



RBL WEBINAR

**Foundations First:
RBL Solutions for Sheds**



ROGER BULLIVANT

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RBL'S PRESENTERS



James Cowburn

Technical Manager



Gerard Loose

Regional Technical Manager



Megan Goodchild

Marketing Manager

WHAT ARE WE COVERING?

01 Our Business

02 Market Challenges

03 Case Study Examples

a) Taylormade Timber, Durham

b) Repurposing sheds

c) King George V Docks, Glasgow

04 Summary

05 Q&A



ROGER BULLIVANT LIMITED

AT A GLANCE

Total employees.

500+

Linear metres of precast beam
manufactured annually.

>250,000 LM

Providing piling and foundation
solutions in the residential sector.

Residential

RBL has the capacity to
manufacture over 1 million metres
of precast pile every year.

1M

Fleet of piling rigs.

50+

100% of precast products manufactured
with low carbon concrete.

100%

Providing piling and foundation
solutions for various commercial projects.

Commercial

OUR PRODUCTS

WHAT WE DO

PILING



- Driven Precast Concrete Piles
- Driven Steel Tubular Piles
- RB Combipile
- Continuous Helical Displacement Piles (CHD)
- Continuous Displacement Auger Piles (CDA)
- Continuous Helical Auger Displacement Piles (CHAD)
- Continuous Flight Auger Piles (CFA)
- Contiguous Piled Retaining Walls

GROUND IMPROVEMENT



- Vibro Stone Columns
- Rigid Inclusions

FOUNDATION SYSTEMS



- RBeam Precast Concrete Ground Beams
- Precast Caps

RESTRICTED ACCESS



- Sectional Flight Auger (SFA)
- Bottom Driven Minipiles
- Overburden Drilling System
- Jack Piles & Jack Pile Raft
- Grundomat Piles
- Drill Bar Piles
- Underpinning

LOCAL KNOWLEDGE NATIONAL SUPPORT



THINK FOR A SECOND PUT SAFETY FIRST



Market Challenges



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS

! Pile/foundation performance is more critical (e.g. due to high tech racking systems)



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 Need for cost and programme certainty

 Resistance to some large developments or local issues










MARKET CHALLENGES

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-  Skills shortage
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-  Local procurement of materials
-  ESG/sustainability requirements
- 

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-  Skills shortage
-  Local procurement of materials
-  ESG/sustainability requirements
-  Upgrading existing sheds

RBL Case Studies





Taylormade Timber, Durham

Driven Precast Concrete Piles x CFA Piles

Key issues/requirements

- Cut & fill
- Various level changes
- Multiple phases
- Retaining wall piles
- Bearing piles

Project Solution

- Detailed design
- Detailed programme
- Phased approach
- Dual disciplines



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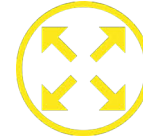
TAYLORMADE TIMBER, DURHAM PROJECT BRIEF



Foundations to accommodate specific pile loading criteria for a new sawmill unit, retaining wall, and office facilities.



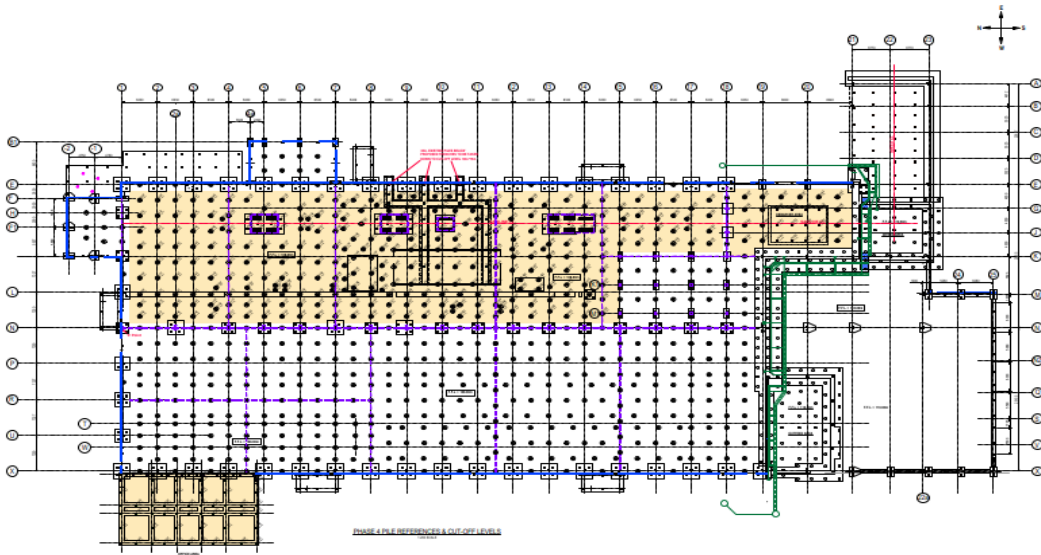
Driven Precast Concrete Piles and Continuous Flight Auger (CFA) Piles.



Larger piled bases were designed for the retaining wall and adjacent office buildings.



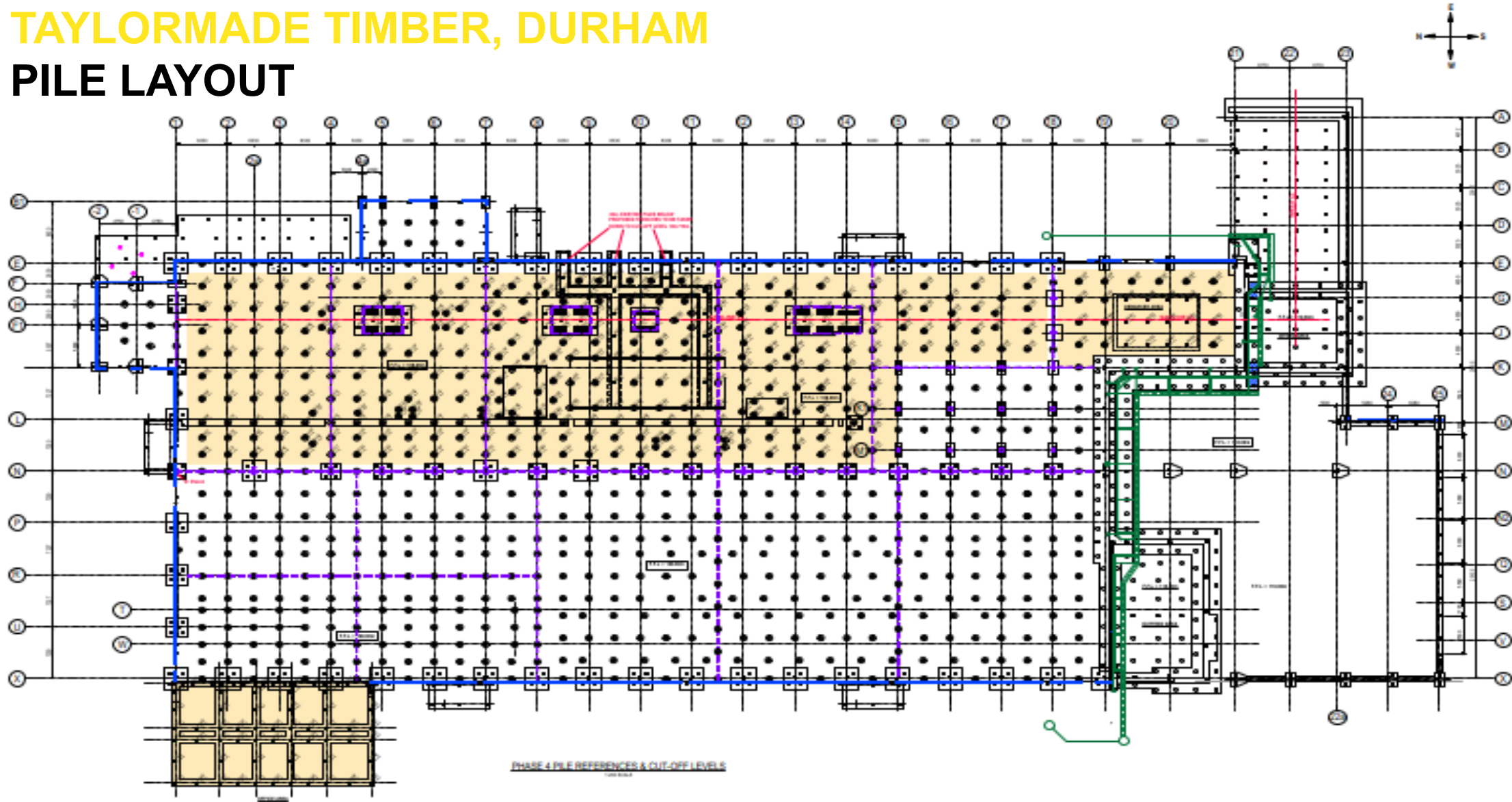
Optimising efficiency and cost-effectiveness for the client.



The piling layout incorporated a large floor slab area with varying loading conditions.

TAYLORMADE TIMBER, DURHAM

PILE LAYOUT



TAYLORMADE TIMBER, DURHAM

KEY ISSUES

1

The project required phased construction due to its complexity and scale, necessitating careful coordination of several rig mobilisations.

