



Flood Risk Assessment and Surface Water Drainage Strategy for Planning

Prepared for:

Racquet Sports Group

Location:

Racquet Depot,
Station Approach,
Emsworth
PO10 7PW

June 2020

Our reference:

89530-TFD-StationApprch-190620-v1.0



Document Issue Record

Location:	Racquet Depot, Station Approach, Emsworth, PO10 7PW				
Application:	Erection of a single-storey extension to the existing warehouse and construction of a parking platform				
Prepared for:	Racquet Sports Group				
Title:	Flood Risk Assessment and Surface Water Drainage Strategy for Planning				
Project No.:	89530	Date:	19 th June 2020	Issue No.:	1.0
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1. Introduction

- 1.1. This Flood Risk Assessment and Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Racquet Sports Group, in support of a planning application for the *Erection of a single-storey extension to the existing warehouse and construction of a parking platform*. The aforementioned development is proposed at Racquet Depot, Station Approach, Emsworth, PO10 7PW. This report assesses the flood risk and surface water drainage for the proposed development.
- 1.2. The planning application is for the erection of a single-storey side extension to the existing warehouse building, and construction of a parking platform to the south centre south of the site. According to plans provided by the client the proposed warehouse extension will introduce an additional 606m² of roof area to the site.
- 1.3. In order to mitigate flood risk posed by the development's runoff, adequate control measures will be required within the site. This will ensure that surface water runoff is dealt with at source and the flood risk off site is not increased.



Figure 1: Site location plan (Source: Temple Ford Design Ltd)

2. Existing Site:

- 2.1. The existing site is occupied by a warehouse building in the north and car park in the centre. According to aerial photography it appears that the section of land in the west, proposed to be developed upon, is currently utilised for storage purposes. In total, the site is approximately 4219m² and utilised for warehousing and distribution by Racquet Depot UK.
- 2.2. Racquet Depot UK is one of the largest internet resellers of brand name products for racquet sports equipment. According to online information all orders are dispatched from the current operation at the site.
- 2.3. The existing site is formed of approximately 82% impermeable surfaces comprising the existing warehouse building and surrounding hardstanding areas. A swathe of land along the southern boundary is reportedly underlain by soft landscaping and appears to form a bank.
- 2.4. The site is located within a larger industrial complex off North Street, Emsworth. The north of the site is bound by railway sidings with residential dwelling gardens adjacent south. Emsworth train station is located approximately 100m east of the current warehouse, at the entrance to the industrial estate.



Figure 2: Site location (Source: Google)

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Figure 3: South and East Elevations of Existing Building (Source: Lowans Ecology & Associates)

Site Topography:

- 2.5. A topographical survey has been undertaken by Hampshire Land Surveys Ltd and provided by the client for inclusion within the report. This indicates that levels on site range between 4.23mAOD in the south and 9.78mAOD in the north western corner.
- 2.6. The main area of the site, incorporating the land proposed to be developed upon, has a reported elevation range of 8.99mAOD to 9.78mAOD, with the site sloping gently down from higher land in the west towards the east.
- 2.7. According to available information the new warehouse extension will be constructed upon land with an approximate elevation of 9.43mAOD.

Existing Ground Conditions:

- 2.8. The 1:50,000 BGS map shows the site to be located upon the bedrock of London Clay Formation – Clay, Silt and Sand. This strata was formed during the Ypresian Age.
- 2.9. According to BGS mapping superficial deposits comprising River Terrace Deposits and Head (Sand Silt and Clay) underlie the site.
- 2.10. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep Colluvium with a soil texture of Clayey Loam to Sandy Loam.
- 2.11. An intrusive site investigation was undertaken by Soils Limited in December 2019.
- 2.12. As part of the works undertaken, a series of trial pits were excavated throughout the site. The succession of conditions encountered within the trial holes in descending order was summarised as follows:

Made Ground (MG/TS) Head (HEAD) London Clay Formation (LCF) [not encountered]					
The ground conditions encountered in the trial holes are summarised in Table 2.2.					
Table 2.2 Ground Conditions					
Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
MG	Anthropocene	0.00	2.00–4.00 ¹	>4.00m	Concrete over black and brown clayey sandy GRAVEL, clayey gravelly SAND and gravelly CLAY. Gravel comprised fragments of clinker, ash, flint, brick, tarmac, chalk and ceramics.
HEAD	Quaternary	2.00– >4.00 ¹	6.00 ^{1,2}	Not proven	Orangish brown mottled greyish brown slightly sandy silty CLAY with rare angular to rounded fine to medium flint and ironstone gravel clasts.
Notes: ¹ Final depth of trial hole. ² Depth inferred from dynamic probe. ³ Base of strata not encountered. 0.00 denotes ground level					

Figure 4: Underlying, In-Situ Ground Conditions (Source: Soils Limited)

- 2.13. According to Soils Limited, no groundwater strikes were encountered during the site investigation. However, further groundwater monitoring conducted within the standpipes installed on site, following completion of site works, revealed that the resting groundwater level rose to 2.75mbgl beneath land in the west.
- 2.14. The published Environment Agency Groundwater Vulnerability map shows the site is not located within an area classified as a Groundwater Source Protection Zone.

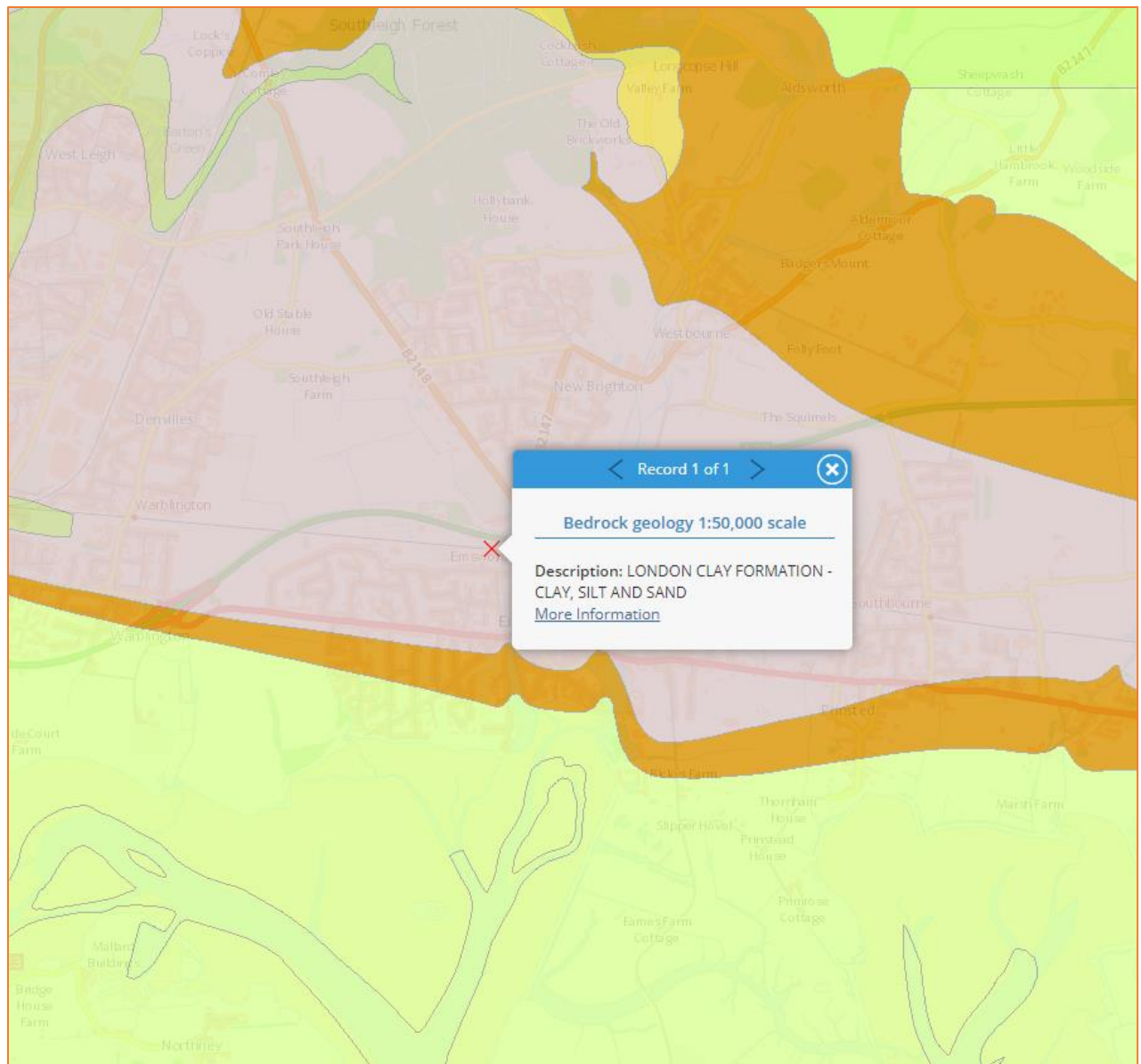


Figure 5: BGS Bedrock Geology (Source: BGS)

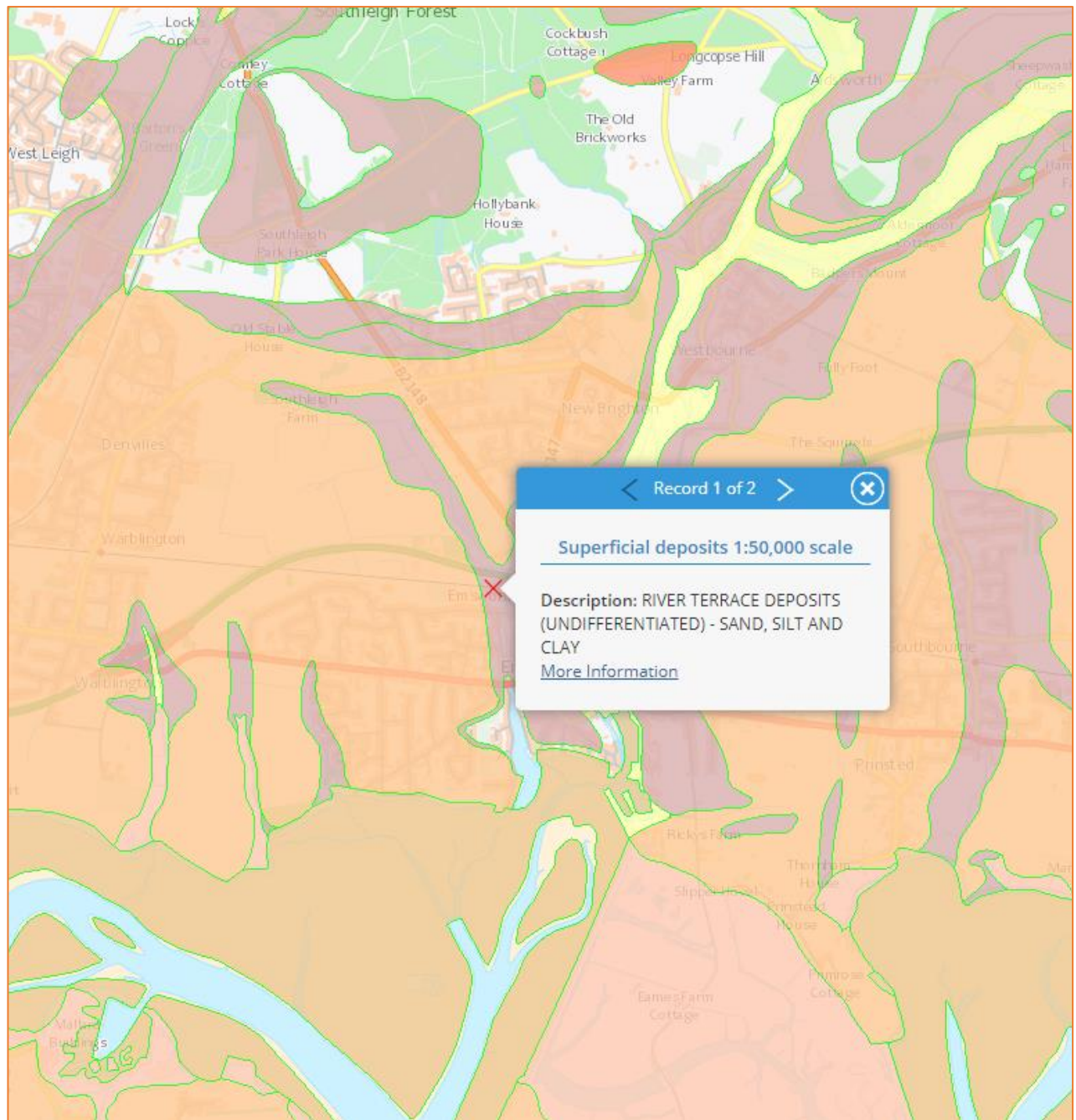


Figure 6: BGS Superficial Geology (Source: BGS)

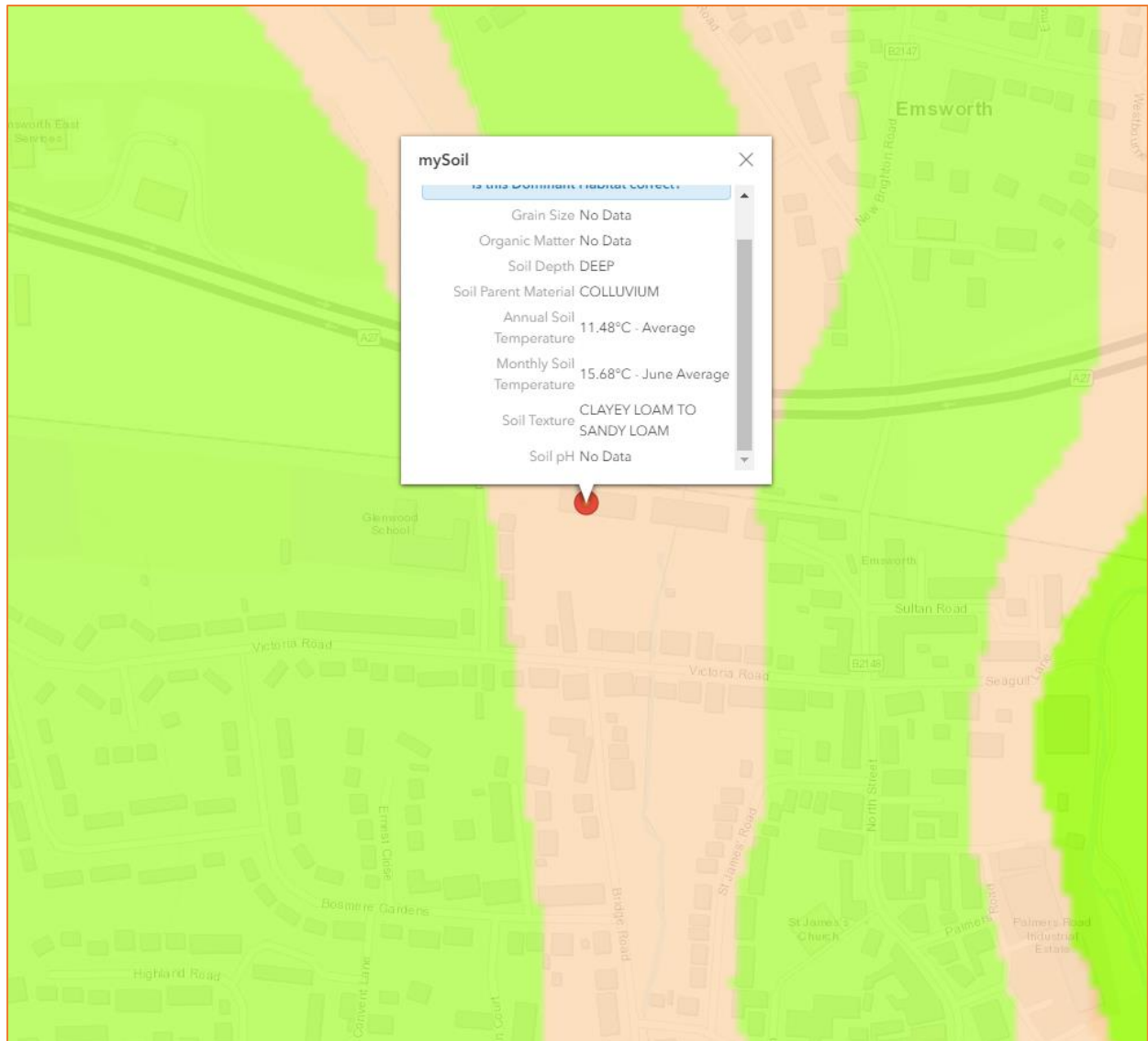


Figure 7: Soil Map (Source: UK Soils, BGS)

Nearby Watercourses / Drainage Features:

- 2.15. There are no existing open watercourses or rivers at the site or along the site boundaries.
- 2.16. According to aerial imagery the nearest watercourse to the site is an unnamed drainage channel, some 15m south east. It appears that this watercourse flows in a southerly direction and is culverted beneath the railway line and site entrance before re-emerging as an open channel 15m south east of the site boundary. This unnamed feature proceeds in a southerly direction and discharges into Slipper Mill Pond some 440m south of the site.

Existing Drainage:

- 2.17. The client has provided information which indicates that a 100/150mm private sewer system runs around the periphery of the existing warehouse building and flows towards the south west of the site. According to the topographical survey, completed by Hampshire Land Surveys Ltd, nine manholes are situated along the private sewer route around the circumference of the existing warehouse.
- 2.18. Given the reported depth of the manholes it is assumed that the private sewer conveys surface water runoff only from the existing building into a main Southern Water sewer.
- 2.19. According to details within the topographical survey, the aforementioned manholes have the following cover and invert levels; listed in the direction from the north eastern corner to the north western corner, and from the south eastern corner to the south western corner.

	Cover Level (mAOD)	Invert Level (mAOD)
Manhole 1	9.46	8.35
Manhole 2	9.51	8.59
Manhole 3	9.49	-
Manhole 4	9.46	-
Manhole 5	9.51	8.51
Manhole 6	9.07	8.18
Manhole 7	9.24	8.72
Manhole 8	9.32	8.32
Manhole 9	9.28	8.07

Table 1: Private Sewer Manhole Elevations (Source: Hampshire Land Surveys Ltd)

- 2.20. Asset records obtained from Southern Water indicate that there are no main surface water or foul sewers within vicinity to the site.
- 2.21. The nearest Southern Water asset to the site appears to be a 200mm foul sewer flowing in a southerly direction beneath Washington Road, some 20m south west.
- 2.22. Having reviewed the Southern Water Asset Location Search the nearest main surface water sewer manhole to the site is reference 6252, located approximately 60m south west. According to information provided by Southern Water manhole 6252 relates to a 150mm pipe run which has an invert and cover level of 6.26mAOD and 6.86mAOD, respectively.
- 2.23. Given that a warehouse building is already present at the site, and the information provided by Southern Water Ltd, surface water generated within the existing site boundary is likely to currently discharge at an uncontrolled rate to ground, and via overland/subsurface flow to Southern Water sewer via the existing private arrangement.

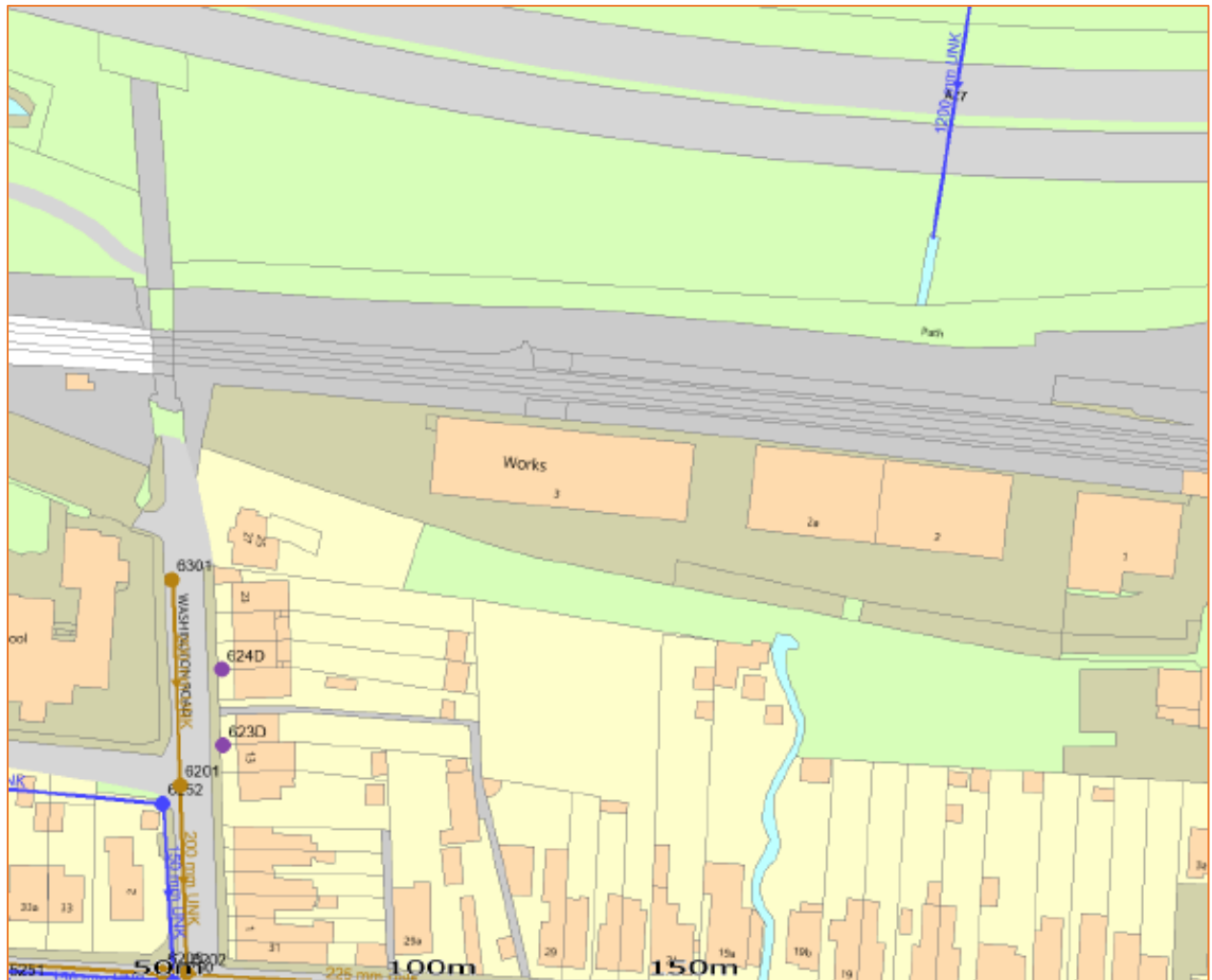


Figure 8: Local sewer network (Source: Southern Water)

3. Development Proposals:

Proposed Development:

- 3.1. The proposed planning application is for *Erection of a single-storey extension to the existing warehouse and construction of a parking platform.*
- 3.2. Having reviewed the proposed plans, the application is comprised of two separate elements with regards to the introduction of impermeable surfacing: development of a new side extension (upon land already underlain entirely by concrete hardstanding) and construction of a new parking platform.
- 3.3. According to plans provided by the client, the proposed warehouse extension will introduce an additional 606m² of roof area to the site. However, it is worth noting that the area proposed to be developed upon is already entirely underlain by concrete hardstanding.
- 3.4. Therefore, whilst the proposal is to introduce 682m² of new impermeable surfacing (including 606m² of built footprint) the overall increase in hardstanding at the site will amount to only 76m²; associated with the car park platform element of the development.
- 3.5. Despite this, all surface water runoff calculations have been based upon providing attenuation storage for the western section of the proposed extension, amounting to 271m³. Thus a significant betterment will be provided post development.

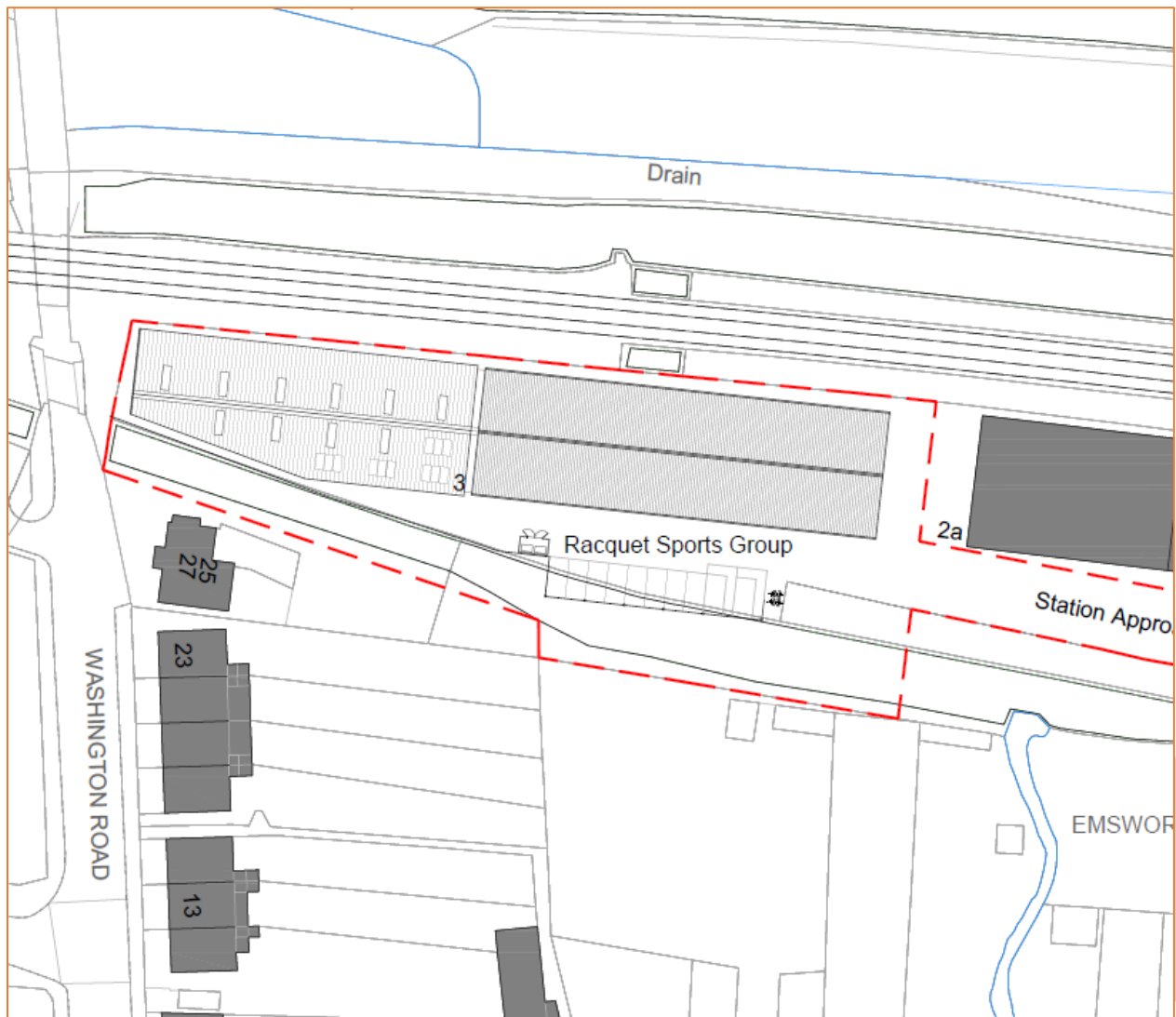


Figure 9: Proposed Site Layout Plan (Source: Temple Ford Design Ltd)

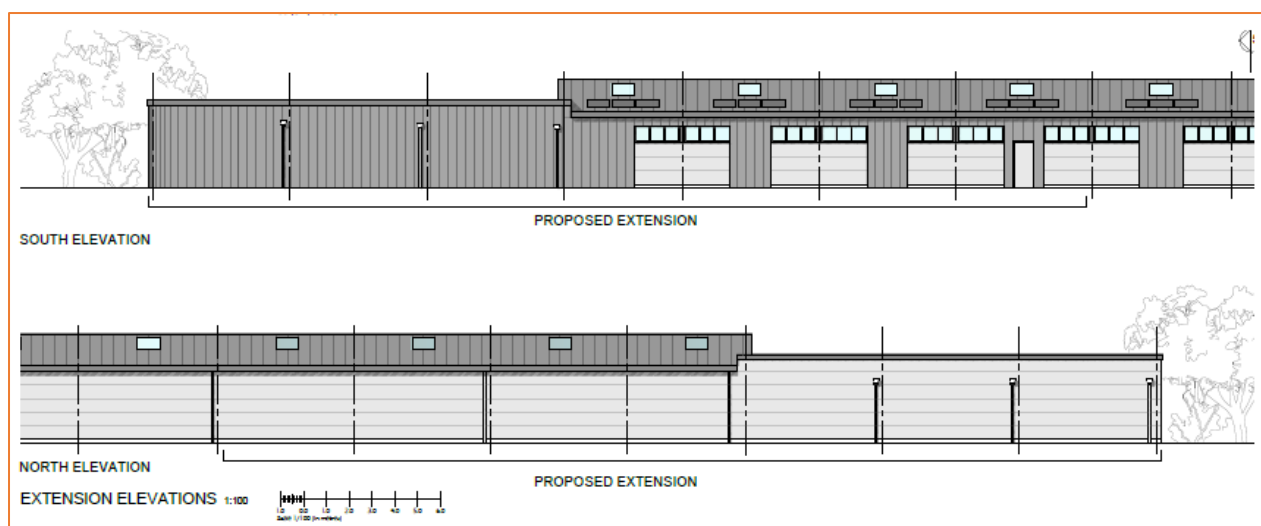


Figure 10: Proposed Extension Elevations (Source: Temple Ford Design Ltd)

Vulnerability to flooding:

- 3.6. The NPPF classifies property usage by vulnerability to flooding. The site is currently occupied by a warehouse utilised by Racquet Depot UK and is therefore classified as “less vulnerable” under the NPPF.
- 3.7. The site will remain “less vulnerable”, as the application is for erection of a single-storey side extension to provide additional space to increase the current business operations.
- 3.8. Accordingly, it is considered that the vulnerability of the site as a whole will not increase post development.

