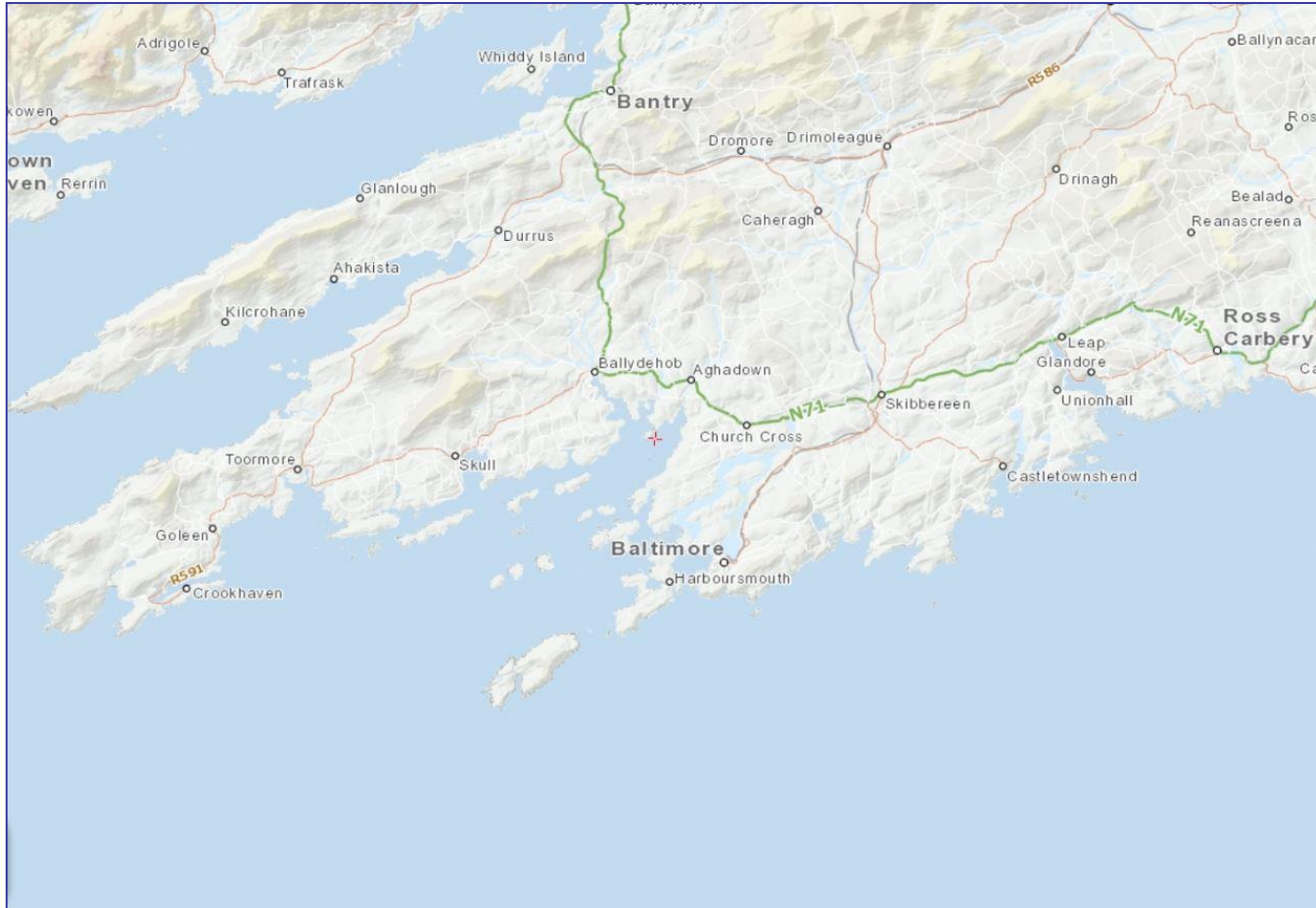


# THE BULL'S NOSE & STORM GATE, NORTH HARBOUR, CAPE CLEAR



Department of  
**Agriculture,  
Food and the Marine**  
An Roinn  
**Talmhaíochta,  
Bia agus Mara**





➤ **Lack of Shelter**

- Very turbulent conditions during storms
- Bull's Nose crucial for protection

➤ **Lack of Depth and Capacity**

- Very limited berthing capacity

➤ **Road Access**

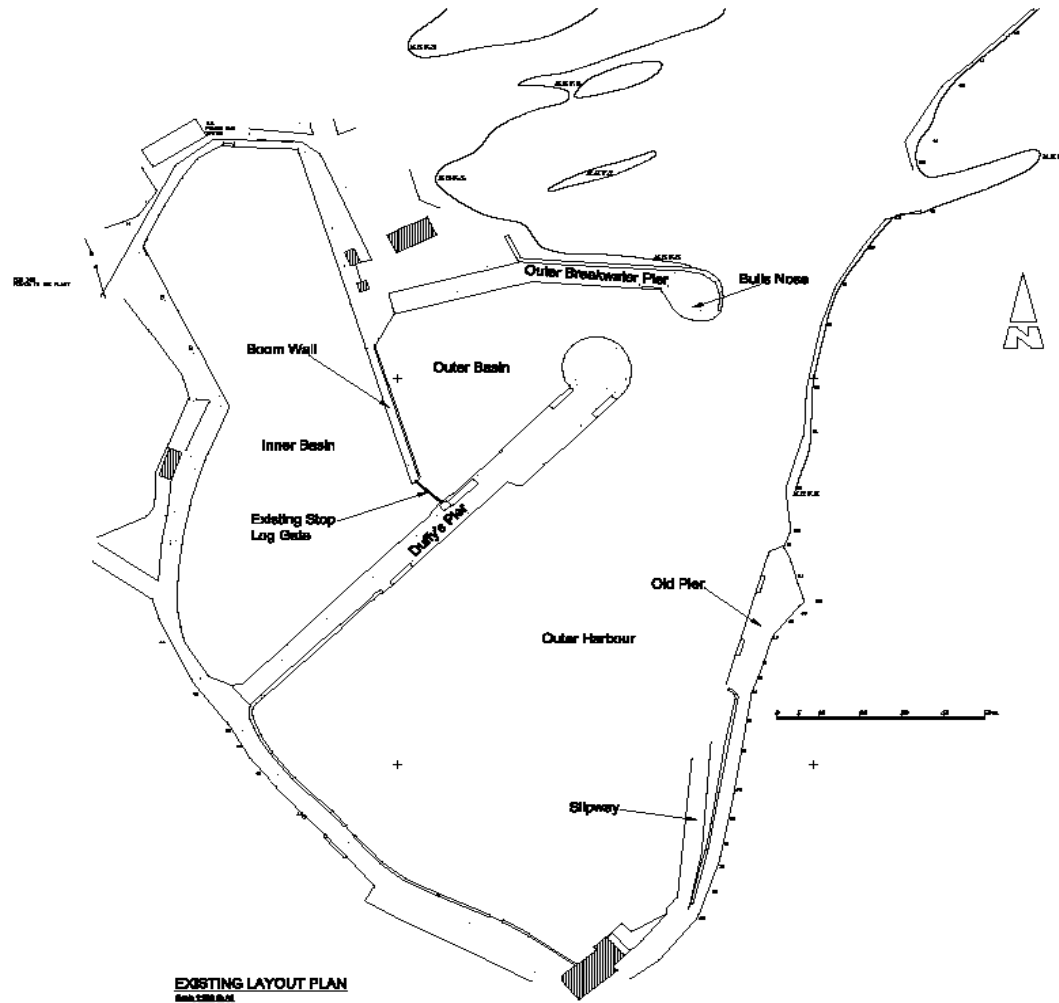
- Access road exposed to wave overtopping and wave reflections

➤ **Vulnerability of Existing Structures**

- Boom Wall
- Duffy's Pier

➤ **Stop Logs / Boom Wall**

- Ability to protect Inner Basin



## REASONS FOR DEVELOPMENT



- **SOCIO-ECONOMIC – DEPENDENCE OF ISLAND POPULATION ON HARBOUR FACILITIES**
- **MAJOR STRUCTURAL CRACKS**
- **ONGOING SUBSIDENCE OF BULL'S NOSE STRUCTURE**
- **ONGOING DETERIORATION**
- **CONSEQUENCE OF COLLAPSE**
  - **Potential for serious damage to vessels in the Harbour**



➤ **SITE INVESTIGATIONS DATA**

- Several boreholes, sampling and testing previously undertaken

➤ **KIRK MCCLURE MORTON HYDRODYNAMIC STUDY 2001/2002**

- Established that the most penetrating waves into the Harbour occur when the offshore wave direction is 280°
- Potential solutions were proposed but concerns remained that the solution proposed could result in more severe activity than predicted due to the omission of long waves from the study

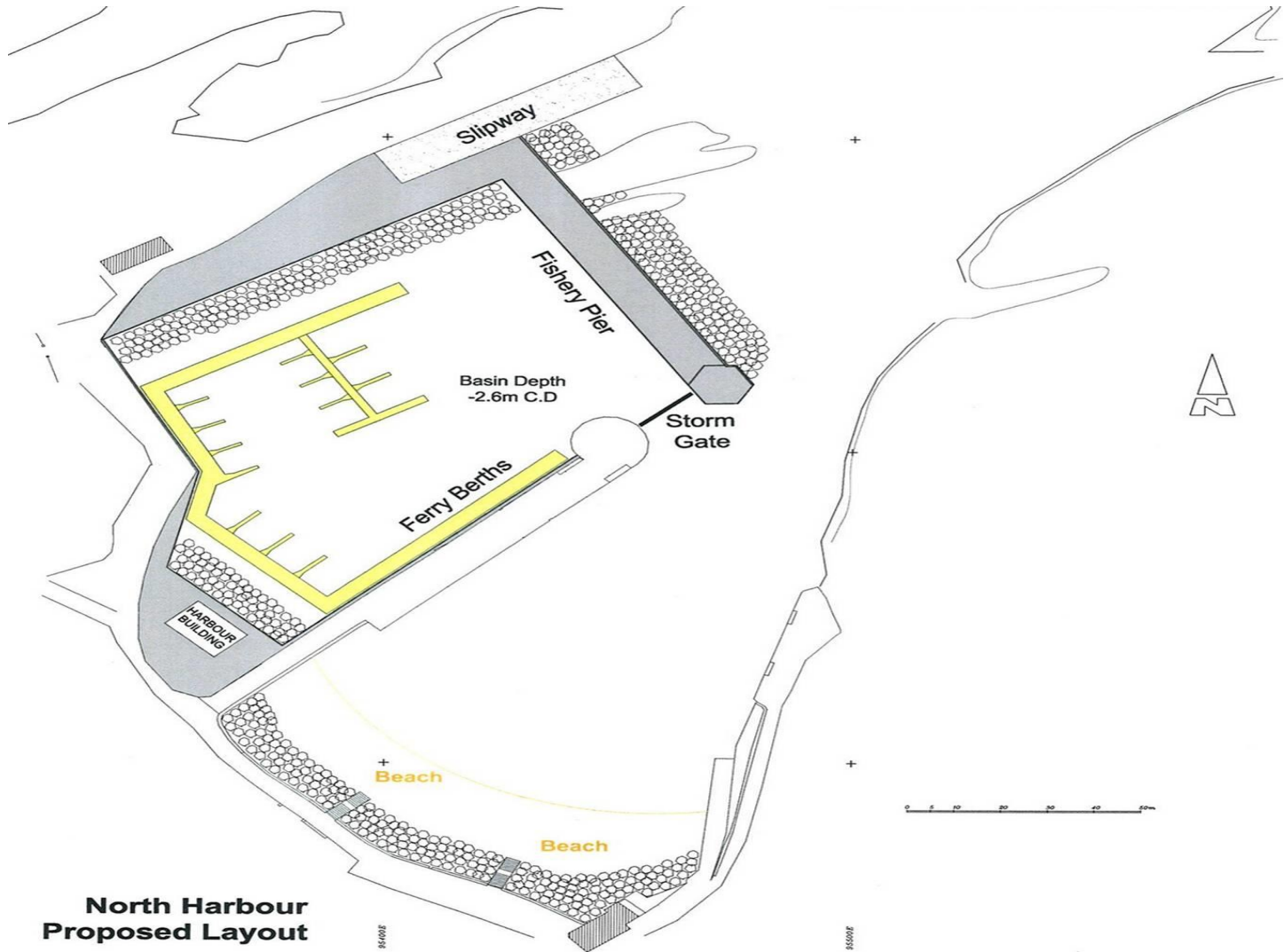
➤ **HMRC Wave and Harbour Development Study 2008**