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Phased piling operations were essential to avoid disrupting other trades on site.

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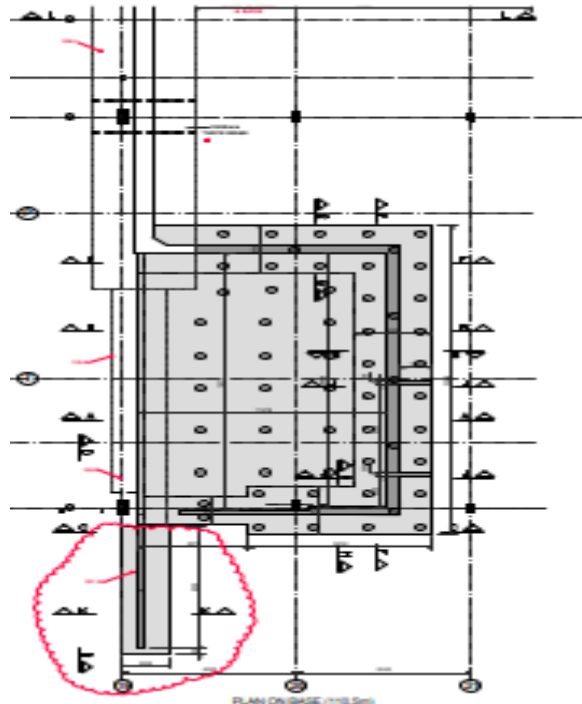
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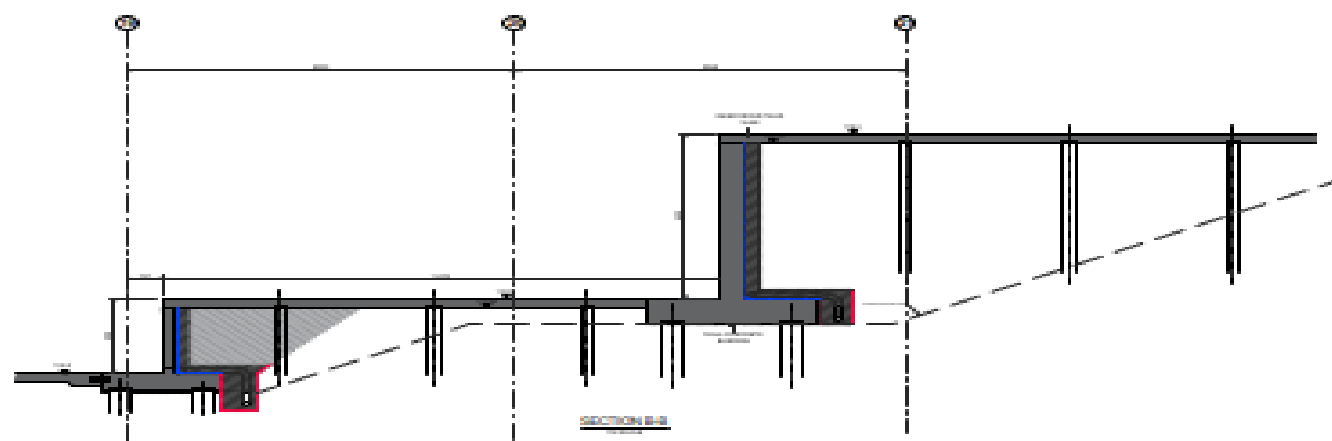
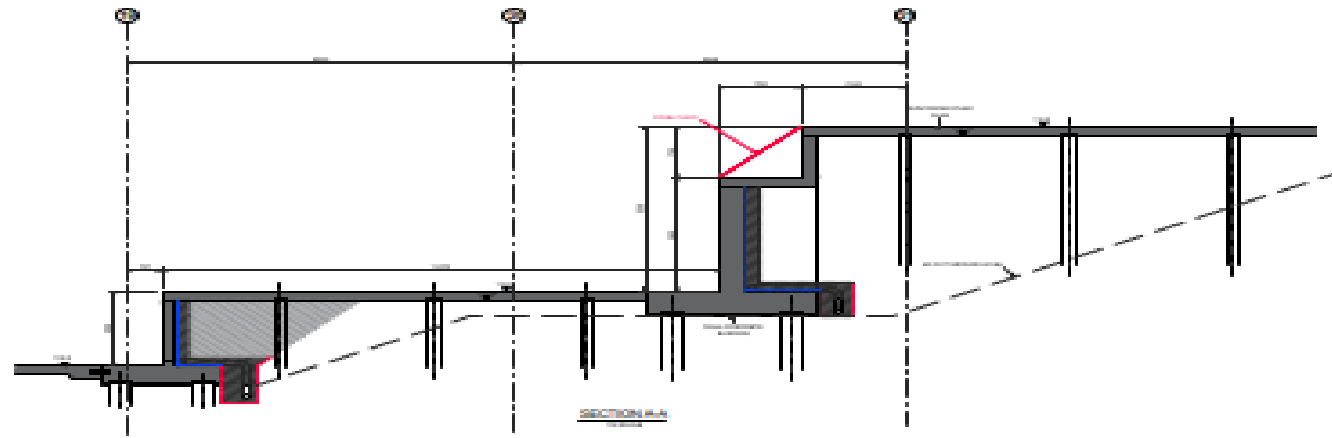
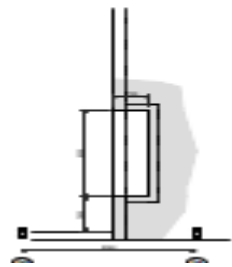
The formation levels required careful consideration in the piled foundation design.

TAYLORMADE TIMBER, DURHAM

SITE SECTIONS



WALL CLADDING HAS ALREADY BEEN ISSUED



TAYLORMADE TIMBER, DURHAM SOLUTION

3

Rigs mobilised



270

350/450/600mm CFA Piles installed to depths of 7m to 11m.

1440

Driven Precast Concrete Piles installed to depths ranging from 10.5m to 17.5m.



TAYLORMADE TIMBER, DURHAM SOLUTION

COLLABORATIVE DESIGN AND VALUE ENGINEERING

- ✓ Given the broad range of pile loads beneath the proposed slabs and column bases, the team worked closely with the principal designers to refine and optimise the foundation scheme.
- ✓ This collaboration involved careful value engineering to align the pile design loads with the project's loading criteria, resulting in optimised pile spacing.

COMPLIANCE WITH EUROCODE STANDARDS

- ✓ All piles were designed and executed in accordance with Eurocode standards.
- ✓ For the precast piles supporting the portal frame columns, the design accommodated maximum design actions of over 850kN DA1C2 compression, over 115kN DA1C1 horizontal load, and 10kN DA1C1 tension.

SUSTAINABILITY

RBL's Driven Precast Concrete Piles are manufactured using low carbon concrete, with a reduced cement content by 50% using GGBS.



TAYLORMADE TIMBER, DURHAM SOLUTION

COMPREHENSIVE TESTING AND VALIDATION



To ensure the reliability of the design, working static tests were conducted on the working piles, and uplift pull-out testing was performed on a selection of piles.



Test results confirmed compliance with the project's design and specifications, validating the effectiveness and quality of the foundation solution.

TAILORED SOLUTIONS FOR VARIED STRUCTURAL REQUIREMENTS



RBL's ability to offer a combination of piling techniques proved essential for accommodating the diverse structural elements of the project.



The mixture of steel-framed structures, retaining walls, and office facilities required distinct foundation approaches, and RBL's expertise enabled a seamless integration of precast and CFA piling tailored to the specific load demands of each element.







Amazon, Barlborough **Driven Steel Tubular Piles**

Key issues/requirements

- High loads
- Sloping rock head
- Variable depth of fill
- Sensitive existing slab
- Programme requirements

Project Solution

- Pre-drilled pile positions
- Top-driven steel tubular piles
- Working from slab protection
- Detailed programme