4. Flood Risk Assessment:

Flood Zones:

- 4.1. Within planning, Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's website.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

- 4.2. The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

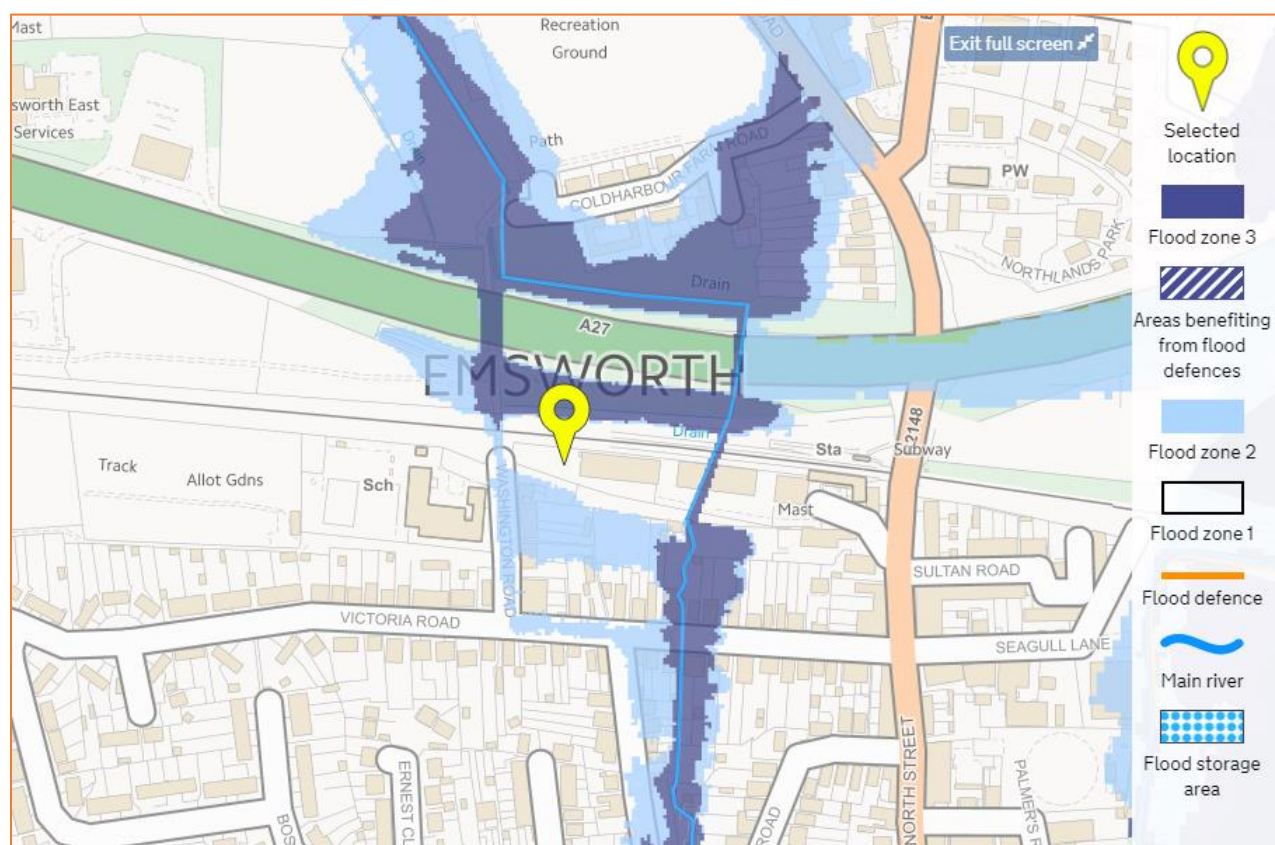


Figure 11: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

- 4.3. The site, including the areas proposed to be developed, is located entirely within Flood Zone 1 (Low Probability) which means it is defined as land having greater than a 1:1000 annual probability of fluvial flooding.

- 4.4. However, an area of land adjacent south of the site has been identified within Flood Zone 2, associated with residential rear gardens at the bottom of the embankment which runs along the southern site boundary.
- 4.5. Additionally, a swathe of land 15m east of the site has been modelled within Flood Zone 3. Comparison of the area identified to be within Flood Zone 3 with aerial imagery reveals that the modelled 1 in 100 year extent is associated with exceedance of the open watercourse some 15m south east.

Detailed flood modelling:

- 4.6. Whilst the site is located entirely within Flood Zone 1, given that the development has been identified within close proximity to Flood Zone 2 and 3 extents, a Product 4 enquiry has been raised with the Environment Agency. The Environment Agency have confirmed that they do not hold any detailed modelling for fluvial risk in relation to the site.
- 4.7. In the absence of detailed flood modelling the Environment Agency have provided fluvial flood levels extracted from JFLOW Improvements for Solent and South Downs Area completed by JBA Consulting in 2008. Fluvial undefended water levels and depths for the 1 in 1000 year event have been provided for analysis.
- 4.8. The Environment Agency have provided details for four floodplain node points at the site (refer to Figure 12) along with corresponding flood depths and levels.

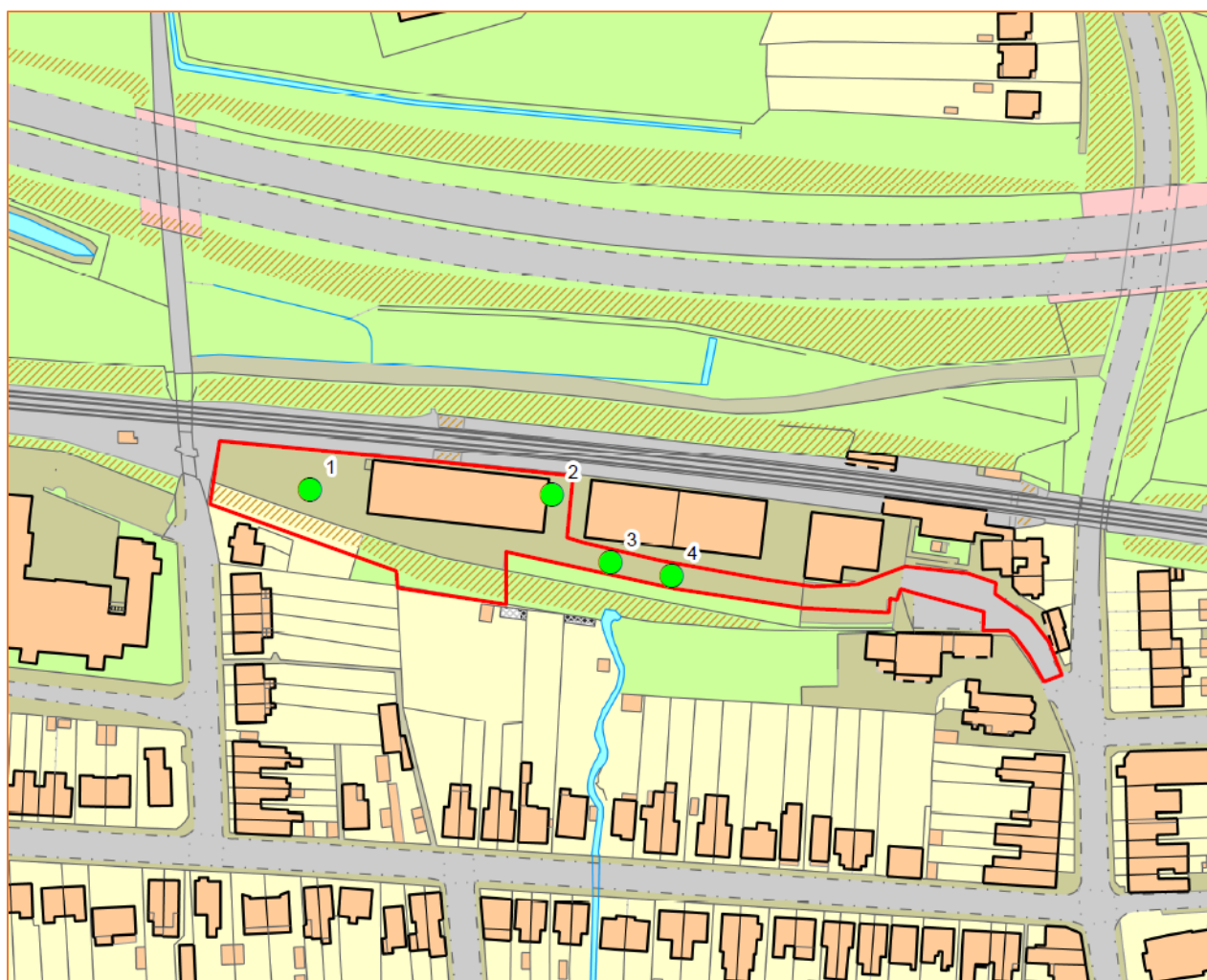


Figure 12: Node Point Map (Source: Environment Agency)

Table 1: Water Levels: Fluvial Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD
			Undefended Annual Exceedance Probability
	Eastings	Northings	0.1%
1	474651	106324	-
2	474718	106323	9.89
3	474735	106304	9.52
4	474752	106300	9.10

Table 2: Water Depths: Fluvial Undefended

Node Ref	NGR		Modelled Flood Depths in Metres
			Undefended Annual Exceedance Probability
	Eastings	Northings	0.1%
1	474651	106324	-
2	474718	106323	0.27
3	474735	106304	0.47
4	474752	106300	0.01

Figure 13: Corresponding Node Point Depths and Levels (Source: Environment Agency)

- 4.9. Having reviewed the information provided floodplain Node 1 is located in the east, upon land proposed to be developed, and is therefore considered most appropriate for utilisation within this assessment. According to Environment Agency modelling the area surrounding Node 1 is not anticipated to experience any flooding during the 1 in 1000 year fluvial scenario.
- 4.10. The next closest floodplain node to the development area, Node 2, is located in the north eastern corner of the site adjacent to the existing warehouse building. According to data extracted from JFLOW Improvements for Solent and South Downs Area (2008) the north eastern corner of the site could experience depths of flooding up to 0.27m deep during the 1 in 1000 AEP event.

Flood defences:

- 4.11. The Environment Agency have confirmed that there are no formal flood defences within proximity to the site.

Residual risk (breach or overtopping of flood defences):

- 4.12. Breaching of flood defences can cause rapid inundation of areas behind flood defences as flow in the river channel discharges through the breach. A breach can occur with little or no warning, although they are much more likely to concur with extreme river levels or tides when the stresses on flood defences are highest. Flood water flowing through a breach will normally discharge at a high velocity, rapidly filling up the areas behind the defences, resulting in significant damage to buildings and a high risk of loss of life. Breaches are most likely to occur in soft defences such as earth embankments although poorly maintained hard defences can also be a potential source of breach.
- 4.13. Overtopping of flood defences occurs when water levels exceed the protection level of raised flood defences. The worst case occurs when the fluvial or tidal levels exceed the defence level as this can lead to prolonged flooding. Less severe overtopping can occur when flood levels are below defence levels, but wave action causes cyclic overtopping, with intermittent discharge over the crest level of the defence. Flood defences are commonly designed with a freeboard to provide protection against overtopping from waves. The risk from overtopping due to exceedance of the flood defence level is much more significant than the risk posed by wave overtopping. Exceedance of the flood defence level can lead to prolonged and rapid flooding with properties immediately behind the defences at highest risk.

Historical flood events:

- 4.14. The Environment Agency have confirmed that they do not hold any information relating to historical flood incidents within vicinity to the site. At the time of writing Unda has not been made aware of any previous inundation events to have impacted upon the site.

Pluvial:

- 4.15. Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.
- 4.16. In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.
- 4.17. The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):
- 1:30 (3.3%)
 - 1:100 (1%)
 - 1:1000 (0.1%)
- 4.18. The mapping below shows the Risk of Flooding from Surface Water centred on the site. Please note that the EA do not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.
- 4.19. The EA Risk of Flooding from Surface Water Map suggests that the site, including the new warehouse extension, lies predominantly within an area at "Very Low" risk of flooding from surface water.
- 4.20. However, it appears that surface water runoff has been modelled to collect to the east of the site associated with the site access road. This swathe of land has been identified at "Low" risk of surface water flooding.

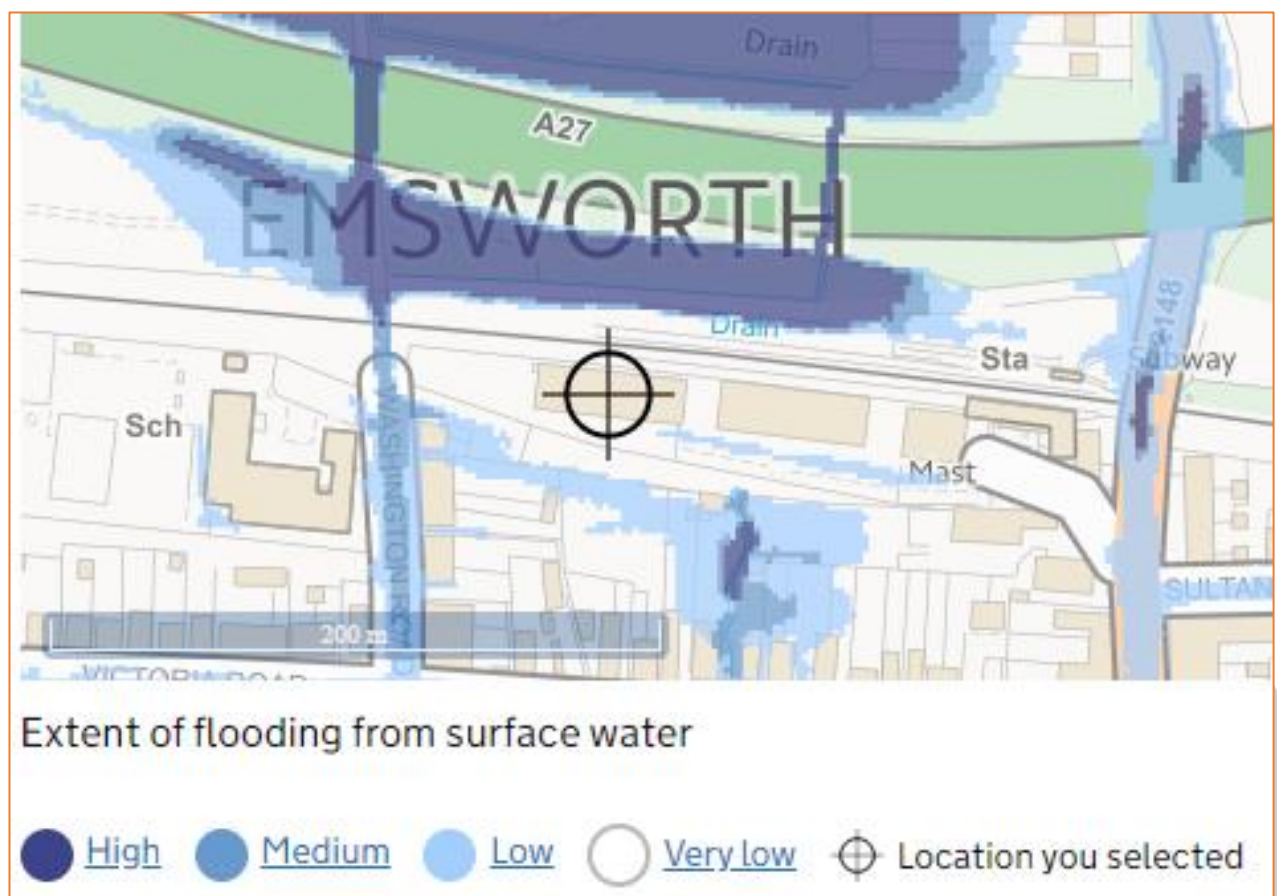


Figure 14: Extract from Environment Agency RoFSW map (Source: EA)

Groundwater:

- 4.21. Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.
- 4.22. Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.
- 4.23. No information has been provided to suggest that the site is susceptible to groundwater flooding.

Sewer:

- 4.24. Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.
- 4.25. All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.
- 4.26. No information has been made available to suggest that the site has ever been subject to any sewer flood incidents.

Other Sources:

- 4.27. The EA Risk of Flooding from Reservoirs Map suggests that the site lies outside the "Maximum extent of flooding" from reservoir failure. The EA also advise on their website that reservoir flooding is extremely unlikely. All major reservoirs have to be inspected by specialist dam and reservoir Engineers. These inspections are monitored and enforced by the EA themselves. The risk to the site from reservoir flooding is therefore minimal and is far lower than that relating to the potential for fluvial flooding to occur.
- 4.28. No further information has been provided to suggest the site is susceptible to from the failure of reservoirs, canals or other artificial infrastructure from the risk of flooding.

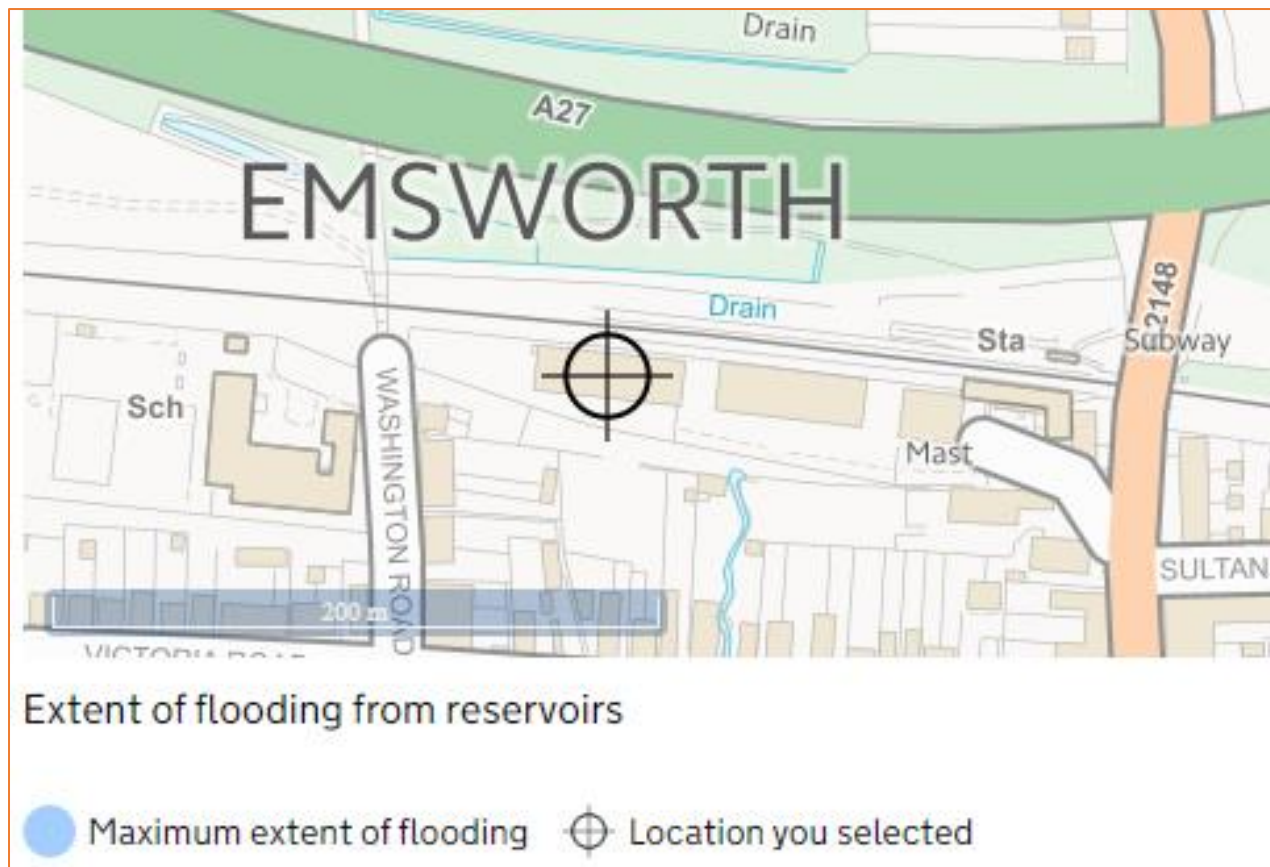


Figure 15: Extract from Environment Agency Flood Risk from Reservoirs map (Source: EA)

5. Surface Water Drainage Strategy:

- 5.1. In order to mitigate flood risk posed by post development runoff, adequate control measures will need to be considered within the site. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere.

Drainage Hierarchy:

- 5.2. The drainage strategy for the site has been prepared according to the drainage discharge hierarchy from CIRIA C753 The Suds Manual, as follows:
- Infiltration to the maximum extent that is practical;
 - Discharge to surface waters;
 - Discharge to surface water sewer.

Infiltration Potential:

- 5.3. The 1:50,000 BGS map shows the site to be located upon the bedrock of London Clay Formation therefore infiltration SuDS features are not considered feasible at the site.
- 5.4. Additionally, Havant Borough Council Consultation Memorandum, reference CONS/20/00446, states the following:

The contamination conceptual site model would weigh substantially against the use of infiltration drainage at this site for surface water disposal.

- 5.5. In light of the underlying strata and memorandum comments, an attenuation based strategy is proposed.

Discharge Location:

- 5.6. There are no existing watercourses or rivers within close proximity to the site.
- 5.7. Therefore, it is initially proposed to discharge all post development runoff at a controlled rate to the existing 100/150mm diameter private surface water sewer that flows around the existing warehouse building.
- 5.8. If connection to the private sewer system is not possible a new connection should be established to Southern Water surface water manhole reference 6252, some 60m south west of the site.
- 5.9. This sewer appears to flow in a southerly direction from manhole 6252 beneath Washington Road and converges with another surface water sewer beneath the intersection with Victoria Road.
- 5.10. According to Southern Water, manhole reference 6252 is located 60m south west of the red outline boundary and is reported to have a cover and invert level of 6.86mAOD and 6.26mAOD, respectively.

Areas of Focus:

- 5.11. As discussed within Section 3.0, the proposed development is formed of two separate elements with regards to the introduction of impermeable surfacing: development of a new side extension (upon land already underlain entirely by concrete hardstanding) and construction of a new parking platform.
- 5.12. Surface water attenuation within this strategy has been calculated based on the increase in impermeable hardstanding, post development
- 5.13. Given that the site is brownfield a number of constraints are associated with the locating of any SuDS features, the most pertinent of which are:
- The site is already predominantly underlain by concrete hardstanding;
 - According to Soils Limited the strata composition beneath the concrete surface is predominantly comprised of clay;
 - All infiltration features must be located at least 5m away from any building;
 - The existing private sewer system is shallow. Reported to be a maximum depth of 1.21mbl to the south west of the existing warehouse, and;
 - An existing network of subterranean infrastructure is already present beneath the site.

- 5.14. Considering the site constraints, highlighted above, and the fact that the proposed application is for construction of a parking platform and erection of a single storey warehouse extension (positioned entirely upon existing hardstanding); it is proposed to offset surface water runoff from part of the new extension roof and direct this to an above ground attenuation storage tank.
- 5.15. The drainage layout plan, attenuation storage sizing and MicroDrainage calculations provided within this report are based on runoff from an impermeable area of 271m², comprising roof area associated with the western half of the proposed extension.
- 5.16. According to development plans provided by the client the actual total proposed increase in impermeable surfacing, arising solely from the car park platform element of the proposals, amounts to only 76m². Therefore, by providing attenuation storage designed to accommodate surface water runoff from 271m² of roof area, not only is any increase in impermeable surfacing offset, but significant betterment is provided over policy requirements by way of reducing the volume of runoff entering the current sewer network by 195m².
- 5.17. Runoff from the newly introduced car park platform will be managed via the existing drainage arrangements serving the wider car park and road.
- 5.18. Roof runoff from the eastern section of warehouse extension will discharge directly into manhole reference Manhole 9 (adjacent to the south western corner of the existing building) similar to the existing drainage arrangement for the existing warehouse.

Proposed Discharge Rate:

- 5.19. Existing greenfield runoff rates for the site have been calculated as 0.7 l/s for the 1:1 annual runoff event, 1.9 l/s for the 1:30 year event and 2.6 l/s for the 1:100 year event. Refer to calculations in appendix.
- 5.20. However, the existing site is brownfield and covered by approximately 3443m² of impermeable surfacing, comprising concrete hardstanding and existing built footprint. The existing site is therefore considered to be made up of approximately 82% impermeable surfacing. Runoff rates for the existing site (including 75% impermeable coverage) have been calculated using MicroDrainage as 2.2 l/s for the 1:1 annual runoff event, 4.5 l/s for the 1:30 year event and 5.2 l/s for the 1:100 year event. Refer to calculations in appendix.
- 5.21. Surface water runoff from the increase in impermeable surfaces post development will be offset by directing all roof runoff from the western half of the proposed extension (271m²) towards an above ground attenuation tank. It is initially proposed to locate the above ground storage tank adjacent west of the new built footprint however, this will be dependent upon construction engineer specifications.
- 5.22. From the above ground attenuation storage tank, runoff will be gradually discharged to the existing private surface water sewer network located beneath the centre of the site.
- 5.23. If connection to the existing on site private sewer is not possible a new connection should be established to Southern Water surface water manhole reference 6252, some 60m south west of the site.
- 5.24. Outflow from the proposed drainage system (attenuation storage tank) to the surface water sewer will be limited to 0.7 l/s for all storms up to, and including, the 1:100 year + 40% climate change event via an orifice flow control.

Attenuation Storage:

- 5.25. The proposed warehouse extension footprint is already entirely underlain by hardstanding however additional works, which fall within the development proposals, include the creation of a car park platform. The extension to the car park will result a net increase in hard landscaped areas by 76m². Therefore, in order to compensate for this increase, the client has agreed to provide significant betterment by offsetting 271m² of roof runoff to above ground attenuation storage tank.
- 5.26. Runoff from the western half of the proposed warehouse extension roof will be directed towards an above ground attenuation storage tank located adjacent west of the post development footprint. The final location of the proposed attenuation storage tank will be dependent upon manufacturer and construction engineer specifications.
- 5.27. From the above ground storage tank, runoff will discharged at a controlled rate of 0.7 l/s to the existing private surface water sewer network located beneath the centre of the site.

- 5.28. Preliminary calculations indicate that sufficient storage required to attenuate roof runoff from the western half of the extension (271m²), arising during the critical 1:100 year + 40% climate change event, can be provided within an above ground storage tank of dimensions 4.5m² x 3.5m high.
- 5.29. Preliminary calculations indicate that some 13.1m³ of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 40% climate change event.
- 5.30. All preliminary surface water drainage calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Water Quality:

- 5.31. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

Design Exceedance:

- 5.32. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

Adoption and Maintenance:

- 5.33. It is proposed that all SuDS facilities, including the Hydro-Brake flow control device, will be maintained privately by the end user.
- 5.34. A draft Maintenance Schedule is outlined in the Table below.

