building footprints linked to multiple addresses and key information (age, type etc)
- Finds closest point in 3D space
- Applies buffer to buildings
- Uses PostGIS for clash detection
Utilities & Infrastructure

• Information includes large sewer, water, telecoms, electricity, gas & other transit tunnels

• Utilities and Infrastructure are created in CAD or delivered by Asset Owners

• Converted to multipatch
Clash detection carried out in FME rather than database
Database – Schema / Tables
Database – Schema / Tables

Asset / Clash Risk

Building Attributes

Geometry
• A big part of our engineering work is delivering a **new alignment** and understanding obstructions, geology and all associated risks

• A fundamental document is a set of *plan and profiles*
• Obstructions model
• Clash Risk analysis
• Tunnel alignment
• Annotations
• Slice / section through structural models
Summary

- ArcGIS aids engineers understanding of assets in a 2D & 3D environment
- GIS and CAD Tools are complimentary technologies
- Single Source of truth for project – efficient and accurate
- Data editing by wider team in browser – saving time
- Data driven processes creating Production Drawings
- Potential for further expansion of features
QUESTIONS

Lisa Bowman | Arup