

DOCUMENT:	Proposed JCG Building, Former Crown Packaging Site, Neath Site Specific Ground Contamination Risk Assessment		
REF:	Q0140_GCRA	DATE:	6 th November 2019

Introduction

J.G. Hale Construction Ltd are to construct a new biomass boiler house building to house woodchip fed biomass plant that will involve demolition of an existing building and erection of a new structure to house the new plant within the grounds of the site known locally as the former Metal Box Factory, located at 2 Milland Road Industrial Estate Milland Road Neath SA11 1NJ.

The site under review forms only a small area within the main site of the former works, as shown on the appended Site Plan in the Appendix to this Risk Assessment.

This desk-based report is intended to provide a site-specific risk-based appraisal of the proposed development, drawing on existing data to provide a risk assessment to workers and the wider environment that is proportionate to the work being undertaken.

Existing Information

Previous ground investigations have been undertaken on the site by Environment Resources Management Ltd (ERM) on behalf of the former site owner, and a subsequent desk study report by Terra Firma on behalf of our mutual Client:

- ERM: IPPC Phase 1a & 1b Site Condition Report: Neath Facility, May 2003
- ERM: Neath PPC Site Condition Report Supplementary Information, April 2003
- Terra Firma: Geotechnical & Geo-Environmental Desk Study Report: Proposed JCG Building Former Crown Packaging Site, Neath. Job No.15452/1, July 2019.

These reports should be read in conjunction with this site-specific risk assessment. In the interest of brevity, copies of these reports are not appended.

Summary of Previous Studies

Following the work undertaken by ERM in 2003 a site-wide Conceptual Site Model was presented as follows:

Sources:	Sources of process chemicals present at concentrations above the established background concentrations identified in unsaturated soils and groundwater; Probable historic/off-site sources of chemicals in soil and groundwater.
Pathways:	Leaching from soils in downward migration through alluvial mud facilitated by piles/foundations.
Receptors:	Controlled Waters.

Within Terra Firma's more recent report, this discusses the ERM reports, reiterating their conclusions. They conclude that the potential *Sources* of contamination remain chemicals and solvents used previously on the overall site, in the soil and groundwater, with potential chemical and solvent contaminants of concern identified from remnant

contamination. The presence of asbestos in any buildings to be demolished could be a potential source of contamination. The potential for ground gas generation was also postulated as a source of risk to the development.

The *Receptors* at potential risk on the site are identified as human and hydrological. The ground workers and site end users are highlighted to be possibly affected by contamination in the soils and ground gases, predominantly during construction but also post-construction in regard to the ground gases; while the groundwater is also rightly identified as a potential receptor from leachable contaminants.

The *Pathways* identified that may allow a pollutant linkage to be realized are given as by dermal contact and ingestion of soils and inhalation of dust to site workers. Accumulation of harmful ground gases into the new building are a potential risk, if present to site end users. It is stated that previous testing of groundwater suggests that the risk to the aquatic environment from contamination of groundwater beneath the site is low. The possibility of a preferential pathway being realised from piled foundations is noted.

Summary Conceptual Site Model

In compiling a site-specific risk assessment for the new JCG Building, we have taken Terra Firma's qualitative human health risk assessment and qualitative environmental risk assessment as a prudent baseline to discuss the actual risks that will need to be managed or mitigated as part of the redevelopment on this site.

These are re-presented on the following two pages for ease of reference.

Table 3.1 - Qualitative Preliminary Human Health Risk Assessment

Potential Source	Pathway	Receptor During Construction	Level of Risk	Receptor Post Construction	Level of Risk
Made Ground on and adjacent to development site and factory land	Ingestion, inhalation and dermal contact with soil and soil dust	Construction Workers	Low <i>No gross contamination anticipated and short-term exposure for construction workers</i>	Future site users	Low <i>No gross contamination anticipated and site to be almost entirely capped with new building</i>
Spilt/leaked fuel from on-site oil store	Ingestion, inhalation and dermal contact with soil and soil dust	Construction Workers	Moderate	Future site users	Low <i>Site to be almost entirely capped with new building</i>
Spilt/leaked fuel from on-site oil store	Inhalation of vapours	Construction Workers	Moderate	Future site users	Moderate
Spilt/leaked solvents/chemicals/fuels from surrounding former factory site	Ingestion, inhalation and dermal contact with soil and soil dust Inhalation of vapours	Construction Workers	Low <i>No gross contamination anticipated and short-term exposure for construction workers</i>	Future site users	Low <i>No gross contamination anticipated and site to be almost entirely capped with new building</i>
Made Ground beneath the development site	Asbestos Inhalation	Construction Workers	Low <i>No source of asbestos identified but origin of made ground on site unknown</i>	Future site users	Low <i>No source of asbestos identified but origin of made ground on site unknown</i>
Radon Gas	Inhalation <i>Accumulation of gas indoors in confined spaces- asphyxiation and explosion</i>	N/A	N/A	Future site users	Acceptable Risk <i>BGS confirm no Radon Protection required for new buildings</i>
Landfill Gas	Inhalation <i>Accumulation of gas indoors in confined spaces- asphyxiation and explosion</i>	N/A	N/A	Future site users	No Risk
Ground Gas	Inhalation <i>Accumulation of gas indoors in confined spaces- asphyxiation and explosion</i>	N/A	N/A	Future site users	Medium Risk <i>Made ground present beneath the site. Areas of filled ground in the surrounding area</i>
Site Soils	Ingestion of potable water <i>Absorption of contamination from made ground into potable water pipes</i>	N/A	N/A	Future site users	Moderate <i>If potable water supply intended for new building</i>