Cellular Storage:

- 5.35. It is not envisaged that silt build up within the cellular crate systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits and inspection chambers on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection and silt removal (as necessary). Inspection should be undertaken using CCTV equipment offered up the inspection tunnels located within the crate system. Camera access can be gained via inspection chambers and inlet pipework located at each end of the tunnels.
- 5.36. Silt removal can be achieved by jetting the inspection tunnels. Jetting should be undertaken in accordance with current jetting guidelines, in particular the Code of Practice for Sewer Jetting published by The Water Research Centre. Jetting at 150bar at 300l/min should be more than adequate in removing any build-up of material within the tunnel. The crate system will take higher pressures. However, unlike regular jetting which relies heavily on high pressure to remove hardened deposits on the inner bore of pipes, effective cleansing of a crate system relies more on the delivery flow rate to flush solids back through the system.
- 5.37. A standard jet head with rear facing nozzles should be used. The head should be fed to the far end of the crate tunnel via the nearest inspection chamber, activated and retracted. As the nozzle is removed, debris will be swept back into the inspection chamber where it can then be removed with the use of a standard gully sucker. This method will ensure the effective removal of gross solids (carrier bags, cans, leaf litter etc.) from the system. Whilst 100% removal cannot be guaranteed, it has been shown that this jetting method will also remove an element of finer material which would otherwise be 'lost' within the system.

Pipework and Catchpits:

- 5.38. It is not envisaged that silt build up within the pipework systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection (every three months) and silt removal (as necessary).

Drainage Element	Maintenance Requirement	Frequency
Cellular Storage	Inspect and remove debris	CCTV inspection following first storm event. Monthly CCTV inspections for first 3 months. 6 monthly CCTV inspections thereafter. Jetting to remove silt as necessary.
Gutters & Downpipes	Inspect and remove silt/ debris	To be inspected every three months and silt/ debris removed as necessary.
Catchpits and Inspection Chambers	Inspect and remove silt	To be inspected every three months and silt/ debris removed as necessary. Flow control to be checked for blockages.
Flow Controls	Inspected for blockage and blockage / debris build up removed	Every six months

Table 3: Suggested Maintenance Regime for Elements of the Drainage Infrastructure

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:

- Following the first storm event
- Monthly for the first 3 months following commissioning

6. Flood Risk Mitigation:

Physical Design Measures:

- 6.1. The NPPF requires all residential dwellings to be located 300mm above the modelled 1:100 year flood level with allowance for Climate Change.
- 6.2. The proposed development is for extension to the existing warehouse and is entirely located within Flood Zone 1, therefore considered to lie entirely outside of the 1 in 100 year flood extent.
- 6.3. In the absence of detailed flood modelling the Environment Agency have provided fluvial flood levels extracted from JFLOW Improvements for Solent and South Downs Area completed by JBA Consulting in 2008. Fluvial undefended water levels and depths for the 1 in 1000 year event have been provided for analysis.
- 6.4. Having reviewed the information provided floodplain Node 1 is located in the east, upon land proposed to be developed. According to Environment Agency modelling the area surrounding Node 1 is not anticipated to experience any flooding during the 1 in 1000 year fluvial scenario.
- 6.5. Despite this, the developer has agreed to adopt a precautionary approach and will install standard building thresholds. The warehouse extension slab level will be set at least 100mm above the surrounding ground levels.
- 6.6. To further help protect against flooding during extreme events, the application has agreed to implement flood resistant design measures into the new extension, in consultation with the Local Authority building control department. These measures can include the following:
 - Solid concrete ground floor slab, with waterproof membrane;
 - Waterproof screed used on floors;
 - Closed-cell foam used in wall cavities;
 - Waterproof ground floor internal render;
 - External walls rendered resistant to flooding to 0.6m above surrounding ground level;
 - Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
 - Ground floor electrical main ring run from first floor level; and on separately switched circuit from first floor;
 - Electrical incomer and meter situated at first floor level or above;
 - Boilers, control and water storage / immersion installed at first floor level or above;
 - Gas meter installed at first floor level or above;
 - Plumbing insulation of closed-cell design;
 - Non-return valves fitted to all drain and sewer outlets;
 - Manhole covers secured;
 - Anti-syphon fitted to all toilets;
 - Kitchen units of solid, water resistant material;
 - Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at ground floor level;
 - Stairs of solid hardwood construction with wood faces treated to resist water penetration.
- 6.7. The applicant should also consider the use of demountable flood defence barriers to defend ground level doorways and low windows.

Safe Escape:

- 6.8. The NPPF requires a route of safe escape for all residents and users to be provided from residential properties in Flood Zone 3. Safe escape is usually defined as being through slow moving flood water no deeper than 25cm.
- 6.9. The planning application relates to a new warehouse extensions, and the entire site is located within Flood Zone 1, therefore a route of safe escape is not required.
- 6.10. In the absence of safe escape, users should follow the warning and evacuation procedure detailed in the following section.

Flood Warning:

- 6.11. The EA is responsible for issuing flood warnings. Flood warnings are issued to the emergency services and local authorities. Both private individuals and organisations can sign-up to receive warnings via phone, text or email. This system of receiving warnings is currently voluntary.
- 6.12. Advice regarding severe flood warnings will generally be given during weather forecasts on local radio and TV. In the case of extreme events, warnings can also be disseminated via door to door visits by the police or locally appointed flood wardens.
- 6.13. The EA issue flood warnings to specific areas when flooding is expected. It is recommended that the applicant registers online with the free Environment Agency Floodline Warnings/Alert Direct service at <https://fwd.environment-agency.gov.uk/app/olr/register> to receive flood warnings by phone, text or email.
- 6.14. The flood warning service has three types of warnings that will help you prepare for flooding and take action:

Flood Warning	Flood Alert	Flood Warning	Severe Flood Warning
			
What it means?	Flooding is possible. Be prepared.	Flooding is expected. Immediate action required.	Severe flooding. Danger to life.
When it's used?	Two hours to two days in advance of flooding.	Half an hour to one day in advance of flooding.	When flooding poses a significant threat to life.
What to do?	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.

Table 4: Flood Warnings

Flood Plan:

- 6.15. It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

Before a flood:

- Find out if you are at risk of flooding.
- Find out if you can receive flood warnings.
- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood such as vehicles, machinery, furniture, and electrical equipment.
- Know how to turn off gas, electricity and water supplies.
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.
- Consider buying flood protection products such as flood boards and airbrick covers to help reduce flood water getting into your property.

During a flood:

- Tune into your local radio station on a battery or wind-up radio.
- Grab your flood kit - if you have prepared one.
- Collect blankets, torch, first aid kit, medication and food.
- Move important documents, valuables, and lightweight belongings upstairs or to high shelves.
- Raise large items of furniture, or put them in large bags if you have them.
- Move people, outdoor belongings, cars and machinery to higher ground.
- Switch off water, gas and electricity at mains when water is about to enter your home. Do not touch sources of electricity when standing in water.
- Fit flood protection products, if you have them, for example flood boards, airbrick covers, sandbags.
- Put plugs in sinks. Weigh them down with a plastic bag filled with soil.
- If you do not have non-return valves fitted, plug water inlet pipes with towels or cloths.
- Listen to the advice of the emergency service and evacuate if told to do so.
- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

After a flood:

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you don't have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics, central heating and water checked by qualified engineers before switching them back on.

Fluvial floodplain storage:

- 6.16. The NPPF requires that where development is proposed in undefended areas of floodplain, which lie outside of the functional floodplain, the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain. Flood storage capacity can be maintained by lowering ground levels either within the curtilage of the development or elsewhere in the floodplain, in order to maintain at least the same volume of flood storage capacity within the floodplain.
- 6.17. In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.
- 6.18. For development in a defended flood risk area, the impact on residual flood risk to other properties needs to be considered. New development behind flood defences can increase the residual risk of flooding if the flood defences are breached or overtopped by changing the conveyance of the flow paths or by displacing flood water elsewhere. If the potential impact on residual risk is unacceptable then mitigation should be provided.
- 6.19. The site is situated in Flood Zone 1 when using the Environment Agency Flood Map for Planning (Rivers and Sea). No fluvial floodwater has been displaced by the development.

7. Discussion and Conclusions:

- 7.1. This Flood Risk Assessment and Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Racquet Sports Group, in support of a planning application for the *Erection of a single-storey extension to the existing warehouse and construction of a parking platform*. Development is proposed at Racquet Depot, Station Approach, Emsworth, PO10 7PW.
- 7.2. The existing site is occupied by a warehouse building in the north and car park in the centre. According to aerial photography it appears that the section of land in the west, proposed to be developed upon, is currently utilised for storage purposes. In total, the site is approximately 4219m² and utilised for warehousing and distribution by Racquet Depot UK.
- 7.3. The existing site is formed of approximately 82% impermeable surfaces comprising the existing warehouse building and surrounding hardstanding areas. A swathe of land along the southern boundary is reportedly underlain by soft landscaping and appears to form a bank.
- 7.4. A topographical survey has been undertaken by Hampshire Land Surveys Ltd and provided by the client for inclusion within the report. This indicates that levels on site range between 4.23mAOD in the south and 9.78mAOD in the north western corner.
- 7.5. The main area of the site, incorporating the land proposed to be developed upon, has a reported elevation range of 8.99mAOD to 9.78mAOD, with the site sloping gently down from higher land in the west towards the east. According to available information the new warehouse extension will be constructed upon land with an approximate elevation of 9.43mAOD.
- 7.6. The proposed planning application is for *Erection of a single-storey extension to the existing warehouse and construction of a parking platform*.
- 7.7. Having reviewed the proposed plans, the application is comprised of two separate elements with regards to the introduction of impermeable surfacing: development of a new side extension (upon land already underlain entirely by concrete hardstanding) and construction of a new parking platform.
- 7.8. According to plans provided by the client, the proposed warehouse extension will introduce an additional 606m² of roof area to the site. However, it is worth noting that the area proposed to be developed upon is already entirely underlain by concrete hardstanding. Therefore, whilst the proposal is to introduce 682m² of new impermeable surfacing (including 606m² of built footprint) the overall increase in hardstanding at the site will amount to only 76m²; associated with the car park platform element of the development.
- 7.9. Despite this, all surface water runoff calculations have been based upon providing attenuation storage for the western section of the proposed extension, amounting to 271m³. Thus a significant betterment will be provided post development.
- 7.10. According to 1:50,000 BGS mapping the site is located upon London Clay Formation, River Terrace Deposits and Head (Sand Silt and Clay). The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep Colluvium with a soil texture of Clayey Loam to Sandy Loam.
- 7.11. An intrusive investigation was undertaken at the site in December 2019. According to Soils Limited, no groundwater strikes were encountered during the site investigation. However, further groundwater monitoring conducted within the standpipes installed on site, following completion of site works, revealed that the resting groundwater level rose to 2.75mbgl beneath land in the west.

Flood Risk Discussion

- 7.12. The site, including the areas proposed to be developed, is located entirely within Flood Zone 1 (Low Probability) which means it is defined as land having greater than a 1:1000 annual probability of fluvial flooding.
- 7.13. However, an area of land adjacent south of the site has been identified within Flood Zone 2, associated with residential rear gardens at the bottom of the embankment which runs along the southern site boundary.
- 7.14. Additionally, a swathe of land 15m east of the site has been modelled within Flood Zone 3. Comparison of the area identified to be within Flood Zone 3 with aerial imagery reveals that the modelled 1 in 100 year extent is associated with exceedance of the open watercourse some 15m south east.
- 7.15. Whilst the site is located entirely within Flood Zone 1, given that the development has been identified within close proximity to Flood Zone 2 and 3 extents, a Product 4 enquiry has been raised with the Environment Agency. The Environment Agency have confirmed that they do not hold any detailed modelling for fluvial risk in relation to the site.

- 7.16. In the absence of detailed flood modelling the Environment Agency have provided fluvial flood levels extracted from JFLOW Improvements for Solent and South Downs Area completed by JBA Consulting in 2008. Fluvial undefended water levels and depths for the 1 in 1000 year event have been provided for analysis.
- 7.17. Having reviewed the information provided floodplain Node 1 is located in the east, upon land proposed to be developed, and is therefore considered most appropriate for utilisation within this assessment. According to Environment Agency modelling the area surrounding Node 1 is not anticipated to experience any flooding during the 1 in 1000 year fluvial scenario.
- 7.18. Despite this, the developer has agreed to adopt a precautionary approach and will install standard building thresholds. The warehouse extension slab level will be set at least 100mm above the surrounding ground levels.
- 7.19. To further help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the new extension, in consultation with the Local Authority building control department. Details of potential measures can found on page 23.
- 7.20. The EA Risk of Flooding from Surface Water Map suggests that the site, including the new warehouse extension, lies predominantly within an area at "Very Low" risk of flooding from surface water.
- 7.21. No information has been provided to suggest that the site is susceptible to groundwater or sewer surcharge flooding.
- 7.22. The EA Risk of Flooding from Reservoirs Map suggests that the site lies outside the "Maximum extent of flooding" from reservoir failure.
- 7.23. The site is situated in Flood Zone 1 when using the Environment Agency Flood Map for Planning (Rivers and Sea). No fluvial floodwater will be displaced by the development.

Surface Water Drainage Discussion

- 7.24. The 1:50,000 BGS map shows the site to be located upon the bedrock of London Clay Formation therefore infiltration SuDS features are not considered feasible at the site.
- 7.25. Additionally, Havant Borough Council Consultation Memorandum, reference CONS/20/00446, states the following; *the contamination conceptual site model would weigh substantially against the use of infiltration drainage at this site for surface water disposal.*
- 7.26. In light of the underlying strata and memorandum comments, an attenuation based strategy is proposed.
- 7.27. There are no existing watercourses or rivers within close proximity to the site.
- 7.28. Therefore, it is initially proposed to discharge all post development runoff at a controlled rate to the existing 100/150mm diameter private surface water sewer that flows around the existing warehouse building.
- 7.29. If connection to the private sewer system is not possible a new connection should be established to Southern Water surface water manhole reference 6252, some 60m south west of the site.
- 7.30. As discussed, the proposed development is formed of two separate elements with regards to the introduction of impermeable surfacing: development of a new side extension (upon land already underlain entirely by concrete hardstanding) and construction of a new parking platform.
- 7.31. Surface water attenuation within this strategy has been calculated based on the increase in impermeable hardstanding, post development
- 7.32. Given that the site is brownfield a number of constraints are associated with the locating of any SuDS features, the most pertinent of which are:
- The site is already predominantly underlain by concrete hardstanding;
 - According to Soils Limited the strata composition beneath the concrete surface is predominantly comprised of clay;
 - All infiltration features must be located at least 5m away from any building;
 - The existing private sewer system is shallow. Reported to be a maximum depth of 1.21mbl to the south west of the existing warehouse, and;
 - An existing network of subterranean infrastructure is already present beneath the site.

- 7.33. Considering the site constraints, highlighted above, and the fact that the proposed application is for construction of a parking platform and erection of a single storey warehouse extension (positioned entirely upon existing hardstanding); it is proposed to offset surface water runoff from part of the new extension roof and direct this to an above ground attenuation storage tank.
- 7.34. The drainage layout plan, attenuation storage sizing and MicroDrainage calculations provided within this report are based on runoff from an impermeable area of 271m², comprising roof area associated with the western half of the proposed extension.
- 7.35. According to development plans provided by the client the actual total proposed increase in impermeable surfacing, arising solely from the car park platform element of the proposals, amounts to only 76m². Therefore, by providing attenuation storage designed to accommodate surface water runoff from 271m² of roof area, not only is any increase in impermeable surfacing offset, but significant betterment is provided over policy requirements by way of reducing the volume of runoff entering the current sewer network by 195m².
- 7.36. Runoff from the newly introduced car park platform will be managed via the existing drainage arrangements serving the wider car park and road. Roof runoff from the eastern section of warehouse extension will discharge directly into manhole reference Manhole 9 (adjacent to the south western corner of the existing building) similar to the existing drainage arrangement for the existing warehouse.
- 7.37. Existing greenfield runoff rates for the site have been calculated as 0.7 l/s for the 1:1 annual runoff event, 1.9 l/s for the 1:30 year event and 2.6 l/s for the 1:100 year event. Refer to calculations in appendix.
- 7.38. However, the existing site is brownfield and covered by approximately 3443m² of impermeable surfacing, comprising concrete hardstanding and existing built footprint. The existing site is therefore considered to be made up of approximately 82% impermeable surfacing. Runoff rates for the existing site (including 75% impermeable coverage) have been calculated using MicroDrainage as 2.2 l/s for the 1:1 annual runoff event, 4.5 l/s for the 1:30 year event and 5.2 l/s for the 1:100 year event. Refer to calculations in appendix.
- 7.39. The proposed warehouse extension footprint is already entirely underlain by hardstanding however additional works, which fall within the development proposals, include the creation of a car park platform. The extension to the car park will result a net increase in hard landscaped areas by 76m². Therefore, in order to compensate for this increase, the client has agreed to provide significant betterment by offsetting 271m² of roof runoff to above ground attenuation storage tank.
- 7.40. Runoff from the western half of the proposed warehouse extension roof will be directed towards an above ground attenuation storage tank located adjacent west of the post development footprint. The final location of the proposed attenuation storage tank will be dependent upon manufacturer and construction engineer specifications.
- 7.41. From the above ground storage tank, runoff will be discharged at a controlled rate of 0.7 l/s to the existing private surface water sewer network located beneath the centre of the site.
- 7.42. Preliminary calculations indicate that sufficient storage required to attenuate roof runoff from the western half of the extension (271m²), arising during the critical 1:100 year + 40% climate change event, can be provided within an above ground storage tank of dimensions 4.5m² x 3.5m high.
- 7.43. Preliminary calculations indicate that some 13.1m³ of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 40% climate change event.
- 7.44. Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 The SuDS Manual. Runoff from roof areas is considered to be uncontaminated thus does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.
- 7.45. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.
- 7.46. This drainage strategy has been undertaken in accordance with the principles set out in NPPF. We can conclude that providing the development adheres to the conditions advised above, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

8. Appendix

A - Plans by Others:

- Location and Block Plan – Temple Ford Design Ltd;
- Existing Site Plans - Temple Ford Design Ltd;
- Proposed Development Plans – Temple Ford Design Ltd;
- Topographic Survey - Hampshire Land Surveys Ltd.

B – Local Authority Consultee Comment:

- Havant Borough Council Environmental Health Consultation Memorandum CONS/20/00446.

C – Drainage Plans:

- Asset Location Search - Southern Water.

D - MicroDrainage Calculations:

- ICP SUDS Rural Runoff Calculations;
- ICP SUDS Urban Runoff Calculations;
- Attenuation Storage Sizing and Discharge Calculations.

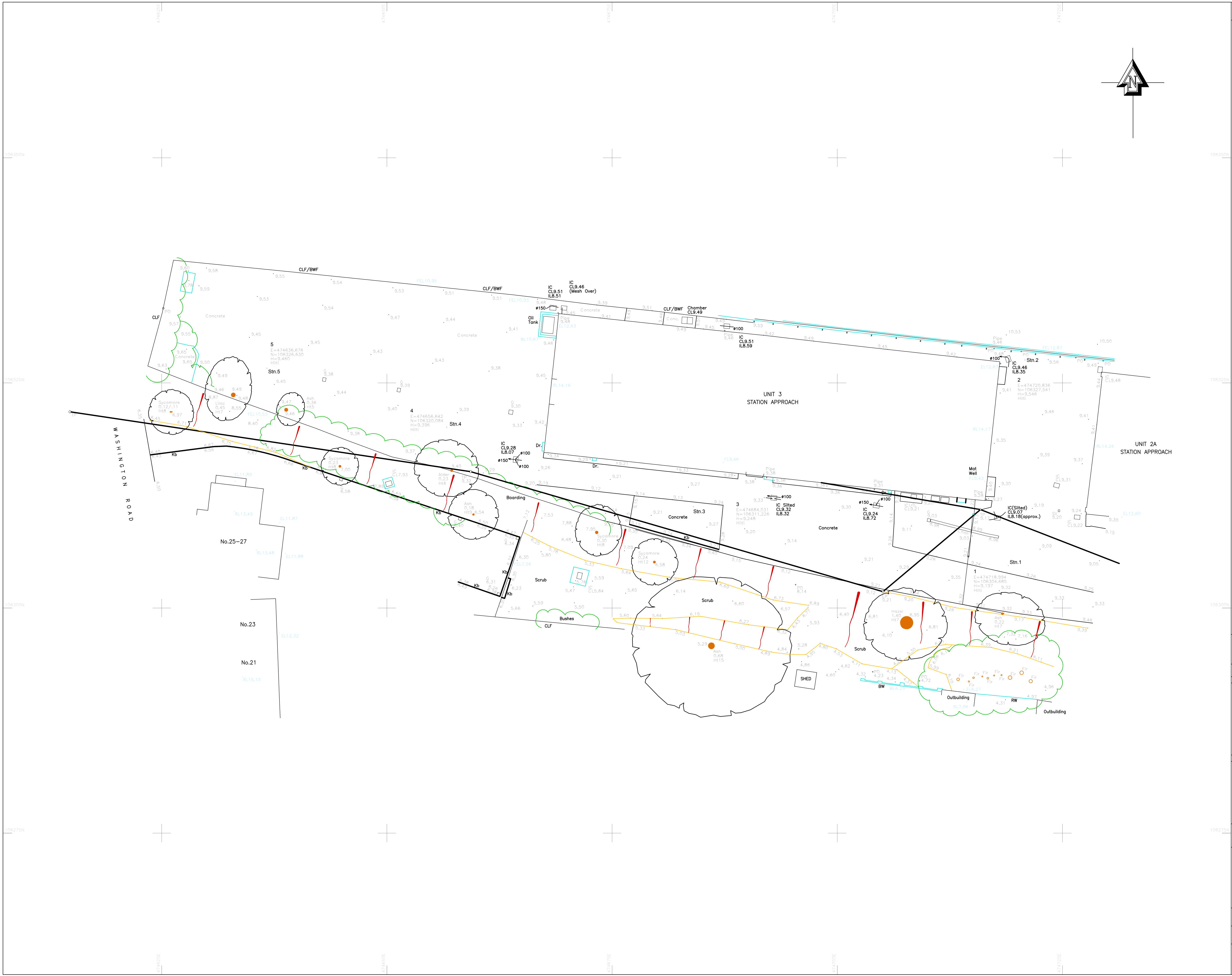
E - Plans:

- Proposed Drainage Layout – 1:250 Scale.

F – Reports by Others:

- Product 4 Information Request – Environment Agency;
- Intrusive Investigation Report – Soils Limited;
- Attenuation Tank Specification Sheet – EnduraTank.

Appendix A



NOTES

DO NOT SCALE FROM DRAWING
ALL DIMENSIONS TO BE CHECKED ON SITE

NOTES:

ALL MEASUREMENTS ARE TAKEN TO EXISTING
SURFACE FINISHES UNLESS STATED OTHERWISE

ALL HEIGHTS ARE IN M

ALL ARROWS POINT UP

ALL LEVELS IN METRES AND RELATE TO
GPS CONTROL (OD)

Legend

AV	Air Valve	L/Bin	Litter Bin
BEB	Bellish Beacon	LB	Lamp Post
BH	Borehole	LP	Lamp Post
BL	Bed Level	M/Bole	Multiple Bole
BO	Bollard	MB	Memorial
BS	Brick Setts	MS	Marker
BS	Bus Stop	MS	Milestone
CATV	Cable TV Cover	NB	Notice Board
CB	Control Box	OH	Overhead Cable
CCTV	Surveillance Camera	OB	Bench Mark
CH	Channel	Pav	Paving
CL	Cover Level	PI	Pillar
Cob	Cobbles	PM	Parking Meter
Col	Column	PO	Post
Conc	Concrete	PWL	Parapet Wall Level
Cul	Culvert	RE	Rodding Eye
Cyc	Cycle Rack	RG	Rough Ground
DA	Drop Away	RL	Ridge Level
DK	Drop Kerb	RTL	Road Line
DR	Drain	RN	Road Nail
DP	Down Pipe	RNG	Road Name Board
EL	Eave Level	RP	Reflector Post
ELC	Electricity IC	RS	Road Sign
EP	Electricity Pole	RWP	Rain Water Pipe
ER	Earth Rod	Sap	Sapling
FB	Flower Bed	Shr	Shrub
Fd	Foundations	SL	Sump Level
FEL	Fence Level	Spk	Spade
FH	Fire Hydrant	ST	Step
FL	Floor Level	STW	Stay Wire
FP	Flag Pole	SV	Stop Valve
FLT	Floodlights	TabP	Tactile Paving
FRL	Flat Roof Level	TGB	Telephone Call Box
G	Gully	THL	Threshold Level
Gh	Glass House	TIC	Telecom IC
GP	Gate Post	TK	Tank
GV	Gas Valve	Thm	Ticket Machine
HL	Hedge Level	TL	Traffic Light
HT	Height	Tm	Tarmac
IC	Inspection Cover	TP	Telegraph Pole
IL	Invert Level	Tr	Tree
IRV	Irrigation Valve	UTL	Unstable To Lift
JB	Junction Box	VP	Vent Pipe
Kb	Kerb	WL	Water Level
KO	Kerb Outlet	WLL	Wall Level
		WM	Water Meter
		Ø	Diameter

Boundary Descriptions

Fence Details

Barr	Barrier	IntLF	Interwoven
BWF	Barbed Wire	LLF	Larch Lap
CBF	Close Board	P	Post
CF	Concrete Fence	PCF	Post & Chain
CF	Corrugated Iron	PPF	Post & Rail
CLF	Chain Link	PWF	Post & Wire
CHF	Chestnut Paling	PWM	Post & Wire Mesh
IRF	Iron Rollings		

Wall Details

BFW	Brick and Flint Wall	OSBM	Ordnance Survey Bench Mark
BNW	Block Wall	TBM	Temporary Bench Mark
BW	Brick Wall		
CW	Concrete Wall		
FW	Flint Wall		
RM	Retaining Wall		
SLM	Sloping Masonry		
W	Wall		

All underground service information should be checked prior to any work taking place. The type, size and route of all drainage has been ascertained by visual inspection only. An error/warning must be contacted to verify tree species and descriptions if necessary.

