

Columbia Road Flood Alleviation Scheme

surface water flood alleviation project in Bournemouth

by Bruce McAuslane

Columbia Road is a main commuter route, situated in a densely populated residential area, just to the north-west of the town centre of Bournemouth. It is served by separate foul and surface water sewer systems. Overland flows from the adjacent Priestley Road, and inadequate capacity in the associated surface water system, led to flooding affecting 17 properties and a significant area of highway in Columbia Road. Eleven of the properties had suffered from internal flooding via air-bricks. Based on historical records and a verified catchment model, the frequency of flooding was estimated at 1:2 years. All the properties were detailed on the DG5 Ofwat flooding register. In response to historical reports of flooding, Bournemouth Borough Council provided additional drainage in Columbia Road in the form of gullies and slit-drains. Despite these measures the flooding continued, adding to the perception that it was being caused by hydraulic inadequacies in the surface water system.



Operatives managing culvert pulling operation - Courtesy of WECS

Background

Wessex Engineering and Construction Services (WECS), was tasked with providing a solution to give a flood protection level of 1:30 years, enabling the properties to be removed from the DG5 register.

Atkins plc was engaged to undertake the optioneering, design and site-support. The client target date for the project was 31 March 2012.

Options

Two options were developed:

- Storage of excess flows in Columbia Road or Priestley Road.
- Diversion of part of the upstream catchment to an attenuation pond in the Fernheath Valley.

The attenuation pond option was rejected due to high estimated costs and performance concerns, as storage availability would be affected by flows in the Fernheath Valley stream. Wessex Water operations also raised significant concerns in respect to long-term operation and maintenance, particularly in regard to the potential for pollution to the Fernheath Valley SSSI (Site of Special Scientific Interest) via the open pond.

Site selection

Although siting the storage in Columbia Road was considered, it was rejected due to the road being a heavy commuter route and congested with other utility apparatus. Works in Columbia Road would have involved a very disruptive road closure, diversion of water, gas and electric mains and potential for significant claims for compensation from local businesses.



Final positioning of culvert section - Courtesy of WECS

By comparison, Priestley Road was a relatively quiet residential road and although still requiring a road closure to undertake the works, the associated diversion would cause minimal disruption to residents.

Although diversion of third party utility apparatus was not considered a significant issue, consideration would need to be given to a potential clash with existing foul drain connections, from properties on the west side of Priestley Road, and the close proximity of a strategic fibre-optic cable, which provided broadband service to a significant area of Bournemouth.

Storage requirements

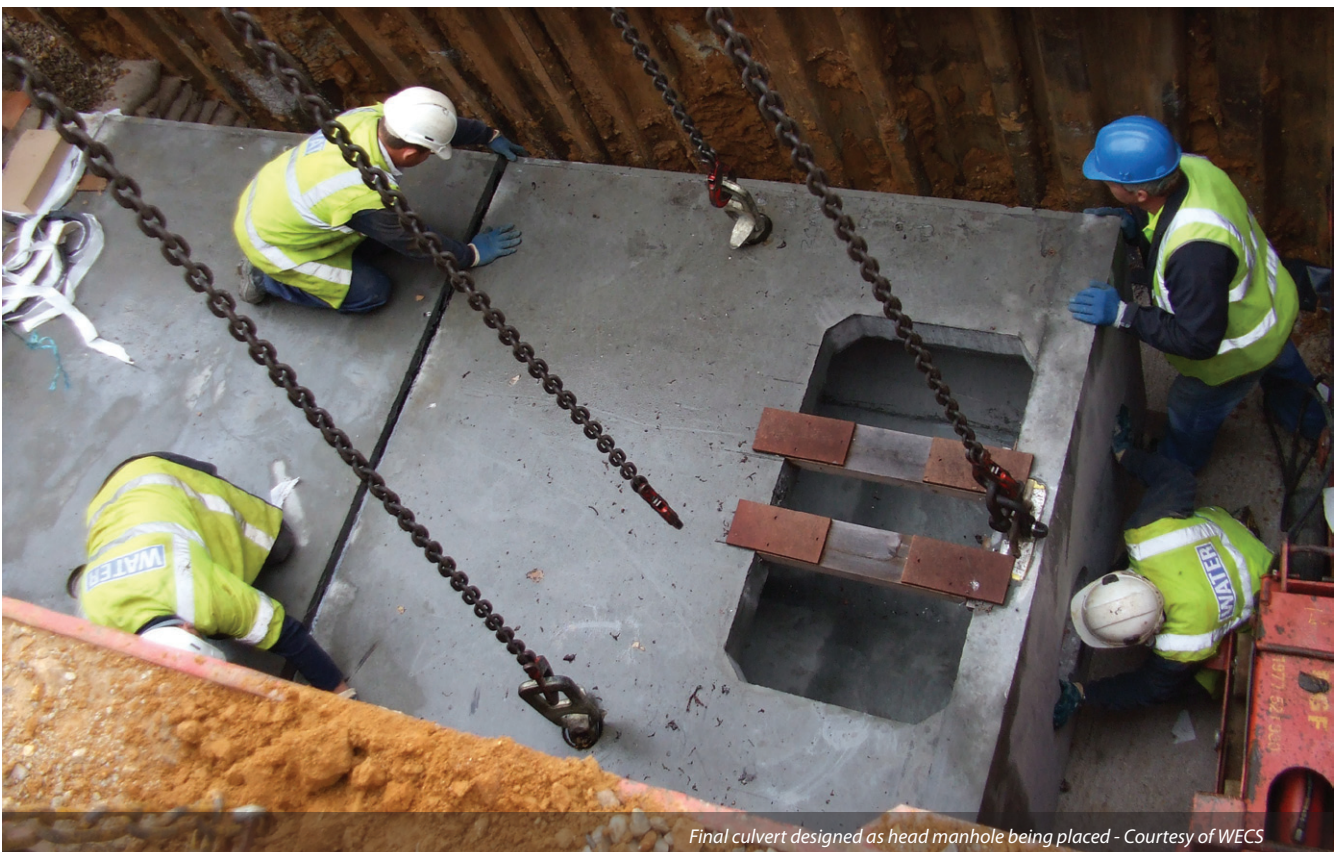
During the optioneering phase of the project, it was identified that 345m³ of storage would be required in Priestley Road, to provide the necessary 1:30 year flood protection. Storage would be in the form of upsizing on line approximately 250m of the existing 300mm diameter sewer, to a combination of 900mm, 1,200mm and 1,800mm diameters.