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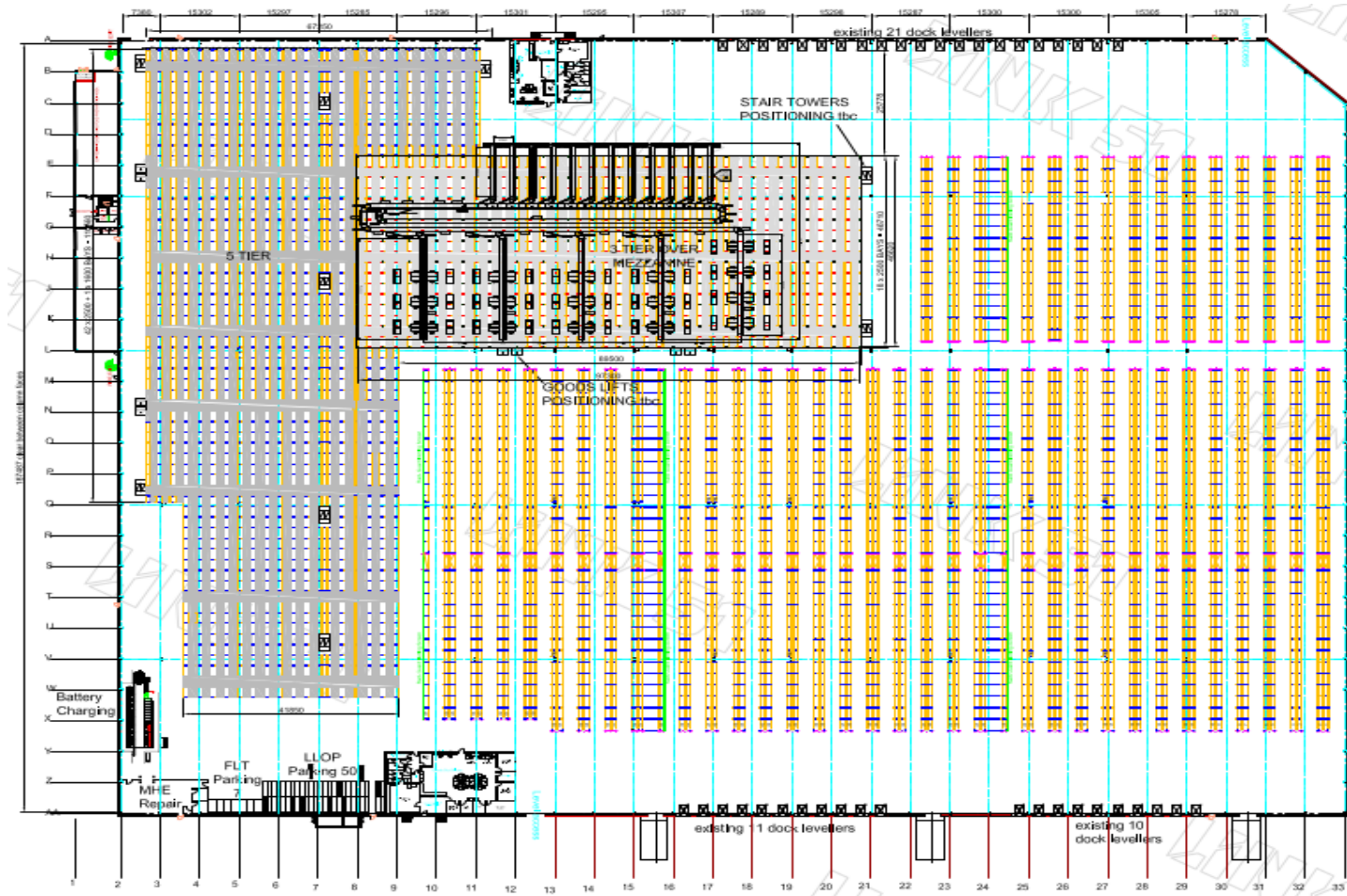
AMAZON, BARLBOROUGH PROJECT BRIEF

RBL was contracted to provide a piled foundation solution for the installation of a 3 to 5 storey mezzanine within an existing development.

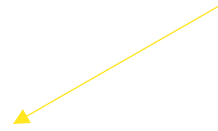


AMAZON, BARLBOROUGH

KEY ISSUES

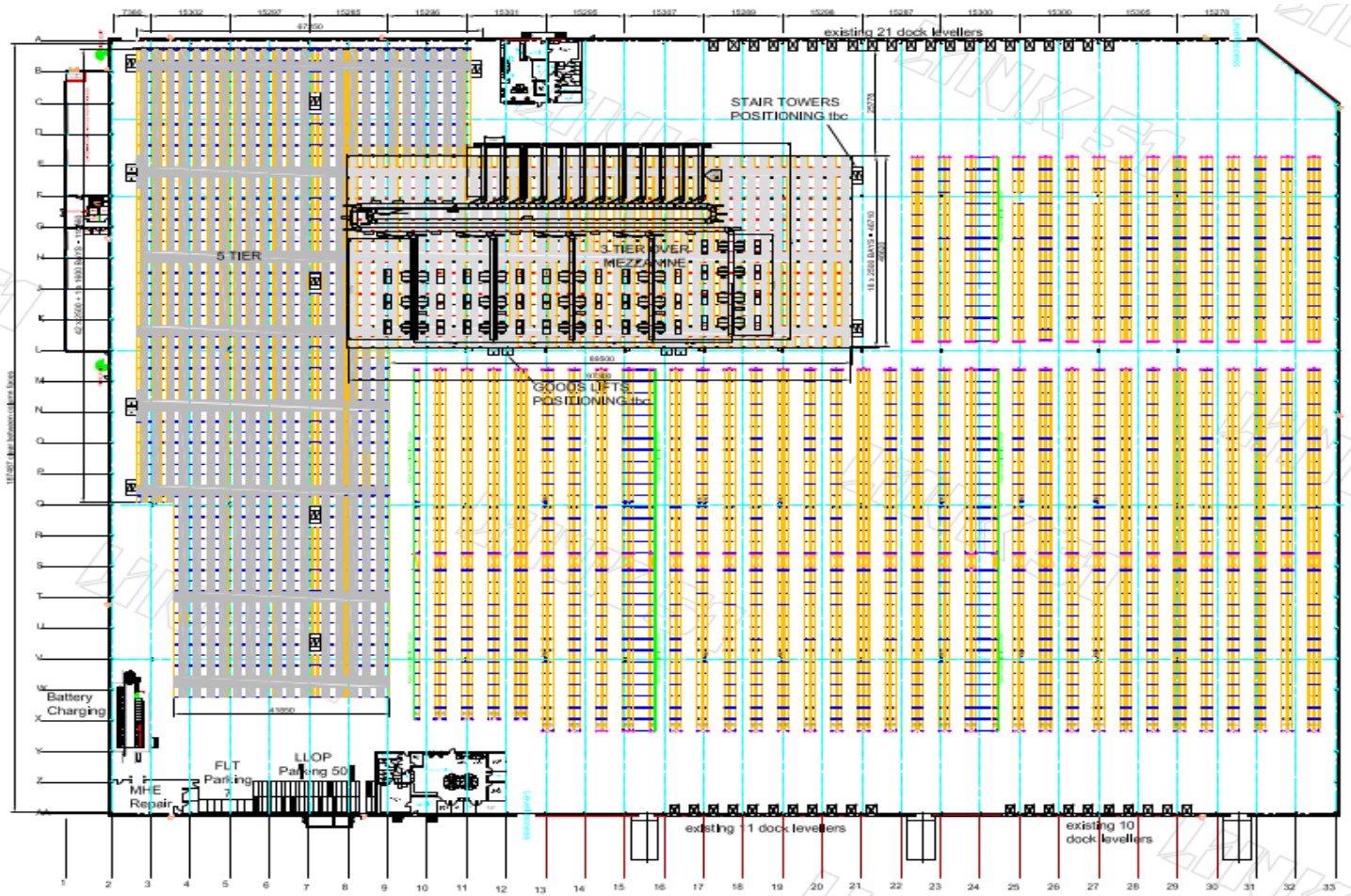


Restricted Access / Egress – 4.0m x 5.0m roller shutters doors.
Height Restriction 15.0m at lowest point.

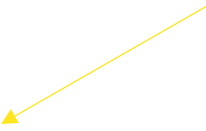


AMAZON, BARLBOROUGH

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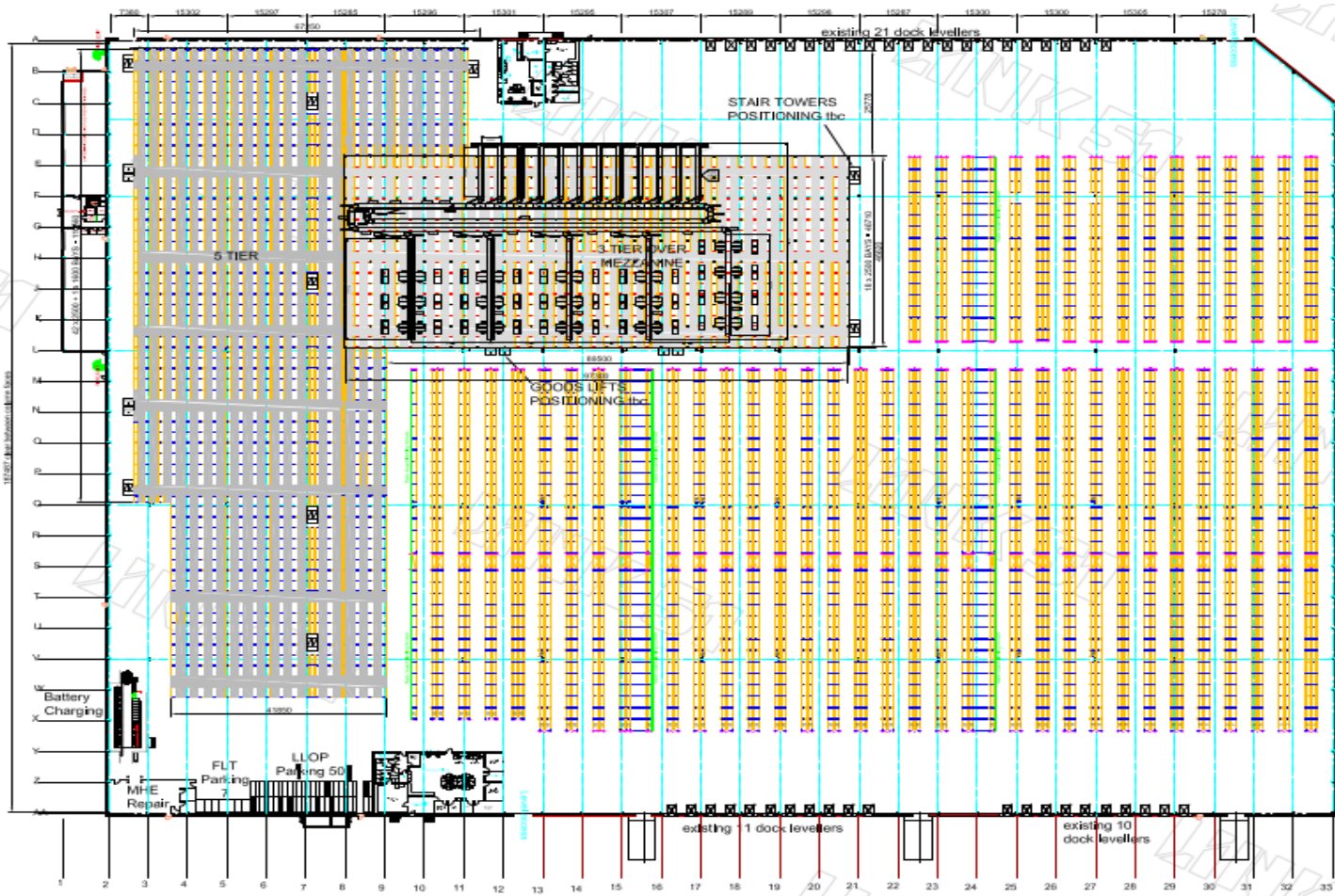
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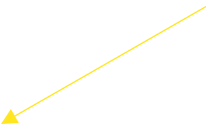
Existing sensitive piled slab.