DATE	REVISIONS

HAMPSHIRE LAND SURVEYS LTD

Land, Building and Engineering Surveys

THE LEVELS
18 SHETLAND RISE
WHITELEY
FARFHAM
HAMPSHIRE PO15 7JP

Tel. 01489 325871
Mobile 07721 423330
E-Mail hampsltd@aol.com
www.hsltd.co.uk

CLIENT

Raquet Sports Group
Unit 3
Station Approach
North Street
Emsworth
PO10 7PW

PROJECT No. HLS 2034

TITLE	Raquet Depot Emsworth Site Survey Existing	SCALE	1:200	DRAWN	KLB
DATE	SEPT 2018	CHECKED	DB		
DRG No.	2034_18_09_01	REV.	-		

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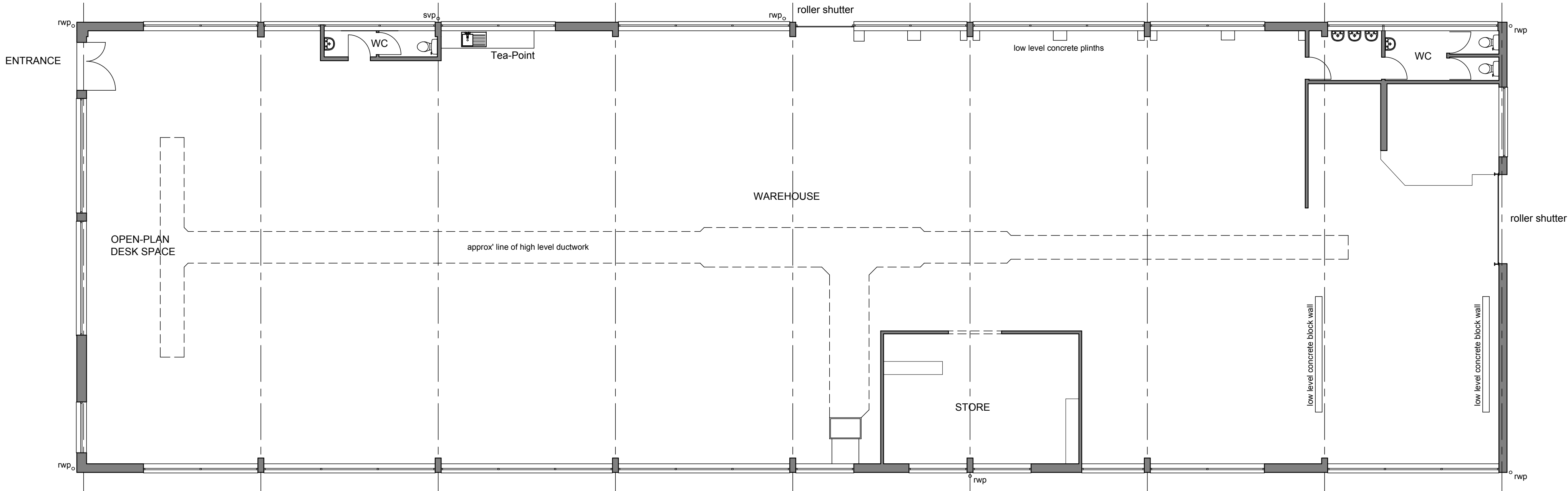
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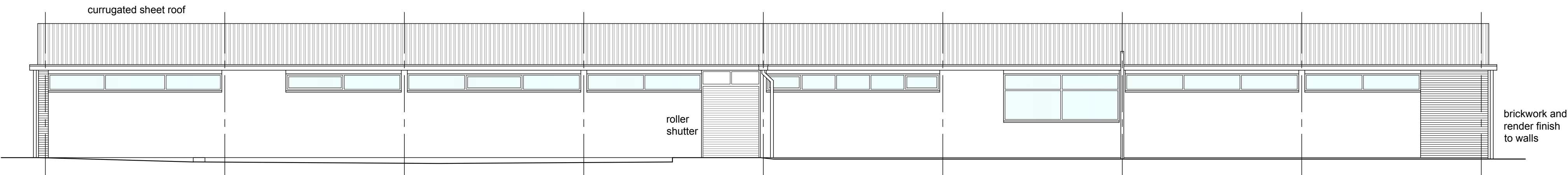
Floor Plan



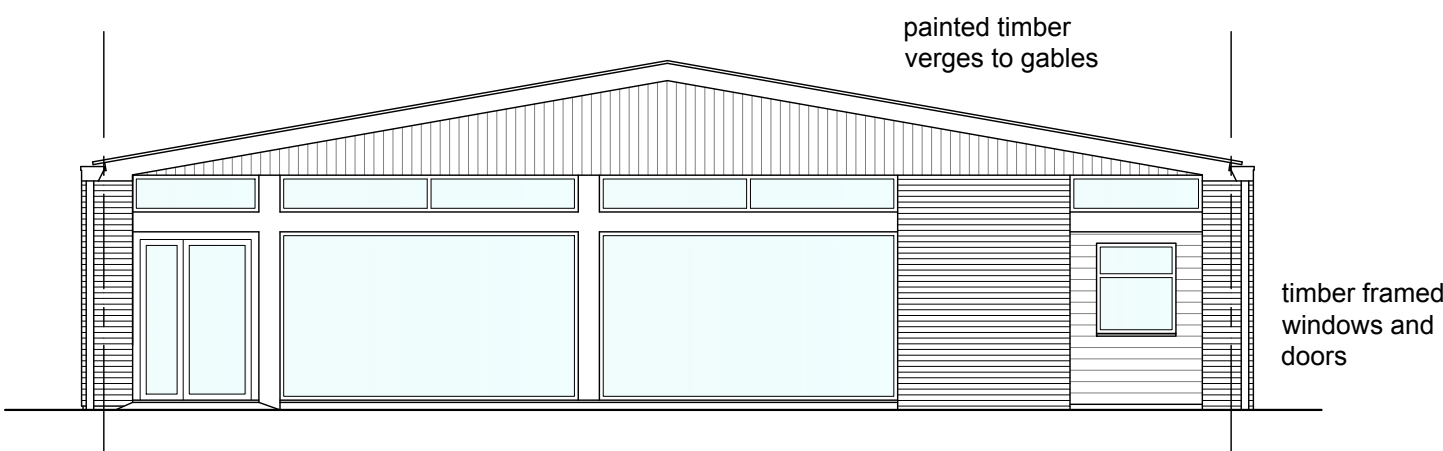
Site Location Plan 1:1250

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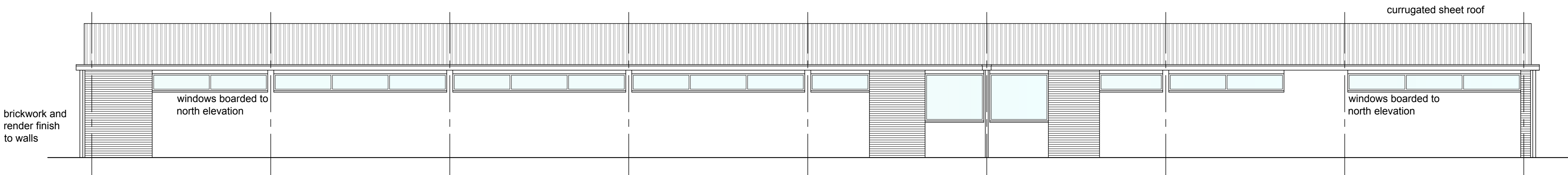
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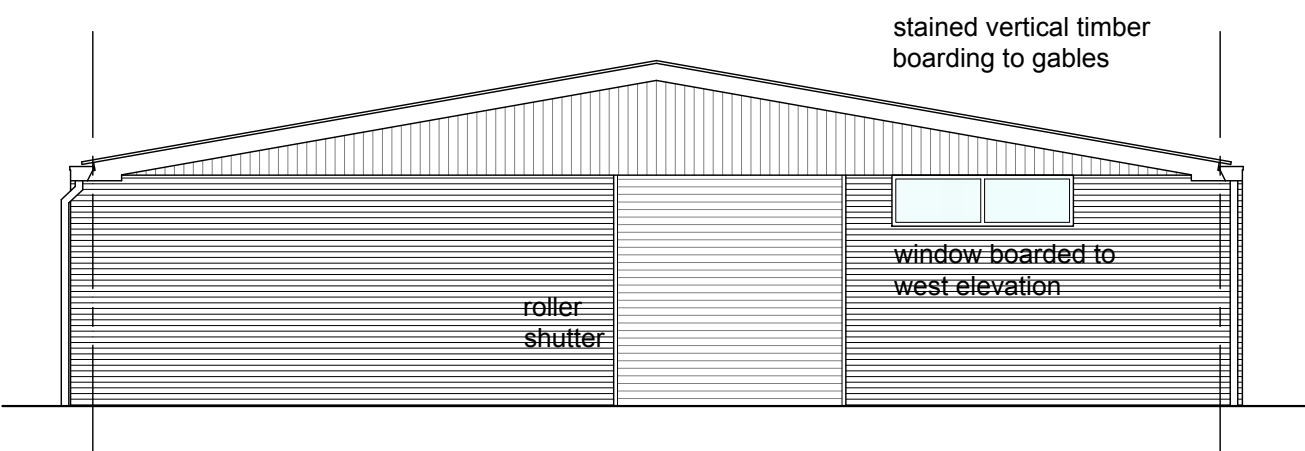
South Elevation



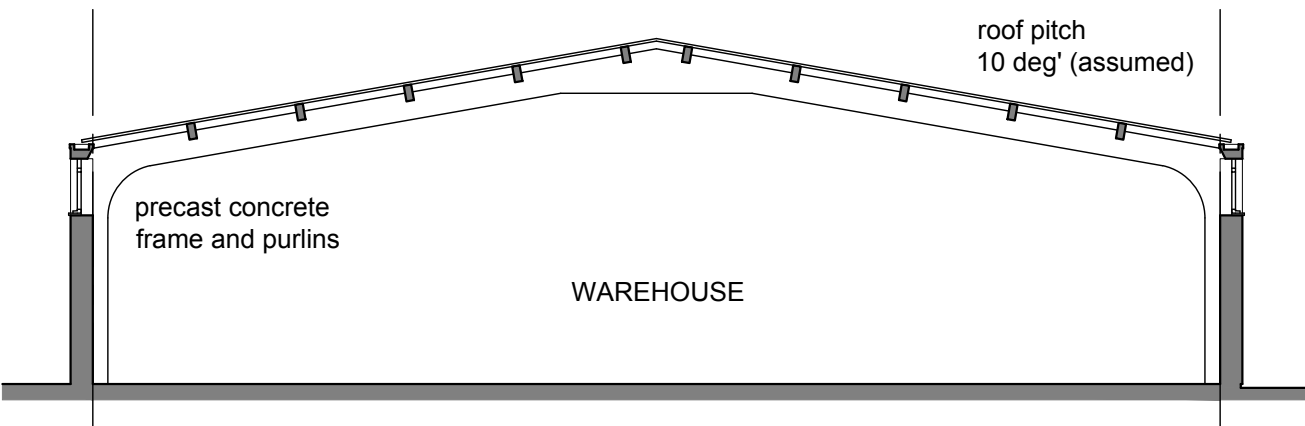
East Elevation



North Elevation



West Elevation



Cross Section

Scale 1/100 (in metres)

Notes
Report any discrepancies to the author.
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Full topographical site survey required.
Full survey of existing mechanical and electrical installations required.

Revision Notes:

Rev: Date: Description:

Date: Sept 2018

Scale @ A1: 1:100 / 1:1250

Status: Preliminary
Drawn: mp
Checked: dm

Project: Proposed Extension
The Racquet Depot, Emsworth

Drawing Title: Plans and Elevations
As Existing

Client: Racquet Sports Group

Project: 1727
Dwg No: 002
Rev:

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SITE LOCATION PLAN @ 1/1250

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Scale 1/1250 (in metres)



SITE BLOCK PLAN @ 1/500

Scale 1/500 (in metres)

Scale 1/100 (in metres)

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Revision Notes:		
Rev:	Date:	Description:

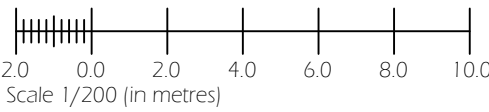
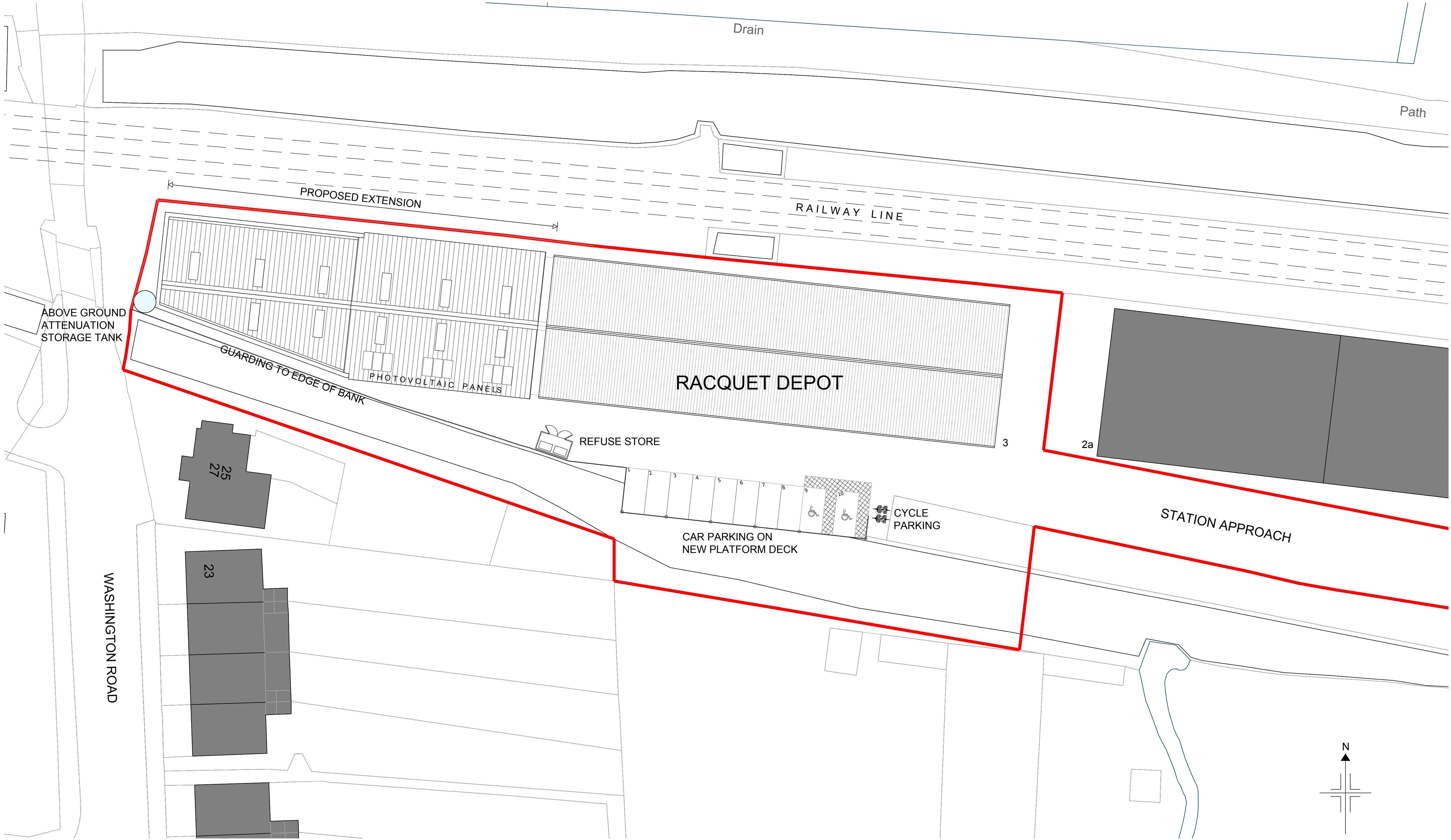
Date: July 2020		
Scale @ A1: 1:1250 / 1:500		
Status: Planning	Drawn: mp	Checked: dm

Project: Racquet Depot Extension Station Approach, Emsworth		
Drawing Title: Site Location & Block Plans As Existing		

Client: Raquet Sports Group		
Project: 1727	Dwg No: D20	Rev:

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Revision Notes:

Rev: Date: Description:

Date:
July 2020

Scale @ A1:
1:200

Status: Planning
Drawn: mp
Checked: dm

Project:
Racquet Depot Extension
Station Approach, Emsworth

Drawing Title:
Site Plan
As Proposed

Client:
Raquet Sports Group

Project:
1727

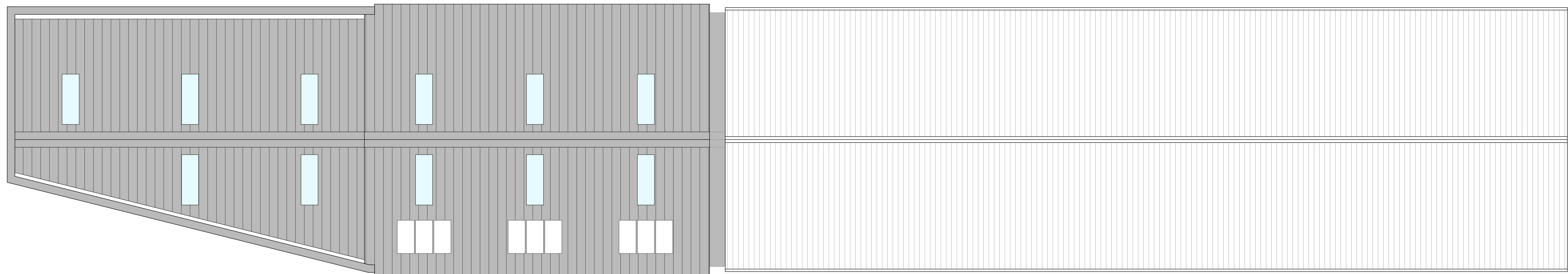
Dwg No:
D21

Rev:

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The architectural floor plan illustrates a building extension with two distinct roof types: a flat roof extension on the left and a pitched roof extension on the right. The plan is divided into several functional areas:

- Flat Roof Extension:** This section on the left contains a series of rectangular rooms, some of which are marked with dashed lines, indicating potential future use or structural elements. It includes a fire exit and a section labeled 'B'.
- Pitched Roof Extension:** This section on the right is more complex, featuring a 'STORE' room, a large 'WAREHOUSE' area, and an 'OPEN-PLAN DESK SPACE'. It also includes a 'Tea-Point' and a 'WC' (toilet) facility. A 'link' is shown connecting the two extensions, with a note stating: "The link is intended to provide separation between the existing and new buildings to avoid disturbing the existing asbestos roof." Another note specifies: "The finished height of the link is designed to finish below the timber clad section of the wall above the brackings to avoid disturbing the wall panels behind which contain asbestos." The link also includes a note: "Existing roller shutter and opening to be modified to accommodate a new link between the existing warehouse and the new extension."
- Structural and Safety Features:** The plan shows various structural elements such as 'low level concrete plinths', 'roller shutter', and 'approx. line of high level ductwork'. Safety features include multiple 'fire exit' locations and an 'ACCESSIBLE WC'.
- Orientation and Grid:** The plan is oriented with a north arrow pointing towards the top left. A grid of numbered circles (1-9) and lettered squares (A, B, C) is overlaid for reference.

Architectural elevation drawing of a proposed extension to an existing warehouse. The drawing shows a long, low building with a flat roof. The existing building is on the right, and the proposed extension is on the left. The extension features a new link between the existing warehouse and the new extension, a new fire exit, and trapezoidal insulated vertical metal cladding. The existing building has a corrugated sheet roof, micro-rib insulated wall cladding, and an existing roller shutter. The drawing includes labels for 'New fire exit', 'trapezoidal insulated vertical metal cladding', 'micro-rib insulated wall cladding', 'existing corrugated sheet roof', 'existing roller shutter', and 'brickwork and render finish to existing wall'. A scale bar at the bottom indicates the length of the extension.

EXTERNAL MATERIAL AND COLOURS	
BASELINE WALLS	MATERIALS TRIPODICAL INSULATED VERTICAL PANELS MONOCHROME INSULATED HORIZONTAL PANELS FACING BRICKWORK ROOF TRIPODICAL INSULATED ROOF PANELS WINDOWS & DOORS PAVED GLASS ALUMINIUM PRESSED METAL HANDMADE COCKES PPC ALUMENB
	COLOUR HEIK (GREY)* GOOSEWING GREY* RED (To match existing) GOOSEWING GREY* GOOSEWING GREY* ANTHRAKITE GREY GOOSEWING GREY

* The included paint colours are based on the Program 6.1, Faint edge

This diagram is a sectional elevation of the building facade. It shows the existing structure with a series of vertical lines representing the facade. A new fire exit is indicated by a red rectangular area. The fire exit is located between two existing windows. The diagram is labeled 'existing' on the right side and 'New fire exit' at the bottom right.

trapezoidal insulated roof cladding

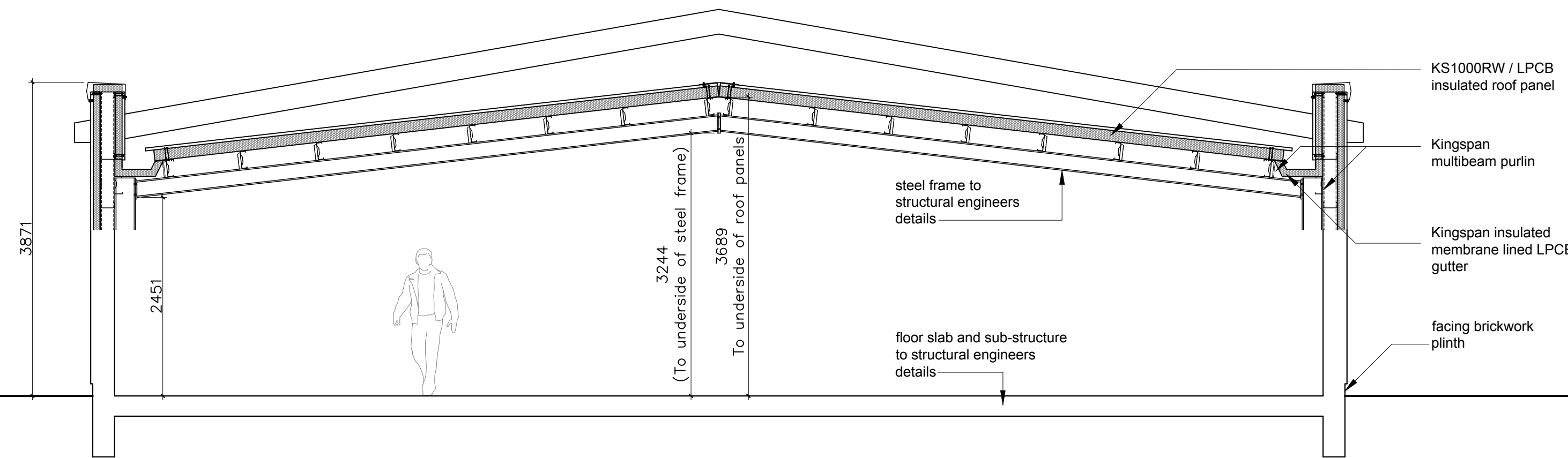
micro-rib insulated

Architectural elevation drawing of the North Elevation of a building. The drawing shows a long, low profile with a brickwork and render finish on the left side and micro-rib insulated wall cladding on the right. The roof is a flat, corrugated sheet roof. The drawing includes labels for 'existing windows boarded to north elevation', 'existing corrugated sheet roof', 'micro-rib insulated wall cladding', and 'PROPOSED EXTENSION'. A 'New fire exit' is indicated on the right side. The drawing is oriented horizontally, with the 'NORTH ELEVATION' label at the bottom left.

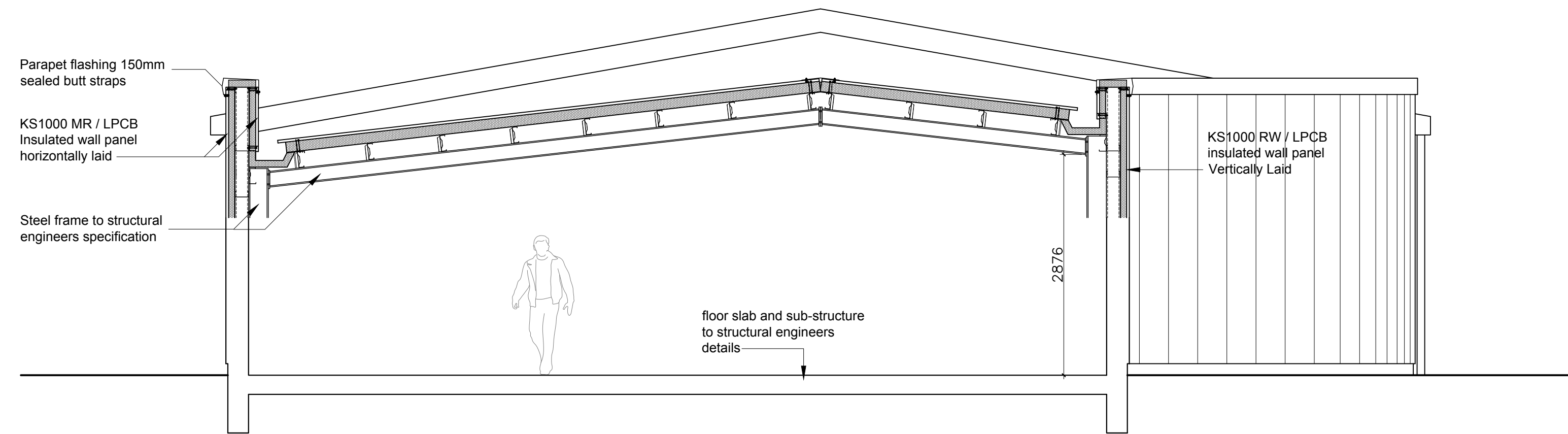
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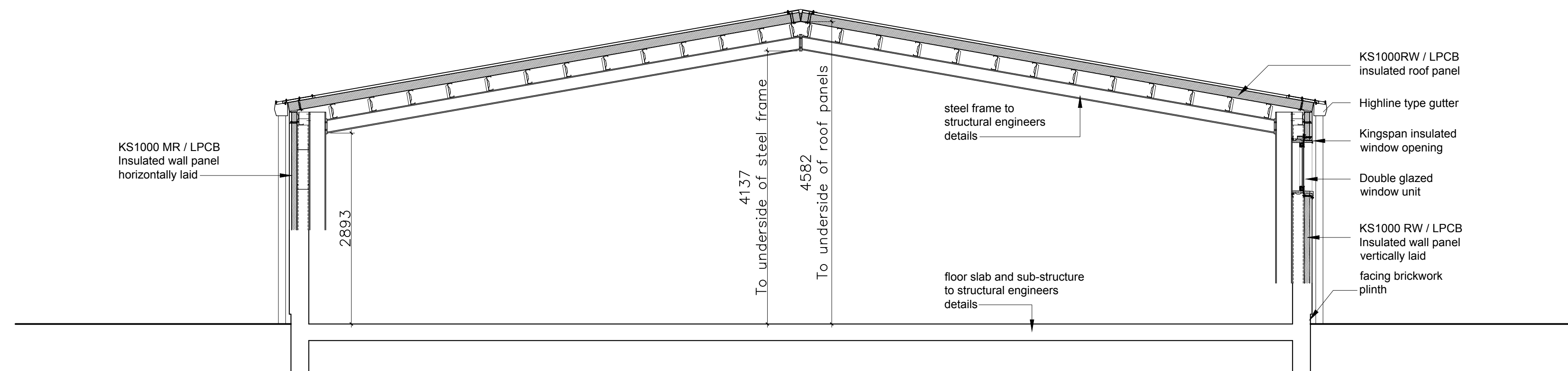
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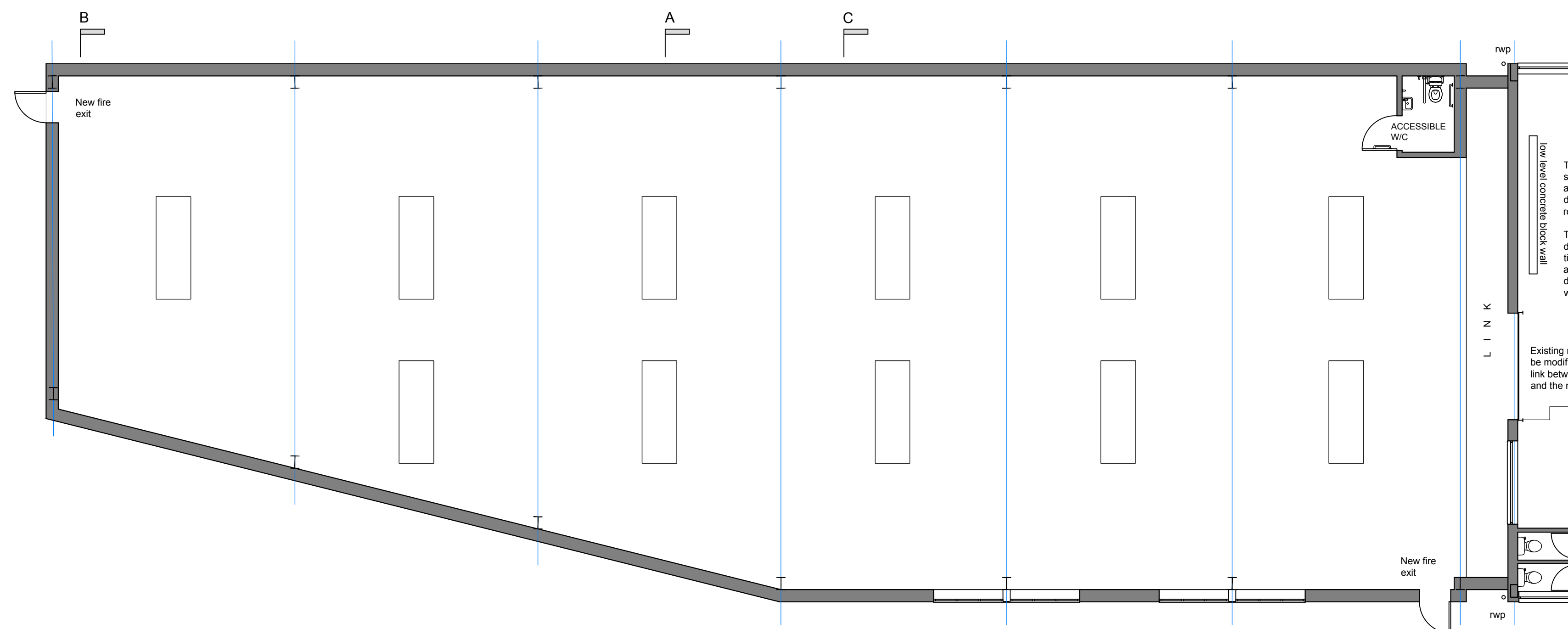
SECTION A - A



SECTION B - B



SECTION C - C



SECTION LOCATION PLAN

Scale 1/200 (in metres)

Notes
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Revision Notes:

Rev:	Date:	Description:

Date:

July 2020

Scale @ A1:

1:200

Status:

Planning

Drawn:

mp

Checked:

dm

Project:

Racquet Depot Extension
Station Approach, Emsworth

Drawing Title:

Building Sections
As Proposed

Client:

Racquet Sports Group

Project:

1727

Dwg No:

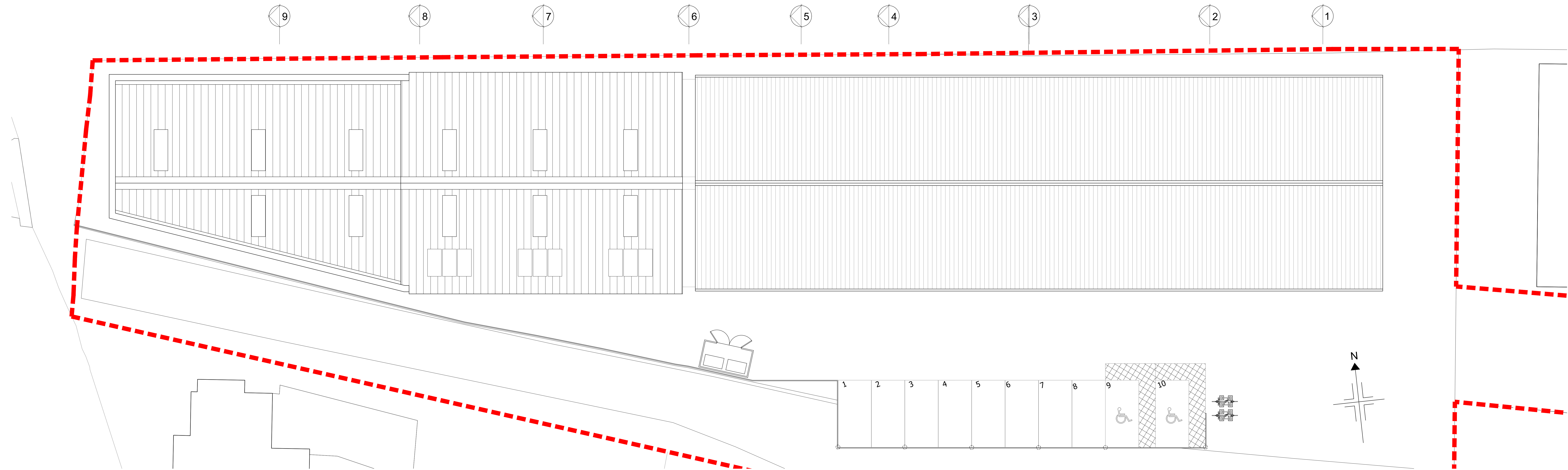
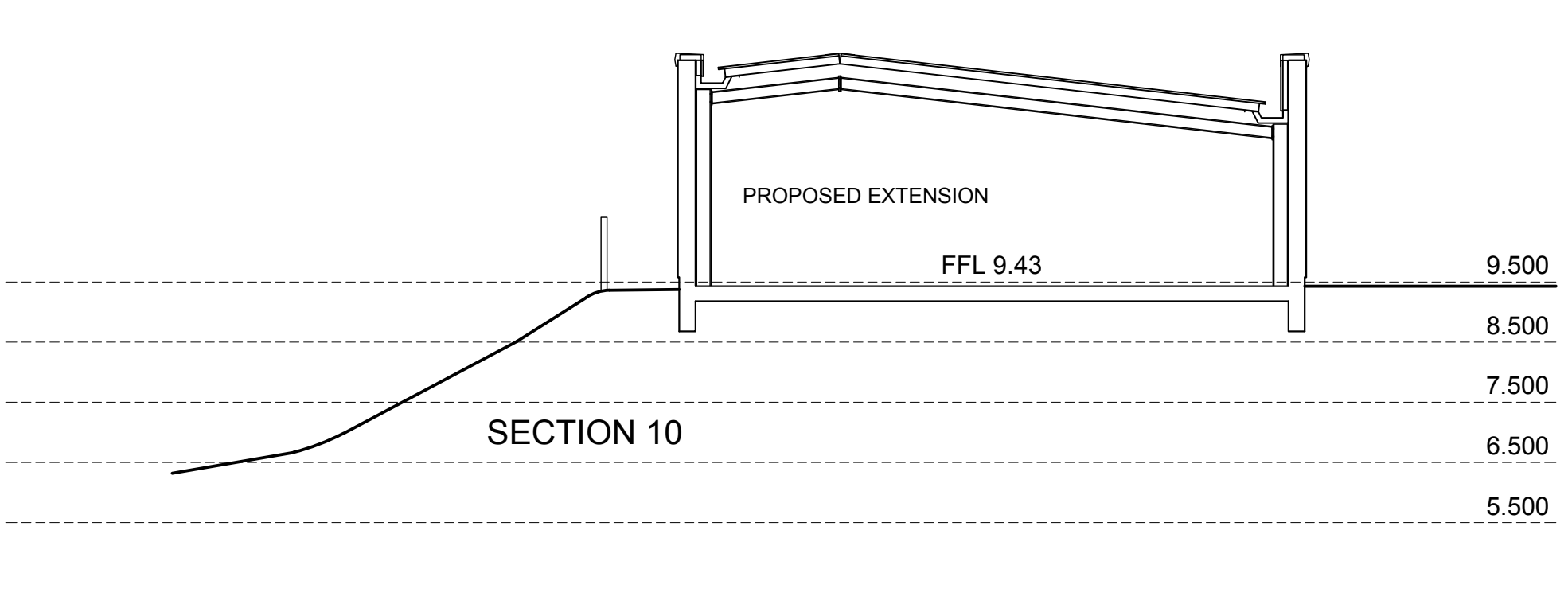
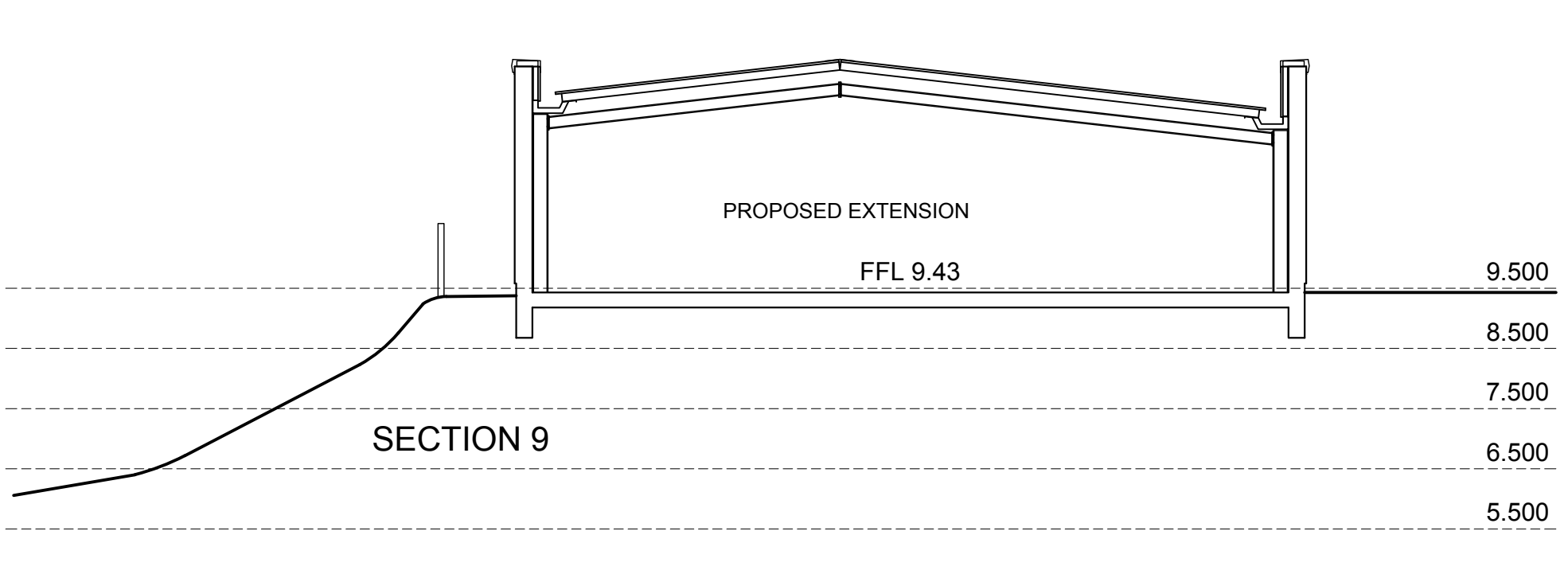
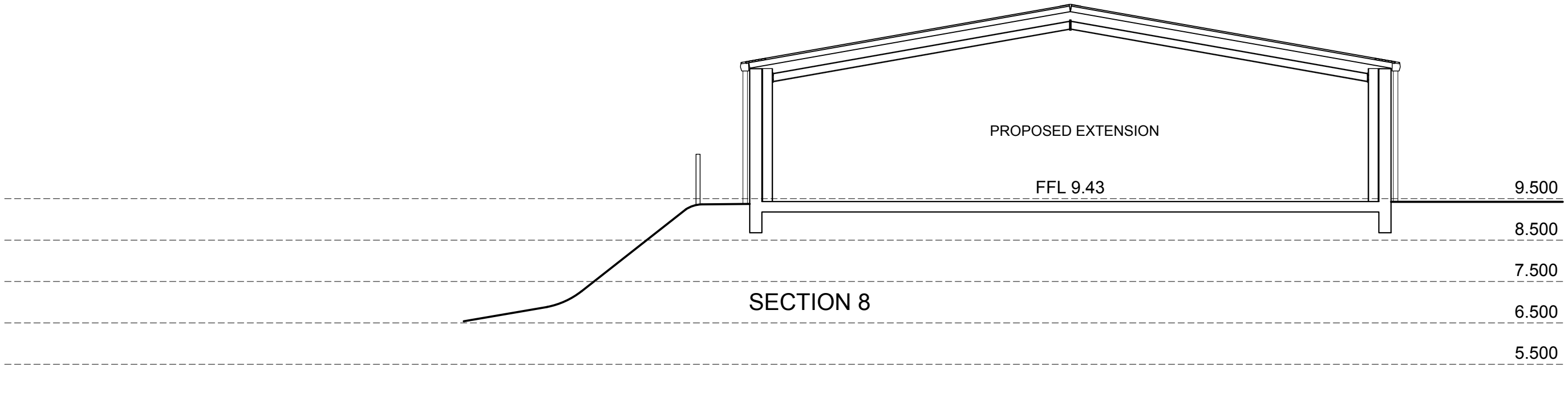
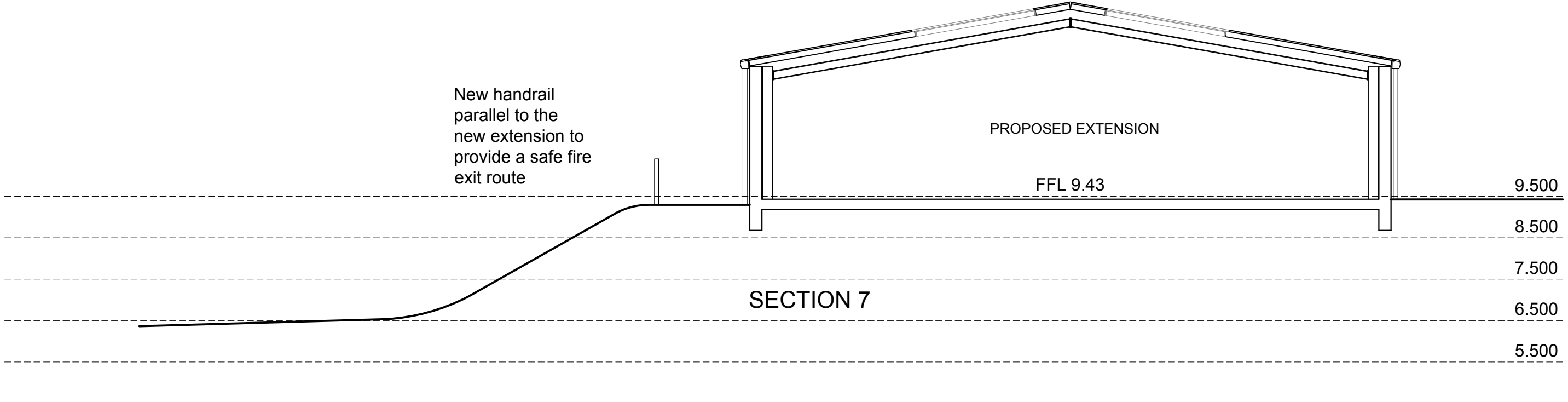
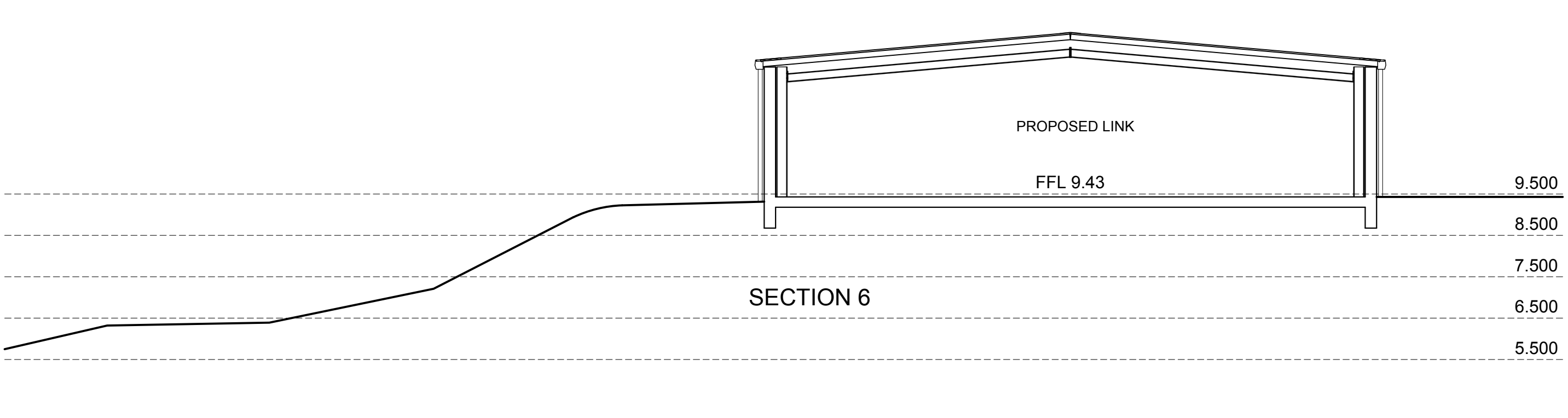
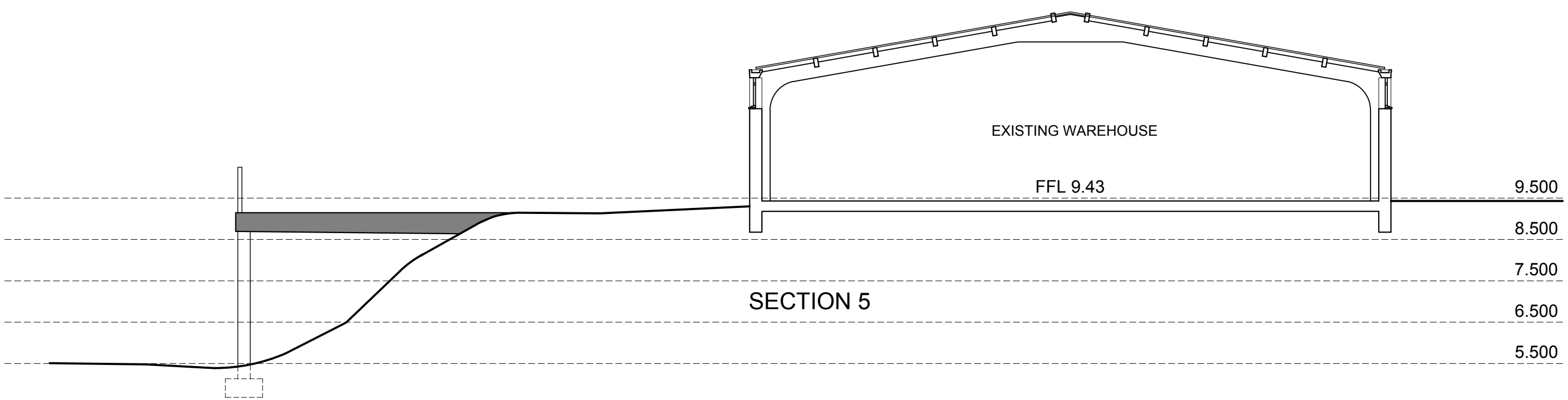
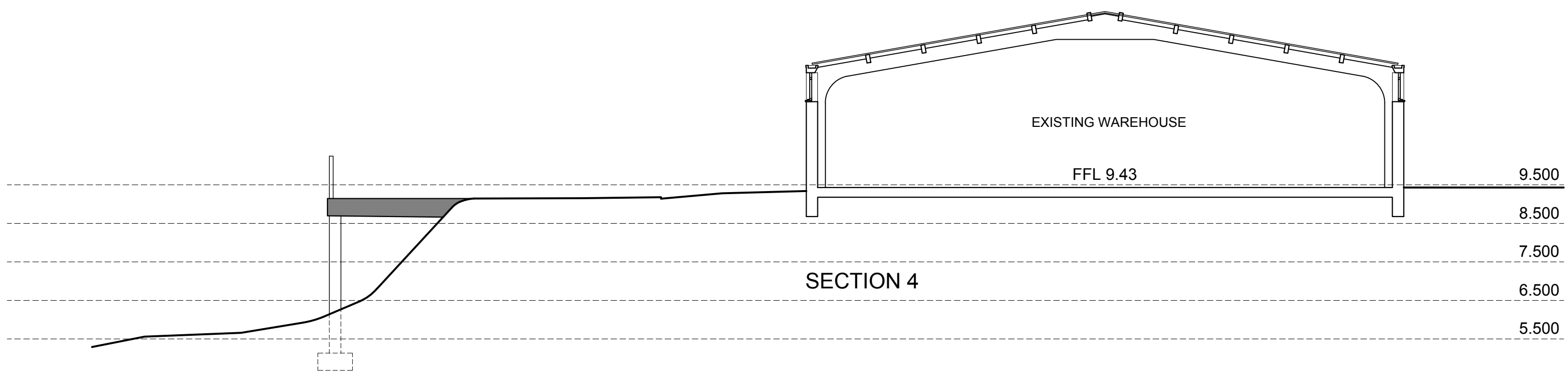
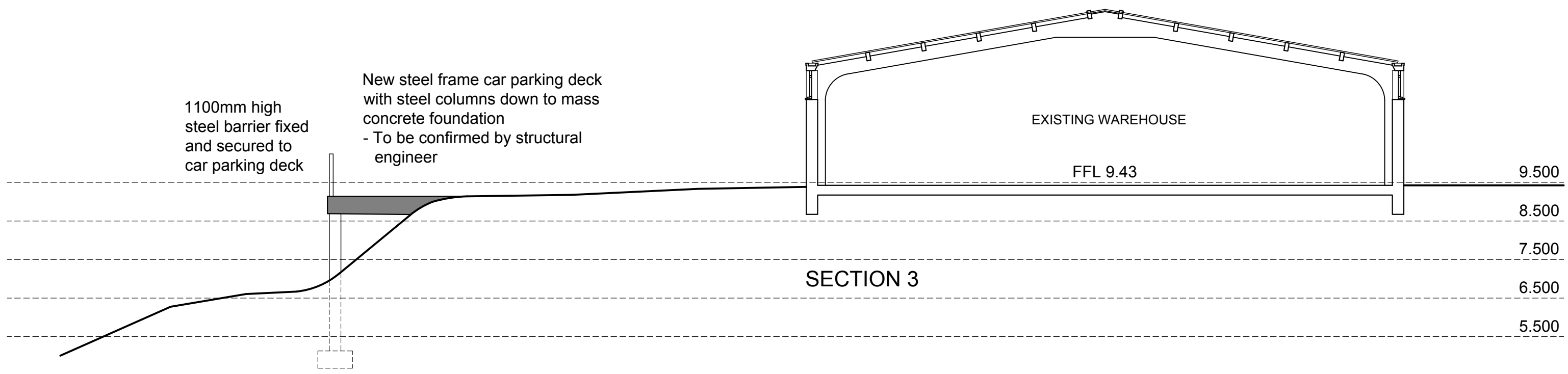
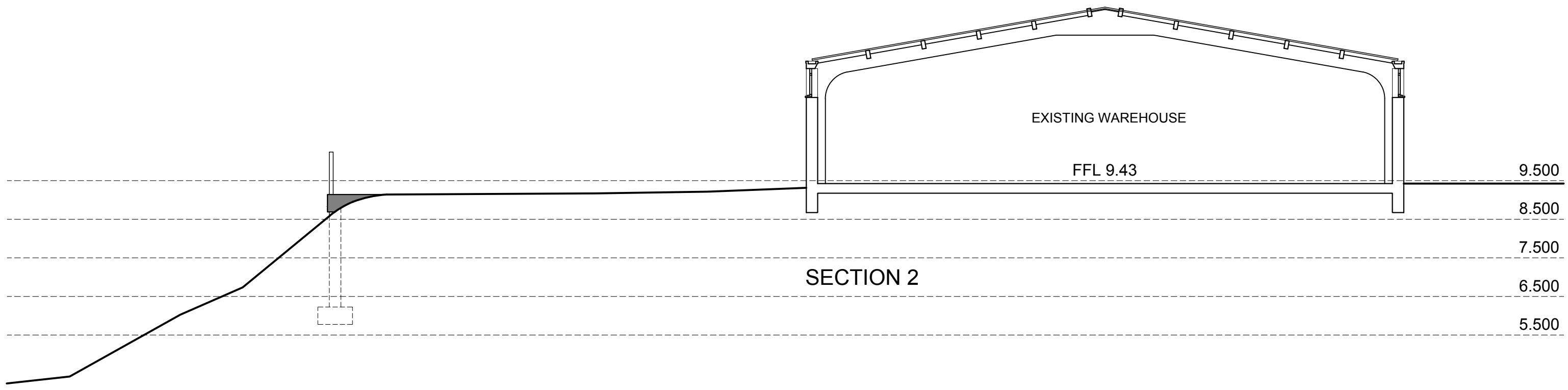
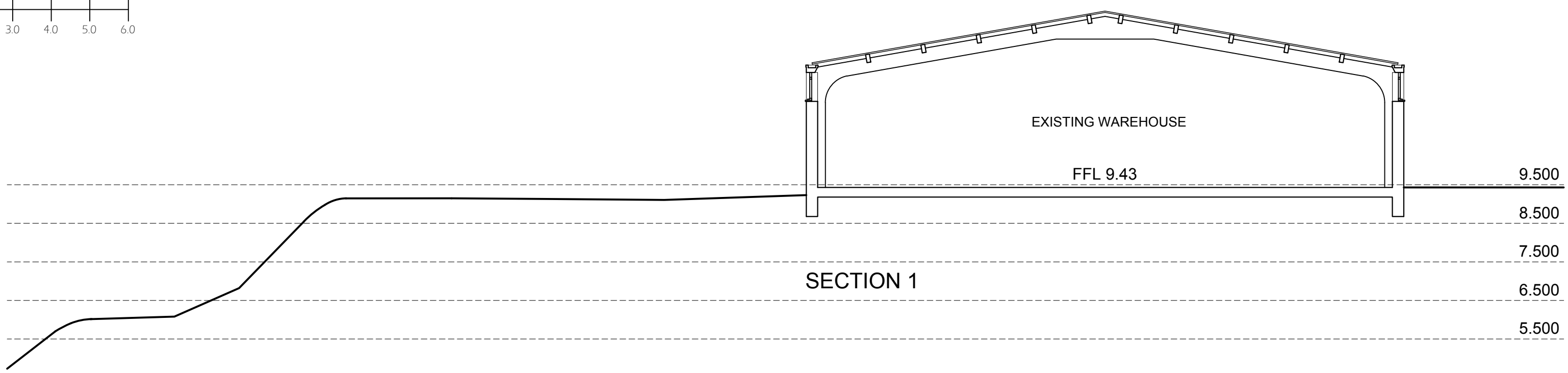
D23

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SECTION LOCATION PLAN

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Revision Notes:		
Rev:	Date:	Description:

Date:	July 2020	
Scale @ A0:	1:100	
Status:	Drawn:	Checked:
Planning	mp	dm

Project:	Racquet Depot Extension Station Approach, Emsworth	
Drawing Title:	Site Sections As Proposed	

Client:	Racquet Sports Group	
Project:	Dwg No:	Rev:
1727	D24	

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Appendix B

HAVANT BOROUGH COUNCIL

Town & Country Planning Act 1990

Consultation on Planning Application

MEMORANDUM

From:	Environmental Health	To:	Development Control
Our Ref:	CONS/20/00446	Your Ref:	APP/20/00061
EH Case Officer Extn:	44 6677	Date:	02 April 2020
DC Case Officer:	Daphney Haywood		
DC Case Officer Extn:	44 6513		
Application Number:	APP/20/00061		
Site Address:	Unit 3, Station Approach, North Street, Emsworth, PO10 7PW		
Proposed Development:	Proposed two storey extension to warehouse and parking platform.		

Observations / Comments:

I have reviewed the application supporting information, alongside comments from key consultees, and the public.

I note the deficiencies in the level of detail included in the application that have been highlighted by other consultees/respondents. I will refer to these only where relevant to my review.

Flood Risk / SuDS (Pollution)

The LLFA comments / recommendations adequately cover the need for further detail in respect of pollution control.

I am unclear why the Environment Agency has chosen to 'no adverse comment' this application following review of the FRA. I would tend toward the view of the LLFA.

The LLFA refers to the SuDS disposal hierarchy, and in this respect I would point out that the contamination conceptual site model would weigh substantially against the use of infiltration drainage at this site for surface water disposal. Environmental Health is likely to object to an infiltration strategy in the absence of significantly more robust site investigation information to support (i.e. indicating that it is appropriate to determine an acceptably low risk to off-site receptors).

Transport Assessment ('TA') / Impact (Air Quality)

It is noted that public consultees have raised concerns about the intensified use of Sultan Road contributing to local pollution. I also note that Network rail has material concerns which would be better characterised as 'highway capacity' concerns relating to the impact on access to railway land / assets.

I have reviewed the submitted transport assessment, and would broadly agree that the development land is 'highly accessible', with generally good pedestrian & cycle links, and excellent proximity to public transport (rail and bus).

Section 2.7 of the TA refers to 'Pedestrian footways within Sultan Road'. I note that this is only true as far as the pedestrian platform access, and beyond here access is via shared surface serving pedestrians, cyclists, private motor cars & HGV's. A significant intensification in the expected number of pedestrian trips might warrant some consideration of pedestrian safety, at least within the red-line area.

Section 3 addresses the traffic impact of the development, with figure 6 indicating a very low number of movements which is expected to be entirely unchanged by the proposed development.

I am unclear on how a development of this scale is expected to lead to a net-zero increase in transport demand and could remain economically justifiable. The origin of the existing figures is unclear, as is the expected trip demand (e.g. no TRICS estimates presented, no specific indication of staffing levels, etc.). It is similarly unclear whether the values are intended to represent 1-way or 2-way trips - one way is assumed given the odd numbers, the text comment describing the tidal nature of staff transport trips, and the notice on gates indicating evening closure for security purposes.

The provision for parking for private motor vehicles is equal to the total daily trips expected (including the HGV trips), which would seem like an over provision given the unusual construction details needed to achieve those spaces.

As a result, I have low confidence in the numbers presented, but (unless they are wildly misleading-) they are nevertheless indicative of a relatively low transport demand. It is considered that the net increase in transport demand represented by the proposed development will be negligible with respect to emissions / local air quality. I would expect however that the submitted TA is unlikely to satisfy network rail in its present form.

I would also highlight that the tracked HGV turning movement shown in the TA does not appear to be feasible - see the cross section drawing for the probable manoeuvre, which relies upon land not within the red-line for the development. I am unclear as to whether this is permissible in planning terms (or not) - it is not material to pollution / emissions / air quality - this comment is intended as an observation only.

Air Quality - Mitigation of Emissions associated with new development

The inclusion of a solar PV installation at roof level is supported for the same reasons as given in the consultation response under APP/19/00253. Comments regarding heating & cooling equipment given under that application are equally relevant to these proposals.

Ground Investigation (Contaminated Land)

The main investigation report follows a preliminary assessment (also dated December 2019), not reviewed by Environmental Health. Comments here relate only to the 17974/MIR_R27 report.

The report documents a significant thickness of made soils at the site, as expected, to an inferred maximum depth of 5.2m below ground level. Made soil overlies low-permeability, cohesive (clayey) Head deposits, and stiff London Clay at depth.