Table 3.2 – Qualitative Preliminary Environmental Risk Assessment

Potential Source	Pathway	Receptor During Construction	Level of Risk	Receptor Post Construction	Level of Risk
Surface Water	Run-off	Site and Adjacent Sites Shallow/Perched Groundwater	Low	Site and Adjacent Sites Shallow/Perched Groundwater	Low
Accidental spillage	Run-off , digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, construction materials and/or exposed ground, wheel washings, oil or chemical spills	Site and Adjacent Sites	Low <i>On site procedures will ensure that all efforts are made to prevent accidental spillage</i>	N/A	N/A
Made ground on site	Leaching of contamination	Shallow/Perched Groundwater	Low	Shallow/Perched Groundwater	Low
Spilt/leaked fuel from on-site oil store	Direct migration of contamination and leaching of contamination	Shallow/Perched Groundwater	Moderate	Shallow/Perched Groundwater	Low Site to be capped with new building preventing rainfall infiltration
Contaminated Perched Groundwater	Direct migration and Perched Groundwater migration	Deep groundwater in superficial gravel	Very Low Alluvial clay may be expected to prevent migration of perched groundwater to the deep groundwater below	Deep groundwater in superficial gravel	Very Low Alluvial clay may be expected to prevent migration of perched groundwater to the deep groundwater below
Contaminated Perched Groundwater	Direct migration and Perched Groundwater migration	Hughes Beds Secondary A Aquifer	Very Low Alluvial clay may be expected to prevent migration of perched groundwater to the deep groundwater below	Hughes Beds Secondary A Aquifer	Low Alluvial clay may be expected to prevent migration of perched groundwater to the deep groundwater below
Contaminated Perched Groundwater	Groundwater Migration	West Block Pond, River Neath	Low	River Neath	Low
Contaminated Perched Groundwater	Groundwater Migration during/following piling (if piled foundations required for the new building)	Superficial gravel and Hughes Beds	Very Low Alluvial clay will reseal around piles	Superficial gravel and Hughes Beds	Very Low Alluvial clay will reseal around piles

Where a *Low* risk has been identified, no further mitigation measures are considered necessary. Where a *Moderate* risk is perceived, the mitigation measures considered appropriate and proportionate for this particular scheme are discussed.

The Potential sources where a *Moderate* Risk to Human Health was identified within Terra Firma's Report were:

Potential Source	Pathway	Receptor During Construction	Level of Risk	Receptor Post-Construction	Level of Risk
Spilt/Leaked Fuel from on-site to Store	Inhalation of Vapours	Construction Workers	Moderate	Future Site Users	Moderate
Ground Gas	Inhalation (Accumulation in confined spaces)	N/A	N/A	Future Site Users	Moderate
Site Soils	Ingestion of Potable Water	N/A	N/A	Future Site Users	Moderate

Ref: Terra Firma Geotechnical & Geo-Environmental Desk Study Report: Proposed JCG Building Former Crown Packaging Site, Neath. Job No.15452/1, July 2019

The Potential sources where a *Moderate* Environmental Risk was identified within Terra Firma's Report were:

Potential Source	Pathway	Receptor During Construction	Level of Risk	Receptor Post-Construction	Level of Risk
Spilt/Leaked Fuel from on-site to Store	Direct migration of contamination and leaching of contamination	Shallow/Perched Groundwater	Moderate	Shallow/Perched Groundwater	Low

Ref: Terra Firma Geotechnical & Geo-Environmental Desk Study Report: Proposed JCG Building Former Crown Packaging Site, Neath. Job No.15452/1, July 2019

At the time of writing, Terra Firma were not probably not privy to the proposed foundation solution for the extension for the new development. The piled foundation solution does potentially introduce an additional pollutant linkage with a pathway from the made ground into the underlying natural soils and potentially groundwater body. The risk to controlled waters, i.e. nearby water courses and aquifers, is defined by the potential for any contaminants present on site to leach from the soils beneath the site.

Risk Assessment

In highlighting the potential human health risks to site workers, in order to mitigate these risks without recourse to a detailed ground investigation, this risk assessment proposes a methodology to mitigate these risks such that they are at an acceptable level. It should be noted that while the previous work has classified these risks as *Moderate*, they may not be considered unacceptable in a risk-based hierarchy.

The purpose of recommending a pragmatic way forward for this particular scheme in reducing all risks to a Low level, is intended to remove the need for additional site testing or monitoring.