AMAZON, BARLBOROUGH

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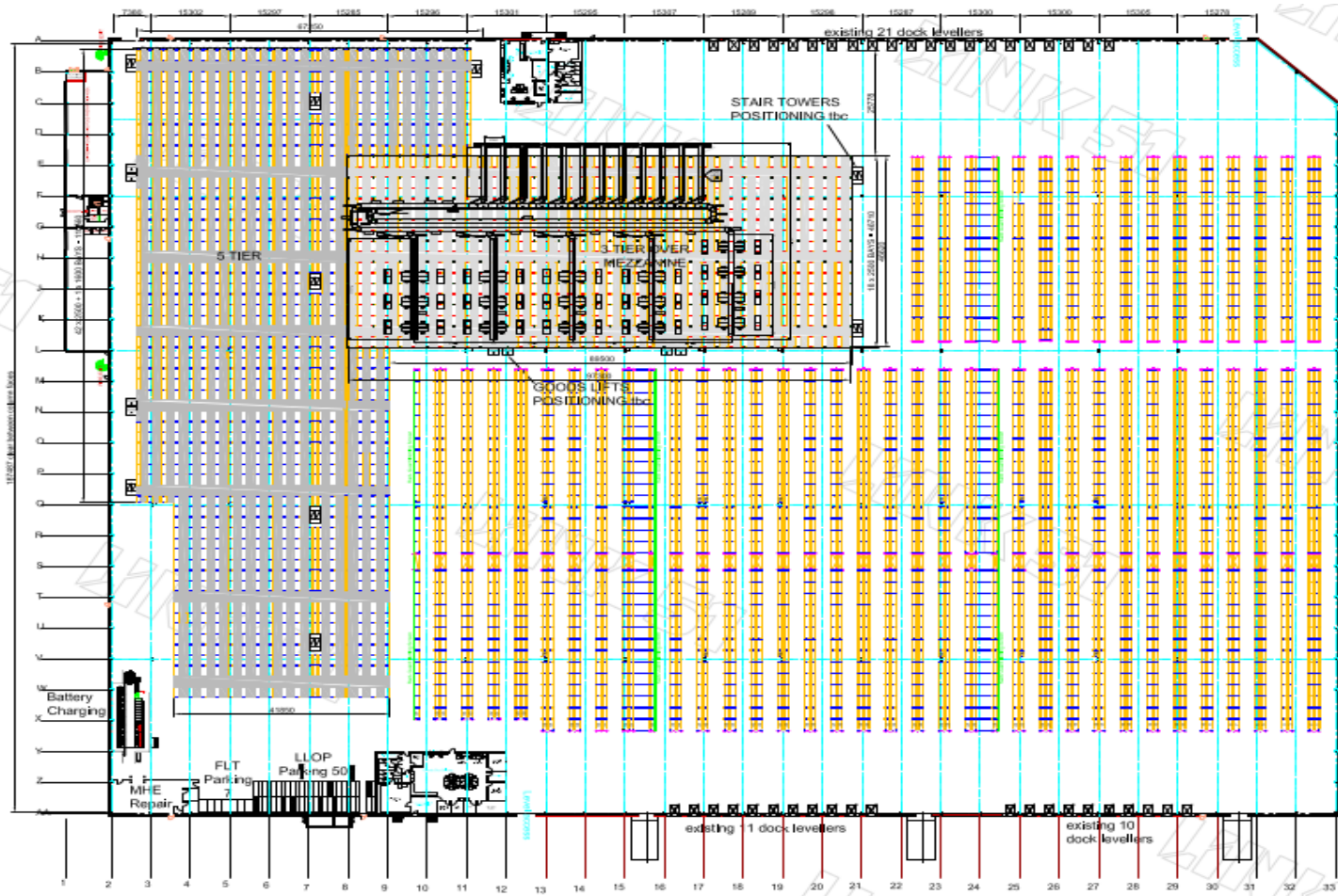


Below Ground Services.

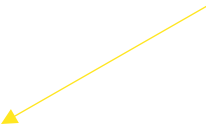


AMAZON, BARLBOROUGH

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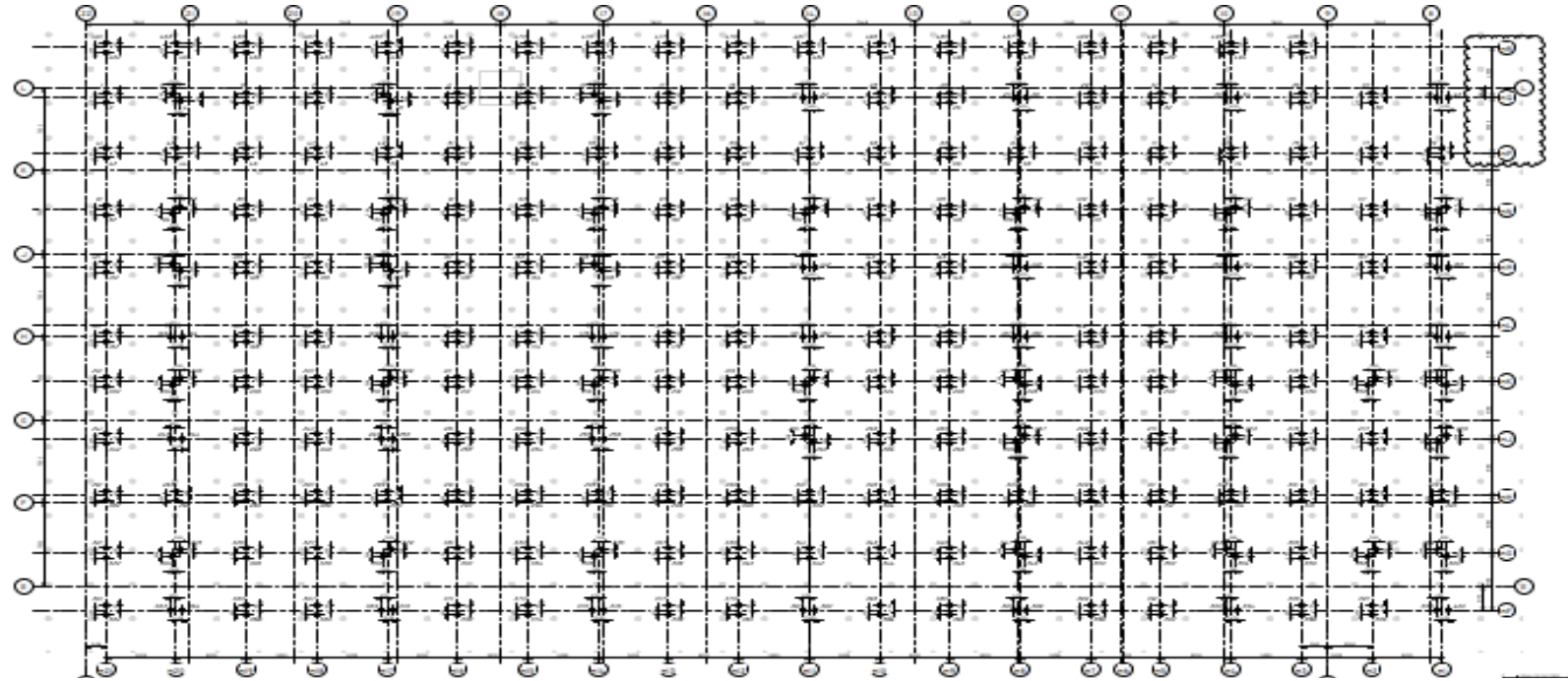
Ventilation.