Logs indicate black staining, bitumen & tar gravel, frequent ash & clinker, metalliferous slag, construction & demolition wastes ceramic wastes from other sources. Asbestos screen returned negative results for all samples, but its presence should be anticipated given the character of described soils and the likely date of their deposit. (1934-1953)

I would agree the conclusions from soil-gas monitoring, there are no 'red flags' in the monitoring results, and the soil description does not suggest that methanogenic / putrescible material is particularly common within the body of made soil. The elevated CO₂ (<3% v/v) is likely due to decomposition of low levels of organic material, or biological degradation of petroleum hydrocarbons. No mitigation of soil gas risk is considered to be necessary.

I view the soils results less favourably. The report indicates that results have been compared to a Commercial landuse scenario generic assessment criteria (GAC). Setting aside for the moment whether this is the most appropriate screening value, the max recorded concentration of B(a)P exceeds the commercial GAC, and the maximum recorded concentration of D(a,h)A is >90% it's respective commercial GAC. Several domestic GAC are exceeded, alongside a number of the public open space GAC.

There is no particular reason to expect that the maximum concentrations recorded as part of this investigation are likely to correspond to the maximum concentrations present at the site.

This is relevant both to the provision of potable water supply to the proposed building (where barrier pipe is likely to be required), and also with respect to off-site contamination sensitive receptors.

With reference to the levels differential indicated in the FRA, the inferred base of Made Soils is broadly coincident with the base of the topographic slope. Made soils are contamination-impacted, and overlie head deposits that are likely to act sufficiently as an aquitard to facilitate down-topographic-slope migration of contaminants, with deposition / accumulation in soils at the base of the slope. The down-slope landuse would appear to be residential, where commercial GAC would be inappropriate. This is arguably the most significant potential pollutant linkage, and the submitted report has not addressed this risk either through consideration of leaching of contaminants from made soils, or through chemical analysis of groundwater samples.

The proposed development could in principle prejudice the remediation of the site, should this be deemed necessary, and so I would recommend that the risk to contamination-sensitive off-site receptors is considered. The most expedient way to consider this risk would be to quantify the concentration of contaminants in groundwater - this would represent liberation rates under real-world / on-site conditions, and give a good steer on the likely degree of mobility of the contaminants identified. It is understood that wells remain available on site, so no additional intrusive work should be necessary in the first instance. Further fieldwork would only be necessary upon return of concerning results from groundwater monitoring

It is understood that the application is to be withdrawn, and comments were sought to inform a re-submission. I have not therefore provided any specific recommendation in respect of determining this application - it is assumed that no determination is to be made.

Mr. Jonathan Driver
Environmental Control Officer

Appendix C

Appendix D

Unda Consulting Ltd		Page 1
Southpoint Old Brighton Road Gatwick RH11 0PR	Greenfield Runoff Rate Warehouse Extension 89530-040320-TFD-StationApprch	
Date 15/06/2020 File	Designed by TS Checked by EJ	
Innovyze	Source Control 2020.1	
ICP SUDS Mean Annual Flood Input Return Period (years)100 Area (ha)0.422 SAAR (mm)739 Soil0.300 Urban0.000 Region NumberRegion 7 Results1/s QBAR Rural0.8 QBAR Urban0.8 Q100 years2.6 Q1 year0.7 Q30 years1.9 Q100 years2.6		
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Unda Consulting Ltd		Page 1																								
Southpoint Old Brighton Road Gatwick RH11 0PR	Brownfield Runoff Rate Warehouse Extension 89530-040320-TFD-StationApprch																									
Date 15/06/2020 File	Designed by TS Checked by EJ																									
Innovyze Source Control 2020.1																										
<u>ICP SUDS Mean Annual Flood</u> Input <table><tr><td>Return Period (years)</td><td>100</td><td>Soil</td><td>0.300</td></tr><tr><td>Area (ha)</td><td>0.422</td><td>Urban</td><td>0.750</td></tr><tr><td>SAAR (mm)</td><td>739</td><td>Region Number</td><td>Region 7</td></tr></table> Results 1/s <table><tr><td>QBAR Rural</td><td>0.8</td></tr><tr><td>QBAR Urban</td><td>2.6</td></tr><tr><td>Q100 years</td><td>5.2</td></tr><tr><td>Q1 year</td><td>2.2</td></tr><tr><td>Q30 years</td><td>4.5</td></tr><tr><td>Q100 years</td><td>5.2</td></tr></table>			Return Period (years)	100	Soil	0.300	Area (ha)	0.422	Urban	0.750	SAAR (mm)	739	Region Number	Region 7	QBAR Rural	0.8	QBAR Urban	2.6	Q100 years	5.2	Q1 year	2.2	Q30 years	4.5	Q100 years	5.2
Return Period (years)	100	Soil	0.300																							
Area (ha)	0.422	Urban	0.750																							
SAAR (mm)	739	Region Number	Region 7																							
QBAR Rural	0.8																									
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Q100 years	5.2																									
Q1 year	2.2																									
Q30 years	4.5																									
Q100 years	5.2																									
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Southpoint Old Brighton Road Gatwick RH11 0PR		Above Ground Attenuation Storage Tank Sizing 89530-TFD-StationApprch			
Date 19/06/2020 File Final Tank Sizing.SRCX		Designed by TS Checked by EJ			
Innovyze		Source Control 2020.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	7.864	1.364	0.4	6.1	O K
30 min Summer	8.289	1.789	0.5	8.0	O K
60 min Summer	8.687	2.187	0.5	9.8	O K
120 min Summer	8.969	2.469	0.6	11.1	O K
180 min Summer	9.035	2.535	0.6	11.4	O K
240 min Summer	9.047	2.547	0.6	11.5	O K
360 min Summer	9.030	2.530	0.6	11.4	O K
480 min Summer	8.980	2.480	0.6	11.2	O K
600 min Summer	8.914	2.414	0.5	10.9	O K
720 min Summer	8.840	2.340	0.5	10.5	O K
960 min Summer	8.690	2.190	0.5	9.9	O K
1440 min Summer	8.414	1.914	0.5	8.6	O K
2160 min Summer	8.083	1.583	0.4	7.1	O K
2880 min Summer	7.831	1.331	0.4	6.0	O K
4320 min Summer	7.481	0.981	0.3	4.4	O K
5760 min Summer	7.253	0.753	0.3	3.4	O K
7200 min Summer	7.097	0.597	0.3	2.7	O K
8640 min Summer	6.987	0.487	0.2	2.2	O K
10080 min Summer	6.904	0.404	0.2	1.8	O K
15 min Winter	8.033	1.533	0.4	6.9	O K
30 min Winter	8.514	2.014	0.5	9.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	126.795	0.0	6.4	18	
30 min Summer	85.223	0.0	8.6	33	
60 min Summer	54.663	0.0	11.1	62	
120 min Summer	33.842	0.0	13.7	120	
180 min Summer	25.180	0.0	15.3	156	
240 min Summer	20.266	0.0	16.4	188	
360 min Summer	14.905	0.0	18.1	254	
480 min Summer	11.976	0.0	19.4	322	
600 min Summer	10.097	0.0	20.4	392	
720 min Summer	8.779	0.0	21.3	460	
960 min Summer	7.033	0.0	22.8	596	
1440 min Summer	5.136	0.0	25.0	864	
2160 min Summer	3.742	0.0	27.3	1236	
2880 min Summer	2.985	0.0	29.0	1612	
4320 min Summer	2.167	0.0	31.6	2336	
5760 min Summer	1.725	0.0	33.5	3056	
7200 min Summer	1.444	0.0	35.1	3752	
8640 min Summer	1.250	0.0	36.4	4496	
10080 min Summer	1.106	0.0	37.6	5240	
15 min Winter	126.795	0.0	7.2	18	
30 min Winter	85.223	0.0	9.7	32	
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Southpoint Old Brighton Road Gatwick RH11 0PR		Above Ground Attenuation Storage Tank Sizing 89530-TFD-StationApprch			
Date 19/06/2020 File Final Tank Sizing.SRCX		Designed by TS Checked by EJ			
Innovyze		Source Control 2020.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	8.969	2.469	0.6	11.1	O K
120 min Winter	9.314	2.814	0.6	12.7	O K
180 min Winter	9.400	2.900	0.6	13.1	O K
240 min Winter	9.396	2.896	0.6	13.0	O K
360 min Winter	9.360	2.860	0.6	12.9	O K
480 min Winter	9.276	2.776	0.6	12.5	O K
600 min Winter	9.171	2.671	0.6	12.0	O K
720 min Winter	9.058	2.558	0.6	11.5	O K
960 min Winter	8.833	2.333	0.5	10.5	O K
1440 min Winter	8.436	1.936	0.5	8.7	O K
2160 min Winter	7.986	1.486	0.4	6.7	O K
2880 min Winter	7.668	1.168	0.4	5.3	O K
4320 min Winter	7.266	0.766	0.3	3.4	O K
5760 min Winter	7.039	0.539	0.3	2.4	O K
7200 min Winter	6.899	0.399	0.2	1.8	O K
8640 min Winter	6.810	0.310	0.2	1.4	O K
10080 min Winter	6.748	0.248	0.2	1.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	54.663	0.0	12.4	60	
120 min Winter	33.842	0.0	15.4	118	
180 min Winter	25.180	0.0	17.1	170	
240 min Winter	20.266	0.0	18.4	196	
360 min Winter	14.905	0.0	20.3	272	
480 min Winter	11.976	0.0	21.7	348	
600 min Winter	10.097	0.0	22.9	422	
720 min Winter	8.779	0.0	23.9	498	
960 min Winter	7.033	0.0	25.5	638	
1440 min Winter	5.136	0.0	28.0	910	
2160 min Winter	3.742	0.0	30.6	1300	
2880 min Winter	2.985	0.0	32.5	1672	
4320 min Winter	2.167	0.0	35.4	2380	
5760 min Winter	1.725	0.0	37.5	3112	
7200 min Winter	1.444	0.0	39.3	3816	
8640 min Winter	1.250	0.0	40.8	4496	
10080 min Winter	1.106	0.0	42.2	5240	
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Unda Consulting Ltd		Page 3
Southpoint Old Brighton Road Gatwick RH11 0PR	Above Ground Attenuation Storage Tank Sizing 89530-TFD-StationApprch	
Date 19/06/2020 File Final Tank Sizing.SRCX	Designed by TS Checked by EJ	
Innovyze Source Control 2020.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.300	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.027

Time (mins)	Area
From:	To: (ha)
0	4 0.027

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Unda Consulting Ltd		Page 4
Southpoint Old Brighton Road Gatwick RH11 0PR	Above Ground Attenuation Storage Tank Sizing 89530-TFD-StationApprch	
Date 19/06/2020 File Final Tank Sizing.SRCX	Designed by TS Checked by EJ	
Innovyze Source Control 2020.1		

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 6.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4.5	3.500	4.5

Orifice Outflow Control

Diameter (m) 0.013 Discharge Coefficient 0.600 Invert Level (m) 6.500

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Appendix E

Key

- Red Outline Site Boundary
- Existing Warehouse Roof Area
- Proposed Roof Area - Draining to SuDS
- Proposed Roof Area - Direct to Sewer
- Above Ground Attenuation Storage
- Existing Private Sewer Pipework
- Existing Private Sewer Manholes
- Proposed Surface Water Pipework
- Proposed Inspection Chamber
- Design Exceedance Route

Notes:

- Offset of increase in surface water runoff via above ground cellular storage tank.
- Preliminary calculations indicate that sufficient storage required to attenuate roof runoff from the western half of the extension (271m²), arising during the critical 1:100 year + 40% climate change event, can be provided within an above ground storage tank of dimensions 4.5m² x 3.5m high.
- All levels are in metres above ordnance datum

Client:

Racquet Sports Group

Site Address:

Racquet Depot,
Station Approach,
Emsworth
PO10 7PW

Job Reference:

89530-TFD-StationApprch

Date:

19-Jun-20

Drawing Number:

89530-01

Revision:

v1.0

Designed by:

TS

Drawn by:

TS

Checked by:

EB

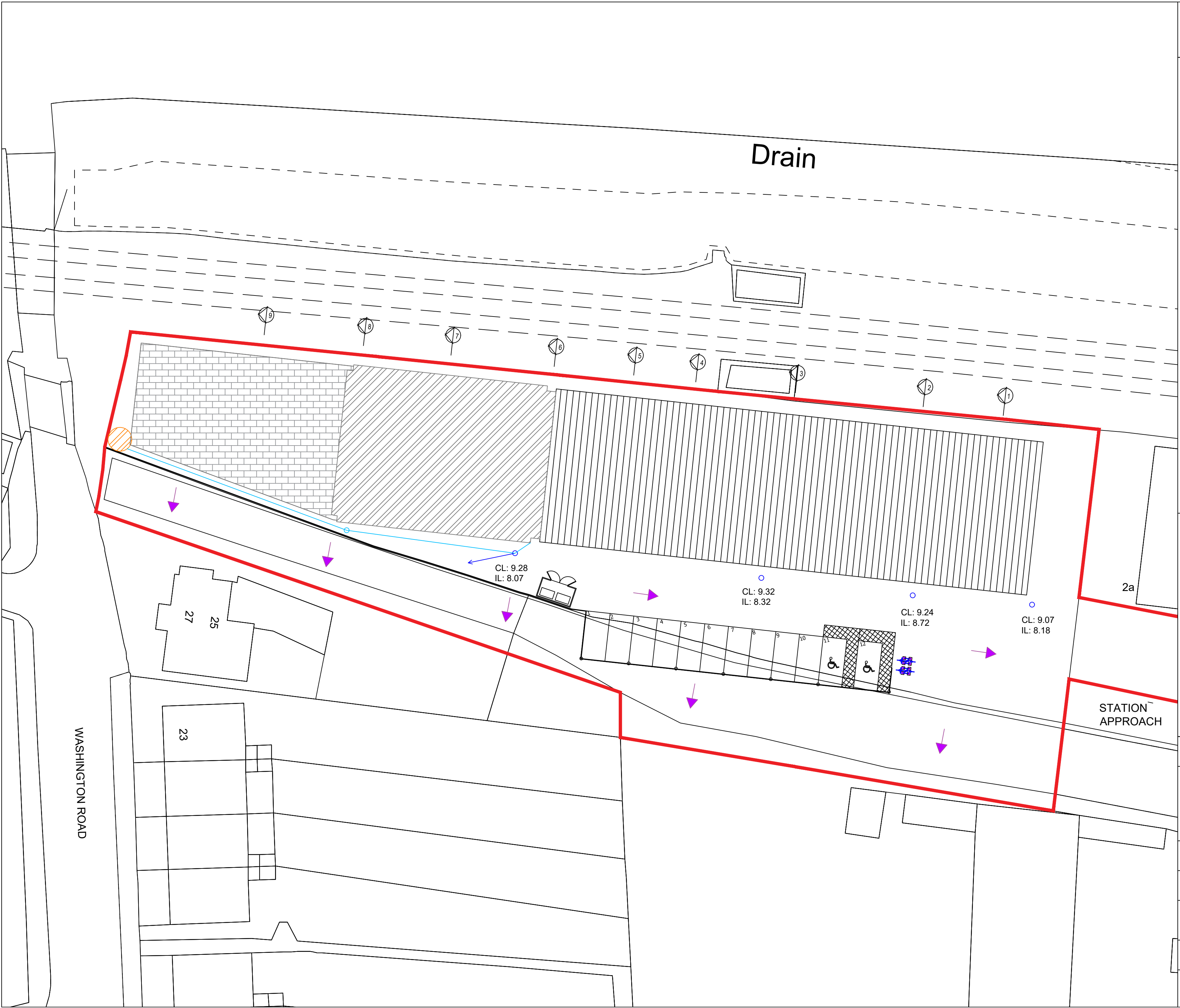
Scale:

1:250@A2

Disclaimer:

The drawings provided are
for planning purposes only.

Unda Consulting Ltd
Southpoint
Old Brighton Road
Gatwick
RH11 0PR



Appendix F

Jackie Stone
Unda Consulting Limited
Southpoint,
Old Brighton Road,
Gatwick,
West Sussex,
RH11 0PR

Our ref: SSD165975
Your ref: 89530
Date: 01/04/2020

Dear Jackie Stone,

Enquiry Regarding Product 4 for Flood Risk Assessment for Unit 3, Station Approach, North Street, Emsworth, PO10 7PW.

Thank you for your enquiry which was received on 04 March 2020.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The site is in an area located within Flood Zone 1, 2 and 3 as shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Flood Defences

There are no formal raised flood defences in the vicinity of the site.

Model Information

We do not hold detailed modelling for fluvial flood risk.

All fluvial data included in this request is taken from 2008 JFLOW Improvements for Solent and South Downs Area completed by JBA Consulting. The project aimed to improve the National JFLOW modelled and mapped flood outlines with a view to increasing the accuracy of Flood Zone 2.

Flood History

We hold no record of previous flooding events affecting this site.

Please note our records are not comprehensive and may not include all events. I recommend contacting the Lead Local Flood Authority, **Hampshire County Council**

or the Local Authority, **Havant District Council** for a more comprehensive flood history check.

[FRA advisory text](#)

Name	Product 4
Description	Detailed Flood Risk Assessment Map for Unit 3, Station Approach, North Street, Emsworth, PO10 7PW.
Licence	Open Government Licence
Information Warning - OS background mapping	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2020 Ordnance Survey 100024198.

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

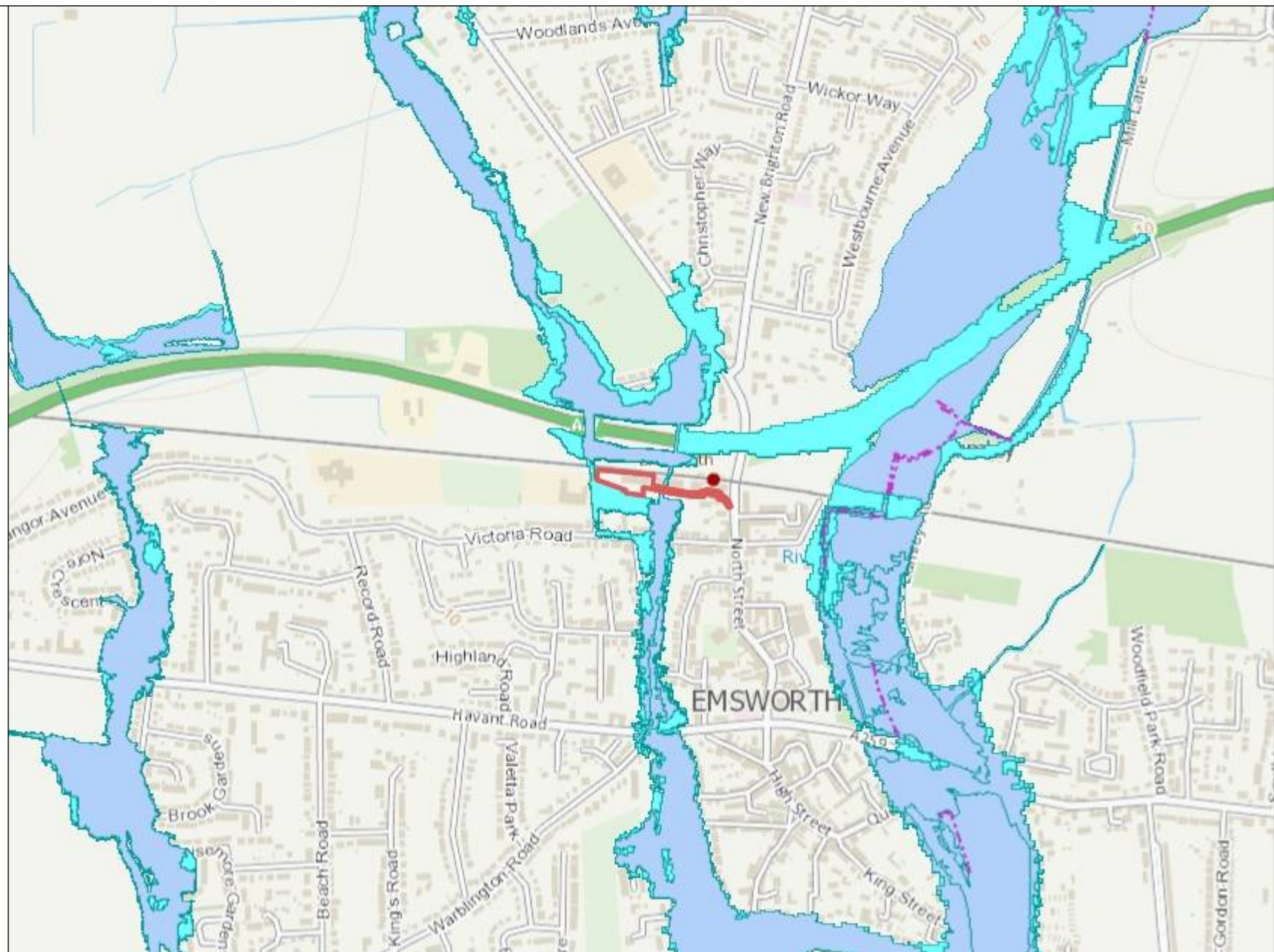
Yours sincerely,

Misha Misri
Flood & Coastal Risk Management Officer,
Partnership & Strategic Overview,
West Sussex,
Solent and South Downs

Flood Map for Planning (Rivers and Sea). Created 01/04/2020.

Legend

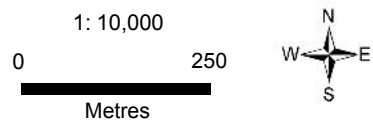
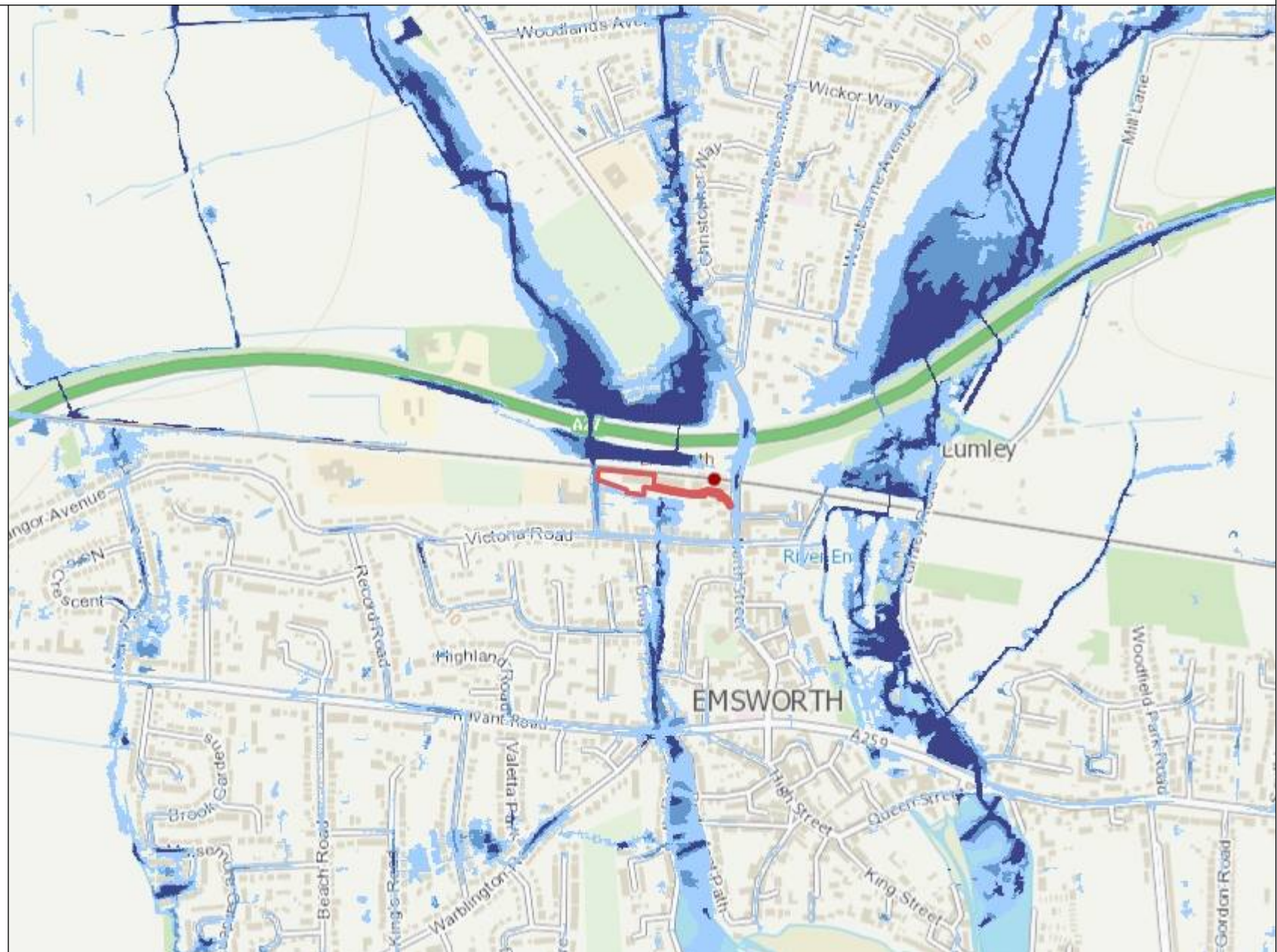
-  Defences
-  Flood Storage Areas
-  Areas benefiting from flood defence
-  Flood Zone 3
-  Flood Zone 2



Risk of Flooding from Surface Water. Created 01/04/2020.