- 12 harbour layouts modelled in order to determine the most effective solution for protecting the Harbour Area. None resulted in calm conditions in the basins during storm conditions. Report concluded that a Storm Gate was necessary
- Developed the long term plan



MALONE O'REGAN

# PROPOSED LAYOUT – (DAFF MASTERPLAN)



➤ **SITE INVESTIGATIONS**

- **More targeted investigation of the work area**

➤ **WAVE DATA**

- **Data collection and analysis**

➤ **WAVE ANALYSIS**

- **Analysis and wave penetration**



➤ **SITE INVESTIGATIONS**

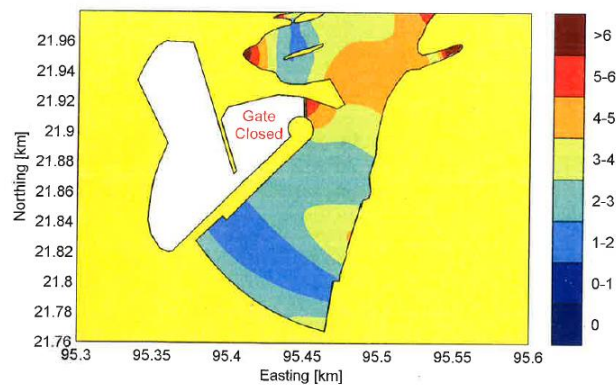
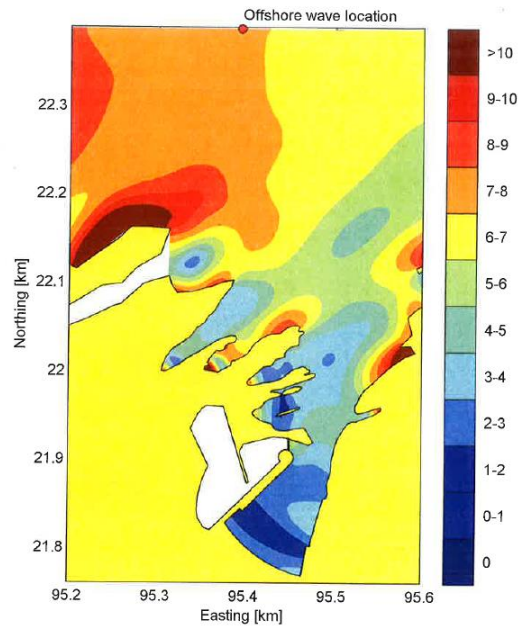
- Indicated variation in rock levels

➤ **HMRC DATA COLLECTION AND WAVE ANALYSIS**

- Provided much more information than previously available

➤ **DELTARES STUDIES – ANALYSIS AND MITIGATION OF WAVE PENETRATION**

- Wave penetration into the bay and harbour are a combination of sea, swell and longer waves
- The combination of swell waves and long waves appears to be the reason for the “draw” in the harbour referred to by local residents
- Provided input for the detailed design



Wave Height [m] for a water level of 4.35 m +CD  
Offshore wave conditions:  $H_s = 7.9$  m,  $T_p = 20.2$  s, MWD = 280 °N  
Upper panel: entire domain, lower panel: close up of harbour

DELTA RES

1/100y condition

Run 7

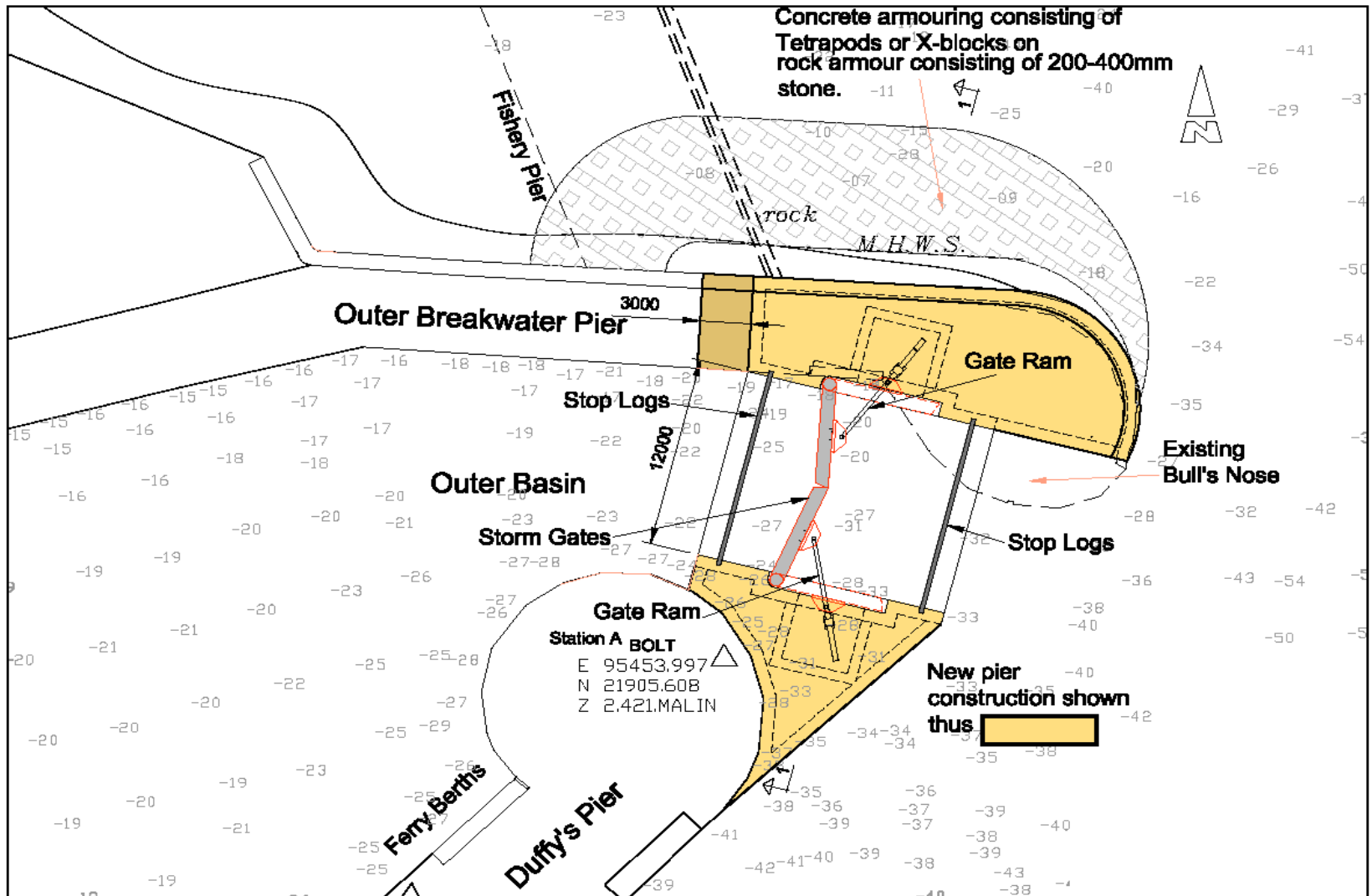
Malone O'Regan

1204986

Fig B7

- **New Slipway**
- **Demolition of Bull's Nose**
- **Storm Gate support structure comprising of a replacement structure for the demolished Bull's Nose and strengthening works to the outer end of Duffy's Pier**
- **12 metres wide hydraulically operated bi-parting storm gate**
- **Reclamation of part of the Inner Basin**





## **KEY DESIGN REFERENCES**

- Hydrological studies by HMRC and Deltares
- US Army Core of Engineers; Shore Protection Manual
- BS 6349; Maritime Structures

## **DESIGN CONSIDERATIONS / PARAMETERS**

- Critical Design Wave; 1/100 year;
- Variable forces on gate support hinges and ram during gate opening/closing
- Potential for buoyancy during construction

## **GATE**

- Performance Specification and Exemplar Drawings provided by KGAL Consulting Engineers
- 7 Load cases to be considered



- **PLANNING PERMISSION**
  - **Natura Impact Statement**
  - **Waste Management Plan**
  - **Archaeological Report**
  - **Flood Risk Assessment**
- **FORESHORE LEASE / LICENCE**
- **CERTIFICATE OF REGISTRATION**

- **CIVIL WORKS**
  - **2 Stage Process**
  - **Suitability Assessment of Candidates for Civil Works**
  - **Short Listing of Candidates**
  - **Tender Process**
  
- **GATE**
  - **Single Stage Process**
  - **Design and Build Contract**
  - **Performance Specification with Exemplar Drawings**
  - **Novation of Specialist Contractor to Main Contractor**

## THE GATE

- Need – protection for vessels in the Basins
- Location – optimum location chosen
- Type – Biparting gate – efficient design. Loads and size for single gate option were both considered excessive
- Operation

## ROADS INFRASTRUCTURE

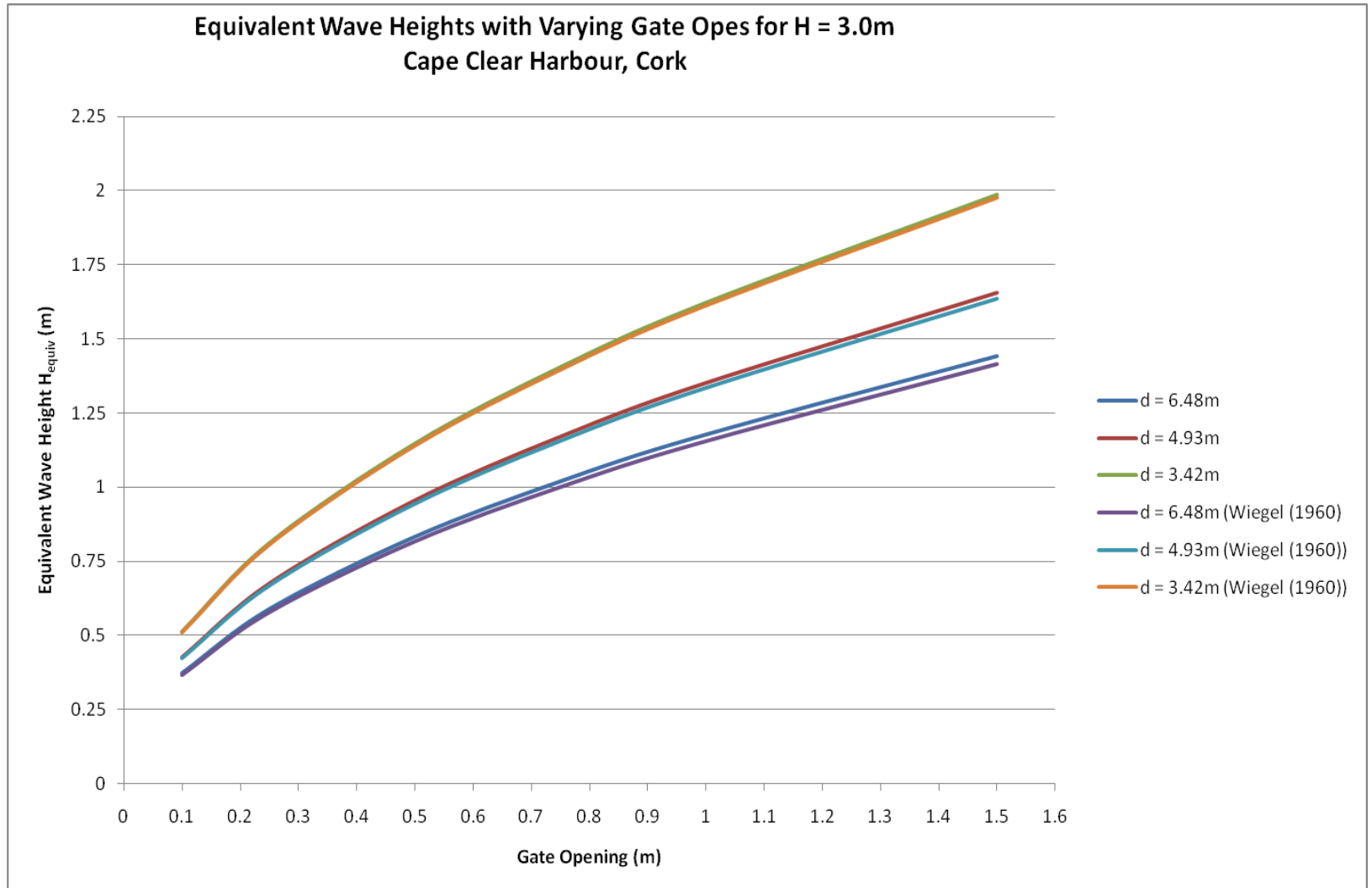
- Existing roads infrastructure between existing slipway and the North Harbour inadequate

