

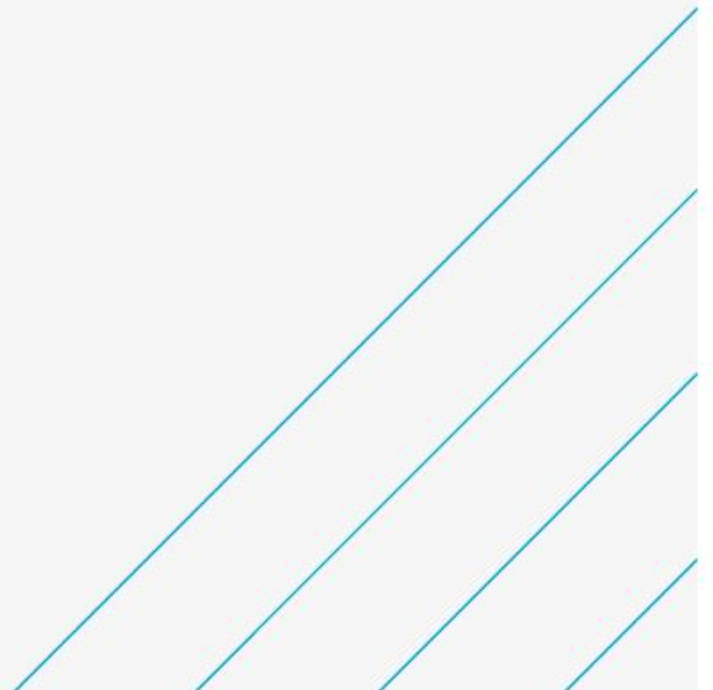
6033 - Steel Museum

Foundation Substantiation

Ace Capital Projects Ltd

10th April 2024

0001



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Introduction

This document has been created to help understand the ground conditions within the site which has helped to identify what type of foundations are needed. Information from the ground investigation report has been used to understand the condition of the ground, type of ground and ground behaviour in the area which has helped come to an overall conclusion that concrete reinforced Bored piles would be the best option given the sites close proximity to natural watercourses. With this in mind it has also been identified from feasibility stage that the foundation levels are to be marginally raised to mitigate potential flooding issues.

1. The Project

The scheme is located adjacent to the A48 Heilbronn Way, the current site is used as a car parking facility for the town of Port Talbot. Access into the site can be attained by exiting the A48 onto Grove Place and then onto Station Road until you come to the south-eastern extent of the site. The proposed steel museum development is the located along the northern boundary of the site extents.