Legend

-  Flood Extent 1 in 30
-  Flood Extent 1 in 100
-  Flood Extent 1 in 1000





Environment
Agency

N
▲

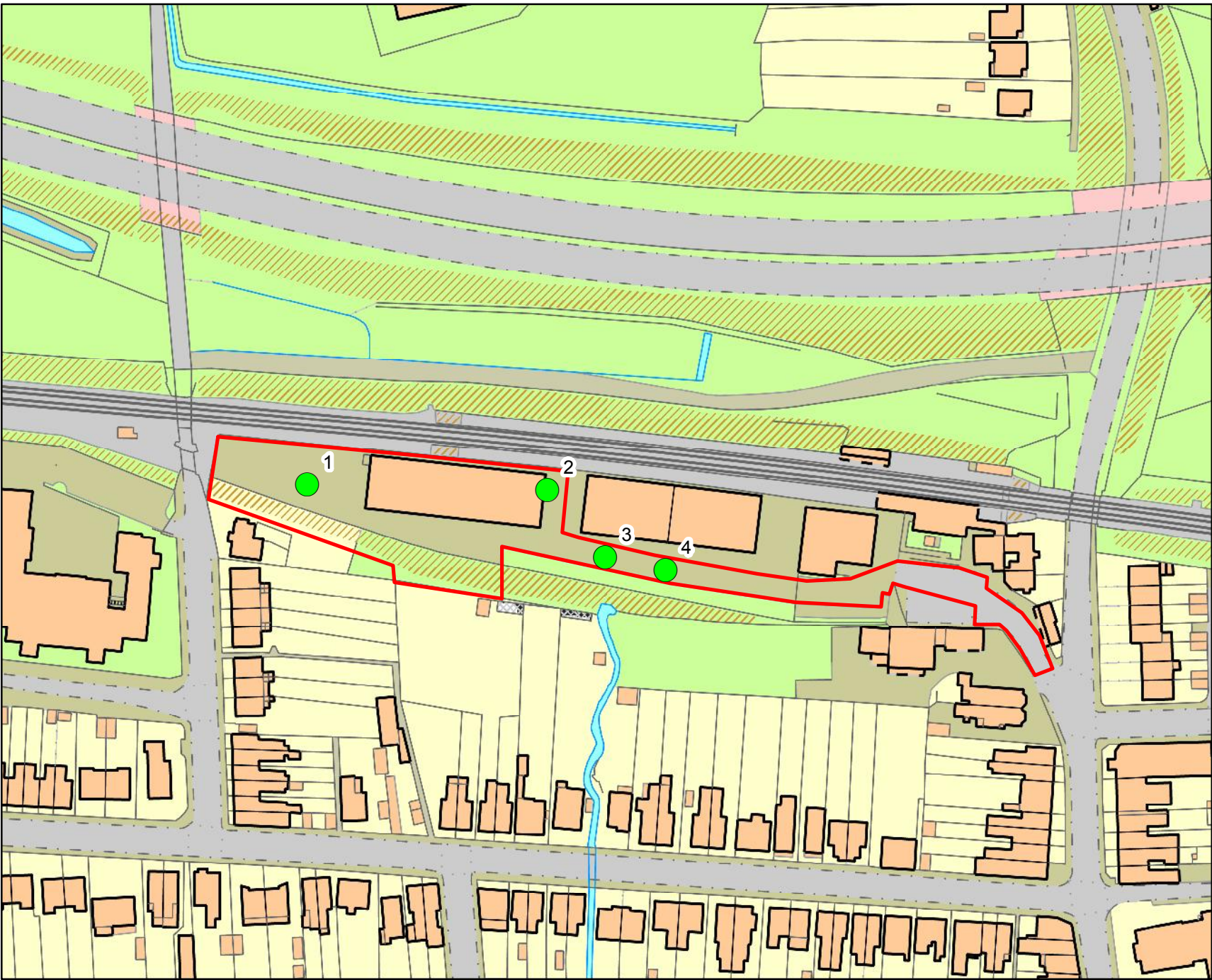
Legend

- Site Nodes
- Site Boundary

Scale: 1:1,500

00.03250.065

Kilometers





Product 4 Flood Risk Data Requested by: Unda Consulting Limited

Site: Unit 3, Station Approach, North Street, Emsworth, PO10 7PW

Table 1: Water Levels: Fluvial Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD
	Eastings	Northings	Undefended Annual Exceedance Probability
			0.1%
1	474651	106324	-
2	474718	106323	9.89
3	474735	106304	9.52
4	474752	106300	9.10

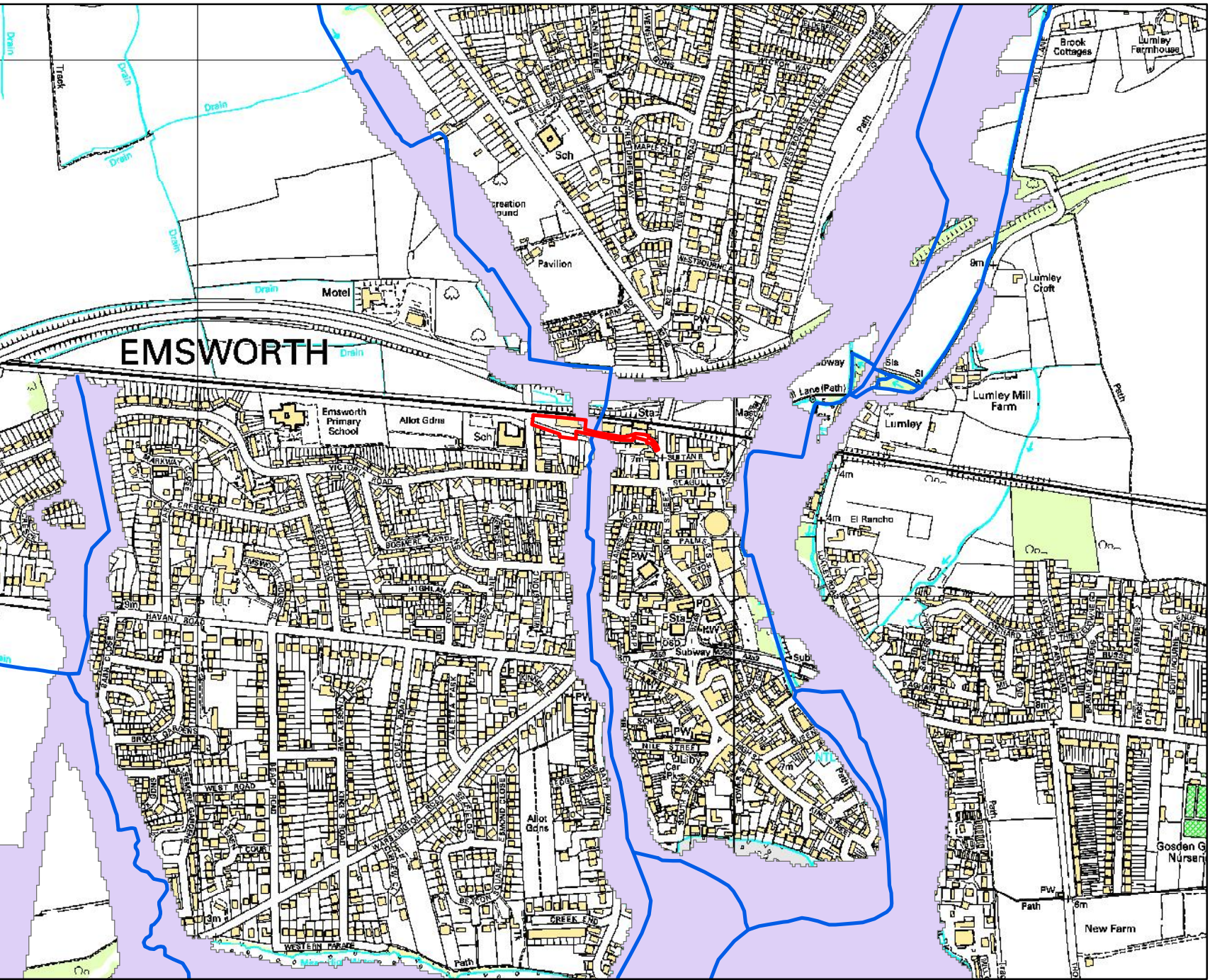
Table 2: Water Depths: Fluvial Undefended

Node Ref	NGR		Modelled Flood Depths in Metres
	Eastings	Northings	Undefended Annual Exceedance Probability
			0.1%
1	474651	106324	-
2	474718	106323	0.27
3	474735	106304	0.47
4	474752	106300	0.01

All levels taken from: JFLOW Improvements (2008)

Produced on: 01/04/2020

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.



Environment Agency



Legend

-  Site Boundary
-  Main River
-  0.1% AEP of Flooding

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000


0 0.225 0.45
Kilometers



Main Investigation Report

at

**Warehouse Extension, Unit 3, Station Approach, North Street,
Emsworth, Hampshire PO10 7PW**

for

Racquet Sports Group

**Reference: I7974/MIR_R27
December 2019**

Control Document

Project

Warehouse Extension, Unit 3, Station Approach, North Street, Emsworth, Hampshire PO10 7PW

Document Type

Main Investigation Report

Document Reference

17974/MIR_R27

Document Status

Final

Date

December 2019

Prepared by

T Rudkin BSc. (Hons.), MSc., FGS.



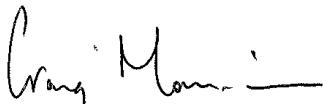
First check by

Eur Ing R B Higginson BSc, PGDip, CEng, MICE, FGS.



Second check by

C Morrison BSc (Hons), FGS, MEnvSc.



This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Commission

Soils Limited was commissioned by Racquet Sports Group to undertake an intrusive ground investigation and prepare a Main Investigation Report on land at Unit 3, Station Approach, North Street, Emsworth, Hampshire PO10 7PW. The scope of the investigation was outlined in the Soils Limited quotation reference Q22087, dated 27th October 2019.

This document comprises the Main Investigation Report and incorporates the results, discussion and conclusions to this intrusive works.

This Main Investigation Report must be read in conjunction with the Preliminary Investigation Report undertaken on the above site by Soils Limited, Report ref: 17974/PIR, dated December 2019.

Standards

The site works, soil descriptions and geotechnical testing was undertaken in accordance with the following standards:

- BS 5930:2015 and BS EN ISO 22476-2 2005+A1:2011
- BS EN ISO 14688-1:2002+A1:2013
- BS EN ISO 14688-2:2004+A1:2013
- BS 10175:2011+A1:2013

The geotechnical laboratory testing was performed by GEO Site & Testing Services Ltd (GSTL) in accordance with the methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accredited test methods.

For the preparation of this report, the relevant BS code of practice was adopted for the geotechnical laboratory testing technical specifications, in the absence of the relevant Eurocode specifications (ref: ISO TS 17892).

The chemical analyses were undertaken by i2 Analytical in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

Contents

Section 1	Introduction.....	1
1.1	Objective of Investigation.....	1
1.2	Location.....	1
1.3	Site Description.....	1
1.4	Proposed Development.....	1
1.5	Anticipated Geology.....	2
1.5.1	Head.....	2
1.5.2	London Clay Formation.....	2
1.6	Limitations and Disclaimers.....	2
Section 2	Site Works.....	5
2.1	Proposed Project Works.....	5
2.1.1	Actual Project Works.....	5
2.2	Ground Conditions.....	6
2.3	Ground Conditions Encountered in Trial Holes.....	7
2.3.1	Made Ground and Topsoil.....	7
2.3.2	Head.....	8
2.4	Roots.....	8
2.5	Groundwater.....	9
Section 3	Discussion of Geotechnical In-Situ and Laboratory Testing.....	10
3.1	Dynamic Probe Tests.....	10
3.2	Atterberg Limit Tests.....	10
3.3	Sulphate and pH Tests.....	10
Section 4	Foundation Design.....	12
4.1	General.....	12
4.1.1	Made Ground and Topsoil.....	12
4.1.2	Head.....	12
4.1.3	Roots.....	13
4.1.4	Groundwater.....	13
4.2	Foundation Scheme General.....	13
4.2.1	Guidance on Shrinkable Soils.....	14
4.3	Foundation Scheme.....	14
4.3.1	Piled Foundations.....	15

4.4	Subsurface Concrete	15
4.5	Excavations	15
Section 5	Determination of Chemical Analysis	17
5.1	Site Characterisation and Revised Conceptual Site Model	17
5.2	Soil Sampling	17
5.3	Determination of Chemical Analysis	17
Section 6	Qualitative Risk Assessment	19
6.1	Assessment Criteria	19
6.2	Representative Contamination Criteria - Soil	19
6.2.1	Asbestos	20
6.3	Risk to Groundwater	20
6.4	Soil Gas Risk Assessment	20
6.5	Tier 1 Quantitative Risk Assessment	22
6.5.1	Soils	22
6.5.2	Groundwater	22
6.5.3	Soil Gas	22
6.6	Duty of Care	23
6.7	Excavated Material	23
6.8	Re-use of Excavated Material On-site	24
6.9	Imported Material	24
6.10	Discovery Strategy	25

List of Figures

Figure 1 – Site Location Map	27
Figure 2 – Aerial Photograph	28
Figure 3 – Trial Hole Plan	29

List of Tables

Table 2.1 Final Depth of Trial Holes	6
Table 2.2 Ground Conditions	7
Table 2.3 Final Depth of Made Ground	7
Table 2.4 Final Depth of Head	8

Table 2.5 Depth of Root Penetration	8
Table 2.6 Groundwater Monitoring	9
Table 5.1 Sampling Strategy	17
Table 5.2 Chemical Analysis Specification	18
Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance	19
Table 6.3 Soil Gas Monitoring Results	20
Table 6.4 WS1 Hazardous Gas Flow Rates	21
Table 6.5 WS4 Hazardous Gas Flow Rates	22
Table B.1.1 SPT "N" Blow Count Cohesive Classification	
Table B.1.2 SPT "N" Blow Count Granular Classification	
Table B.2.1 Interpretation of DPSH Blow Counts	
Table B.2.2 Interpretation of Atterberg Limit Tests	
Table C.1.1 CSM Revised Post Testing	

List of Appendices

Appendix A Field Work

Appendix A.1 Engineers Logs

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Appendix B.2 Interpretation

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Appendix C.2 Chemical Laboratory Results

Appendix C.3 General Assessment Criteria

Appendix D Information Provided by the Client

Section I Introduction

I.1 Objective of Investigation

Soils Limited was commissioned by Racquet Sports Group to undertake an intrusive ground investigation and to prepare a Main Investigation Report to supply the client and their designers with information regarding ground conditions, to assist in preparing a foundation scheme for development that was appropriate to the settings present on the site.

The investigation was to be undertaken to provide comment on appropriate foundation options for the proposed warehouse extension. The investigation was to be made by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the trial holes.

Soil samples were taken for chemical laboratory testing to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any contamination identified as dictated by the Conceptual Site Model (CSM) in the Preliminary Investigation Report undertaken for the site by Soils Limited (Report ref: 17974/PIR, dated December 2019).

I.2 Location

The site was located at Unit 3, Station Approach, North Street, Emsworth, Hampshire PO10 7PW and had an approximate O.S Land Ranger Grid Reference of SU 746 063.

The site location plan is given in Figure 1.

I.3 Site Description

At the time of investigation, the site comprised a detached single storey warehouse unit with concrete courtyard and surrounds set on a raised embankment associated with adjacent railway infrastructure. The south and west site boundaries were heavily vegetated, and the site was bound by a railway line to the north, mixed industrial/commercial to the east and residential land to the south and west. The wider topography was undulating but sloping down to the south.

An aerial photograph has been included in Figure 2.

I.4 Proposed Development

The proposal comprised a new extension as a continuation from the existing single storey warehouse (west elevation) onsite, with the inclusion of a flat roof extension at the end of the new extension. The proposed development comprised hard landscaping to include a new parking platform near the entrance to the site. No soft landscaping formed part of the proposed development.

No information was available on the foundation configuration of the existing warehouse onsite.

In compiling this report reliance was placed on drawings reference 1727-D01, D03B, 002, D04 and D05 dated February 2019, prepared by Temple Ford Design Ltd. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix D.

1.5 Anticipated Geology

The 1:50,000 BGS Geology map showed the site to be situated on the London Clay Formation bedrock, with overlying superficial deposits of Head. A significant thickness of Made Ground was anticipated underlying the site given its position on a former railway sidings embankment.

1.5.1 Head

Head deposit are drifts produced by solifluxion, the downslope movement of debris outwash during the periglacial period, and characteristically comprise poorly sorted sands gravels and chalk of local derivation.

1.5.2 London Clay Formation

The London Clay Formation in the Hampshire region comprises silty and sandy clay, clayey and sandy silt, silty sand; sporadic claystones and thin beds of flint pebbles. The formation includes the Bognor Sand, Whitecliff Sand, Durley Sand, Portsmouth Sand and Nursling Sand Members. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

The lowest part of the London Clay Formation rests on the Reading Formation (Lambeth Group).

1.6 Limitations and Disclaimers

This Main Investigation Report relates to the site located at Warehouse Extension, Unit 3, Station Approach, North Street, Emsworth, Hampshire PO10 7PW and was prepared for the sole benefit of Racquet Sports Group (The "Client"). The report was prepared solely for the brief described in Section 1.1 of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot by plot basis prior to the construction of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data on any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, substantial bushes or shrubs, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping).

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as:

"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused".

The investigation, analysis or recommendations in respect of contamination are made solely in respect of the prevention of harm to vulnerable receptors, using where possible best practice at the date of preparation of the report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets remains with Soils Limited. License is for the sole use of the client and may not be assigned, transferred or given to a third party.

Section 2 Site Works

2.1 Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations for the proposed commercial development. The intended investigation, as outlined within the Soils Limited quotation (Q22087, dated 28th October 2019), was to comprise the following items:

- 4No. up to 4m deep windowless sampler boreholes
- 4No. up to 6m deep dynamic probes
- Geotechnical laboratory testing
- Contamination laboratory testing

1No. day of concrete coring, installation of 2No. soil gas and groundwater monitoring wells, a period of soil gas and groundwater monitoring and development of Soil Gas Risk Assessment was subsequently commissioned by the client via email correspondence.

2.1.1 Actual Project Works

The actual project works were undertaken on 18th November 2019 and comprised:

- 1No. day concrete coring
- 4No. windowless sampler boreholes (WS1 – WS4)
- 4No. super heavy dynamic probes (DP1 – DP4)
- 2No. installations of soil gas and groundwater monitoring wells
- Geotechnical laboratory testing
- Contamination laboratory testing

Two windowless sampler boreholes (WS1 and WS4) were backfilled with gravel and bentonite following the installation of monitoring wells. The remaining trial holes were backfilled with gravel on completion.

All trial hole locations have been presented in Figure 3.

Following completion of site works, soil cores were logged and sub sampled so that samples could be sent to the laboratory for both contamination and geotechnical testing.

Four post-works soil gas and groundwater monitoring rounds undertaken weekly were requested by the client, undertaken between 25th November and 16th December 2019 to allow production of Soil Gas Risk Assessment for the site, which has been included within this report.

2.2 Ground Conditions

On 18th November 2019, four windowless sampler boreholes (WS1 – WS4) were each drilled to a depth of 4.00m below ground level (bgl) at locations selected by Soils Limited using a development plan provided by the client.

Four super heavy dynamic probes (DP1 – DP4) were driven prior and adjacent to their corresponding windowless sampler boreholes to depths ranging between 5.20m and 6.00m bgl. DP1 was terminated at 5.20m bgl on contact with an obstruction which could not be safely penetrated with the equipment available.

Monitoring standpipes were installed within windowless sampler borehole locations WS1 and WS4 to allow for continued monitoring of both groundwater and soil gas, where present. Four post-works monitoring visits were undertaken between 25th November and 16th December 2019.

The maximum depths of trial holes have been included in Table 2.1.

All trial holes were scanned with a Cable Avoidance Tool (C.A.T.) and signal generator (Genny) prior to excavation to ensure the health and safety of the operatives.

Table 2.1 Final Depth of Trial Holes

Trial Hole	Depth (m bgl)	Trial Probe	Depth (m bgl)
WS1 ^w	4.00	DP1	5.20
WS2	4.00	DP2	6.00
WS3	4.00	DP3	6.00
WS4 ^w	4.00	DP4	6.00

Note: w - well installation

The approximate trial hole locations are shown on Figure 3.

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots or has been identified as part of the in-situ weathering profile, it has been described as Topsoil both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered, with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for

the purposes of discussion, the succession of conditions encountered in the trial holes in descending order can be summarised as:

**Made Ground (MG/TS)
Head (HEAD)
London Clay Formation (LCF) [not encountered]**

The ground conditions encountered in the trial holes are summarised in Table 2.2.

Table 2.2 Ground Conditions

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
MG	Anthropocene	0.00	2.00–4.00 ¹	>4.00m	Concrete over black and brown clayey sandy GRAVEL, clayey gravelly SAND and gravelly CLAY. Gravel comprised fragments of clinker, ash, flint, brick, tarmac, chalk and ceramics.
HEAD	Quaternary	2.00- >4.00 ¹	6.00 ^{1,2}	Not proven	Orangish brown mottled greyish brown slightly sandy silty CLAY with rare angular to rounded fine to medium flint and ironstone gravel clasts.

Note: ¹ Final depth of trial hole. ² Depth inferred from dynamic probe. ³ Base of strata not encountered. 0.00 denotes ground level

2.3 Ground Conditions Encountered in Trial Holes

The ground conditions encountered in trial holes have been described below in descending order. The engineering logs are presented in Appendix A.1.

2.3.1 Made Ground and Topsoil

Soils described as Made Ground were encountered in all four trial holes from ground level and persisted to depths ranging between 2.00m bgl (WS1) and full investigatory depth of 4.00m bgl for the remaining trial hole. The base of the Made Ground was inferred in the corresponding dynamic probes at depths of between 4.20m and 5.00m bgl.

The Made Ground comprised concrete over black and brown clayey sandy GRAVEL, clayey gravelly SAND and gravelly CLAY. Gravel comprised fragments of clinker, ash, flint, brick, tarmac, chalk and ceramics.

The final depths of Made Ground have been included in Table 2.3.

Table 2.3 Final Depth of Made Ground

Trial Hole	Depth (m bgl)
WS1	2.00

Trial Hole	Depth (m bgl)
WS2/DP2	4.00 ¹ /4.20 ²
WS3/DP3	4.00 ¹ /4.80 ²
WS4/DP4	4.00 ¹ /5.00 ²

Note: ¹ Final depth of trial hole. ² Depth inferred from dynamic probe

2.3.2 Head

Soils described as Head were encountered in one trial hole (WS1) underlying the Made Ground from 2.00m bgl and persisted to the full investigatory depth of 4.00m bgl.

The Head comprised orangish brown mottled greyish brown slightly sandy silty CLAY with rare angular to rounded fine to medium flint and ironstone gravel clasts.

The depth of Head has been included in Table 2.4.

Table 2.4 Final Depth of Head

Trial Hole	Depth (m bgl)
WS1/DPI	4.00 ¹ /5.20 ^{1,2}
DP2	6.00 ^{1,2}
DP3	6.00 ^{1,2}
DP4	6.00 ^{1,2}

Note: ¹ Final depth of trial hole. ² Inferred from dynamic probe

2.4 Roots

Roots/rootlets were observed within two of the four trial holes, persisting to depths of between 2.50m and 2.70m bgl.

The depths of root penetration have been included in Table 2.5.

Table 2.5 Depth of Root Penetration

Trial Hole	Depth (m bgl)
WS1	2.50
WS2	2.70
WS3	None
WS4	None

Roots/rootlets may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low. A direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

2.5 Groundwater

No groundwater “strikes” were recorded during the drilling of the windowless sampler boreholes. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in November (2019), when groundwater levels should be rising from their annual minimum (lowest) elevation, which typically occurs around September. The annual maximum (highest) elevation typically occurs around March.

Further groundwater monitoring was conducted within the standpipes installed on site following completion of site works and has been presented in Table 2.6.

Table 2.6 Groundwater Monitoring

Trial Hole	Depth to Water (m bgl)				Base of Well (m bgl)
	25/11/19	05/12/19	12/12/19	16/12/19	
WS1	3.78	3.34	3.22	2.75	4.00
WS4	DRY	DRY	DRY	DRY	4.00

Section 3 Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Dynamic Probe Tests

Dynamic probing (DPSH) was undertaken at four locations (DP1 – DP4) prior and adjacent to their corresponding windowless sampler borehole to depths ranging between 5.20m and 6.00m bgl. DP1 was terminated at a depth of 5.20m on contact with an obstruction which could not be safely penetrated with the equipment available.

The results were converted to equivalent SPT “N60” values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix B.1.

The SPT “N60” values presented have been corrected in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the ‘N’ values should therefore not be necessary. The energy ratio of the drilling rig was 78.58%. The energy ratio for each location is presented on the individual logs within Appendix A.1.

Soils described to comprise Made Ground recorded SPT “N60” values between <1 and 19 in cohesive soils and between 4 and 35 in granular soils. The cohesive soils were typically of very low strength with inferred cohesive strength <10kPa and the granular soils were typically of very loose relative density.

The Head recorded equivalent SPT “N60” values between 4 and 22, typically showing an increasing strength with depth trend. The cohesive soils were classified as low to high strength with inferred undrained cohesive strength of 20kPa to 110kPa.

A full interpretation of the DPSH tests are outlined in Appendix B.2, Table B.2.1.

3.2 Atterberg Limit Tests

Atterberg Limit tests were performed on two samples obtained from the Head. The results were classified in accordance with BRE Digest 240.

The Head was classified as low volume change potential in accordance with both BRE Digest 240.

A full interpretation of the Atterberg Limit tests are outlined in Table B.2.2, Appendix B.2 and the laboratory report in Appendix B.3.

3.3 Sulphate and pH Tests

One sample was taken from the Made Ground and one from the Head for water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment

Special Digest 1, 2005, 'Concrete in Aggressive Ground'. pH and W/S sulphate tests were undertaken on an addition four samples of Made Ground.

The tests recorded water soluble sulphate between 12mg/l and 35mg/l with pH values of 8.0 to 8.7.

The significance of the sulphate and pH test results are discussed in Section 4.4 and the laboratory report in Appendix B.3.

Section 4 Foundation Design

4.1 General

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented. Soil descriptions are based on analysis of disturbed samples taken from the trial holes.

4.1.1 Made Ground and Topsoil

The terms *Fill* and *Made Ground (non-engineered fill)* are used to describe material, which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:2015, Clause 4.1.2.2 states, *'Spread foundations should not be placed on non-engineered fill unless such use can be justified on the basis of a thorough ground investigation and detailed design.'*

Soils described as Made Ground were encountered in all four trial holes from ground level and persisted to depths ranging between 2.00m bgl (WS1) and full investigatory depth of 4.00m bgl for the remaining trial hole. The base of the Made Ground was inferred in the corresponding dynamic probes at depths of between 4.20m and 5.00m bgl.

The Made Ground comprised concrete over black and brown clayey sandy GRAVEL, clayey gravelly SAND and gravelly CLAY. Gravel comprised fragments of clinker, ash, flint, brick, tarmac, chalk and ceramics.

The final depths of Made Ground have been included in Table 2.3.

A result of the inherent variability, particularly of uncontrolled Topsoil, Fill and/or Made Ground is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Topsoil and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

4.1.2 Head

Soils described as Head were encountered in one trial hole (WS1) underlying the Made Ground from 2.00m bgl and persisted to the full investigatory depth of 4.00m bgl. The Head comprised orangish brown mottled greyish brown slightly sandy silty CLAY with rare angular to rounded fine to medium flint and ironstone gravel clasts.

The results from DPSH testing inferred that the cohesive soils of the Head were of a low to high strength, with undrained cohesions of between 20kPa and 110kPa.

The results from Atterberg Limits tests confirmed that the soils of the Head had low volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Soils of the Head are normally consolidated, predominantly cohesive soils and as such are expected to display low to moderate bearing capacities with moderate to high settlement characteristics. The soils of the Head were considered a potential founding stratum for adoption of a deep foundation solution, given the depth to its upper horizon, providing a sufficient thickness can be proven underlying the Made Ground at depth. Notwithstanding, deeper piles into the London Clay Formation recorded to underlie the Head is considered a more viable approach.

4.1.3 Roots

Roots/rootlets were observed within two of the four trial holes, persisting to depths of between 2.50m and 2.70m bgl. Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs. Given the ground conditions encountered, roots/rootlets are not considered to present a complication as a deep foundation solution, extending below unsuitable soils of Made Ground and root penetrated cohesive soils must be adopted for this development.

4.1.4 Groundwater

No groundwater “strikes” were recorded during the drilling of the windowless sampler boreholes. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in November (2019), when groundwater levels should be rising from their annual minimum (lowest) elevation, which typically occurs around September. The annual maximum (highest) elevation typically occurs around March.

The results from further monitoring undertaken between 25th November and 16th December 2019 recorded groundwater in one of the two (WS1) monitoring standpipes, rising from a depth of 3.78m bgl to a depth of 2.75m bgl over the monitoring period.

4.2 Foundation Scheme General

The proposal comprised a new extension as a continuation from the existing single storey warehouse onsite, with the addition of a flat roof extension at the end of new extension.. The proposed development comprised hard landscaping to include a new parking platform near the entrance to the site. No soft landscaping formed part of the proposed development.

No information was available on the foundation configuration of the existing warehouse

onsite.

In compiling this report reliance was placed on drawings reference 1727-D01, D03B, 002, D04 and D05 dated February 2019, prepared by Temple Ford Design Ltd. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix D.

4.2.1 Guidance on Shrinkable Soils

The Building Research Establishment (BRE) Digests 240, 241 and 242 provide guidance on 'best practice' for the design and construction of foundations on shrinkable soils.

The results from Atterberg Limits Tests showed that the Head had **low volume change potential** in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Low volume change potential must therefore be adopted where foundations pass through or found within the Head.

The BRE Digest 241 states: "An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used".

The BRE Digest 240 suggests: "*Two courses of action are open:*

Estimate the potential for swelling or shrinkage and try to avoid large changes in the water content, for example by not planting trees near the foundations.

Accept that swelling or shrinkage will occur and take account of it. The foundations can be designed to resist resulting ground movements or the superstructure can be designed to accommodate movement without damage."

The design of foundations suitable to withstand movements is presented in BRE Digest 241 "Low-rise buildings on shrinkable clay soils: Part 2"

4.3 Foundation Scheme

Foundations **must not** be constructed within any Made Ground due to the likely variability and potential for large load induced settlements both total and differential.

Considering the type of development and significant thickness of Made Ground (>4.00m) encountered underlying the site, a deep foundation solution was considered the most suitable.

Further intrusive investigation via cable percussive boreholes is required to determine depth to the underlying London Clay Formation and obtain soil parameters inform the design of a piled foundation solution.

4.3.1 Piled Foundations

Piled foundations must be taken through any Made Ground into suitable strength soils of the Head/London Clay Formation at depth.

The construction of a piled foundation is a specialist job with the actual pile working load depending on the particular type pile and installation method. Prior to finalising the foundation design the advice from a reputable contractor who is familiar with the ground and groundwater conditions present at the site should be sought.

A supplementary intrusive investigation is required utilising cable percussive borehole methods to determine depth to the London Clay Formation and obtain soil parameters at greater depth to inform the design of a piled foundation solution.

4.4 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts fell into Class DS-1 of the BRE Special Digest 1 2005, *'Concrete in Aggressive Ground'*. Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of AC-1. The pH of the soils tested ranged between 8.0 and 8.7. The classification given was determined using the mobile groundwater case, in the view of groundwater being encountered. The laboratory results are presented in Appendix B.3.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, *'Concrete in Aggressive Ground'* taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

4.5 Excavations

Shallow excavations in the Made Ground are likely to be marginally stable in the short term at best.

Deeper excavations taken into the Head are unlikely to be stable given the thickness of overlying Made Ground encountered. Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel.