## SLIPWAY

- Existing slipway too far from the North Harbour
- Need to construct new slipway first to facilitate deliveries

## SAC DESIGNATION

- Roaring Water Bay and the Islands



## ➤ SHORTLISTING

- Challenge by Unsuccessful Candidates
- Debriefing

## ➤ TENDER EVALUATION

- Non compliance issues
- Tenders rejected

### ➤ COMPLEXITY

- The entire process more complex than envisaged

### ➤ TIME

- Project duration longer than projected due to the need for further surveys and studies, regulatory requirements, access and weather issues

### ➤ COST

- Project cost increased as a result

### ➤ BENEFITS

- Basins protected
- Safe haven for vessels
- Facility to carry out future works in the harbour in dry conditions
- Facility to provide dry dock for maintenance of the gates insitu



# Cape Clear Island Harbour – Storm Gate Installation

**Richard Browne**

BE(Hons) BEng Nat Cert CEng MIEI

Tuesday, 9<sup>th</sup> February 2016

# Introduction

- Company introduction
- Cape Clear
  - Structural arrangement
  - Key engineering elements
- Questions & answers

# Company factsheet

- Established 1987 in Kilmihil, Co. Clare by Louis Keating
- 110 direct employees
- Offices in Dublin & Clare
- Turnover €60M
- Marine clients include:



# Market sectors



Building



Civil

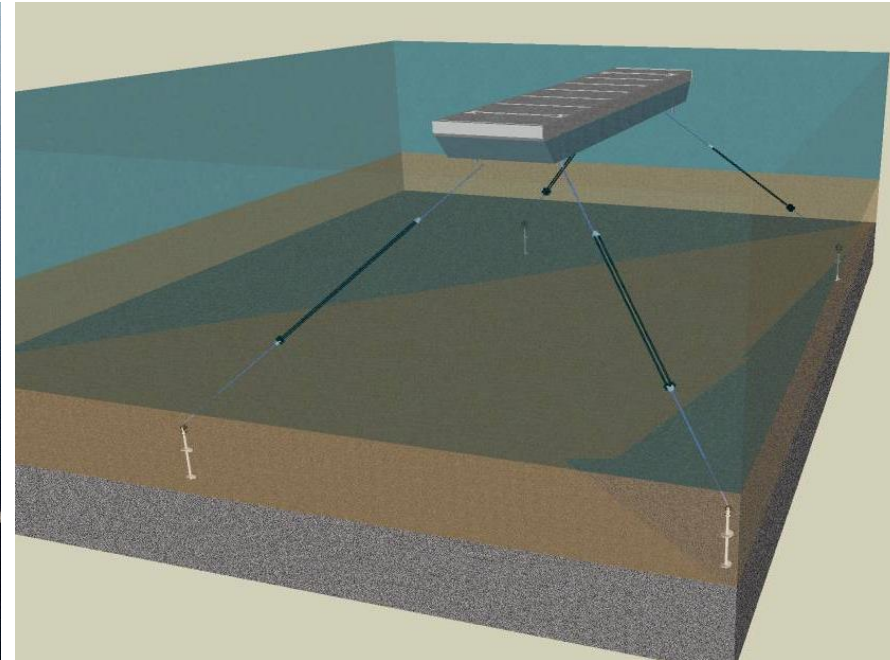


Plant Hire



Marinas

# Marine civil engineering



Floating Concrete Harbour, Valentia Island, Co. Kerry. 2007-2008



# Marine civil engineering

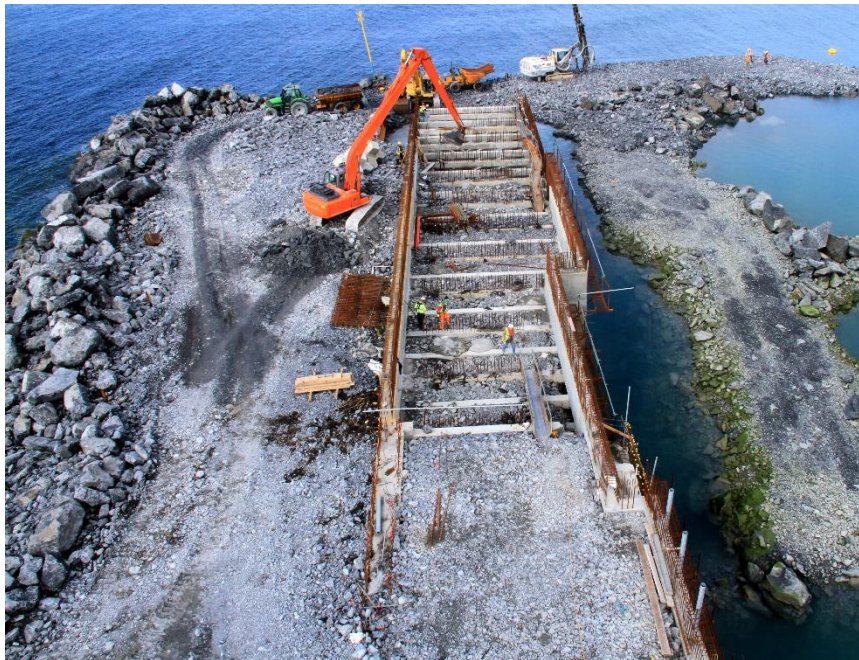


Knightstown Harbour, Valentia Island, Co. Kerry 2007-2008



# Marine civil engineering

- Doolin precast pier technique



- 50t precast units



# Innovative approaches

Castlefore Weir Repairs, Co. Leitrim  
Temporary retaining 1.6m water



Grand Canal Dredging, Dublin City  
Siphon bypass & specialist plant





# Cape Clear

- Project scope
- Structural arrangement
- Design management
- Logistics
- Lock chamber
- Gate installation