The foregoing information has concluded the potential risks in accordance with current guidance by adopting a source-pathway-receptor model. The information gained from the land use assessment has identified the potential pathways that may exist between any contamination source and its receptors. The Conceptual Site Model has been developed for the proposed commercial end use.

Receptors specific for the proposed end use considered in the assessment are as follows:

- Human Health – site worker & end users
- Controlled Waters – ground water and nearby surface waters
- Buildings and Services

Human Health Risk Assessment Mitigation

Having reached the conclusions drawn in the summary tables above, the mitigation to reduce any moderate risk to a lower, acceptable, level can be discussed and proposed.

Spilt/Leaked Fuel from on-site to Store

To reduce the moderate risk identified to site workers, monitoring of excavations for vapours (VOC's) by PID meter should be included in any method statement. Future site workers will not be at any increased risk from vapours that are present at surface currently. If monitoring of excavations at the outset of the construction phase, then a baseline reading will be established. In addition to this any building works will incorporate a gas membrane. This should be of sufficient grade to inhibit migration of vapours into the building.

Ground Gas

To reduce the moderate risk identified to future site workers, the installation of a suitable gas membrane should be incorporated into the project. Although no formal gas risk assessment has been undertaken for this particular scheme, it should be considered adopting a conservative gas characterisation level of *at least* CS2 for any new foundations or floor slabs will mitigate the longer-term risk from migration of ground gases.

The shallow made ground overlying the site comprises of ash, clinker and hardcore and doesn't contain any likely gas generating material. In our view the likely potential source of hazardous ground gas in this area is the Tidal Flat Deposits that underlie the made ground. The historic investigations undertaken by Crown Foods have identified the presence of peat bands within the Tidal Flat Deposits. Such soils are generally recognised as having low gas generation potential and would not normally give rise to a significant gas risk. The subject is addressed in a paper by Card & Wilson¹. The paper, which was presented at the CIRIA / Environmental Protection UK Ground Gas Seminar in 2011, includes the following statement – "Experience on many dockland and similar site has shown that sites on alluvial soils do not generate sufficient hazardous gas flows to exceed Characteristic Situation 2 as defined in BS8485: 2007. Therefore, if gas monitoring is not undertaken it is acceptable to simply install Characteristic Situation 2 (CS2) protection on sites where alluvial soils are present".

It should be noted that the proposed new floor construction will comprise a piled reinforced ground beam and suspended reinforced concrete slab. The slab is 300mm thick with 2 layers of 12mm diameter high yield reinforcing at 150mm centres in both directions. The slab will be constructed off a piling mat constructed from 6F2 material capped with Type 1 sub-base once the piling operation has been completed. Due to the requirement for pits to be incorporated into the new slab, the slab will be tanked in accordance with the specification provided by Atal Structural Water Proofing (Ref: CB3 Consult Ltd drawing C1123-S-051 for construction details, appended for ease of reference). This form of construction will inherently provide a Characteristic Solution 3 (CS3) level of protection for Industrial Buildings when assessed in accordance with BS8485 – Code of Practice for the Design of Protection Measures for Methane and Carbon Dioxide for New Buildings. The use of the granular piling mat could also be considered as providing a passive ventilation blanked which further improve the level of protection provided to the building. It

¹ Card & Wilson (2011) 'A pragmatic approach to ground gas assessment' CIRIA/Environmental Protection UK Ground Gas Seminar.

should also be noted that the new building will be unoccupied and well ventilated due to the presence of five roller shutter doors.

Site Soils

A moderate risk has been identified to potable water supplies that may be utilised in the new building. The caveat included with the preliminary risk assessment is “if a potable water supply” is intended for the new building. The mitigation recommended for this would be to prescribe that no potable water supply is incorporated into the new building.

Controlled Waters Risk Assessment Mitigation

The risk to controlled waters, i.e. nearby water courses and aquifers, is defined by the potential for any contaminants present on site to leach from the soils beneath the site.

Defra guidance on the application of Part 2A² defines tests for significant pollution of controlled waters. Key tests are as follows:

- Contaminants are continuing to enter into controlled waters additional to entry which has already occurred, and such entry is likely to occur again;
- Contamination on site has caused and is continuing to cause the following:
 - Pollution equivalent to “environmental damage” to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009, but which cannot be dealt with under those Regulations.
 - Inputs of pollutants resulting in deterioration of the quality of water abstracted, or intended to be used in the future, for use in human consumption such that additional treatment would be required to enable that use.
 - A breach of a statutory surface water environment quality standard, either directly or via a groundwater pathway.
 - Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of pollutants [as defined in Article 2(3) of the Groundwater Daughter Directive (2006/118/EC/1)].

If the contamination risks to controlled waters can be ascribed to background soil contamination levels effectively from natural or “common” or “widespread” human activity, the Local Authority should not normally regard the contamination as representing significant possibility of significant risk of pollution to controlled waters.

Given the potential for new or continuing contamination sources affecting the ground, and hence controlled waters, will have ceased when manufacturing stopped on the site, the key tests defined above are satisfied, as site work and operation of the building will not trigger any of these.