AMAZON, BARLBOROUGH

KEY ISSUES

High pile loads 575kN
Compression.



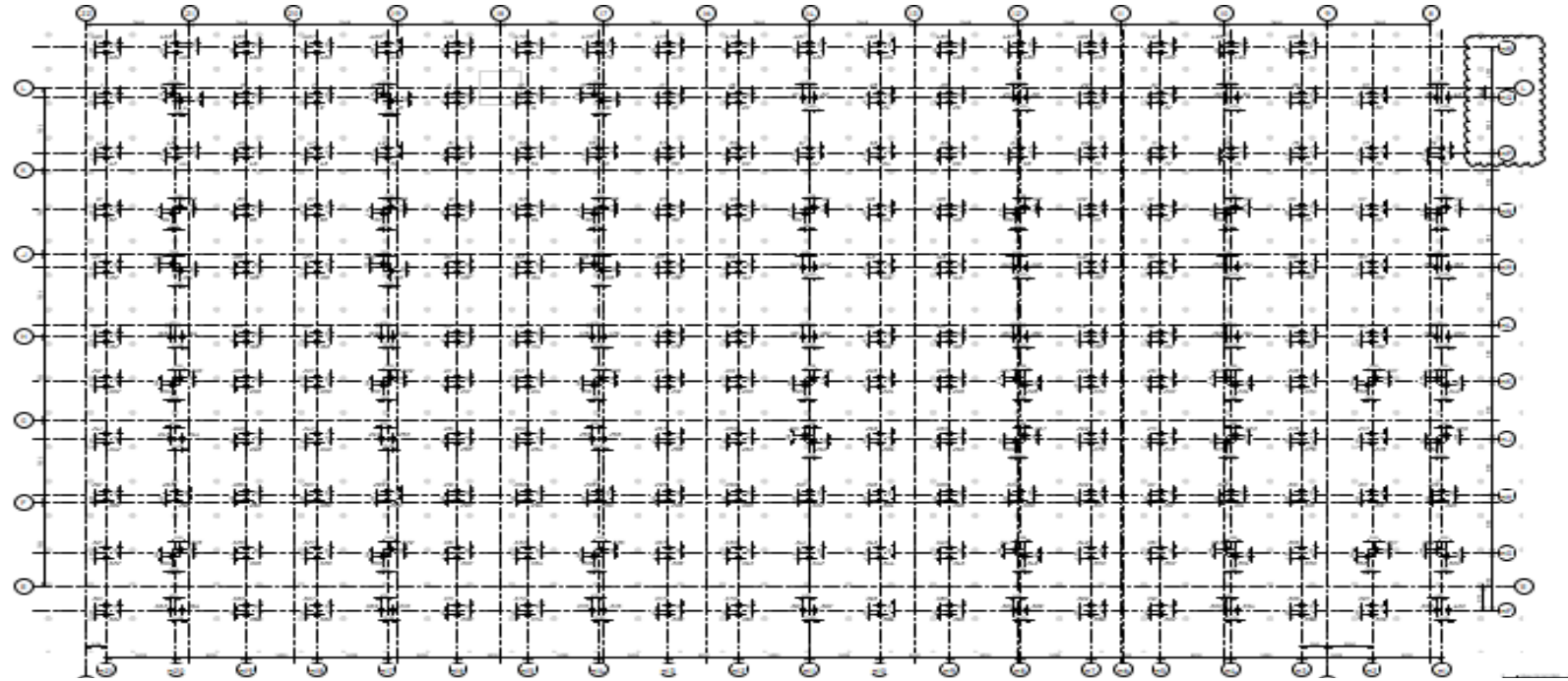
AMAZON, BARLBOROUGH

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Ground conditions -
Shallow rock
head/Sloping rock head /
variable depths of made
ground.



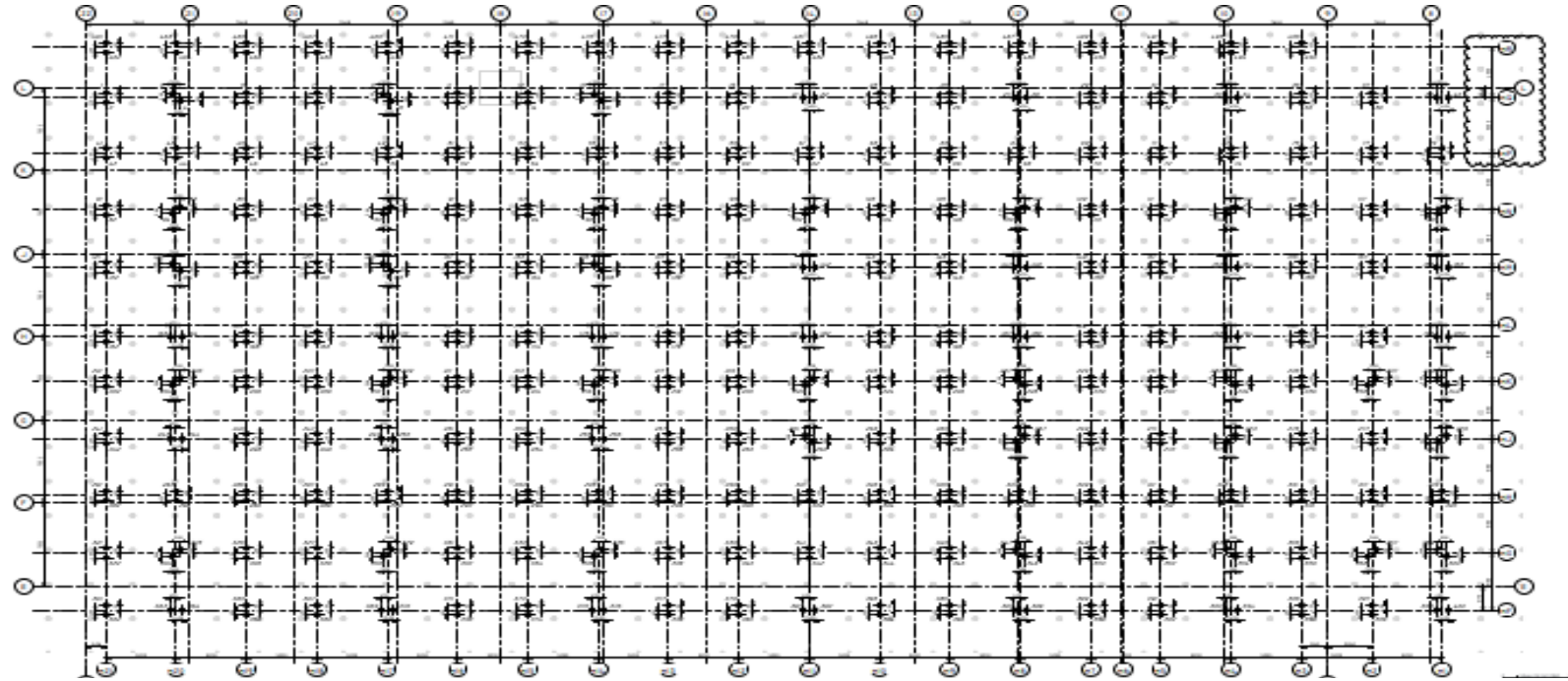
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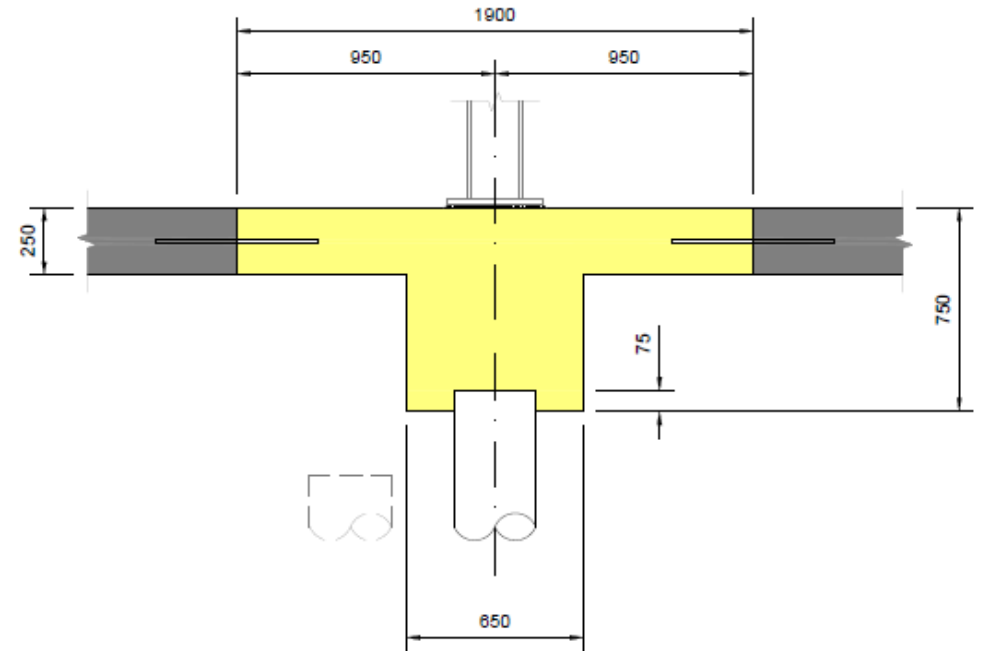
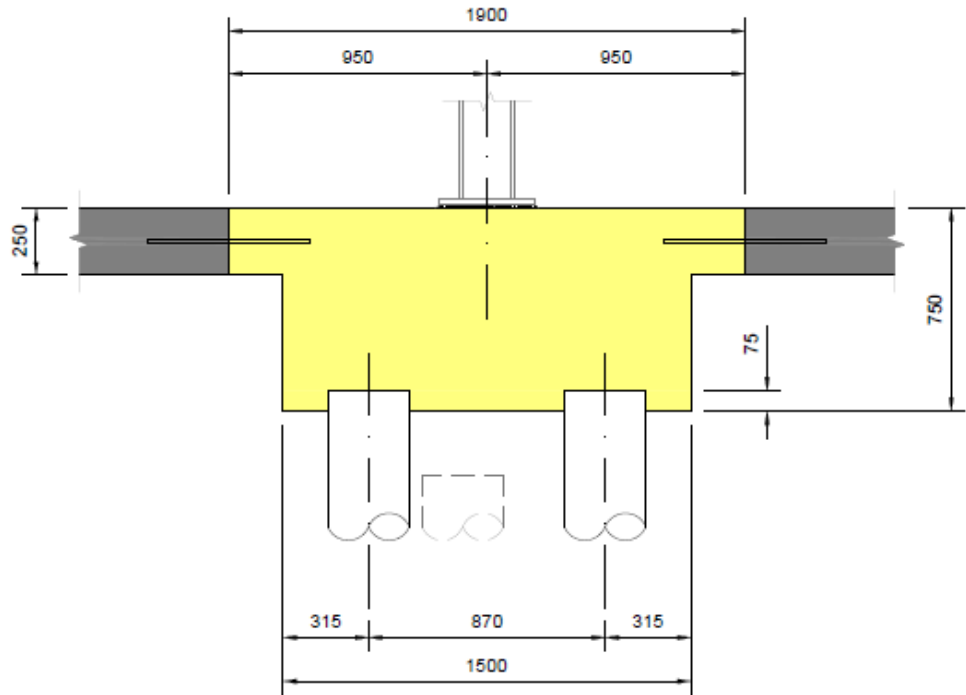
Ground conditions -
Shallow rock
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variable depths of made
ground.