70x10m  
slipway

Xbloc  
revetment

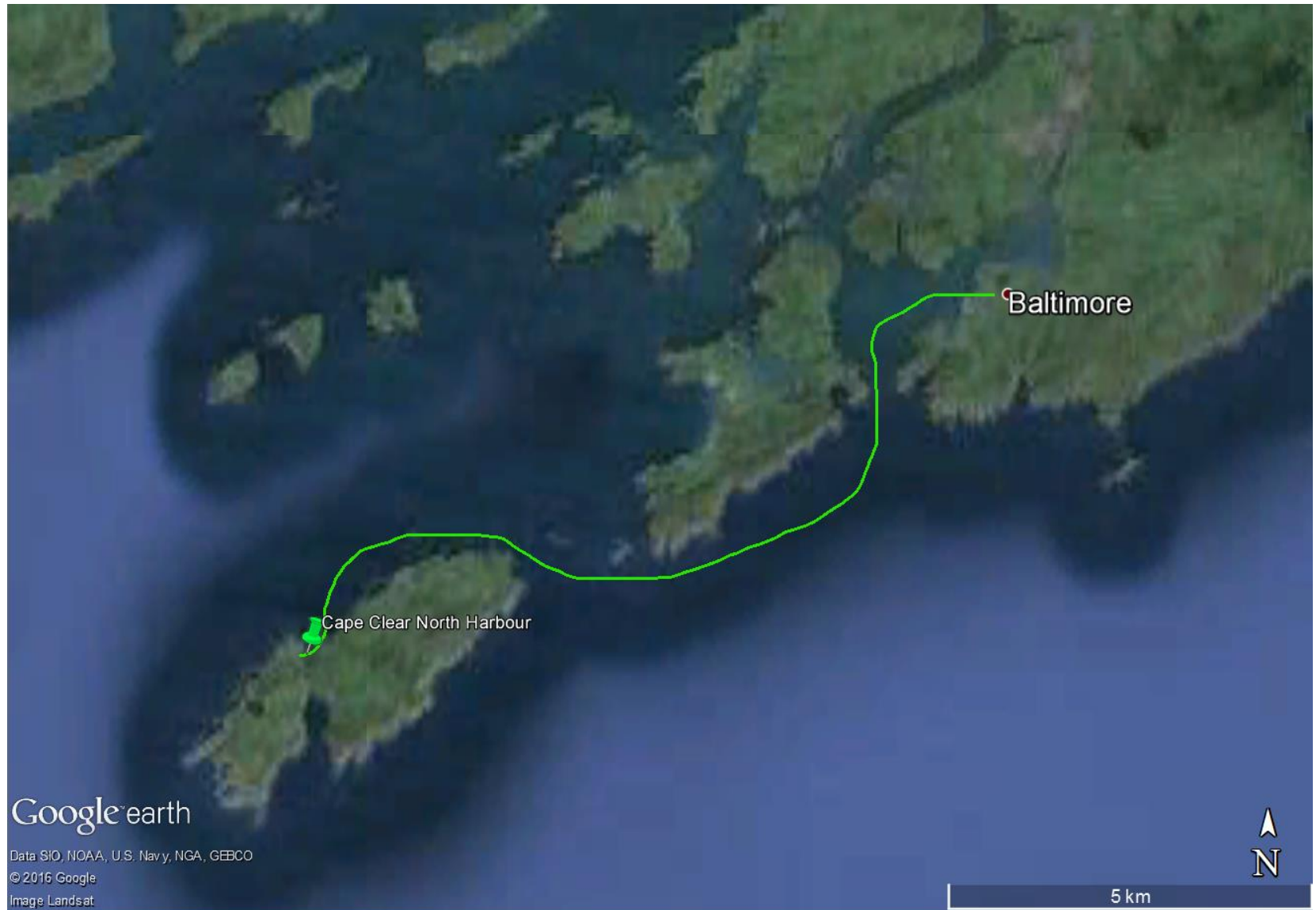
New pier head &  
plant room

Lock chamber  
& gates

New pier &  
plant room



# Environment







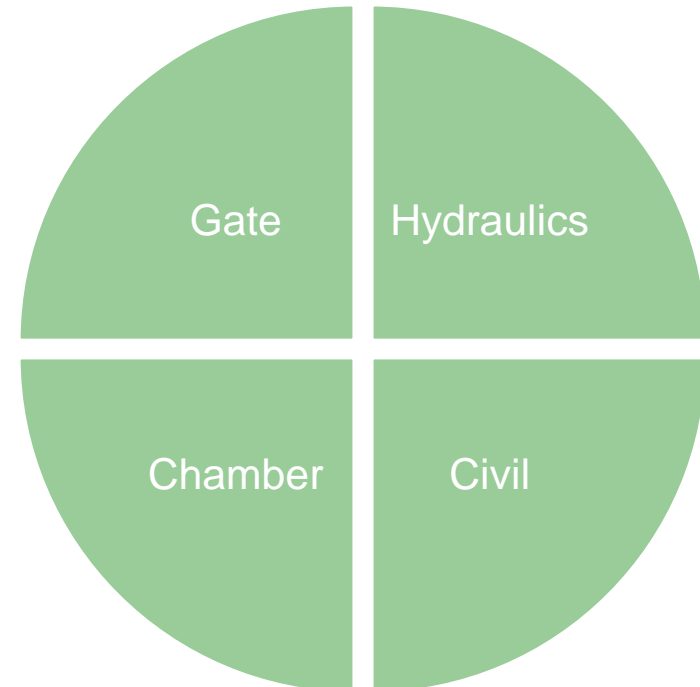
# Design parameters

## Key design parameters

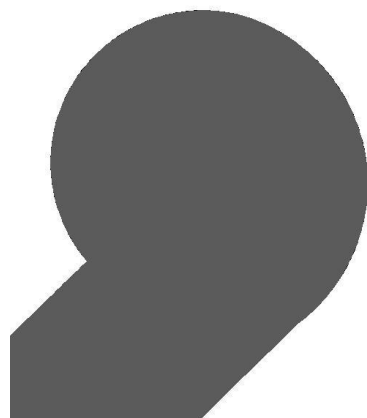
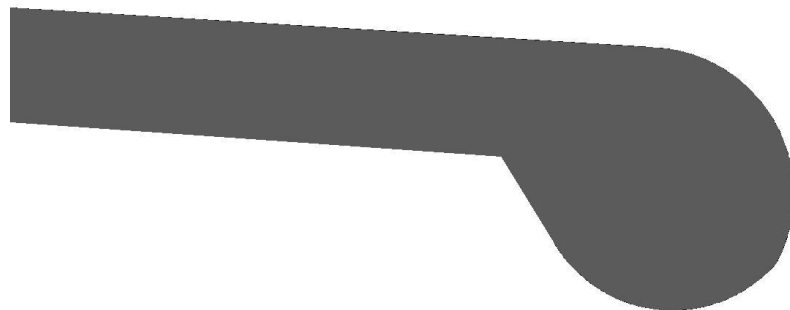
- 12m clear opening
- 4m wave height whilst closing
- Central latching mechanism
- CE Mark (EXC2)
- Low maintenance
- Intuitive

## Key constraints

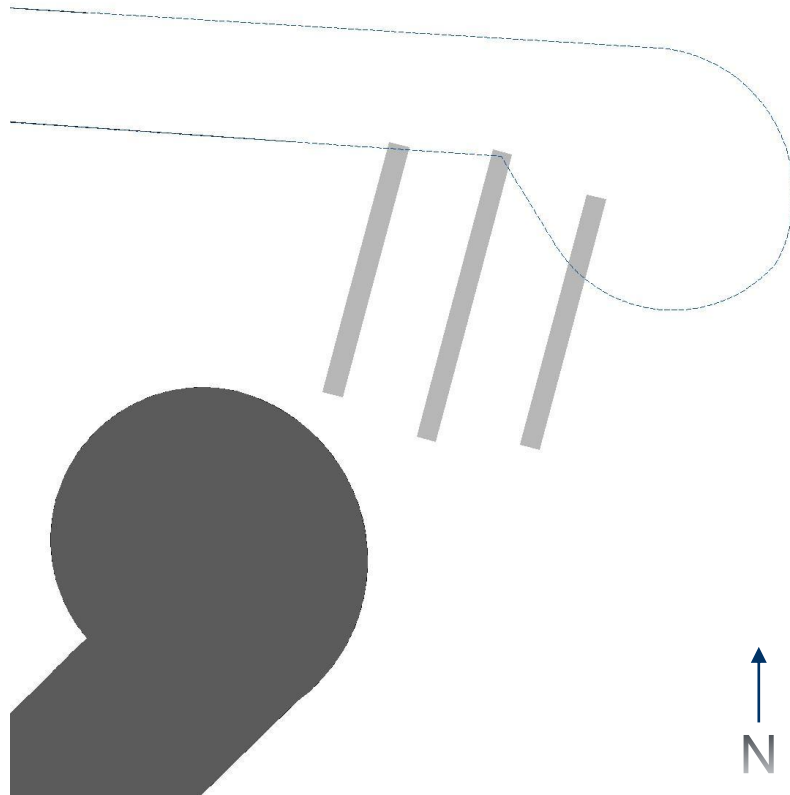
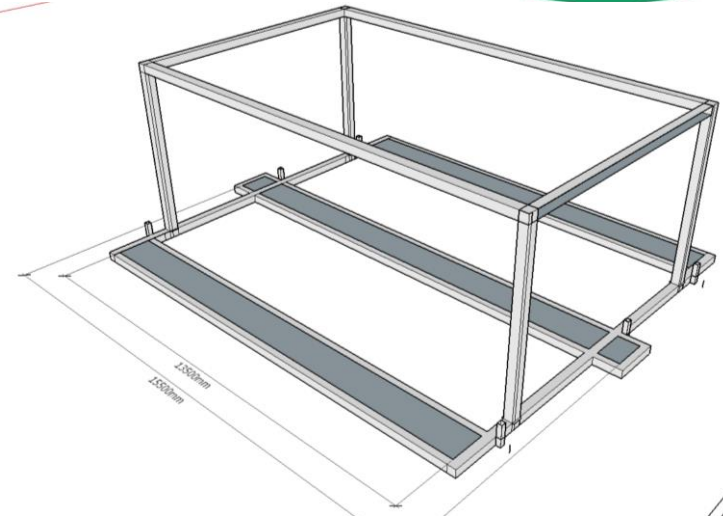
- Special Area of Conservation
- Island working
- Maintain harbour access



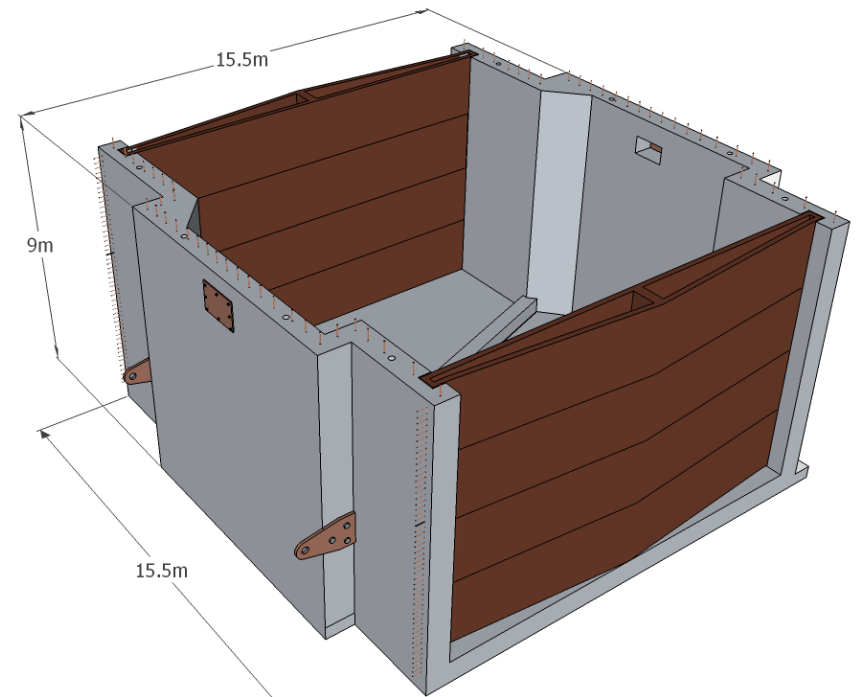
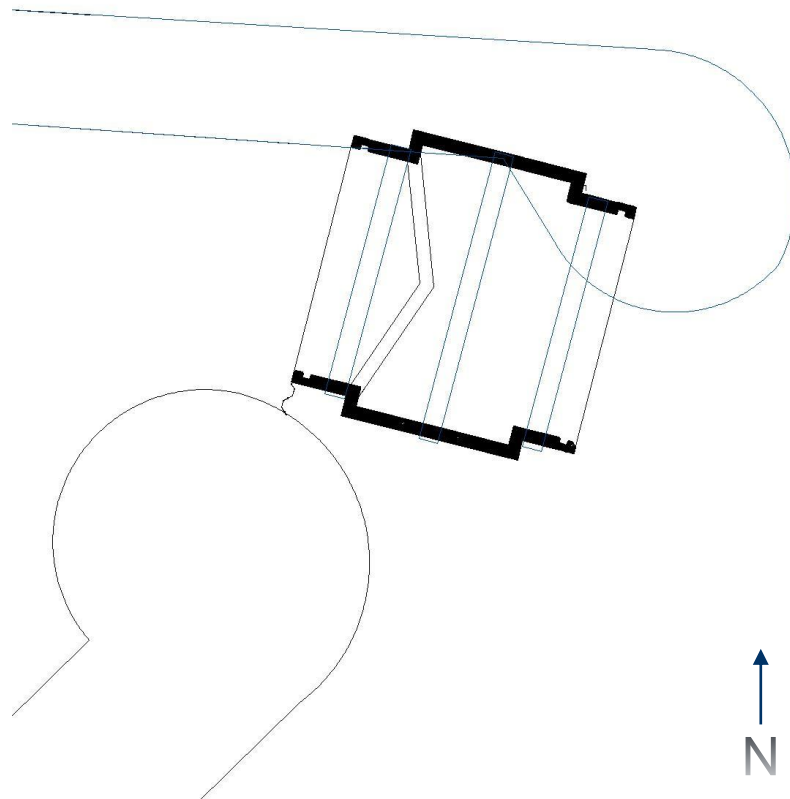
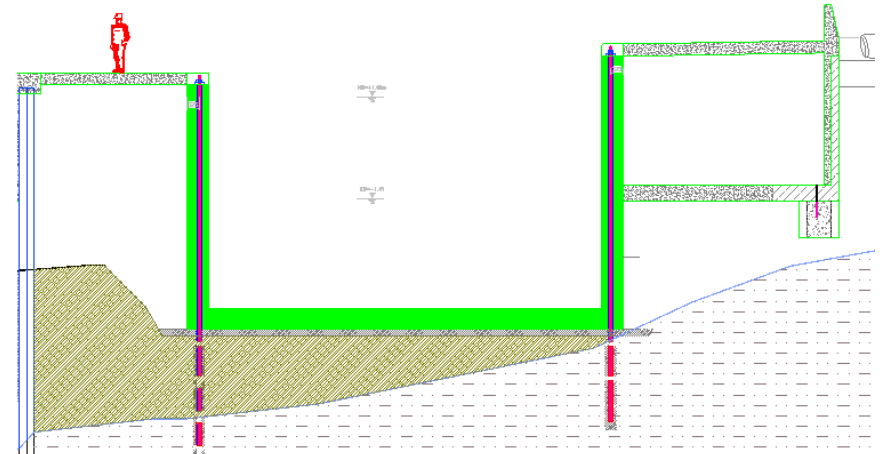
# Structural arrangement