Driven piles are the proposed foundation solution for this scheme and as such could develop a potential pathway for any pollutant linkage.

Having stated this, there is a body of evidence that demonstrates that driven piles through potentially contaminated made ground do not constitute or create an increased risk to controlled waters. The EA document *Piling into Contaminated Sites*³ gives advice on differing scenarios relating to potential hazards when piling on contaminated

² DEFRA (2012). Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance.

³ Environment Agency (2002) Piling into Contaminated Sites.

sites. This reference indicates that the use of displacement (driven) piles was considered the most appropriate based on avoiding contaminated arisings.

Furthermore, the use of displacement piles also results in local compaction of the soil surrounding the pile, generally leading to a reduction in permeability of the penetrated soil (FPS⁴). The radial movement of the soil from the driving process will also create a stress field in the zone of influence that will tend to make the soil close up and 'seal' around the pile after driving is complete, especially in cohesive material (National Groundwater & Contaminated Land Centre⁵).

The piling contractor likely to be employed on this scheme has prepared a method statement in support of this, which is presented in the Appendix to this Report. In summary; creation of pathways are likely to be temporary and reformation of the soils around the pile shaft through cohesive material will aid in the prevention of water penetrating to depth. From the review of the site investigation it is noted that the solid strata below the site are considered to be a secondary aquifer and that water strikes were recorded within this material. The presence of Firm Peat/Clay Layer above the Solid Bedrock and that this material is shown as being between 2.3m to 3.0m thick. Taking into account the Environment Agency Report SC020074/SR⁶ which states that a minimum thickness of 2 pile diameters of ductile or plastic clay above any aquifer will provide an effective seal.

In addition to this, the piling proposal is to adopt a pointed driving shoe that will minimise the small residual risk with slender piles of taking material down on a blunt ended piling shoe, albeit that the risk from this is low.

Updated Conceptual Site Model

By incorporating the mitigation measures discussed, the Conceptual Site Model (CSM) for the scheme can be updated. The aim of the updated CSM is to identify any realised or 'known to exist' pollutant linkages and present the mitigation to reduce any risks to acceptable levels.

The resulting updated Conceptual Site Model is tabulated below.

Human Health

Potential Source	Pathway	Receptor During Construction	Level of Risk with Mitigation	Receptor Post-Construction	Level of Risk with Mitigation	Recommended Mitigation to Reduce Risk
Spilt/Leaked Fuel from on-site to Store	Inhalation of Vapours	Construction Workers	Low	Future Site Users	Low	During: Monitoring of excavations during construction with PID meter. Appropriate PPE. Post: Site finished hard-standing surface will sever link
Ground Gas	Inhalation (Accumulation in confined spaces)	N/A	N/A	Future Site Users	Low	Use appropriate gas proof membrane in construction.
Site Soils	Ingestion of Potable Water	N/A	N/A	Future Site Users	Low	Proscribe use of potable water supply in new building, or specify

⁴ Federation of Piling Specialists (March 2000). Deep Foundations and Aquifers, Water & Sewerage Journal.

⁵ National Groundwater & Contaminated Land Centre Report NC/99/73: Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

⁶ Environment Agency Science Report SC020074/SR (2006) Piling in layered ground: risks to groundwater and archaeology.

						appropriate materials in pipework
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Controlled Waters

Potential Source	Pathway	Receptor During Construction	Level of Risk with Mitigation	Receptor Post-Construction	Level of Risk with Mitigation	Recommended Mitigation to Reduce Risk
Spilt/Leaked Fuel from on-site to Store	Direct migration of contamination and leaching of contamination	Shallow/Perched Groundwater	Low	Shallow/Perched Groundwater	Low	During: At worst is pre-existing so no additional impact. Post: Site to be capped with new building preventing rainfall infiltration
Driven Piles	Direct migration of contamination and leaching of contamination	Controlled Waters	Low	Controlled Waters	Low	Reduction in permeability around driven pile shaft; Sufficient penetration through cohesive soils above secondary aquifer; Use of pointed drive-shoe to limit 'drive' of contaminated soil through strata.

Conclusions and Recommendations

The preliminary Conceptual Site Model proposed identified moderate risks associated with human health and controlled waters. Further assessment identified the potential risk from piling in the prevailing soils as a pollutant linkage.

Practical mitigation measures have been proposed to reduce any risks to an acceptable level which are entirely proportionate for a scheme of this size and risk level. By adopting these measures, the need for any further site testing or risk assessment is considered to be unnecessary.

As a general note, during the construction phase regular inspections should be made for the presence of unexpected made ground deposits or contamination. Though the likelihood is low as site-wide levels of contamination have been discussed fully in the previous investigations referred to in this risk assessment, the potential of unidentified contamination exists and therefore a risk may exist to construction workers through dermal contact and neighbouring site users through wind-blown dust migration. Any demolition work should be undertaken by an appropriately licenced contractor.

Pathways will be removed by the use of suitable PPE, as advised in the mitigation measures, and suitable working methods.