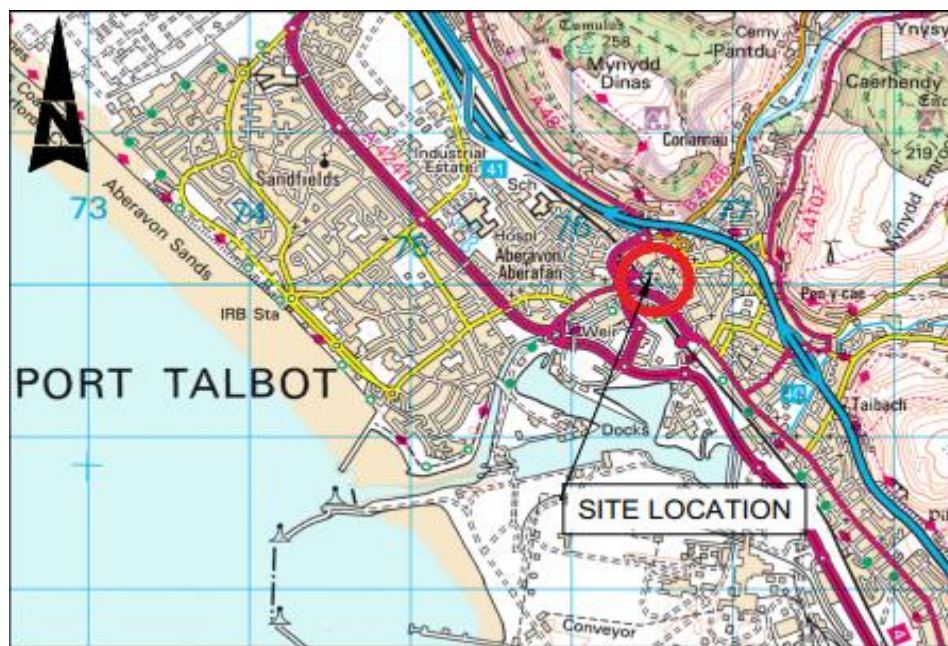


Figure 1-1 - Location Plan

From the feasibility study it is understood the general ground material for the area comprises of tidal flat deposits which mainly consist of sand, clay, and silt the mixture of these materials show various characteristics ranging from poor drainage from clay but good cohesion. Along with sand and silt which are more fine granular material.

2. Ground Conditions

2.1. Tidal Flat Deposits (TFD)

When the ground condition comprises of TFSD this can introduce a number of challenges when designing foundations, this can be in the form of ground settlement given the ground material used and heave of structures. TFD ground also loses it's integrity when disturbed (GroundProjects, 2023).

2.2. Groundwater

It was identified at feasibility stage that the area for construction is located in a low risk flood zone. The general site extents fall into a low-risk flooding from rivers which means there is between a 0.1 – 1% chance in this area and the proposal of the steel museum footprint falls on top of a low-risk area for flooding from surface water & small watercourses. This suggests that this small area is low lying with poor drainage making it subject to flooding with a low chance (0.1% - 1%), the area can be outlined showing the whole site proposal, within the image below and also found within the feasibility report. In addition to this we have proposed to lift the head of the foundations which in turn will raise the footprint of the steel museum to mitigate any potential flooding and futureproof the building against it.

3. Foundations

Given from previous borehole records which show that at approximately 8m depth some signs of cobbles were found. This indicates good ground should be found and the approximate rockhead is going to be lower than this level. With this information it can be determined that the following foundation type is to be Considered.

3.1. Foundation Type

With the poor ground conditions and close proximity to a live watercourse, it is recommended that a concrete reinforced bored pile is to be used in this instance to foot the building. It is estimated that the toe of the pile should be approximately located 10m underground in order to try locating rockhead to increase the buildings stability and risk of settlement. The diameter of the piles and reinforcement details is to be determined following structural calculations.

3.2. Reason for Foundation Selection

Given the poor ground condition and the grounds integrity loss when disturbed it was decided that bored piles were to be used in order minimise ground disruption (Centrum Pile Ltd, 2021). This will also be beneficial as the area surrounding the site is a well built-up area the vibrational frequency will be reduced which will minimise the risk to other buildings and structures. This selection and full set of structural calculations are also to be set out, undertaking independent third party checking to fully certify their integrity.

3.3. Construction of Foundation

Please refer to Structural calculations for size of piles including diameter, depth of toe and total bearing. The piles will be bored using a piling rig, this piling rig will help to remove spoil minimising ground disruptions and making the process more effective.

3.4. Technical Considerations

In order to calculate correct foundations, considering the soft ground conditions the shaft resistance for the pile shall be considered for negative skin resistance (Manual, 2022). The skin resistance may be different for bored piles within either long or short term. For this scour must also be considered as the ground may be more susceptible to retain larger volumes of water (Manual, 2022).

When looking into end bearing resistance for cohesive soils, CFEM suggests a Bearing capacity factor of 9 for piles less than 500mm in diameter. Then a bearing capacity factor of 6 for piles larger than 1m, this gives a good guide to begin and link back to the structural calculations as a checking point (Manual, 2022). Full structural calculations showing these elements along with the structural frame and how the behaviour between the elements can affect the structure.

References

Centrum Pile Ltd. (2021). *What are the differences between Bored Piles and Driven Piles?* [online] Available at: <https://www.centrumpile.co.uk/what-are-the-differences-between-bored-piles-and-driven-piles/> [Accessed 21 Apr. 2024].

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Manual, T. (2022). *Bored Pile*. [online] Available at: <https://static.rocscience.cloud/assets/verification-and-theory/RSPile/RSPile-Bored-Theory-Manual-2022.pdf> [Accessed 23 Apr. 2024].