The design phase site investigation confirmed that the proposed storage would clash with the property connections, requiring approximately 195m of 150mm diameter rider sewer to be included in the scope.

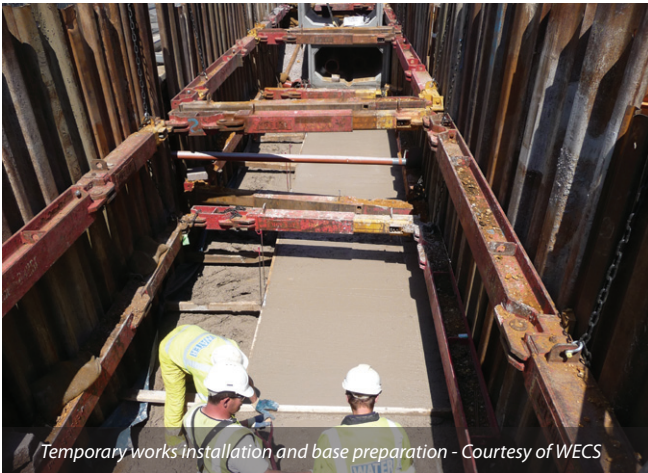
There was also a need to change the form of the storage to 1.75m x 1.0m box culverts, due to a lack of cover to the 1,800mm diameter units.

During this phase of the project, further liaison was undertaken with the fibre-optic company. The strategic sensitivity of the cable became very apparent, as did the potential costs associated with damage and loss of service.

Diversion of the cable was reviewed, but dismissed due to the considerable associated costs, and the consequent effect on the cost-viability of the scheme. It was agreed that construction RAMS would identify working methodologies, ensuring that if encountered, the fibre-optic would not be put at risk.



Final culvert designed as head manhole being placed - Courtesy of WECS



Temporary works installation and base preparation - Courtesy of WECS



Culvert lifting operation - Courtesy of WECS



Culverts and rider sewer - Courtesy of WECS



Preparing culvert for installation - Courtesy of WECS

Informing the public

Due to the unavoidable disruption to local residents, extensive PR activities were undertaken prior to the works commencing, involving letter circulation, press releases and air-time on local radio.

Throughout the construction phase, WECS site management were detailed with undertaking regular liaison with the affected residents, and providing assistance should particular circumstances require it.

Construction

The full scheme consisting of box-culvert storage and rider-sewer, was approved by Wessex Water in March 2011 to a value of £871,000. Construction was programmed to commence in May 2011, with WECS acting as principal contractor and CDM coordinator, and a construction period of 20 weeks.

Following consideration of the site investigation information, WECS concluded that traditional sheet and framing would be suitable for the ground conditions, while excavating to a formation depths ranging between 2m and 4.5m. MGF Ltd was tasked with providing both the design and the equipment for the temporary support.

Construction was based on installing 12m of culverts every six days. The first three days would involve opening and supporting the excavation, with a further two days to prepare and pour the reinforced concrete base. On the sixth day, the culvert sections would be placed. In addition to the culvert placement, the foul water rider sewer and any household connections would also be installed. The process would then be repeated as a rolling operation.

The primary plant used throughout the construction was a 60T crane for placement of the culverts, and 18T slew for all excavation and temporary support works.

Flows in the existing surface water sewer were managed by over-pumping with duty/standby 8" super-silent pumps during the day, then flumed into and through the culverts whenever the site was not operational, to avoid the potential for flooding in the event of failure of the over-pumping.

Due to the known high flows during storm conditions, there was a health and safety requirement to actively monitor the upstream catchment and weather forecast, to avoid the potential for operatives being put at risk in the excavation. This proactive approach was borne out in August 2011, when the works were affected by a storm event over Bournemouth that made the national news, causing the works to be flooded and completely submerging the culverts.

At this stage approximately 150m of storage had been installed, with a further 12m of excavation open in readiness for placing of the next culverts. There were no reports of flooding downstream of the works.

At times during the works, installation of the culverts became a delicate operation, due to the congestion of services serving the properties. As testimony to how diligent the site operatives were, approximately 120 services were successfully crossed without being struck.

Conclusion

The works (including full reconstruction of the affected road) were complete in November 2011, with the installation formally accepted by the client in January 2012.

The editor & publishers thank Bruce McAuslane, Civils Project Manager with Wessex Engineering and Construction Services, Wessex Water, for providing the above article for publication.

Excavation Support Systems

www.mgf.ltd.uk



Own transport fleet
8 depots nationwide
In-house manufacturing facility
Temporary works design service
Products available for hire and sale
Major Projects and bespoke solutions
Technical support and Online resources
NEW: Structural Support Systems division

www.mgf.ltd.uk

01942 402 700

Commitment • Innovation • Sustainability