Should any visual or olfactory evidence of potentially harmful contamination be uncovered during excavations on site, then appropriate advice should be sought and assessment of risk undertaken. Should any further assessment identify areas of unacceptable risk, then an appropriate remediation strategy should be arranged, with subsequent validation statements on completion of validation testing.



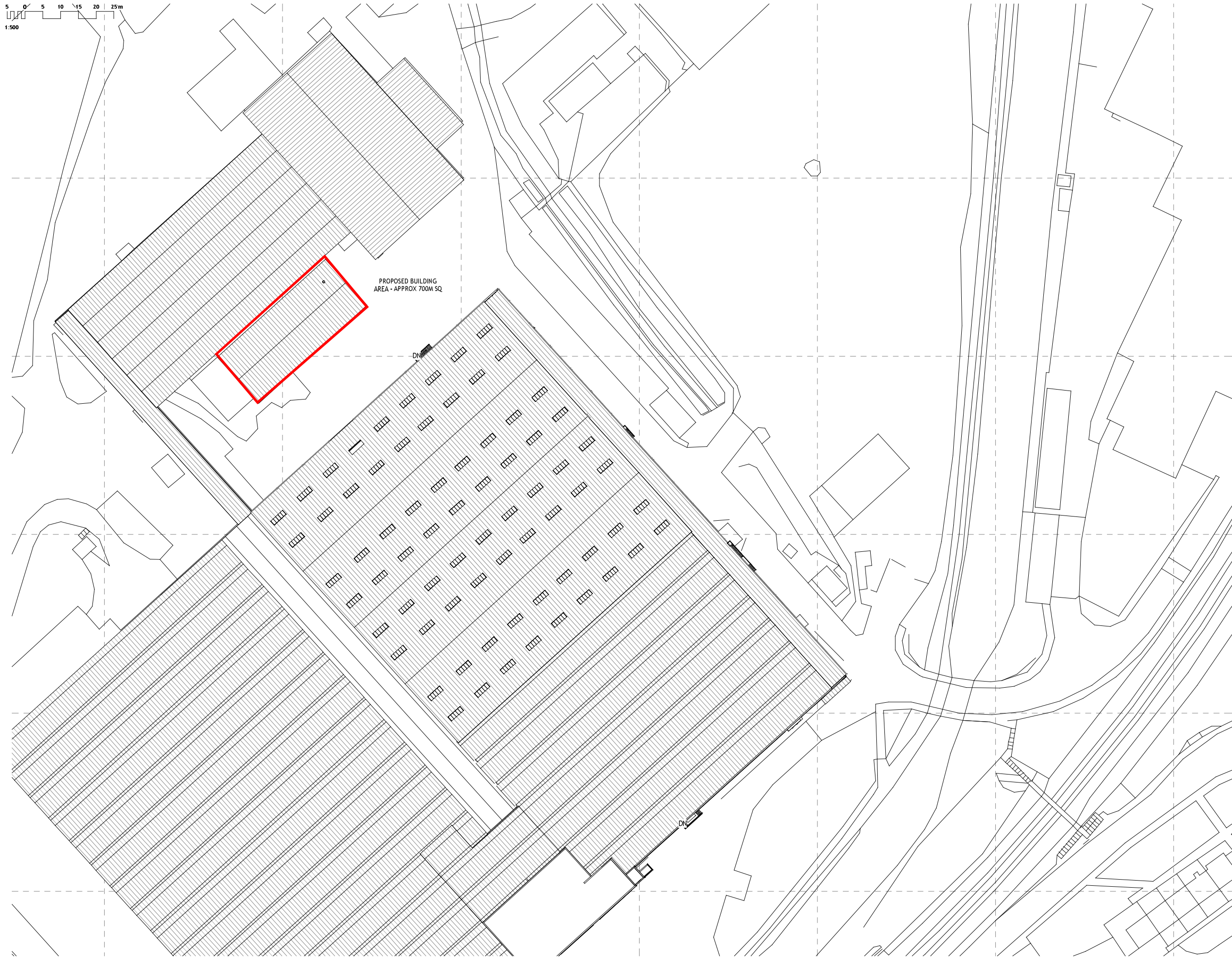
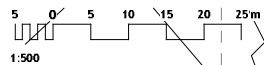
For and on behalf of
QUANTUM GEOTECHNIC LTD

A handwritten signature in black ink, appearing to read 'J. E. Stark', is written over the printed name.

J. E. Stark
Technical Manger

APPENDICES

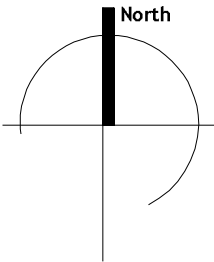
- **Site Location Plan (at reduced scale as A3)**
- **Piling Contractor Method Statement**
- **CB3 Consult Ltd drawing C1123-S-051 (at reduced scale as A3)**



01 PROPOSED SITE PLAN
1 : 500

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Notes:
Do not scale this drawing. Check all dimensions on site. Any discrepancies to be reported back to the Architect for clarity.



