

Provost Driver Court Sewer

the challenges of repairing a collapsed sewer pipe in Clyde alluvial soils

by Scottish Water & George Leslie

In 2020, a significant ground stabilisation project was initiated following the discovery of a sinkhole within the King George V Memorial Playing Fields. Investigations revealed that Clyde alluvial soils were being drawn into a collapsed section of pipework, resulting in void formation and settlement risk in the surrounding area. The Provost Driver Court Wastewater Pumping Station, located in Renfrew near the River Clyde in Glasgow, lies in a region notorious for challenging ground conditions, including soft Clyde alluvial soils and a high groundwater table. Due to the size, complexity, and risk associated with the works, George Leslie was appointed by Scottish Water, having previously delivered similar infrastructure projects under comparable conditions.



Overview of the work site - Courtesy of George Leslie

The problem/issue

The area presented numerous geotechnical and environmental challenges. The soils were quasi-liquid and exhibited low cohesion, making them highly sensitive to disturbance.

The high groundwater table and ingress of fine silts had caused settlement and damage to the pumping station previously. This posed a risk not only to the infrastructure but also to nearby residential properties. Historical ground movement had already been observed, and further deformation could have had significant implications for the surrounding community and public green space.

In August 2020 a ground depression was located within the playing fields and after further investigation a section of the sewer had collapsed, which was drawing in silt, which led to ground settlement.

Ground settlement monitoring

In collaboration with COWI, principal contractor and designer George Leslie began an extensive monitoring regime during the design phase to ensure no further settlements within the area were recorded. This involved a team of engineers carry out daily monitoring for 18 months.

Early contractor involvement (ECI)

George Leslie was engaged early in the process to transition COWI's concept design into a deliverable construction solution. The scope of the ECI contract comprised a detailed site investigation programme and production of a geotechnical baseline report which included:

- Collation of historical site investigation.
- CPTs and boreholes.



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- Ground penetration radar.
- Topographical surveys.
- Engineers monitoring data of natural water table.

The construction methodologies of all the appointed designers and contractors were considered during this stage of the ground stabilisation project, with COWI producing site specifications for each company.

Provost Driver Court Sewer: Key designers

- **Construction & planning:** George Leslie
- **Geotechnical:** COWI
- **Dewatering:** WJUK
- **Temporary works cofferdam:** Mabey Hire
- **Grouting:** Geobear

Early procurement of long-lead items such as the steel sheet piles helped mitigate anticipated supply chain delays. George Leslie coordinated with the dewatering specialists, temporary works engineers, grouting experts, and geotechnical designers to collaboratively de-risk the scheme.

This integrated approach enabled a cost-effective and constructible design while allowing flexibility to adapt to findings from ongoing site investigations.

Provost Driver Court Sewer: Supply chain - key participants

- **Pumps:** Selwood
- **Kowan Pile Press Still Worker:** Watson & Hillhouse Ltd
- **Diamond drilling:** Core Drilling Specialists Ltd
- **Sheet piles:** ArcelorMittal
- **Civils items:** Keyline Civils Specialist Ltd
- **Welfare buildings:** Wernick Group
- **HVO fuel:** OilFast Ltd
- **Crane & plant:** George Leslie
- **Aggregates:** Paterson Quarries Ltd

The scope/solution

The primary aim of the works was to stabilise the soils and reinstate the wastewater infrastructure. Key elements of the scope included:

- Compaction grouting was required to provide support to existing assets during the works, which may be susceptible to settlement. Grouting specialist Geobear was appointed for this stage of the works; utilising their own geopolymer grout to densify the ground around assets to mitigate movement.
- Installation of 16.5m long ZU sheet piles with sealed clutches, which toed into the underlying clay layer identified at -10mAOD. The sheet piles were installed utilising the hydraulic press still worker, supplied by specialist Watson & Hillhouse.
- Deployment of an internal dewatering system to lower the groundwater table and densify the soil allowing for safe excavation of soils. WJUK installed 24 deep wells within the in-pans of the cofferdam, which allowed the dewatering system to be phased and controlled depending on the activity that was being conducted on site. The system also comprised of a remote monitoring system based off wireless piezometers located within the site boundary.
- Application of permeation grouting installed by Geobear using their geopolymer grout which permeated the interstitial spacings within the soils to reduce the bulk permeability of the treated soils.
- Mabey Hire provided design works for a double-braced temporary works system that George Leslie installed. This provided lateral support to the cofferdam during the excavation stage.





Inside the cofferdam - Courtesy of George Leslie

Community engagement

With this large-scale infrastructure project being delivered within community playing fields, George Leslie implement a number of focussed measures to ensure every resident was informed during each phase of the construction process.

In collaboration with Scottish Water, George Leslie led quarterly walk-in events which were held at the local high school, which allowed locals to meet with professionals involved with the construction. Scottish Water also delivered monthly emails and letters to the residents providing an update on the programme and how works were progressing.

A number of STEM events were held at the local school, providing children in the area the vital skills and knowledge to encourage them into STEM based careers.

Carbon savings

George Leslie completed the works whilst being connected to the main energy grid. This powered the site welfare buildings,

temporary sewer pumps and the dewatering system, saving thousands of litres of diesel in the process. The site's construction plant was powered by hydro-treated vegetable oil (HVO) fuels helping to further reduce the project's carbon output.

Scottish Water are committed to delivering net zero emissions by 2040 and beyond and every project we undertake is a step towards that aim.

Conclusion

The Provost Driver Court Ground Stabilisation & Sewer Rehabilitation Project has successfully implemented a multi-million pound, 18-month long project to bring resilience to the local sewer network in Renfrew. Despite the challenges of managing local residents, noise, vibration, ground movement and high water levels, the project team overcame these obstacles to deliver a low carbon approach to sewer infrastructure.

The editor and publishers would like to thank Scottish Water and George Leslie for providing the above article for publication.



Ground stabilisation and sewer repair works underway - Courtesy of George Leslie