Design/Installation of
temporary piling platform
/ slab protection.



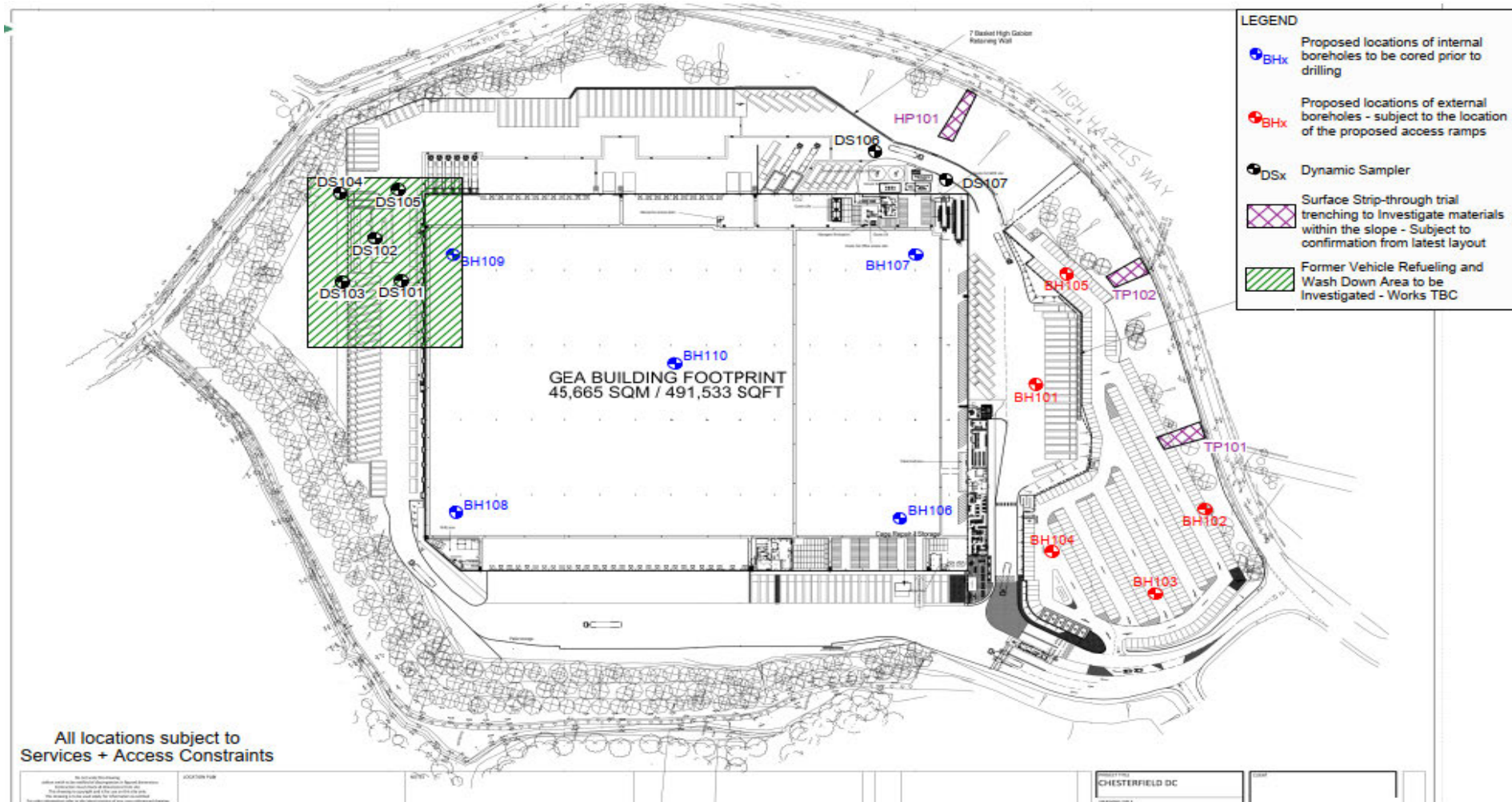
AMAZON, BARLBOROUGH

PILE CAP DETAIL



AMAZON, BARLBOROUGH

BOREHOLE LOCATION PLAN



AMAZON, BARLBOROUGH BOREHOLE LOGS

BH101		EAST				
Rotary Core Borehole Log						
Description of Strata	Legend	Strata Depth (m)	Strata Thickness (m)	Reduced Level (mAGD)	Casing Diameter (mm)	Water
MADE GROUND: Reinforced concrete 0.13 and reinforced concrete 0.18	[Pattern]	0.20	(0.20)			
MADE GROUND: Medium dense light yellow subangular medium to coarse gravel of sandstone. (SUBBASE)	[Pattern]	0.45	(0.25)			
MADE GROUND: Extremely weak light grey mudstone. (REWORKED NATURAL)	[Pattern]	0.50	(0.35)			
Light grey laminated MUDSTONE recovered gravely clay.	[Pattern]	1.20	(0.40)			
Light grey MUDSTONE/siltstone	[Pattern]	1.50	(0.30)			
High strength dark grey SILTSTONE. (SIDERITE 2.15-2.20 BROKEN CORE)	[Pattern]	2.50	(1.00)			
Medium strength grey SILTSTONE finely laminated.	[Pattern]	3.97	(1.47)			
No sample recovery	[Pattern]	4.00				
Grey SILTSTONE.	[Pattern]	4.90	(0.90)			
Siderite SILTSTONE	[Pattern]	4.96				
Medium strength grey SILTSTONE carbonaceous band 5.08-5.09	[Pattern]	5.20	(0.25)			
Dark grey carbonaceous SILTSTONE	[Pattern]	5.38				
Low strength black COAL pyritic 15% bright	[Pattern]	5.50				
Low strength black COAL 10% bright	[Pattern]	5.70				
	[Pattern]	5.72				

BH106		DYNAMIC SAMPLER LOG		
Description of Strata	Legend	Strata Depth (m bgt)	Strata Thickness (m)	Reduced Level (mAGD)
MADE GROUND: Concrete with metal shreds.	[Pattern]	0.24	(0.24)	
MADE GROUND: Yellow medium subangular gravel. (SUBBASE)	[Pattern]	0.35	(0.11)	
Dark grey SILTSTONE with occasional coal.	[Pattern]	1.20	(0.65)	
Low strength weathered black dull COAL	[Pattern]	1.38	(0.18)	
Light orange brown siderite SILTSTONE	[Pattern]	1.48	(0.10)	
Medium strength orange siderite SILTSTONE	[Pattern]	1.83		
Low strength weathered dark grey SILTSTONE with siderite bands 2.72-2.77 and 2.90-2.98 carbonaceous from 2.0	[Pattern]	2.24	(0.71)	
Low strength black dull COAL	[Pattern]	2.70	(0.46)	
Low strength black dull COAL	[Pattern]	2.80	(0.10)	
Low strength dark grey SILTSTONE with occasional carbonaceous and coal bands.	[Pattern]	3.37	(0.57)	
Low strength light grey slightly weathered interbedded MUDSTONE and siltstone.	[Pattern]	4.20	(0.83)	
Medium strength light grey finely laminated SILTSTONE.	[Pattern]	4.20	(2.00)	