B	Biomass building re-positioned	PC	01.08.19
A	Biomass building width reduced by 9510mm	PC	26.07.19
Rev	Revision	By	Date



Project:
METALBOX

Job Number: **L848**

Date: **25.04.19**

Drawn by: **PC**

Dwg No: **A143**

PROPOSED SITE PLAN

Revision: **B**

Scale: **1 : 500 @ A1**

Drawing Status:
PLANNING



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PP19/2032

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PILING METHOD RISK ASSESSMENT



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1. Pile Installation process

Precast piles are installed using hydraulically operated piling hammers of 3-6 tonne weight, with the stroke energy being determined by the pile loading requirements and ground conditions encountered.

Pile sections are be joined to ensure the design length is reached with minimal watage (See figure 1 and 2)

No spoil is generated during installation and groundwater does not affect the installation or performance of the piles.

The hammer stroke is variable to allow control of pile driving stresses during installation.

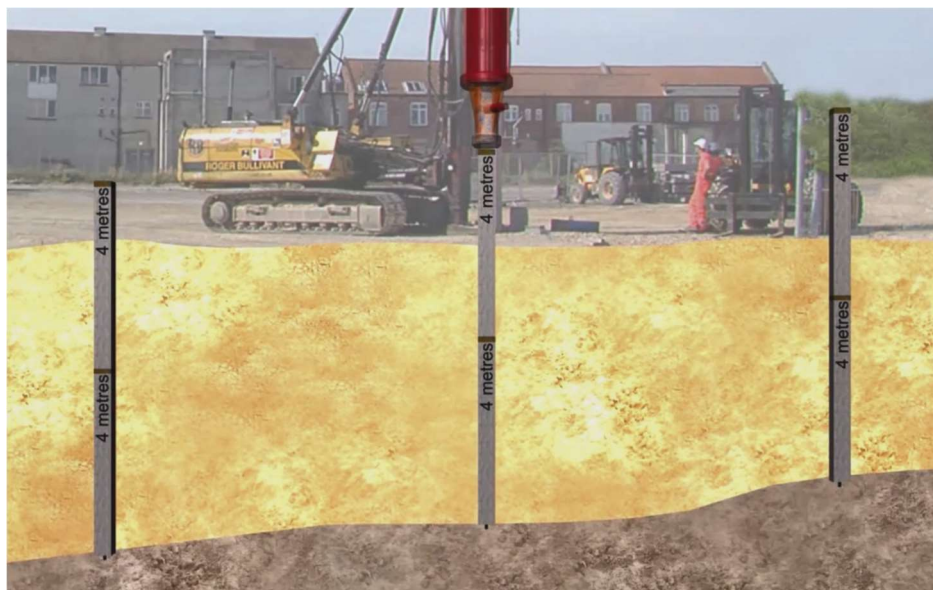


Figure 1 : Driven pile installation process

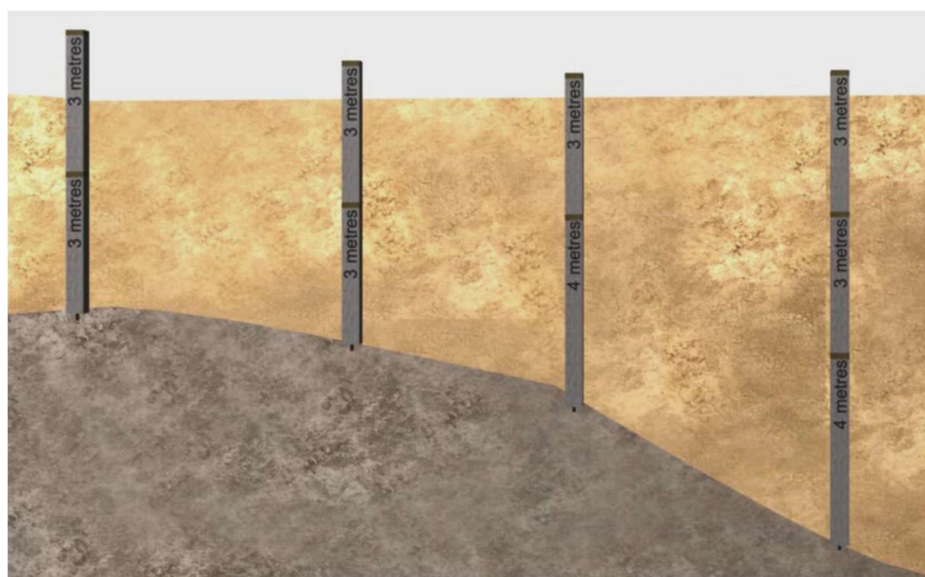


Figure 2 : Segmental pile sections reduce waste

At the new Boiler Building at the former Metalbox site, the piles will be driven in 4m lengths to achieve an anticipated design length of 16m however 3m and 6m units will be delivered to allow flexibility in the total pitched length should the depth of the founding strata vary. The piles will derive bearing capacity primarily in end bearing from the underlying Dense/Very Dense Gravel strata.

