

LMR Drilling UK Ltd.

Under the Atlantic Ocean...



Installation of 125 mm HPPE Pipe by Horizontal Directional Drilling



Across Cuan Sound to Luing

LMR Drilling UK Ltd., leaders in the European Horizontal Directional Drilling (HDD) market, successfully completed the installation of 350 m of 125 mm HPPE sleeve pipe carrying a 90 mm HPPE fresh water supply line to the Island of Luing on the West Coast of Scotland. The Main Contractor was Raynesway Construction who were contracted by West of Scotland Water to install 14 km of 90 mm PE pipe over some rough terrain from South of Oban to Luing, crossing Cuan Sound to the Island.

On this project LMR used their tracked 40 Tonne Hutte Rig which weighs 17 Tonnes, has a pull force of 380 kN and a torque of 27 kNm. Access to site had its problems, with very narrow roads and hump backed bridges, especially across the Atlantic Bridge leading to site.



Rock Structure on Beach showing Bands of Quartz

The drilling of the crossing was mostly through Dalradian Slate and Basalt. LMR on this occasion used a 9 $\frac{7}{8}$ " rock bit mounted on a 6 $\frac{3}{4}$ " mud motor. A shock tool was installed behind the motor to absorb vibration during drilling operations. A suitable profile with 22° entry angle and 15° exit was designed by LMR and approved

by the Client, it had to drop to more than 40 m below the entry and exit point levels due to the depth of the channel.

At this time of year the temperature can plummet as low as -15°, so precautions had to be taken at the close of each shift to avoid freezing of plant and equipment.

Steering control of the drill bit was given by the use of (MGS) Magnetic Guidance System. To ensure that punch out of the drill bit was on target, the area at exit side was surveyed and a cable grid (Trutrack) system was laid across the rocky foreshore, this again was surveyed at each peg securing the cable and co-ordinates taken.

Using 4.5" dia. x 3 m long drill pipe, drilling commenced on 14th January 2001. Due to the lack of fresh water at the location, LMR used a salt water based drilling mud, enabling water to be taken direct from the Atlantic at a fraction of the cost. This proved very effective at transporting the twenty pence sized cuttings out of the bore. After approximately 36 m the shock tool was installed and drilling continued at an average of 15 to 25 minutes drilling time per joint.

During the drilling operation Raynesway Construction, using Butt Fusion equipment, welded up the required 400 m length of SDR 17.6 HPPE 125 mm Sleeve Pipe and 90 mm Product Pipe on the exit side (Luing).



Rock Cuttings contained in Mud Returns

On completion of welding, a rope was inserted through the 125 mm HPPE pipe. This was attached to the 90 mm product line and pulled through the 125 mm sleeve. For most of the project freezing conditions were encountered and some days operations had to be delayed until the temperature increased.

Drilling operations were progressing smoothly with good-sized cuttings being visible in the entry side pit.

On completion of threading the 90 mm product line through the 125 mm sleeve pipe, the 90 mm was pressure tested to the West of Scotland Water specification. On acceptance of the test, the ends were cut off and an expanding pulling head was attached to the 125 mm pipe at the leading end of the string. This was secured internally to the 90 mm pipe as a back-up contingency should the 125 mm pipe fail.

On 21st January, LMR punched out successfully on the Island of Luing, only 300 mm off line, well within the tolerances required by the Client.

The completed pipe string was pulled into place across the moorland and connected up to the drill string, the 90 mm pipe was pre-filled with water, as was the void between the 90 mm and 125 mm sleeve pipe. The water neutralises the buoyancy forces created by the displacement of the fluid in the drilled bore. In areas of rough, rocky terrain, the pipe was supported on peat mounds and sandbags to avoid any damage to the PE pipe. The correct entry angle of the pipe into the bore was maintained by site plant.

On Tuesday 23rd January, at 1605 hrs, the pipe pull commenced. Raynesway Construction personnel assisting LMR at pipe side to ensure that the pipe string ran freely in to the bore.



124 mm PE Pipe Across Moorland

The pipe pull was successfully completed at 0300 hrs on 24th January 2001.

This project took just 10 days from commencement of the pilot to pullback, which was a considerable achievement, since a parallel line had taken another company almost 2 months to complete. LMR were called upon to complete the project and honour the commitment of Raynesway Construction to the Client, West of Scotland Water. Client and Contractor expressed their thanks to LMR Project Manager, Alan Safian, and the drilling crew for a job well done.