BH107		DYNAMIC SAMPLER LOG		
Description of Strata	Legend	Strata Depth (m bgt)	Strata Thickness (m)	Reduced Level (mAGD)
MADE GROUND: Concrete.	[Pattern]	0.24	(0.24)	
MADE GROUND: Yellow medium subangular gravel. (SUBBASE)	[Pattern]	0.35		
MADE GROUND: Light brown and grey siltstone. (REWORKED NATURAL)	[Pattern]	1.00	(0.70)	
Light grey SILTSTONE (highly fractured).	[Pattern]	1.60	(0.60)	
Grey SILTSTONE finely laminated with occasional bands of very fine grained sandstone.	[Pattern]	1.60	(1.62)	
Dark grey and black interbedded SILTSTONE and carbonaceous siltstone with rare coal lamination.	[Pattern]	3.22	(0.24)	
Dark grey interbedded SILTSTONE and carbonaceous siltstone.	[Pattern]	3.45	(0.24)	
Light grey SILTSTONE becoming very fine grained sandstone.	[Pattern]	4.20	(0.50)	
Very fine grained grey SANDSTONE with fine finely spaced siltstone lamination increases at base of limit. Siderite 4.9/5.78/6.20	[Pattern]	4.20	(2.13)	

BH110		WEST			
Rotary Core Borehole Log					
Description of Strata	Legend	Strata Depth (m)	Strata Thickness (m)	Reduced Level (mAGD)	Casing Diameter (mm)
CONCRETE handstanding.	[Pattern]	0.23	(0.23)		
MADE GROUND: Greyish brown sandy subangular medium coarse gravel. Gravel comprises of concrete and sandstone. Sand is fine. (SUBBASE)	[Pattern]	0.45	(0.22)		
MADE GROUND: Greyish brown gravely fine to medium sand. Gravel is subangular fine to coarse concrete and sandstone with rare siltstone and mudstone.	[Pattern]	1.20	(0.60)		
MADE GROUND: Grey clayey SILTSTONE with coarse sandstone nodules. (REWORKED NATURAL)	[Pattern]	1.70	(0.50)		
Hand PI release at 0.60m. Dynamic sampling follow on until 2.20 mgt where refusal was encountered. Rotary core commenced from 2.20 mgt.	[Pattern]	2.20	(0.50)		
MADE GROUND: Low strength clayey SILTSTONE. (REWORKED NATURAL)	[Pattern]	2.20	(0.50)		
MADE GROUND: Low strength grey clayey SILTSTONE, no carbonaceous laminations. (REWORKED NATURAL)	[Pattern]	2.85	(0.65)		
Low strength grey slightly weathered laminated SILTSTONE with rare nodules of fine to medium mudstone.	[Pattern]	3.47	(0.62)		
Medium strength grey highly laminated SILTSTONE.	[Pattern]	3.70	(0.23)		
GRAVEL Gravel is coarse subangular of siltstone. (weathered siltstone) (poor recovery)	[Pattern]	4.10	(0.23)		
Low strength grey laminated SILTSTONE. (RECOVERED AS SUBANGULAR FINE TO COARSE SILTSTONE GRAVEL)	[Pattern]	4.40	(0.40)		
Low strength grey laminated SILTSTONE with rare subangular fine to medium nodules of mudstone.	[Pattern]	4.80	(0.40)		
Low strength grey laminated MUDSTONE with weak bands of siltstone.	[Pattern]	5.20	(0.40)		
Low strength grey laminated MUDSTONE with rare subangular fine quartz nodule grey associated mineralisation.	[Pattern]	5.20	(0.60)		
Low strength grey weakly laminated SILTSTONE.	[Pattern]				

AMAZON, BARLBOROUGH SOLUTION

PILING SYSTEM SELECTION

Based on site constraints, prevailing ground conditions and required pile loads, predrilled top-driven steel tubular piles were selected.

SELECTION OF SUITABLE PILING RIGS

Appropriate piling rigs were selected to suit access, working conditions and pile installation requirements.

EXISTING SLAB BREAKOUT

1.9m x 1.9m square sections removed from existing slab to establish exact position of existing floor slab piles to prevent clashes with new piles / pile caps. New piles subsequently relocated and existing piles trimmed below bottom of cap level if required. Holes in slab backfilled to slab level.

PRELIMINARY STATIC LOAD TESTING

Preliminary static load testing undertaken to verify achievable pile loads prior to the main works.



AMAZON, BARLBOROUGH SOLUTION

PILING PLATFORM AND SLAB PROTECTION

Piling platform/slab protection to consist of minimum 70mm thick timber “bog mats” to be installed prior to tracking rig over floor slab. The rig loading details sent to Structural Engineer in the early stages to determine suitable slab protection /bearing capacity.

PRE-BORING OF PILE POSITIONS

496 No. Pile positions to be pre-bored 250mm diameter to a depth of 4.0m to ensure a minimum pile depth and to identify any obstructions.

INSTALLATION OF DRIVEN STEEL TUBULAR PILES

496 No. 244mm diameter 12/13mm thick wall steel tubular piles installed for a maximum load of 575kN.

SUSTAINABILITY

Driven Steel Tubular Piles selected which are a byproduct of the oil and gas industry.





KGV Docks, Glasgow

Hybrid Solution – Rigid Inclusions and Continuous Helical Displacement Piles

Key issues/requirements

- 150kPa bearing pressure
- Variable layered soils
- Variable depth of fill
- Access restrictions
- Residual foundations 5m bgl

Project Solution

- CHD piles and Rigid Inclusions
- Testing to confirm settlements
- 2 rigs utilised to aid programme
- Probing in advance of main works

KING GEORGE V DOCKS, GLASGOW

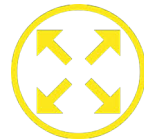
PROJECT BRIEF



150kPa bearing pressure required for salt storage. Variable layered soils with variable depth of fill.



Continuous Helical Displacement (CHD) piles and Rigid Inclusions (RI).



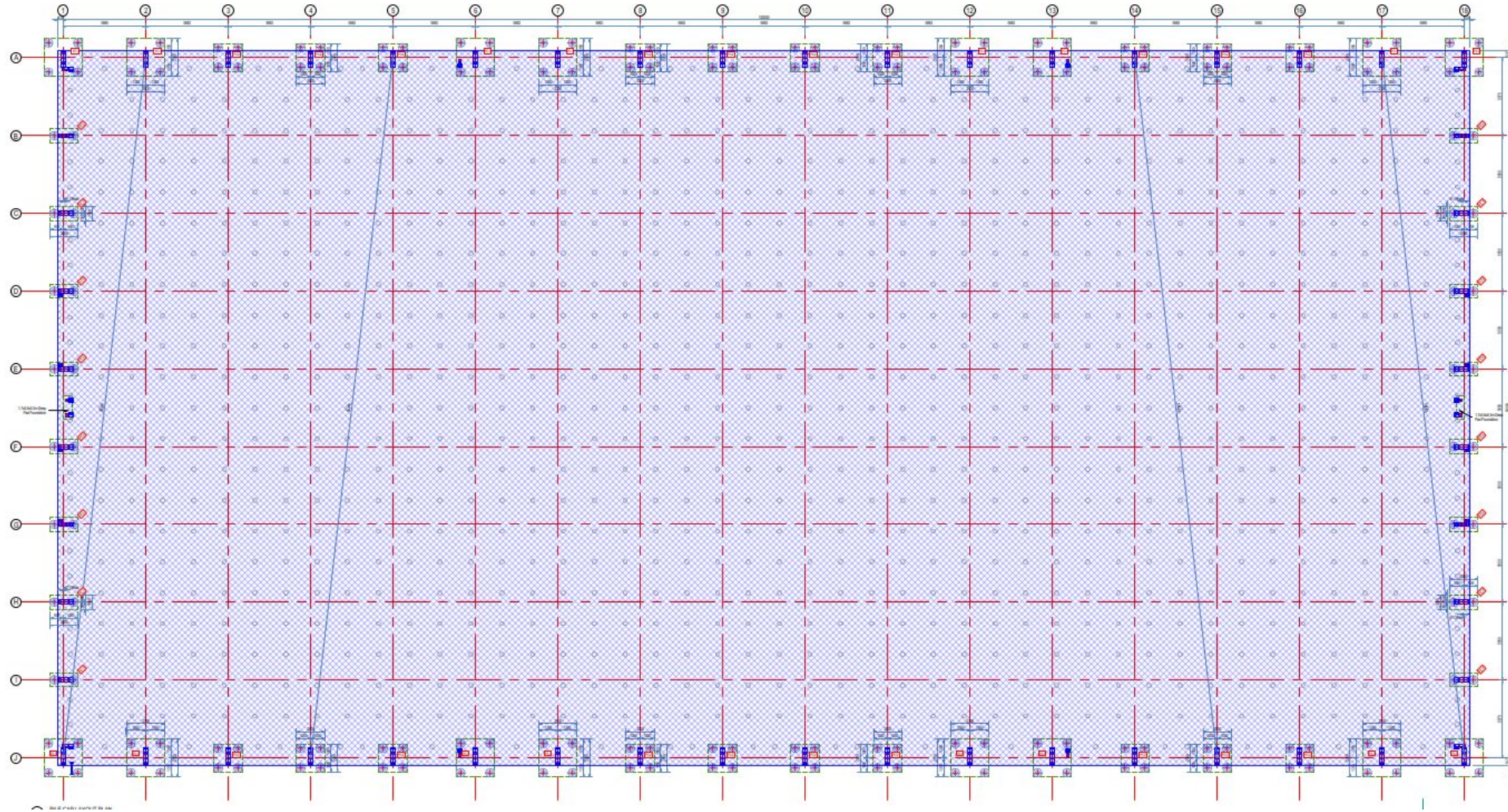
Residual Foundations up to 5m below ground level to be removed.