2. Advantages of the driven precast piling technique

The precast piling technique offers a multitude of benefits over other piling and ground improvement techniques, some benefits include;

- ☐ Pile installation is quick and clean
- ☐ Piles are manufactured in factory controlled conditions to BS EN ISO 9001:2008
- ☐ Pile lengths are fully reinforced
- ☐ Ground water does not affect the installation or performance of the piles
- ☐ Less plant and equipment required than other techniques
- ☐ As such less deliveries are required
- ☐ No spoil to remove off site

3. Piling in Contaminated Ground

We have noted from the site investigation report provided the 'made ground' is described as contaminated and there is concern regarding pollution of the underlying groundwater.

We have reviewed the site investigation report ref 9088 by ERM dated January 2003 and the boreholes indicate the following soil profile: -

0 – 2m Made Ground
2 – 14m Soft Alluvial Clayey Silts (Cohesive material)
14m+ Dense Sandy Gravel

The soils report has noted that the made ground is dominated by granular material with some man made material namely ash, brick, and clinker

There are two options available for piling on this project: -

- 1) CFA piling
- 2) Driven precast piling

CFA PILING

The main points of concern with CFA piling are:-

The potential of creation of pathways through the made ground due to the requirement to rebore the piles due to obstructions and /or the installation of the reinforcement cages.

Disposal of contaminated pile arisings on site.

Human contact with the contaminated arisings

DRIVEN PRECAST PILING

Creation of pathways alongside the piles due to displacement of the soil during the driving process

Driving of contaminated material under the toe of the pile

We would draw your attention to the following reports which deal with this issue.

Environmental Agency report Piling in Layered Ground: Risks to Ground water and Archaeology SC020074/SR.

Environmental Agency report Piling and Penetrative Ground Improvement: Methods on Land Affected by Contamination: Guidance on Pollution Prevention dated May 2001

University of Sheffield Piling In Layered Ground Annual Report 2007 – 2008

The conclusion of these reports regarding the use of displacement piles is as follows:-

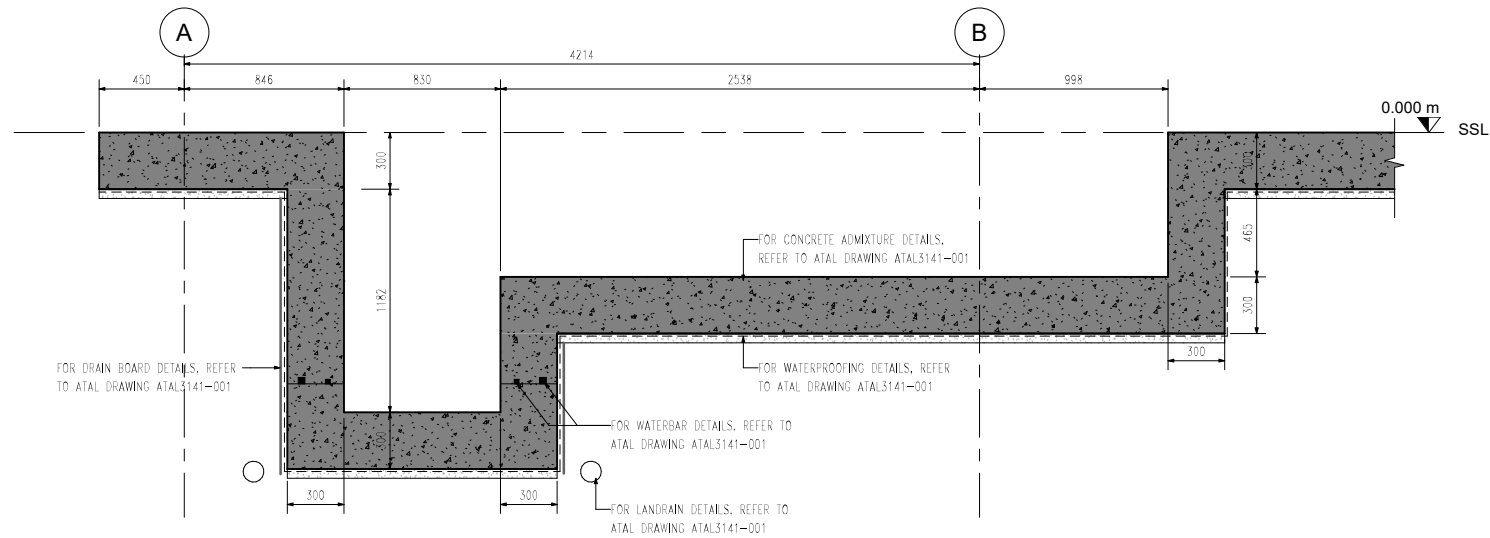
Creation of pathways are likely to be temporary and reformation of the soils around the pile shaft through cohesive material will aid in the prevention of water penetrating to depth. From our review of the site investigation we have noted that the solid strata below the site are considered to be a secondary aquifer and that water strikes were recorded within this material. The presence of Firm Peat/Clay Layer above the Solid Bedrock and that this material is shown as being between 2300mm to 3000mm thick. Taking into account the Environment Agency report SC020074/SR (ref 8) which states that a minimum thickness of 2 pile diameters of ductile or plastic clay above any aquifer will provide an effective seal.