# Structural arrangement

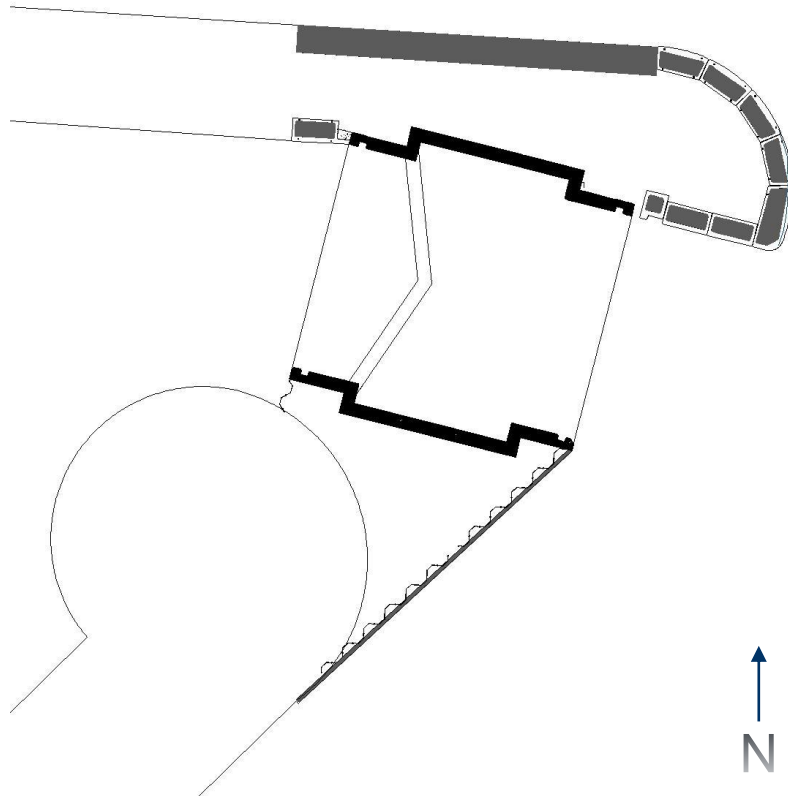


# Structural arrangement

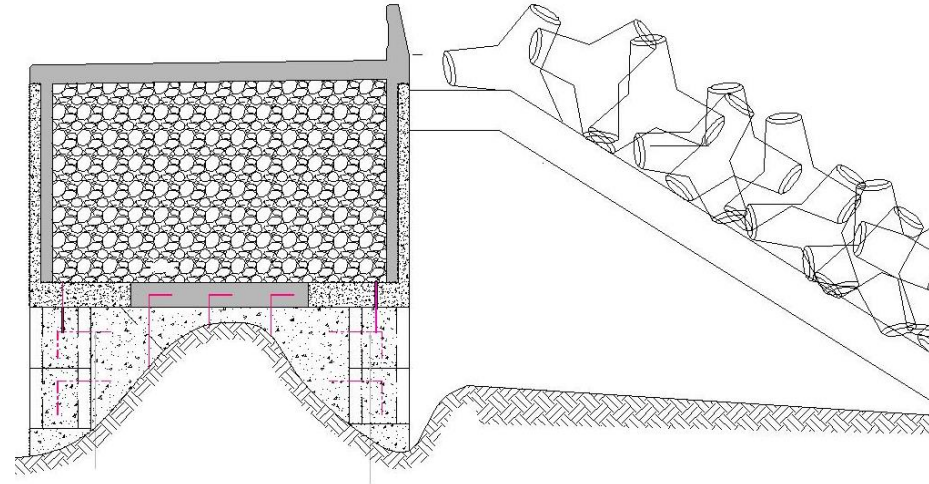
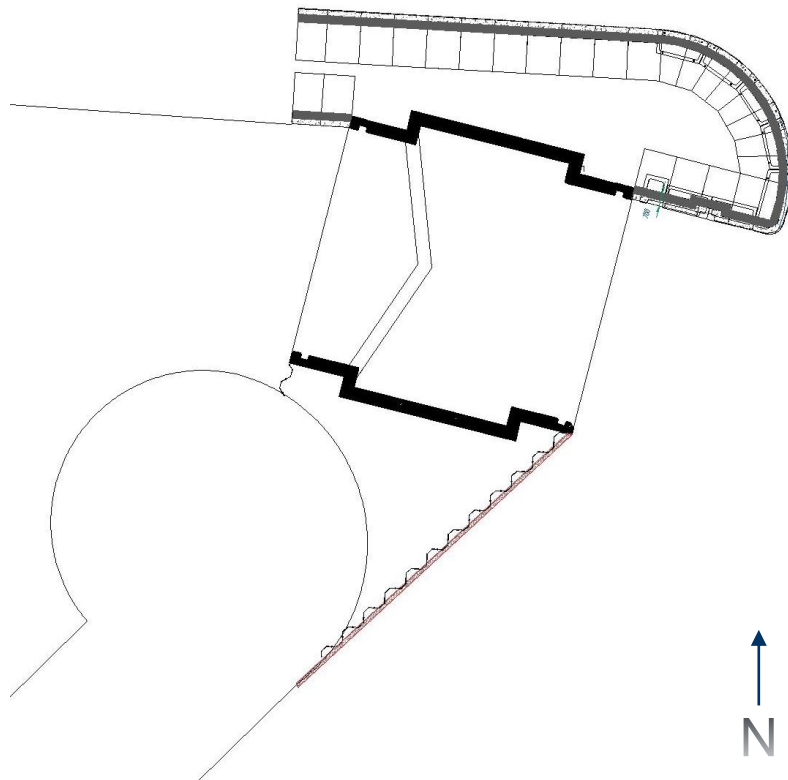




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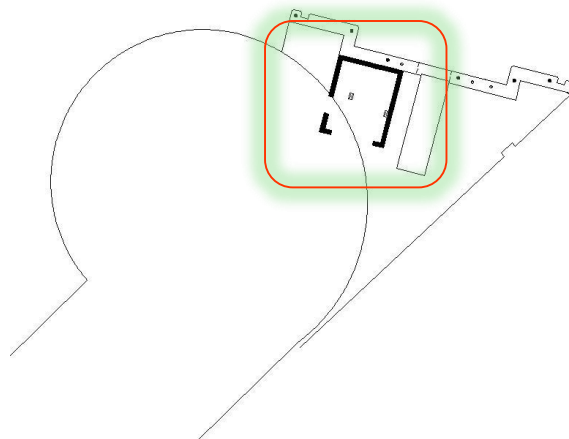
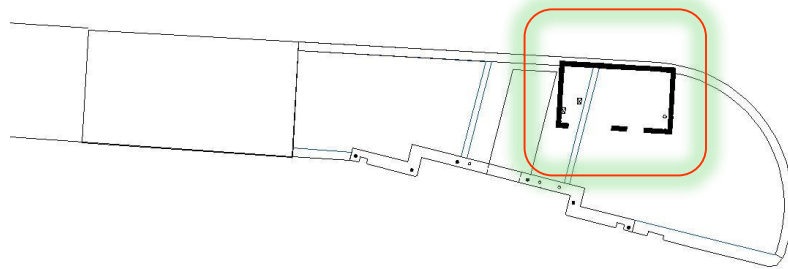


# Structural arrangement

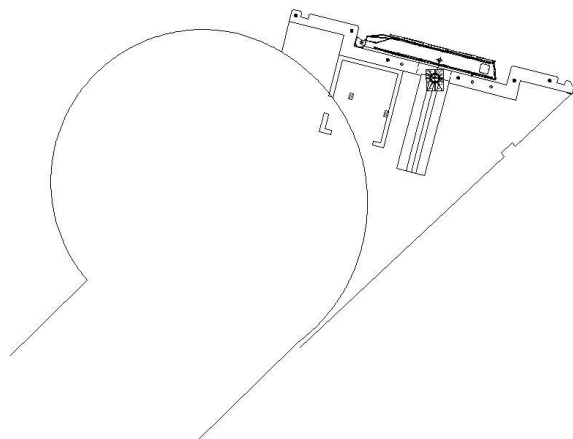
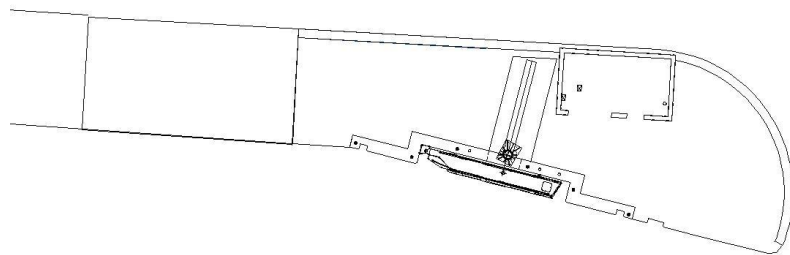




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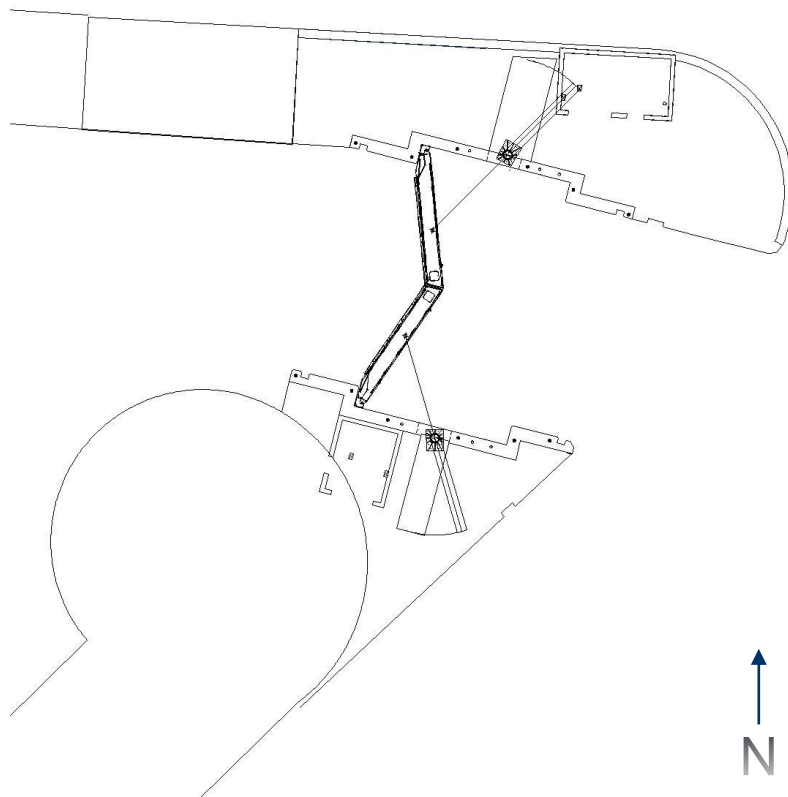


