



# Waterford City Public Infrastructure Project

Eastern & Western Flood Defences  
Ireland



Waterford north quays. Retrieved from <https://waterfordnorthquays.ie>. © BAM Civil Ltd

## Background

Waterford, Ireland's oldest city, lies on the southeast coast along the tidal River Suir. With critical infrastructure such as Plunkett Station, and surrounding railway lines located close to the river, making them vulnerable to tidal surges and sea level rise. Over the past 15 years, the area has experienced a sequence of flood events, the most recent occurring in October 2020.

Recognising the strategic potential of the riverfront, the site was designated a Strategic Development Zone (SDZ) in 2016, enabling a fast-track, plan-led regeneration. As one of Ireland's top ten projects under the National Planning Framework (Ireland 2040), the North Quays initiative aims to deliver a compact, sustainable extension to the city centre. A planning scheme adopted in 2018 outlined proposals for a public transport hub including the relocation of Waterford train station to the North Quays, and a sustainable transport bridge, which will link the relocated train station to new walking and cycling infrastructure, serving a future population of over 83,000.

## About the project

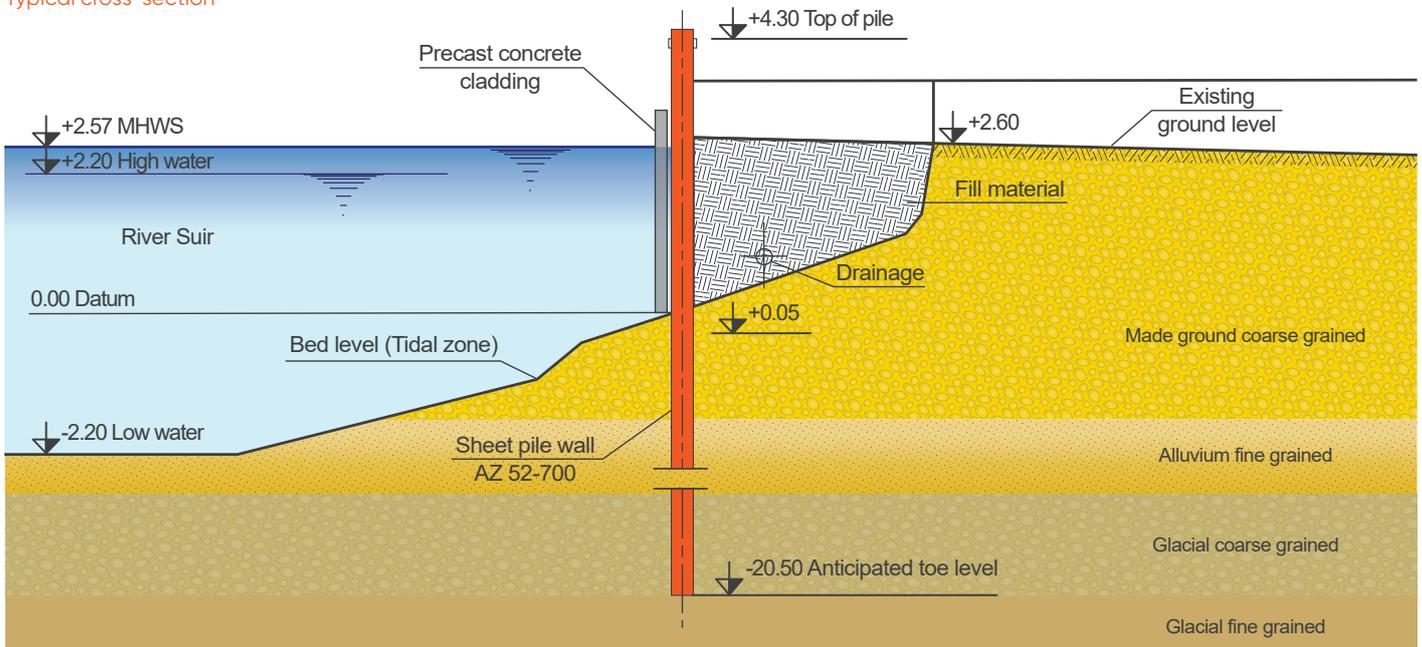
The permanent Flood Defences form part of a wider public infrastructure programme, valued at 207 M€ as confirmed by

Waterford City & County Council (September 2024) with BAM Civil Ltd as the main contractor and ArcelorMittal as supplier of the steel sheet piles.

Given the site's low-lying nature, repeated exposure to tidal flooding, and the need to future-proof both new and existing infrastructure on the north side of Waterford, it was found that large sections of the existing quay wall were of inadequate height and below the design flood level, rendering it ineffective at protecting Iarnród Éireann (Irish Rail) land and associated rail infrastructure against flooding.

