

Birkdale B Gravity Sewer Project North Shore City, Auckland.

World Record Holder* and Now New Zealand's Record Holder
Fusible PVC™ Pipe.**

In 1998 North Shore City Council launched Project Care, with the primary aim of resolving the beach pollution problem caused by an overburdened sewer and storm-water system. For many years, residents in the Birkenhead area endured overflows of local sewer manholes that during rain events (small and large), discharged directly into the Eskdale Stream, one of the area's most environmentally significant streams. As one of the measures to eliminate overflows, a new pipeline for extra system capacity was needed to carry increasing loads of sewage from the area.

The Birkdale pipeline was divided into 3 separate contracts: Area A was completed in 2009, Area C completed early 2010 and the centre section Birkdale B was awarded to Pipeworks Ltd.

The Birkdale B pipeline extends 1030 metres under arterial roads and established residential housing. It was installed by Horizontal Directional Drilling (HDD) methods and has a 28m depth to invert as it passes through a steep hillside before weaving through a wetland and terminating at a newly installed manhole. The ground conditions along the pipeline route include Waitemata sandstone (MPa2-MPa20+), coupled with short sections of high plasticity clays, silts, sands, and organics.

Pipe Materials

Although originally designed in DN630 SDR11 PE100 Pipe, Birkdale B was constructed using DN550 OD Fusible PVC™ pipe. FPVC™ pipe meet the hydraulic flow requirements of the design but reduced the pipe OD by 13%, therefore requiring a much smaller borehole, with a reduction in removed borehole material. This provided several benefits, including reduced drilling and installation time on site and a lower friction coefficient during installation. These, combined with less pipe weight, provided easier pull-back and improved site management, owing to reduced drilling lubricant volumes.

Horizontal Directional Drilling

The initial pilot bore was drilled using a bottom hole assembly (BHA) configured for drilling through rock, utilising a down-hole 'mud motor' and non-magnetic steering. Six weeks was required for the pilot bore as the requirements for both grade and invert level tolerance were most stringent. Various hole enlargement passes followed, up to a final size of 712mm diameter before pipe-pull-back commenced.



Fusible PVC™ Pipe connected to the barrel reamer prior to launching.

Fusion Jointing

Underground Solutions (UGSI) INC, USA was contracted as the Fusion Jointing Service provider, using their patented fusion process, while NZ based technicians completed the Licensed fusion training in the U.S.A. UGSI bought their own specifically designed and calibrated fusion equipment from the U.S. to fuse the pipe together. The fusion machine remains in NZ for future project work.

Pull-back

At completion of the final reamed bore hole, Pipeworks began the pull-back process. The first pipe-string was connected to the barrel reamer and pulled through the bore hole. Three intermediate butt fusion joints completed the 1048m pipe-string. The Fusible PVC pipe weighed 34% less than the originally specified PE100 pipe (Table 2): this allowed the contractor to complete the pull-back with a Vermeer HD100 120 Directional Drill. The pipeline was pulled into final position on December 14th 2010.

****It has become NZ's longest HDD pull-back of a thermoplastic pipeline installed in a single continuous drill-shot to date.**

Fusible PVC™ Pipe

In North America, over 3000 projects have been constructed using FPVC™ installed by HDD, Slip Lining, static Pipe Bursting and restrained open cut methods.

*FPVC™ holds the current World Record for the longest single continuous HDD pull-back of a thermoplastic pipe material. The 1.95 Km DN400 drill shot occurred at Parris Island, South Carolina in the United States in December 2009.

Table 1. Material Comparison Specified vs Alternate Solution.

Birkdale B - Pipe Properties	20" FPVC DR 21	DN630 PE SDR 11	FPVC % Advantage
Outside Diameter (mm)	550	630	+13%
Excavated Volume per m (m ³)	0.24	0.31	+23%
Wall Thickness (mm)	26	59	+56%
Inside Diameter (mm)	498	512	(3.7%)
Weight (kg / m)	67.5	102.0	+34%
Safe Pulling Force (tonnes)	84	86	(2.3%)

Contractor;

Pipeworks, Auckland.

Asset Owner;

Former, North Shore City Council.

Design Consultant;

Sinclair Knight Merz, in association with Opus International Consultants Ltd.

Iplex Pipelines NZ Ltd Technical Services Contacts

Frank O'Callaghan

Mobile 027 495 4523

Todd Randell

Mobile 027 211 4838

Iain McNaught

Mobile 027 243 3000



U.S. based fusion technician Mike Benvenuti completing butt fusion joints.



Low profile fusion bead joining two pipe ends.



Typical radius of curvature during construction.

Table 2.