# Structural arrangement

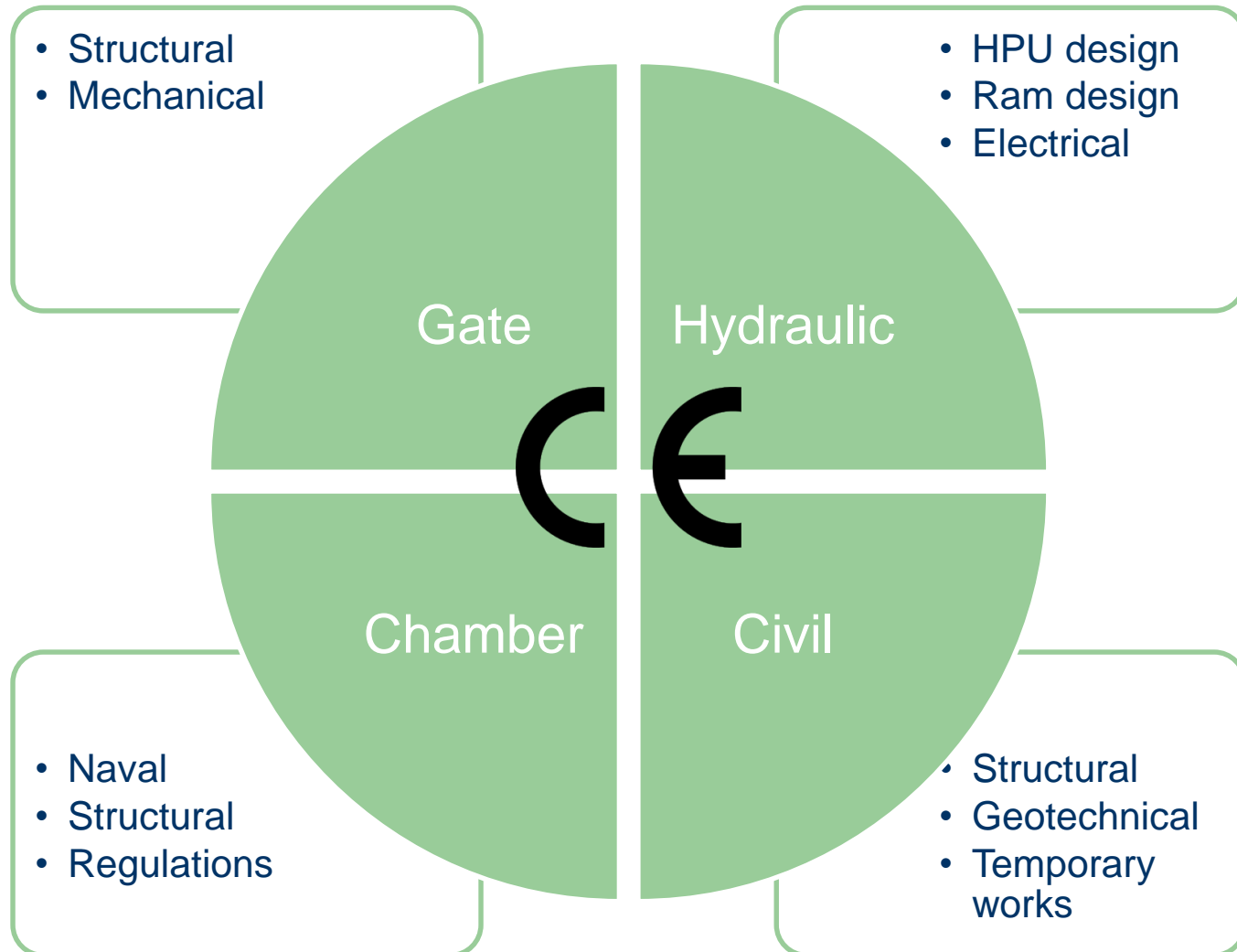




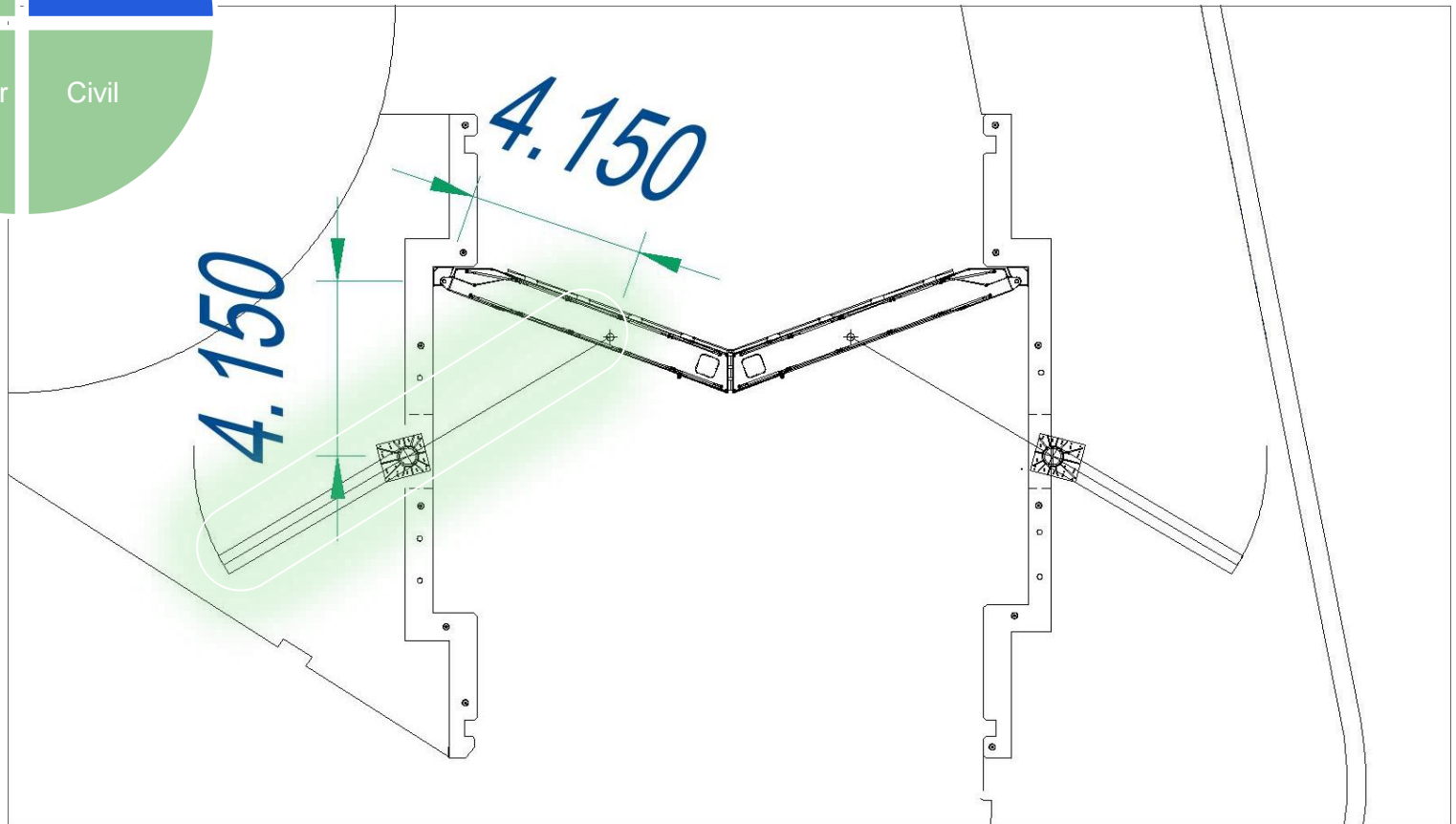
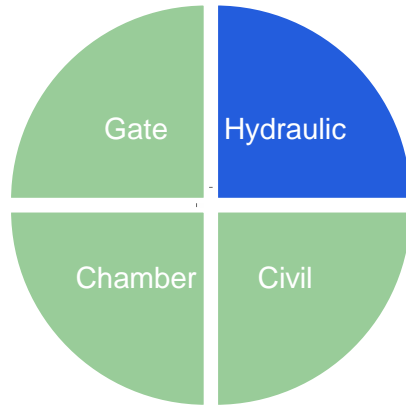
# Structural arrangement



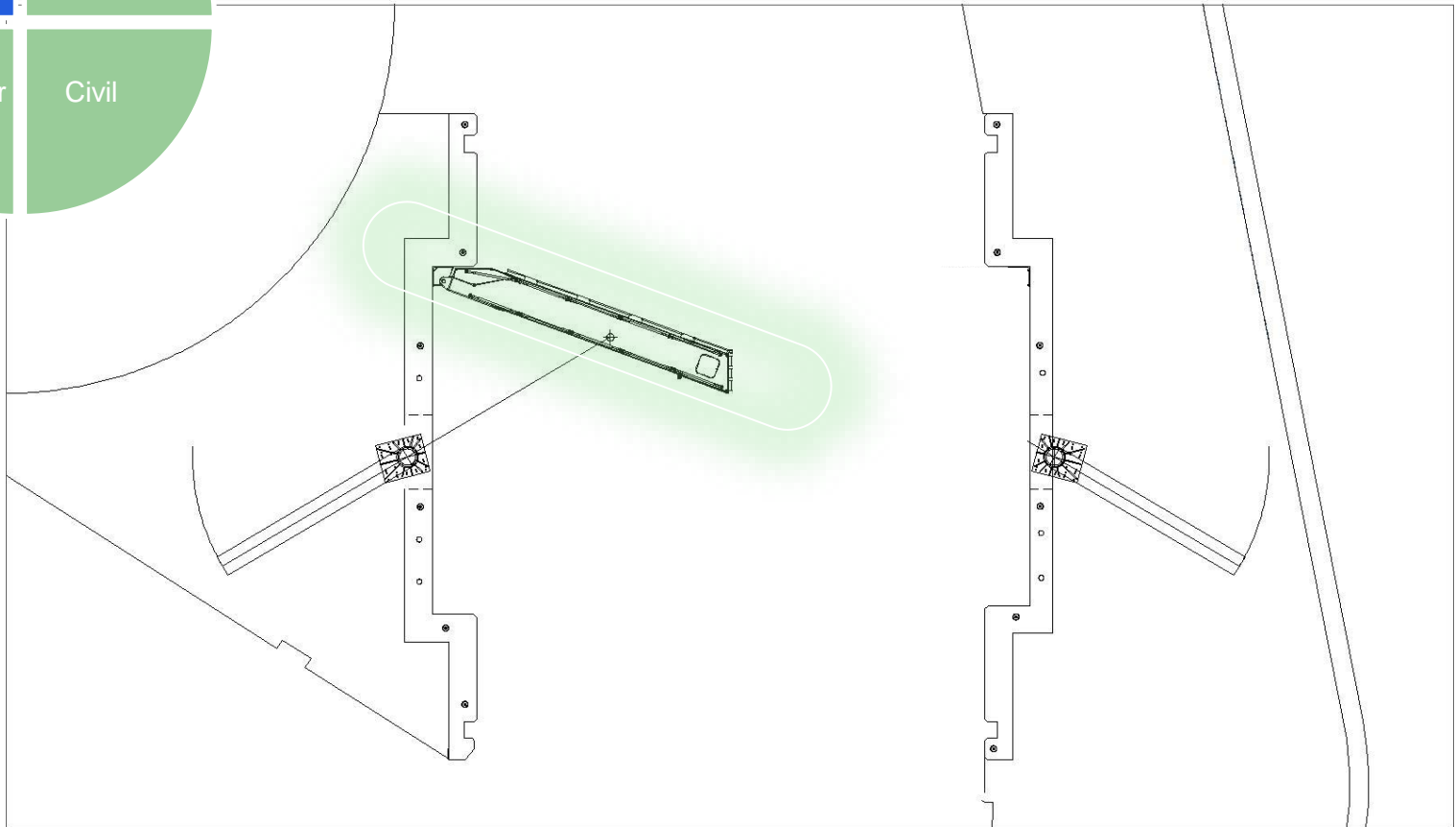
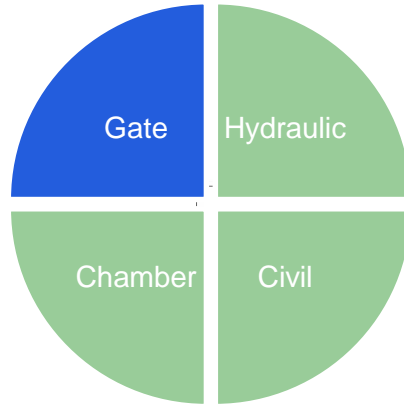
# Design management