With regard to contamination being trapped under the pile toe we confirm the precast piles will be close ended therefore no plugging of material will be possible and that the slenderness ratio is in excess of 1 in 50 therefore any material on the tip of the pile will be minimal

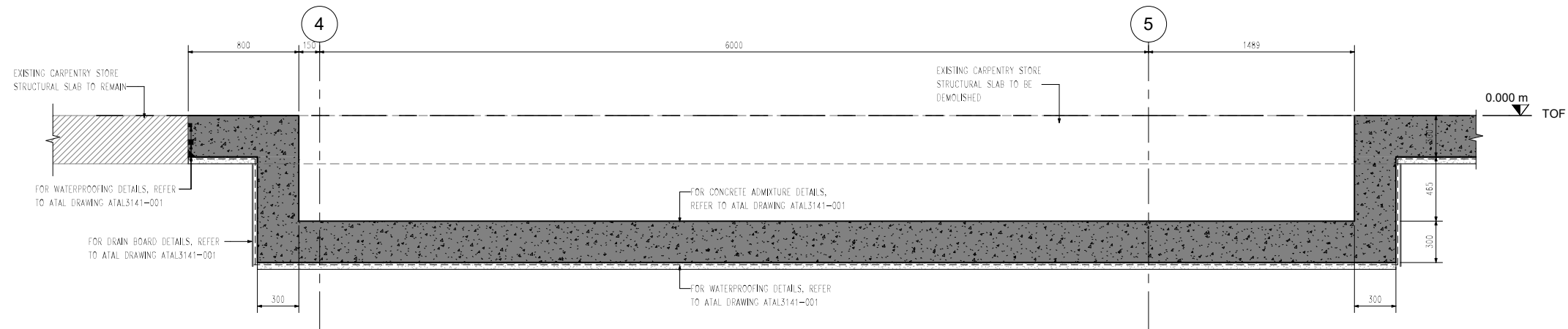
4. Conclusion

In conclusion based on the above RB consider driven precast piles will provide the best environmental and technical solution to the project.

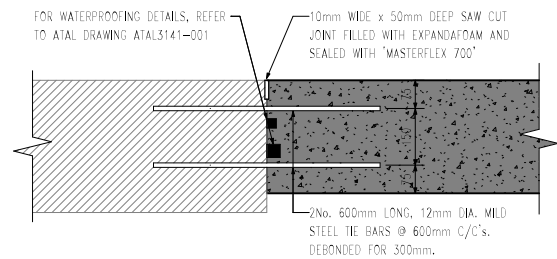
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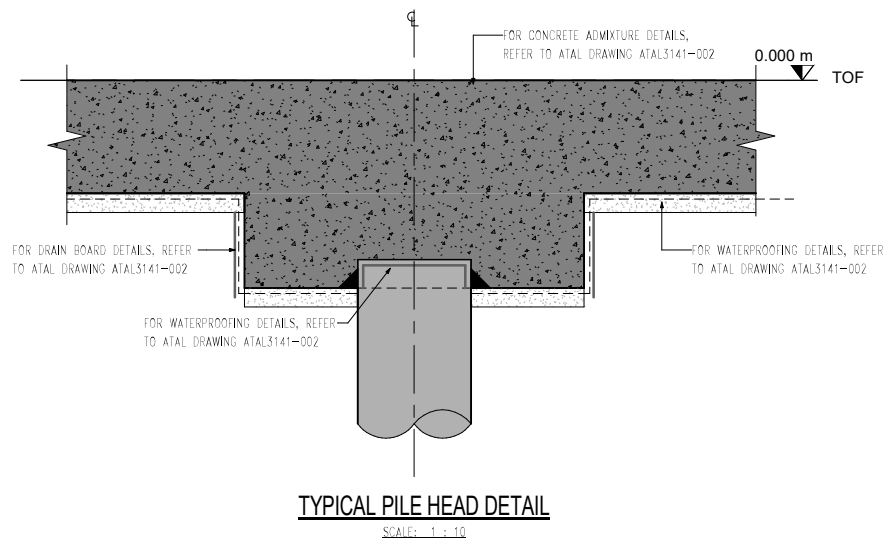
SECTION A-A THROUGH PIT
SCALE: 1 : 20



SECTION B-B THROUGH PIT
SCALE: 1 : 20



TYPICAL DOWEL DETAIL ALONG JUNCTION
BETWEEN EXISTING AND PROPOSED SLABS
SCALE: 1 : 10



TYPICAL PILE HEAD DETAIL
SCALE: 1 : 10

NOTES

DO NOT SCALE THIS DRAWING

CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER

Rev.	Detail	By	Date
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Revisions

Reinforcement schedules nos.



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Client
HALE CONSTRUCTION

Project
**JCG BUILDING
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FACTORY
MILLAND ROAD, NEATH**

Drawing Title
**PROPOSED
CONSTRUCTION DETAILS**

CONSTRUCTION

Project No.

C1123

Drawing No.

S-051

Scale

As indicated

Date

OCT 2016

Revision

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Sheet Size

A1