Programme efficiency and access restrictions due to location in working port.

KING GEORGE V DOCKS, GLASGOW

PILE LAYOUT



KING GEORGE V DOCKS, GLASGOW

KEY ISSUES

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The project required 150 kN/m² bearing pressure across pad foundations and slab to achieve 40,000 tonnes of salt storage capacity

KING GEORGE V DOCKS, GLASGOW

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The ground conditions generally comprised Alluvium, consisting of interbedded loose silty sands and sandy gravelly clays, over Glacial Till, consisting of stiff to very stiff clay at approximately 15m bgl.

KING GEORGE V DOCKS, GLASGOW

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Due to the site being an active port, with restrictions on access and working boundaries, there were several logistical challenges.

KING GEORGE V DOCKS, GLASGOW

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Historical structures were anticipated as with all dockland redevelopment.

KING GEORGE V DOCKS, GLASGOW

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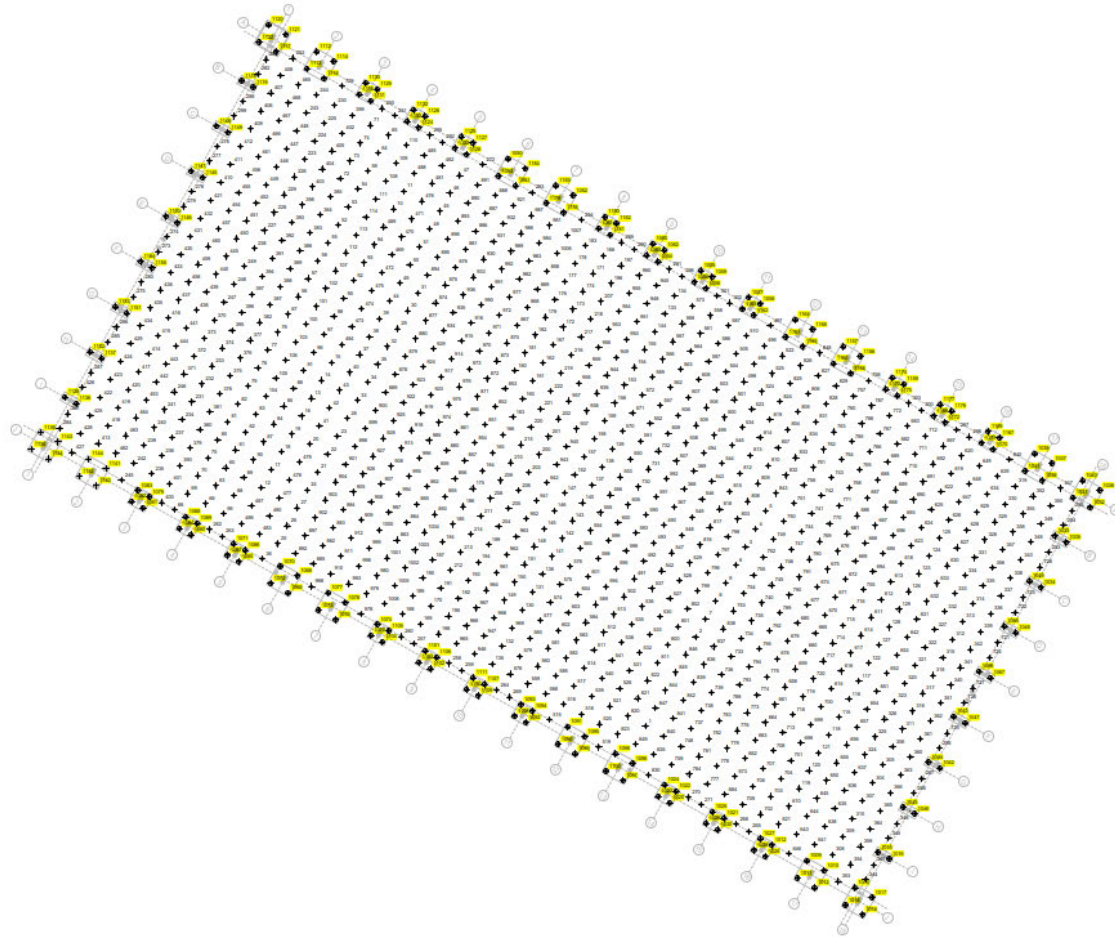
Historical structures were anticipated as with all dockland redevelopment.

5

This included residual foundations and existing piles needing excavation up to 5m below existing ground level.

KING GEORGE V DOCKS, GLASGOW

RI LAYOUT



KING GEORGE V DOCKS, GLASGOW

SOLUTION

3

Rigs mobilised

178

300/600mm CHD Piles installed to depths of approx. 10m.

1008

Rigid Inclusion (RI) installed to depths of 15.7m.



KING GEORGE V DOCKS, GLASGOW SOLUTION

COLLABORATIVE DESIGN AND VALUE ENGINEERING



RBL worked closely with both the client and engineer over six months to adapt the design to our proposals from the original scheme, carrying out preliminary calculations and input into the design of the superstructure.



This collaboration involved careful value engineering to align the foundation design loads with the project's loading criteria, resulting in optimised layout and spacing.

COMPREHENSIVE TESTING AND VALIDATION



CHD piles were validated by static load testing to confirm settlement performance.



RIs were validated by carrying out a series of plate load and zone tests to validate the settlements in accordance with the design calculations.



KING GEORGE V DOCKS, GLASGOW

SOLUTION

LARGE FLEET OF VARIED RIGS AVAILABLE

- ✓ RBL mobilised a second rig on site to aid programme due to the location of existing piles and obstructions.
- ✓ This ensured completion within the contract programme period.

SUSTAINABILITY

- ✓ Significant saving in embodied carbon compared to traditional methods due to less concrete and minimal spoil.

TAILORED SOLUTIONS FOR VARIED GEOTECHNICAL ISSUES

- ✓ RBL agreed to mobilise a Vibro Rig equipped with a robust mandril to probe each position in advance.
- ✓ This provided programme and design certainty allowing a pro-active approach to design adaption to account for unchartered obstructions.



Market Challenges Summary



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS



Pile/foundation performance is more critical (e.g. due to high tech racking systems)



How can RBL help?



1) Expertise in **understanding of ground conditions** and pile performance based on wealth of experience.



2) Promotion of **early contractor and specialist involvement**, ensuring value engineering opportunities are identified and embedded before the scheme progresses too far.



3) **Early input into scheme development** to mitigate delivery risk, reducing the likelihood that initial engineering proposals prove impractical.



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS



Need for cost and programme certainty



How can RBL help?



1) Early involvement enables **preliminary test piling and trials**, allowing schemes to be optimised from the outset to maximise cost and programme efficiencies.



2) Early engagement with piling specialists ensures that **sufficient and relevant ground information** is obtained.



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS



Resistance to some large developments or local issues



How can RBL help?



1) Assessment of **displacement pile solutions** (e.g. CHD piles) to reduce on and off-site movements.



2) Use of **off-site manufacture** where applicable to minimise on-site wet concrete operations.



3) Provision of early, evidence-based information on **noise and vibration performance** through experience and preliminary testing.



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS



Skills shortage



How can RBL help?



1) National specialist subcontractors are well positioned to provide **critical expertise and resources**.



2) Specialist teams operating across the UK offer **flexibility and assured access to skilled personnel**.










3) Organisations with **global backing** combined with local delivery expertise offer the best of both worlds.



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS

-  **Local procurement of materials**
- How can RBL help?*
-  1) Consideration of **off-site manufacturing** where feasible.
-  2) RBL's extensive manufacturing capacity and integrated transport network enable **efficient delivery of off-site solutions.**
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MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS



ESG/Sustainability requirements



How can RBL help?



1) RBL can offer **low and very low carbon foundation solutions** compared with traditional CEMI CFA pile solutions.



2) Provision of a wide range of low-carbon foundation systems, including **driven pile sections and recycled steel piles**.



3) Use of displacement piling systems to significantly **reduce on-site waste generation**.



4) Strong advocacy for **early specialist involvement**.



MARKET CHALLENGES

COMMERCIAL/INDUSTRIAL SHEDS



Upgrading existing sheds



How can RBL help?



1) RBL operates a **large and diverse fleet of piling rigs and precast concrete solutions.**



2) An **experienced and knowledge operations team** is available to visit site at an early stage to assess constraints and buildability as well as propose bespoke design solutions.



Q & A



Thank you for listening



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