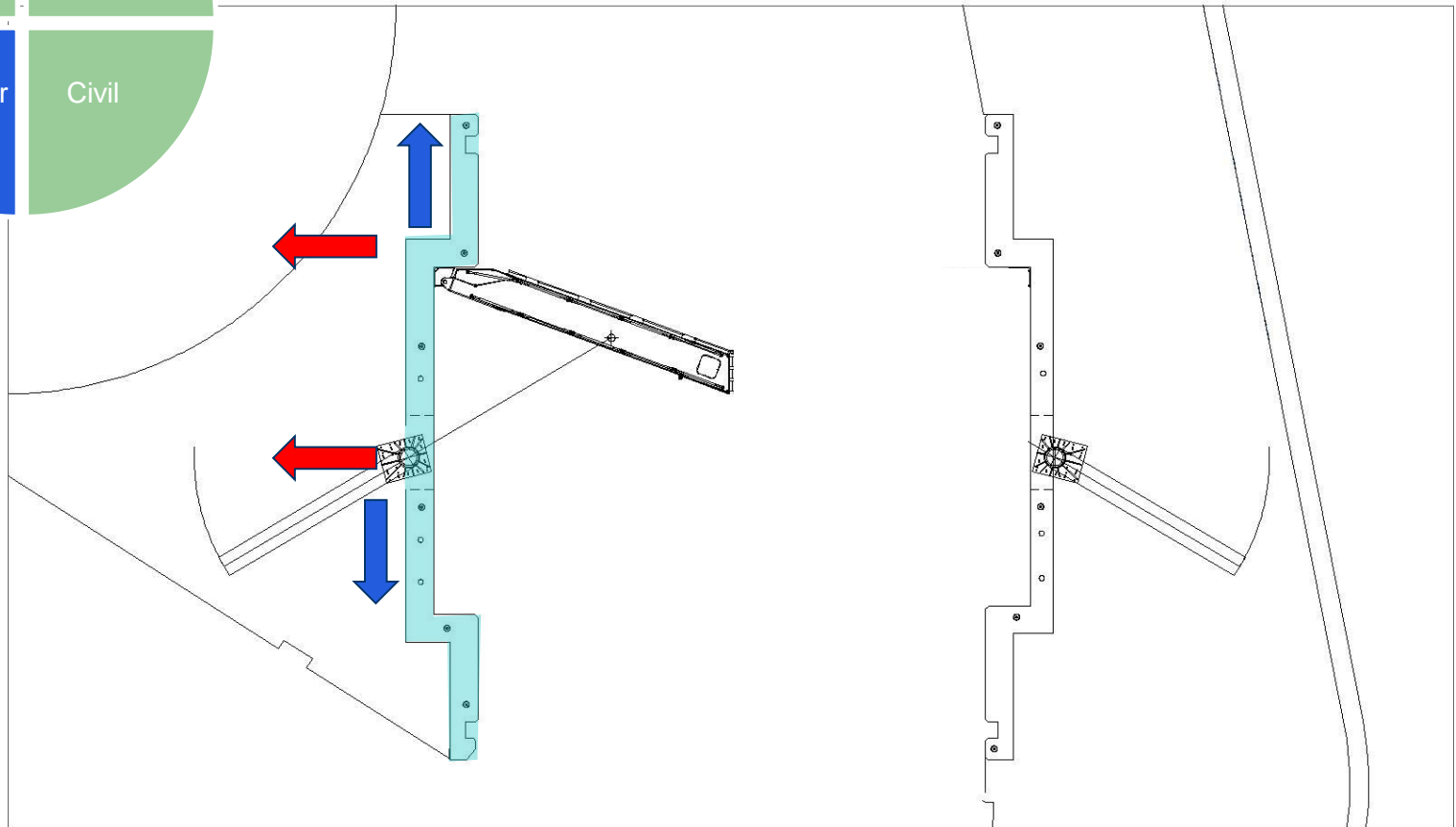
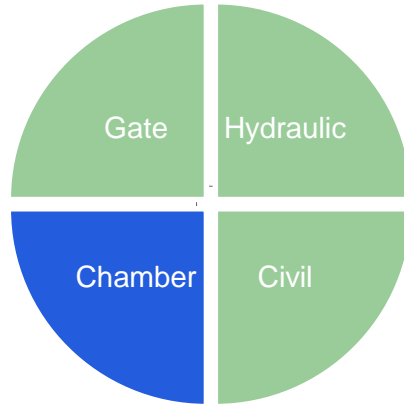
# Design management



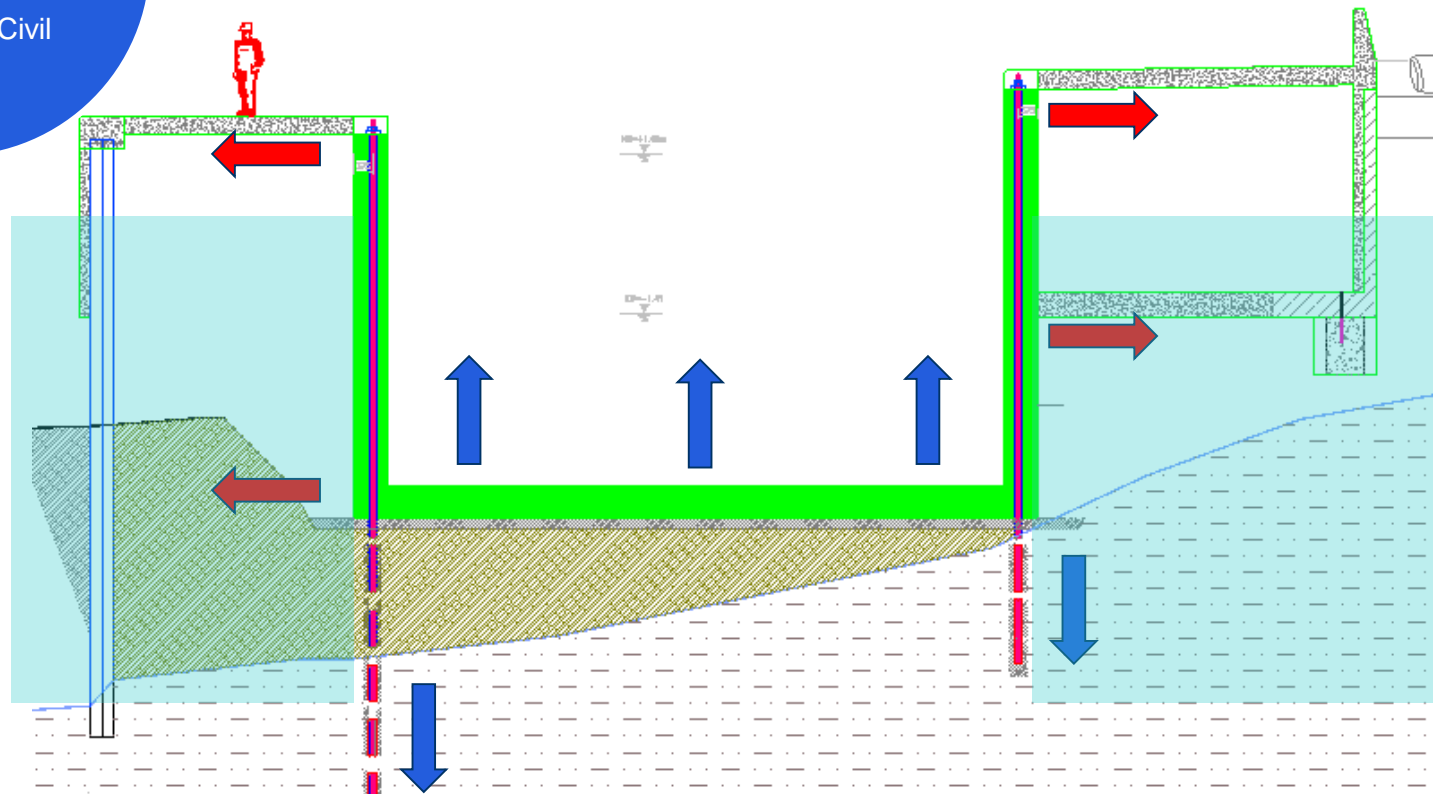
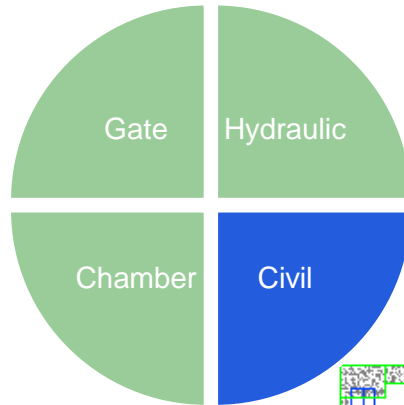
# Design management