ArcelorMittal played a key role throughout supplying 2 km of hot rolled steel sheet piles - selected for their high strength, durability, and proven performance in challenging ground conditions - for both the Eastern & Western Defences (the Western Defences running from Plunkett Station through Mountmisery and Newrath, positioned between the existing quay wall and the railway tracks with the Eastern Defences continuing through Ferrybank). In addition to product supply, ArcelorMittal provided technical support to BAM Civil Ltd from the early stage, including drivability assessments, refusal criteria, and recommendations on suitable installation equipment. The combined quality of the products and technical input ensured safe and efficient pile installation across the site.

## Typical cross-section





## Waterford Flood Defence Scheme | IRL

<b>Customer</b>	Waterford City & County Council			
<b>Design</b>	Roughan & O'Donovan			
<b>Main Contractor</b>	BAM Civil Ltd			
<b>Steel sheet piles</b>	Western Defences			
AZ 40-700 N	11.3 – 14.3 m	S 355 GP Double		455.7 t
AZ 42-700 N	19.3 m	S 355 GP Double		32.9 t
AZ 44-700 N	15.8 – 20.8 m	S 355 GP Double		1,656.6 t
AZ 46-700 N	17.3 m	S 355 GP Double		201.9 t
AZ 48-700	22.3 m	S 355 GP Double/Single		31.8 t
AZ 52-700	24.8 m	S 355 GP Double/Single		375.5 t
<b>Subtotal</b>				2,754.4 t
	Eastern Defences			
PU 32 <sup>-1</sup>	5.8 – 10.3 m	S 355 GP Double/Single		960 t
<b>Subtotal</b>				960 t
<b>Total sheet piles: 3,714.5 tonnes across ~1.85km of flood defences</b>				

### Solutions

Due to the variable and often challenging ground conditions, along with the project's proximity to rail lines and urban infrastructure, a robust and adaptable solution was required. A continuous cantilever steel sheet pile wall was adopted, offering minimal ground disturbance and excellent hydraulic cut-off performance. The flood defences were designed for a 1:200 year flood event accounting for climate change, with a design level of +4.30m AOD to protect against overground flooding and underground groundwater seepage.

In the Western Defences, where deeper embedment was necessary, ArcelorMittal heavy-duty AZ-series piles (AZ 52-700N, AZ 48-700N, AZ 44-700N, AZ 42-700N) were installed, all manufactured in S 355 GP steel grade. Toe levels reached as deep as -20.5 m AOD to penetrate through soft alluvial deposits and anchor into dense glacial layers. On the Eastern Defences, PU 32<sup>-1</sup> sheet piles were used to match the shallower but still variable ground profile.

### Ground profile & pile installation

Ground conditions along the alignment were highly variable, particularly in the Western Defences where installation presented significant technical challenges. Borehole data confirmed the presence of deep layers of made ground, soft to firm alluvial clays, and glacial till with occasional boulders. To reach suitable founding conditions, pile lengths exceeded 24 m in the most challenging locations.

Initial driving was carried out using high-frequency vibratory hammers (PVE 40VM and PTC 52HVRK). In zones where refusal occurred, particularly with longer AZ-series piles, final penetration was achieved using the BSP 3579 impact hammer, with adjustable ram weights between 5 and 9 tonnes. In the hardest ground, ArcelorMittal recommended toe reinforcement and pre-drilling to reduce driving resistance and avoid damage.

In the Eastern Defences, ground conditions were more moderate where PU 32<sup>-1</sup> sheet piles ranging from 7 m to 10.3 m and were installed using RTG MR150AVM-series vibratory hammers. Where refusal was encountered, driving was completed using an excavator-mounted Movax DH-25 hydraulic hammer with pile installation was monitored against defined refusal criteria to maintain accuracy and alignment.

### Environmental & logistical considerations

Across both alignments, constrained working space and the proximity to the railway introduced environmental and operational challenges. All works were performed under vibration and noise control requirements, and were carried out during daytime hours, with a temporary fence in place to separate the site from the railway, ensuring no impact on Iarnród Éireann (Irish Rail) rail traffic.

Along the foreshore, the exposed intertidal zone was fitted with precast concrete cladding units (eco-seawall) to support environmental integration. The structure is also designed to accommodate temporary overground flood barriers, such as water-filled inflatable units, which can be deployed if required during a flood event.

The successful delivery of driven ArcelorMittal sheet piles under these conditions reflects the flexibility of the solution, supports safe rail operations, protects critical infrastructure, and enables the long-term regeneration of Waterford and its riverfront.