# Design management



# Design management





# Logistics





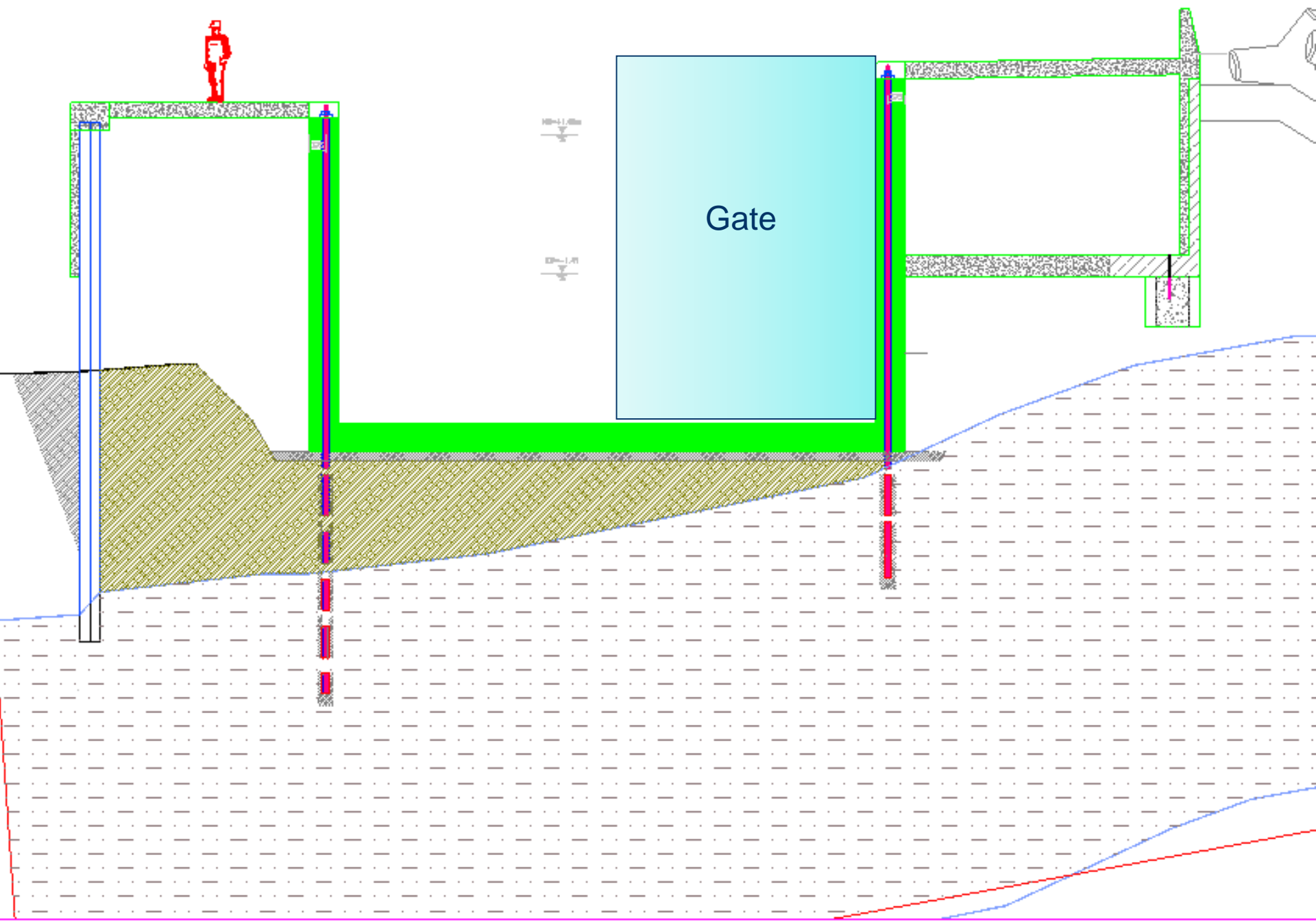
# Chamber / prefabrication



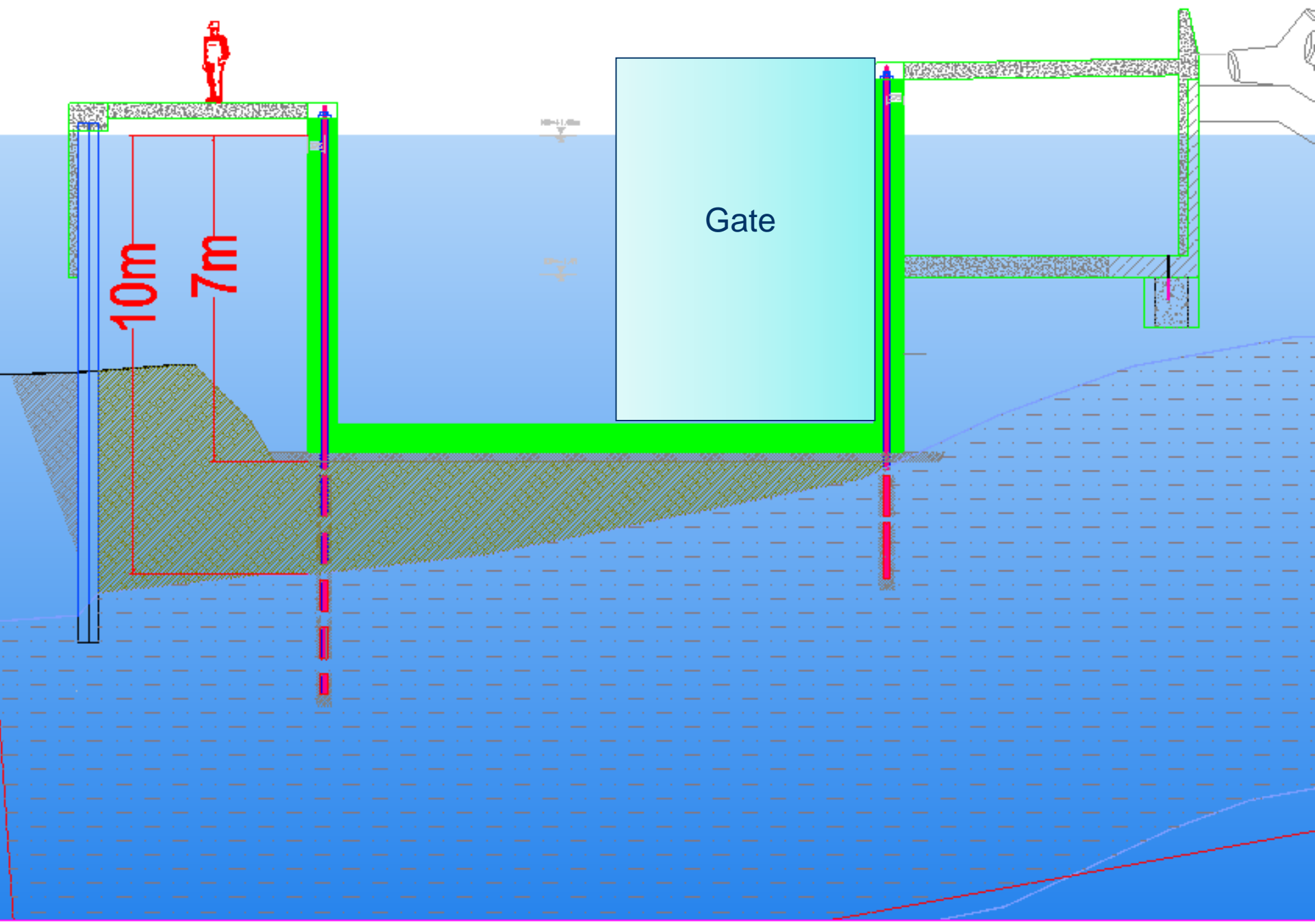
Sheet piling

Lock chamber

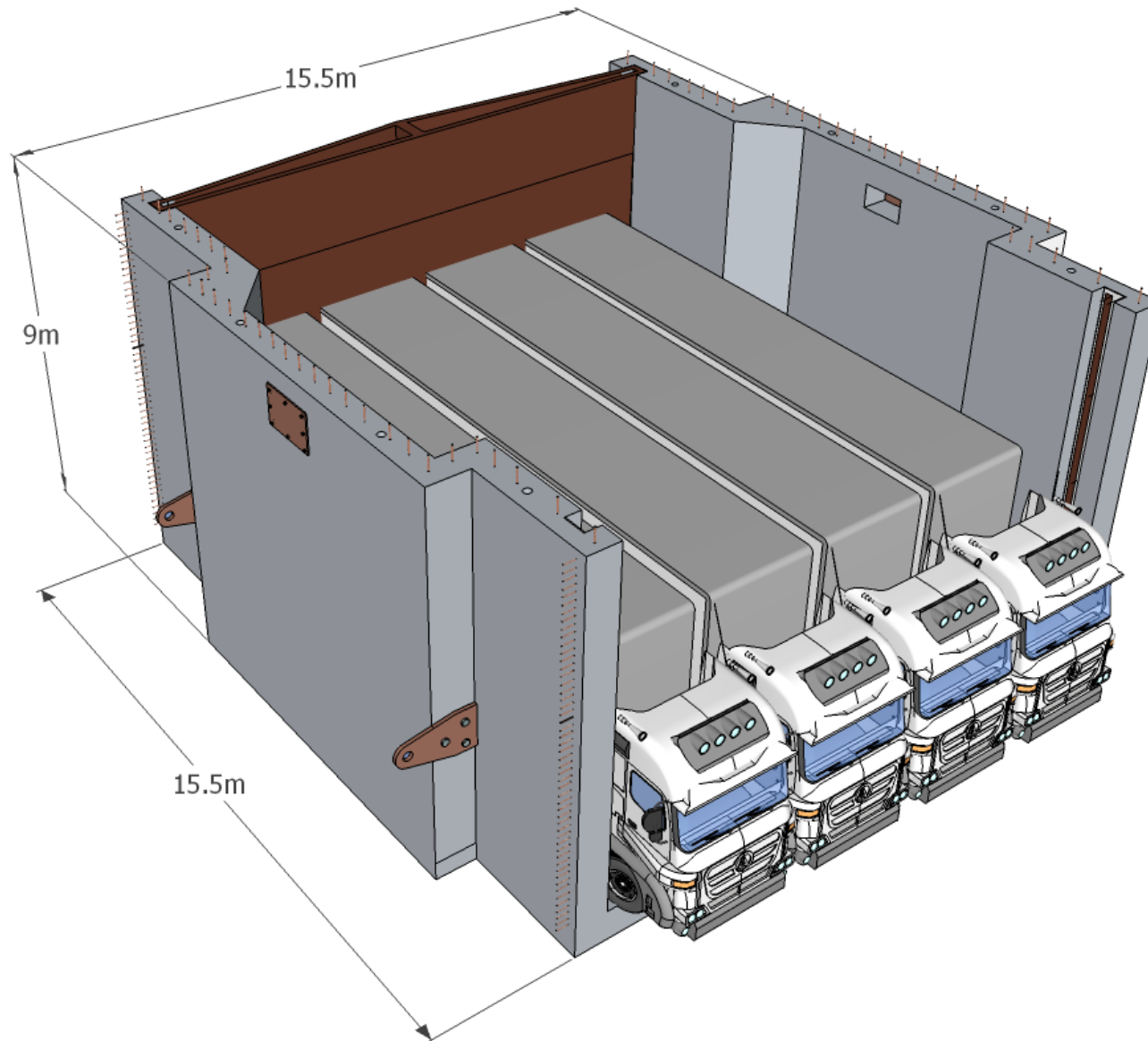
PCC 'L' walls







# Concept design

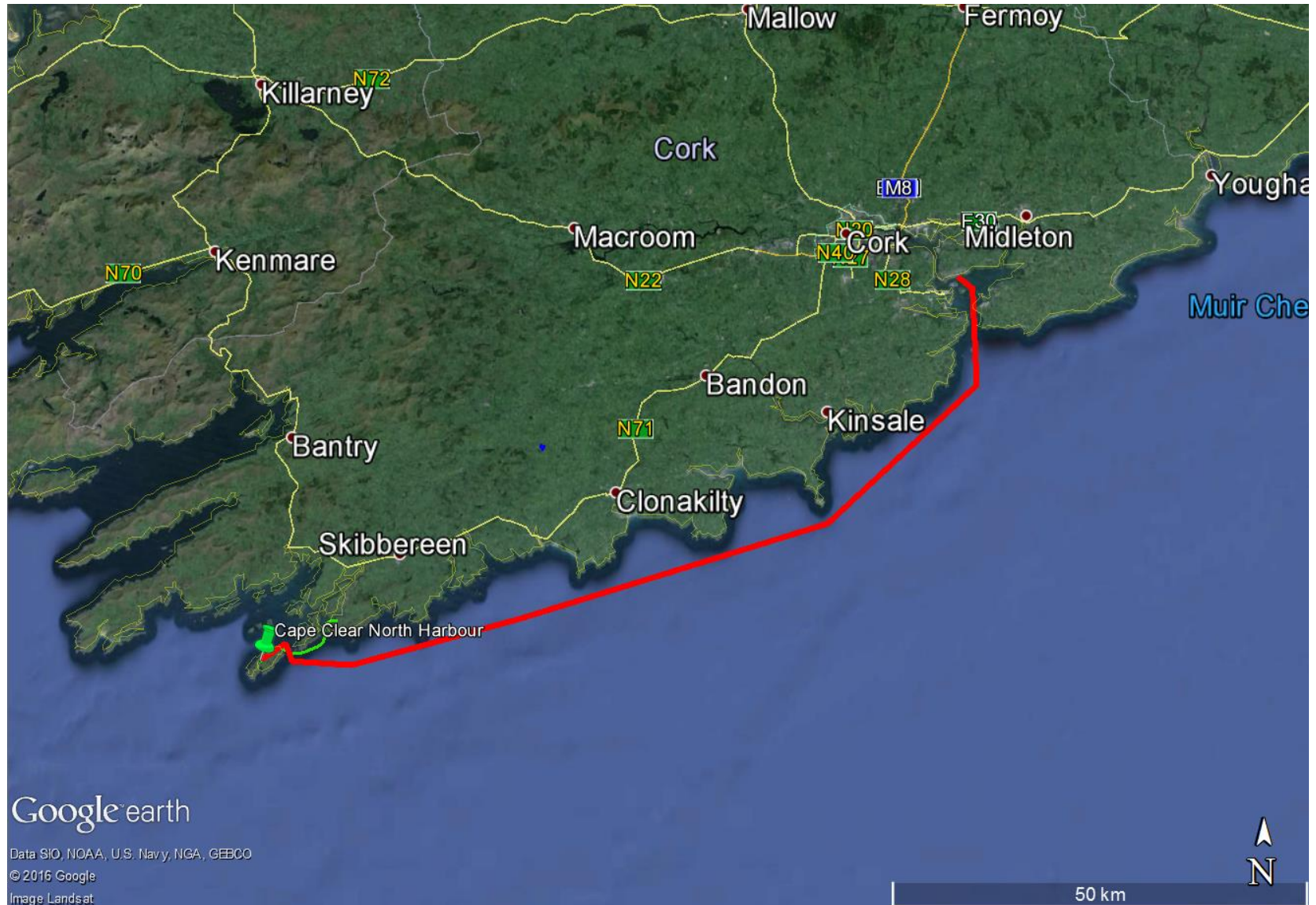


# Lock chamber construction





# Lock chamber construction



# Lock chamber installation





# Gate installation

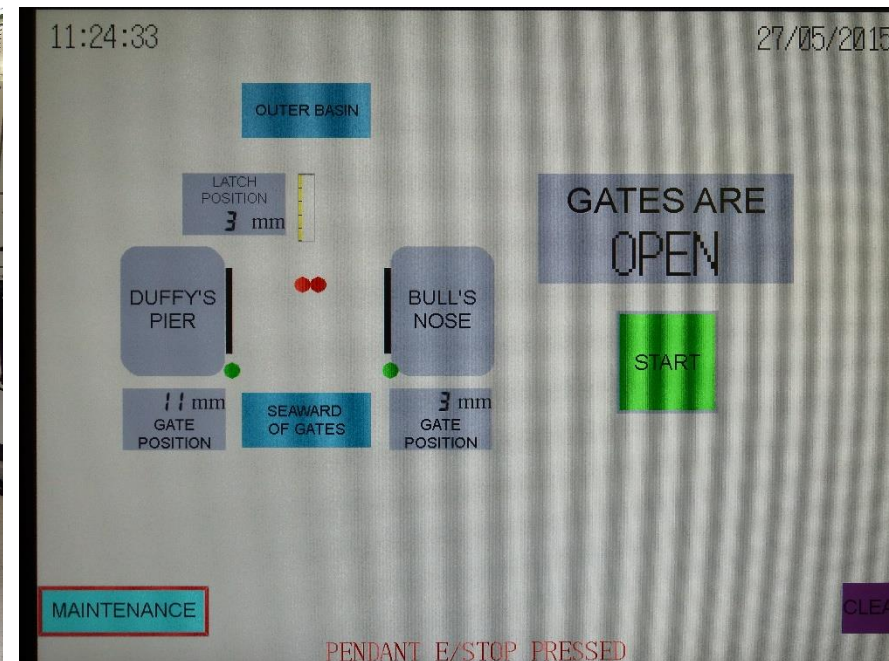


# Gate operation

Hydraulic power pack



Touchscreen HMI



# Gate operation







# Richard Browne

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