Excavations beneath the groundwater table, where encountered, are likely to be unstable and dewatering of foundation trenches may be necessary.

Section 5 Determination of Chemical Analysis

5.1 Site Characterisation and Revised Conceptual Site Model

The Preliminary Investigation Report undertaken by Soils Limited (report ref: 17974/PIR dated December 2019) identified a low to moderate risk of ground contamination from previous usage of the site and offsite sources.

The main intrusive site investigation identified Made Ground to depths between 2.50m and at least >4.00m bgl. The Made Ground comprised concrete over black and brown clayey sandy GRAVEL, clayey gravelly SAND and gravelly CLAY. Gravel comprised fragments of clinker, ash, flint, brick, tarmac, chalk and ceramics.

Potential hydrocarbon odours were noted within WS2 and WS4 within Made Ground from depths of 1.90m and 0.60m respectively.

Superficial deposits of cohesive Head were encountered underlying the Made Ground from 2.00m bgl in WS1 and inferred from depths between 4.20m and 5.00m bgl in dynamic probes.

5.2 Soil Sampling

A non-targeted sampling strategy is appropriate when there is:

- No adequate information available regarding the likely locations of contamination;
- No sensitive areas where there is a need for a high degree of confidence.

A targeted sampling strategy is appropriate when there is:

- Adequate information available regarding the likely locations of contamination
- Sensitive areas where there is a need for a high degree of confidence.

The CSM identified potential sources and a targeted sampling pattern was adopted as appropriate to these sources. Table 5.1 outlines the sampling undertaken.

Table 5.1 Sampling Strategy

Sample	Strategy	Proposed Use
WS1:0.50	Former sidings embankment – Made Ground	Beneath building footprint
WS3:0.50	Former sidings embankment – Made Ground	Beneath building footprint
WS3:1.40	Former sidings embankment – Made Ground	Beneath building footprint
WS3:3.20	Former sidings embankment – Made Ground	Beneath building footprint
WS4:0.50	Former sidings embankment – Made Ground	Beneath building footprint

5.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was the information obtained from the

Preliminary Investigation Report and Main Investigation Report intrusive investigation.
Table 5.2 outlines the specification for each sample tested.

Table 5.2 Chemical Analysis Specification

Substance	Locations:Depths (m bgl)				
	WS1:0.50 ^s	WS3:0.50 ^s	WS3:0.20 ^s	WS3:0.50 ^s	WS4:0.50 ^s
Asbestos Screen	✓	✓	✓	✓	✓
Total Phenols	✓	✓	✓	✓	✓
Organic Matter	✓	✓	✓	✓	✓
pH	✓	✓	✓	✓	✓
Metals	✓	✓	✓	✓	✓
Metalloids	✓	✓	✓	✓	✓
Organics	✓	✓	✓	✓	✓

Notes: **Metals:** Cd, Cr, Pb, Hg, Ni, Se, Cu, Zn, Bo, V. **metalloids:** As. **organics:** USEPA 16 speciated PAH, TPH-Texas **Asbestos screening** was undertaken in accordance with HSG 248. ^s = Soil sample.

Section 6 Qualitative Risk Assessment

6.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix C.3.

6.2 Representative Contamination Criteria - Soil

The proposal comprised a new extension as a continuation from the existing single storey warehouse onsite, with the addition of a flat roof extension at the end of the new extension. The proposed development comprised hard landscaping to include a new parking platform near the entrance to the site. No soft landscaping formed part of the proposed development.

No information was available on the foundation configuration of the existing warehouse onsite.

In compiling this report reliance was placed on drawings reference 1727-D01, D03B, 002, D04 and D05 dated February 2019, prepared by Temple Ford Design Ltd. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

The chemical laboratory results were compared against the representative contaminants concentration for human health receptor to Soil Guideline Values (SGV), Category 4 Screening Levels (C4SL's) or Suitable 4 Use Level (S4UL) for "commercial" land-use scenario, given the type of proposed development.

Table 6.1 outlines the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix C.2.

Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance

Substance	Sample locations where SGV, C4SL or S4UL adopted were exceeded for the 'commercial' land-use scenario
No exceedances	
Asbestos locations where material found (no threshold just presence)	
Not detected	

To assess the potential toxicity to the human health receptor from the concentrations of organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed SOM values of between 0.6% and 4.1%. For each soil sample tested, the Soil Organic Matter recorded was used to derive the appropriate guideline value for organic determinants.

In summary, none of the substances tested recorded concentrations above the commercial end-use screening values.

6.2.1 Asbestos

Although no Asbestos Containing Material (ACM) was detected any of the five samples tested, it is possible that asbestos is present in other areas of the site. If encountered, care must be taken to ensure any such material is separated and disposed of in an appropriate manner to a licensed waste facility.

6.3 Risk to Groundwater

Chemical analysis of groundwater samples lay outside the scope of this investigation. Groundwater samples may be obtained from the monitoring wells installed onsite should this be required. Given marginally elevated PAH and TPH recorded within soil chemical analysis results, chemical analysis of groundwater samples, where encountered, is recommended to quantify risk to underlying groundwater resource.

6.4 Soil Gas Risk Assessment

The Preliminary Investigation Report (Soils Limited report ref.: 17974/PIR, dated December 2019) identified a low risk of soil gas associated with significant thickness of Made Ground underlying the site. Hydrocarbon odours were noted within WS2 and WS4. Given the low risk of soil gas generation of the source and low sensitivity of development, four soil gas monitoring rounds were undertaken across a period of approximately four weeks using the monitoring wells installed within WS1 and WS4. The results of the spot monitoring are presented in Table 6.3.

The concentration of methane (both total and LEL), hydrogen sulphide, carbon monoxide, carbon dioxide and oxygen were measured using an LMS portable infrared gas monitor. Readings of flow-rate were taken with a differential manometer calibrated to give flow rate. A MultiRae Photo Ionisation Detector (PID) was used to detect for Volatile Organic Compounds (VOCs).

Table 6.2 Soil Gas Monitoring Results

Date	WS	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	H ₂ S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	H ₂ O (m bgl)	VOC (ppm)	Dp
25/11/2019	ATM	0.0	0.0	21.1	0.0	0.0	0.0	1000	0.0	-	0	0.0
	WS1	0.0	2.3	18.9	0.0	0.0	0.0	1000	0.0	3.78	0	0.0
	WS4	0.0	2.3	19.7	0.0	0.0	0.0	1000	0.0	DRY	0	0.0
05/12/2019	ATM	0.0	0.0	19.9	0.0	0.0	0.0	1020	0.0	-	0	0.0
	WS1	0.0	1.1	19.0	0.0	0.0	0.0	1020	0.0	3.34	0	0.0
	WS4	0.0	1.3	19.0	0.0	0.0	0.0	1020	0.0	DRY	0	0.0
12/12/2019	ATM	0.0	0.0	19.8	0.0	0.0	0.0	981	0.0	-	0	0.0
	WS1	0.0	1.3	18.9	0.0	0.0	0.0	981	0.0	3.22	0	0.0
	WS4	0.0	0.9	19.4	0.0	0.0	0.0	982	0.0	DRY	0	0.0
16/12/2019	ATM	0.0	0.0	19.8	0.0	0.0	0.0	999	0.0	-	0	0.0
	WS1	0.0	1.4	18.8	0.0	0.0	0.0	999	0.0	2.75	0	0.0
	WS4	0.0	1.2	18.8	0.0	0.0	0.0	1000	0.0	DRY	0	0.0

Minimum	0.0	0.9	18.8	0.0	0.0	0.0	981	0.0	3.78	0	0.0
Maximum	0.0	2.3	19.7	0.0	0.0	0.0	2020	0.0	2.75	0	0.0

Note: Reading of 0.0 = below detection level. VOC=Volatile Organic Compounds. Dp=Pressure Difference.

The highest concentration of carbon dioxide was recorded at 2.3% v/v in both WS1 and WS4 on 25th November 2019.

Oxygen was recorded at concentrations between 18.8% and 19.7% v/v across the monitoring period.

No concentrations of methane, carbon monoxide, hydrogen sulphide or VOCs were recorded above instrument detection level.

No positive gas flow was recovered above instrument detection level (0.1lh) during the monitoring period.

To characterise the gas regime for the site the hazardous gas flow rate has been calculated based on the guidance presented in the "BS 8485:2015, Code of practice for the characterisation and remediation from soil-gas in affected developments". The hazardous gas flow rate (Q_{hg}) was calculated using Equation 1:

$$Q_{hg} = (C_{hg}/100) * q$$

Equation 1

Where:

C_{hg} is the measured hazardous gas concentration (in percentage volume-by-volume).

q is the flow rate in litres per hour of combined gases found by direct measurement.

As part of the assessment, the hazardous gas flow rate (Q_{hg}) was calculated for the highest, average, lowest and worst-case readings for carbon dioxide for each monitoring location using Equation 1, with the highest associated flow rate (0.1l/h), thus reflecting the degree of conservatism adopted.

The results of the analysis are tabulated in Table 6.4 and Table 6.5.

Table 6.3 WSI Hazardous Gas Flow Rates

Trial Hole: WSI		C_{hg}	Adopted Flow (l/hr)	Q_{hg}	Characteristic Situation BS8485 & C665
Carbon dioxide	Highest	2.3	0.1	0.0023	CSI
	Average	1.5	0.1	0.0015	CSI
	Lowest	1.1	0.1	0.0011	CSI
	Worst Case	2.3	0.1	0.0023	CSI

Notes: Methane was not recorded above instrument detection.

Table 6.4 WS4 Hazardous Gas Flow Rates

Trial Hole: WS4		C_{hg}	Adopted Flow (l/hr)	Q_{hg}	Characteristic Situation BS8485 & C665
Carbon dioxide	Highest	2.3	0.1	0.0023	CSI
	Average	1.4	0.1	0.0014	CSI
	Lowest	0.9	0.1	0.0009	CSI
	Worst Case	2.3	0.1	0.0023	CSI

Notes: Methane was not recorded above instrument detection.

The generated worst case site specific Gas Screening Value based on Site Characteristic hazardous gas flow rate (Q_{hg}) of 0.0023l/h for carbon dioxide showed the site to fall into Characteristic Gas Situation 1 (CS1) (very low risk), indicating no soil gas protection measures are required for the development.

6.5 Tier I Quantitative Risk Assessment

Quantitative risk assessments are undertaken for the soil, groundwater and soil gas. The CSM has been updated to take account of the assessments below and presented in Appendix C.1. The full laboratory chemical report is presented in Appendix D.2.

6.5.1 Soils

None of the samples tested showed concentrations in excess of the relevant screening values for a commercial land-use scenario.

The Tier 1 Quantitative risk assessment therefore established that there was **no risk to the human health receptors** of future end-users.

6.5.2 Groundwater

Chemical analysis of groundwater samples lay outside the scope of this investigation. Groundwater samples may be obtained from the monitoring wells installed onsite should this be required. Given marginally elevated PAH and TPH recorded within soil chemical analysis results, chemical analysis of groundwater samples, where encountered, is recommended to quantify risk to underlying groundwater resource.

6.5.3 Soil Gas

The Preliminary Investigation Report identified a low risk of soil gas associated with significant thickness Made Ground underlying the site.

Given the low gas generation potential of the source and the low sensitivity of the development (commercial), a total of four gas monitoring rounds were undertaken between 25th November and 16th December 2019, in-line with current guidance.

An assessment of the sites gassing regime has been undertaken based on the four monitoring visits undertaken, outlined in Section 6.4. In accordance with

BS8485:2015, CS1 (very low risk) was identified, which does not require gas protection measures to be adopted.

6.6 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust is generated as a result of construction activities. The site should be securely fenced at all times to prevent unauthorised access.

Washing facilities should be provided and eating restricted to mess huts.

6.7 Excavated Material

Excavated material as waste must be defined or classified prior to any disposal, transport, recycling or re-use at or by an appropriately licensed or exempt carrier and/or off-site disposal facility. The requirements inherent in both Duty of Care and Health and Safety must also be complied with. In order to determine what is to happen, what is suitable, appropriate and most effective in the disposal of wastes, especially those subject to CDM waste management plan requirements, several factors must be considered and competent advice should always be sought.

The amount, type and nature of the material to be removed will in part determine the amount and type of analysis that may be required to comply with current waste guidance, and thereby allow a competent person to suitably classify the material. Often this data is uncertain or unavailable, especially in the early stages of a project, and therefore further investigation, testing and analysis may be required as additional information regarding the development becomes available.

Wastes must be classified and defined by their solid characteristics to comply with current waste guidance. Existing information and analysis derived for environmental purposes may therefore be suitable for use in this context. Waste Acceptance Criteria (WAC) report the leachability of materials and therefore cannot be used to classify, characterise or define wastes. The only purpose of a WAC analysis is to determine the suitability of a given material for acceptance at one of the three different types of available licenced landfills (inert, stable non-reactive hazardous or hazardous).

Other options are available that may lead to significant savings against disposal to landfill and expert advice should always be sought from a competent person to advise on their relative costs or benefits and advise on any additional analysis, sampling or investigation that may be required to reduce remaining uncertainties and comply with current guidance. Further consideration of results using HazWasteOnline™ can be undertaken

on request to give an indication of potentially hazardous properties in the materials analysed.

6.8 Re-use of Excavated Material On-site

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR.

Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental Permitting Regulations 2007 (EPR). Environmental Permit Exemptions (EPE) are for the re-use of non-hazardous or inert waste only; hazardous waste cannot be re-used under a permit exemption. EPE apply only to imported inert waste materials; inert material arising on site and recovered on site is not classified as waste and does not require an exemption. It is possible that materials arising on-site will be classified as inert and would not need an exemption.

Environmental Permit Exemptions are only allowed for certain activities, placing controls on the quantities that can be stored and re-used. The re-use of waste shall be within areas and levels defined in planning applications and permissions for the development. An EPE requires a site-specific risk assessment for the receptor site to demonstrate that the materials are suitable for use, i.e. that they will not give rise to harm to human health or pollution of the environment.

Under the CL:AIRE voluntary code of practice (CoP) materials excavated on-site are not deemed contaminated if suitable for re-use at specified locations or generally within the site.

Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Should it be necessary to import materials from another site where materials are excavated and which is not material from a quarry or produced under a WRAP protocol, then an EPE would be necessary for the imported material whether the work was managed under the CoP or the EPR.

6.9 Imported Material

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with

specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

6.10 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

Care should be taken during excavation works especially to investigate any soils, which appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea, burning of nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded and the Local Authority, and a competent and appropriate third party Engineer/Environmental consultant notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation action.

The discovery strategy must remain on site at all times and must demonstrate a clear allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

List of Figures

Figure 1 – Site Location Map	27
Figure 2 – Aerial Photograph	28
Figure 3 – Trial Hole Plan	29

List of Appendices

Appendix A Field Work

Appendix A.1 Engineers Logs

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Appendix B.2 Interpretation

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Appendix C.2 Chemical Laboratory Results

Appendix C.3 General Assessment Criteria

Appendix D Information Provided by the Client

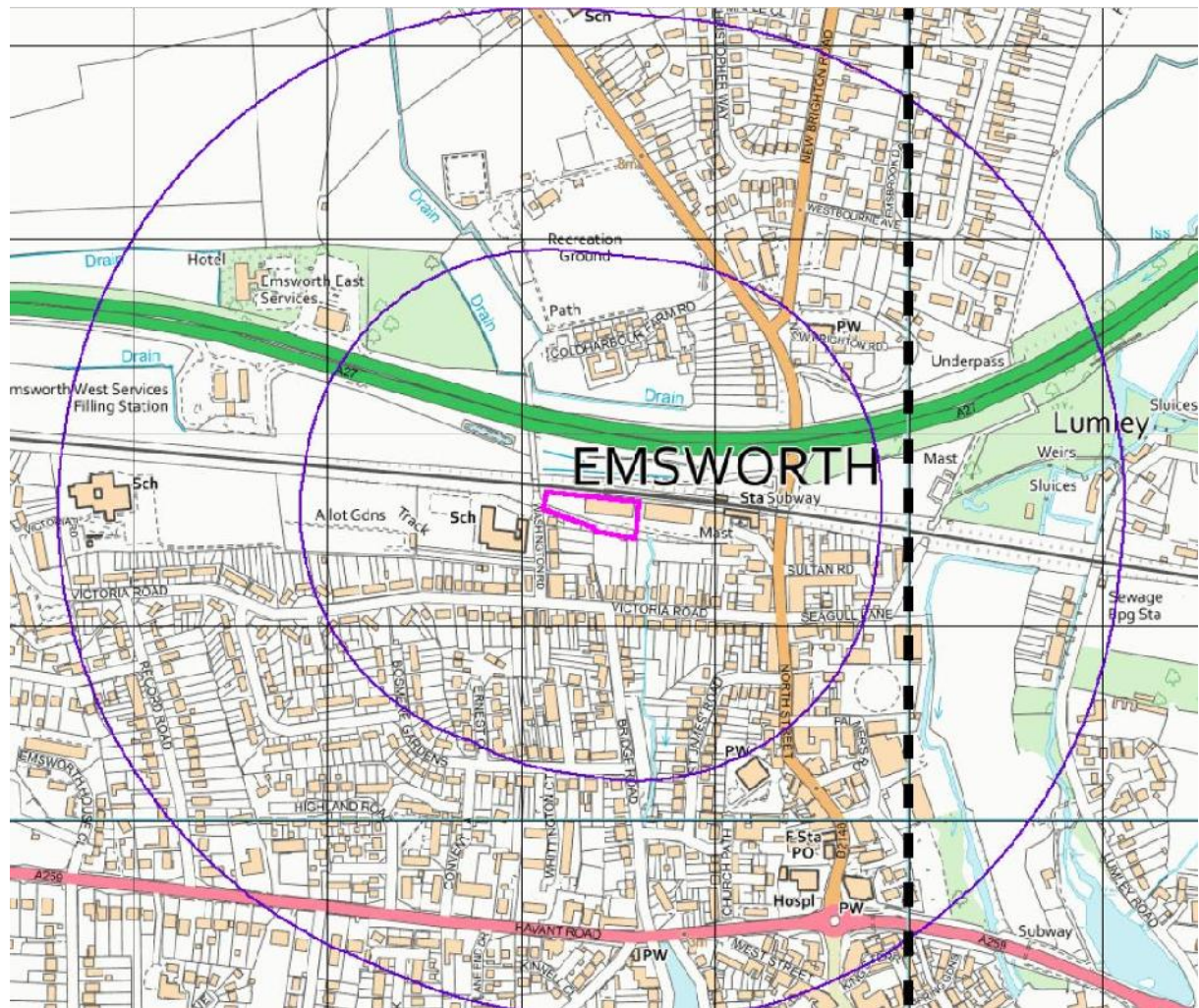


Figure 1 – Site Location Map



Job Number
17974

Project

Warehouse Extension, Unit 3, Station Approach,
North Street, Emsworth, Hampshire PO10 7PW

Client
Racquet Sports Group

Date
December 2019



Figure 2 – Aerial Photograph

Project

Warehouse Extension, Unit 3,
Station Approach, North Street,
Emsworth, Hampshire PO10 7PW

Client

Racquet Sports Group

Date

December 2019

Job Number

17974

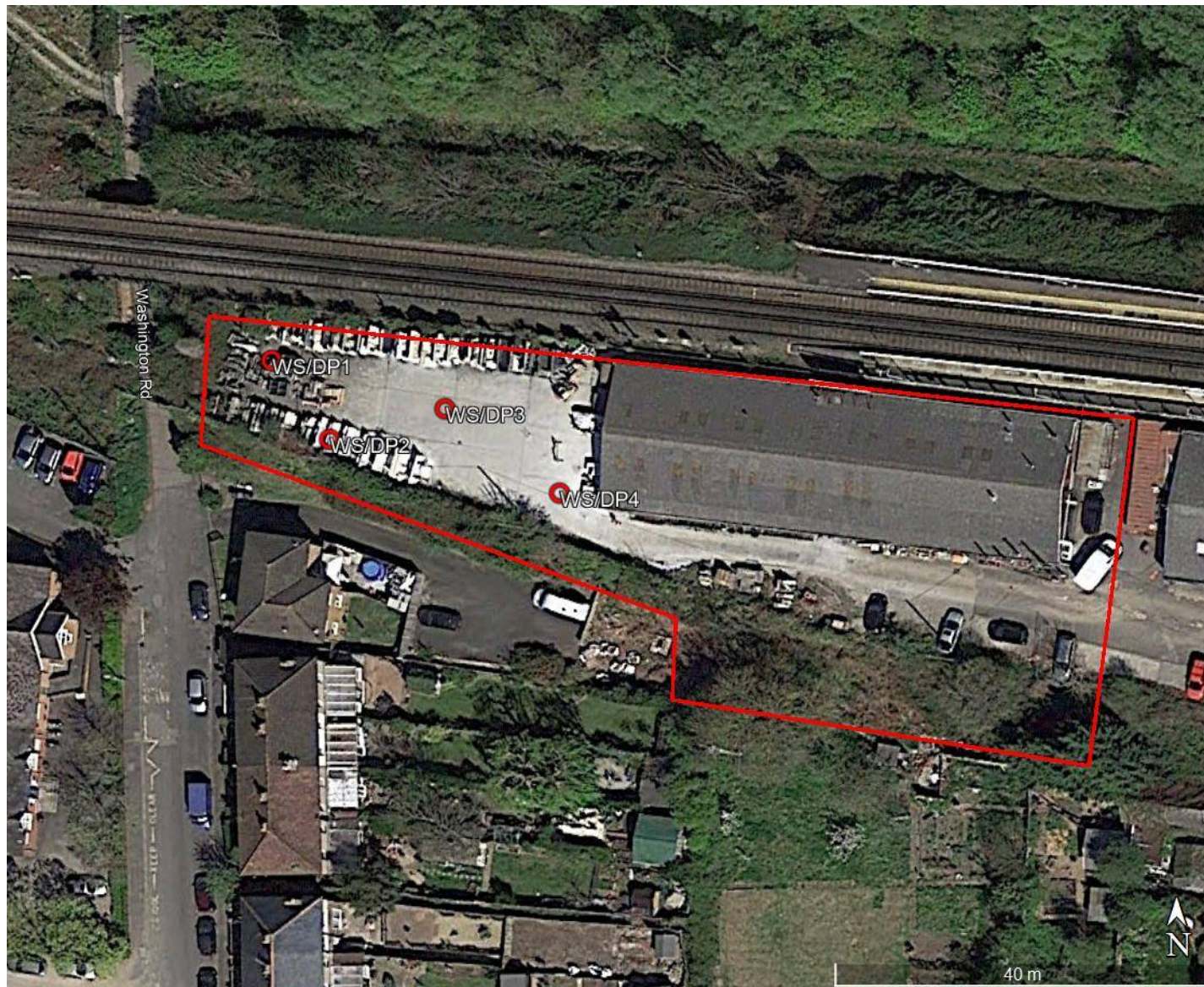


Figure 3 – Trial Hole Plan

Project

Warehouse Extension, Unit 3,
Station Approach, North Street,
Emsworth, Hampshire PO10 7PW

Client

Racquet Sports Group

Date

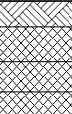
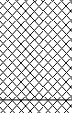
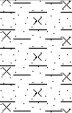
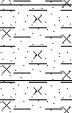
December 2019

Job Number

17974

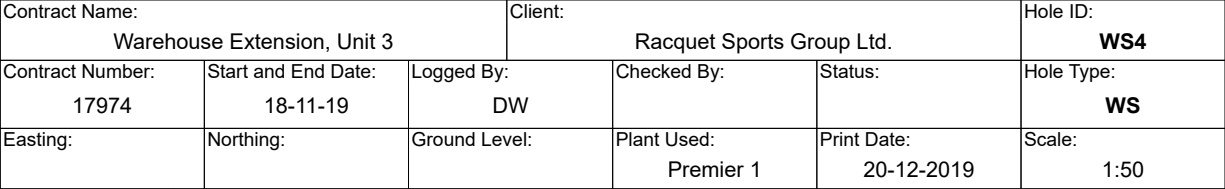
Appendix A Field Work

Appendix A.1 Engineers Logs

	Contract Name: Warehouse Extension, Unit 3				Client: Racquet Sports Group Ltd.				Hole ID: WS1					
	Contract Number: 17974		Start and End Date: 18-11-19		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 1		Print Date: 20-12-2019		Scale: 1:50			
Weather:			Termination:					Sheet 1 of 1						
Samples & In Situ Testing					Strata Details							Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
0.20	ES			0.17		From driller's logs: CONCRETE CORE.						1		
0.50	ES			0.40		Dark brown and black mottled, slightly silty, sandy GRAVEL. Gravel is angular to rounded, fine to coarse clinker and ash with rare flint. MADE GROUND.								
0.70	ES			0.60		Dark brown and white mottled, slightly clayey, sandy GRAVEL. Gravel is angular to rounded, fine to coarse flint, chalk and clinker. MADE GROUND.								
				(0.80)		Slightly greyish brown and black mottled, white, slightly silty, slightly clayey GRAVEL. Gravel is angular to rounded, fine to coarse chalk and rare flint and clinker. Black stained clay pockets from 0.6 - 0.75m bgl (odourless). MADE GROUND.								
1.30	ES			1.40		Firm, brown, slightly sandy, slightly sandy, very gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse chalk, flint and clinker. Band of chalk from 1.7 - 1.8m bgl. Occasional rootlets. MADE GROUND.								
1.50	ES			(0.60)										
				2.00		Orangish brown mottled, yellowish brown, slightly sandy silty CLAY. Occasional angular to rounded, fine to coarse flint and rare ironstone gravel. Rare rootlets. HEAD						2		
2.20	D ES			(1.00)										
2.70	D													
				3.00		Orangish brown mottled, greyish brown, slightly sandy silty CLAY. Occasional angular to rounded, fine to medium flint and rare fine ironstone gravel. HEAD						3		
3.10	D			(0.50)										
				3.50										
3.60	D ES			(0.50)		Black speckled and green mottled, greyish brown, slightly sandy silty CLAY. Occasional angular to rounded, fine to medium flint and rare fine ironstone gravel. Mild odour of decomposition. HEAD								
3.70				4.00		End of Borehole at 4.00m						4		
												5		
												6		
												7		
												8		
												9		
												10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 2.5m bgl.					
									Water Strikes					
Chiselling					Installation				Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)				0	0.00	No groundwater strikes recorded
					0.00	1.00	PLAIN	33						
					1.00	4.00	SLOTTED	33						
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

	Contract Name: Warehouse Extension, Unit 3				Client: Racquet Sports Group Ltd.				Hole ID: WS2					
	Contract Number: 17974		Start and End Date: 18-11-19		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 1		Print Date: 20-12-2019		Scale: 1:50			
Weather:			Termination:									Sheet 1 of 1		
Samples & In Situ Testing					Strata Details							Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
0.30	ES			0.17		From driller's logs: CONCRETE CORE.								
0.50	ES			(0.53)		Black, slightly silty, sandy GRAVEL. Gravel is angular to rounded, fine to coarse clinker and ash with rare flint, pottery, burnt shale, slag and ceramics. MADE GROUND.								
0.80	ES			0.70		Black and brown mottled, slightly clayey gravelly SAND. Gravel is angular to rounded, fine to coarse flint, clinker, ash, and brick. MADE GROUND.						1		
1.40	ES			1.50		Greyish brown, green and brown mottled, slightly clayey, very gravelly SAND. Gravel is angular to rounded, fine to coarse flint, clinker and rare brick. Occasional rootlets. Occasional brown clay pockets. Occasional black staining. MADE GROUND.								
1.60	D ES			(0.40)		Brown, black and dark grey mottled, slightly sandy silty CLAY. Occasional angular to sub-angular, fine to coarse flint, brick, and tarmac gravel. Strong bitumen odour with tarmac gravel. MADE GROUND.						2		
2.10	D ES			1.90		Firm, black speckled greyish brown, slightly sandy silty CLAY. Occasional angular to rounded, fine to medium flint gravel. Rare rootlets. Very rare sub-angular fine to medium clinker gravel above 3.5m bgl. Mild odour of decomposition. Blue mottling at 2.7m bgl. MADE GROUND.						3		
2.70	D ES			2.60										
3.30	D ES			(1.40)										
3.80	D ES			4.00		End of Borehole at 4.00m						4		
											5			
											6			
											7			
											8			
											9			
											10			
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 2.7m bgl.					
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
												0	0.00	No groundwater strikes recorded
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

	Contract Name: Warehouse Extension, Unit 3				Client: Racquet Sports Group Ltd.				Hole ID: WS3					
	Contract Number: 17974		Start and End Date: 18-11-19		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 1		Print Date: 20-12-2019		Scale: 1:50			
Weather:			Termination:					Sheet 1 of 1						
Samples & In Situ Testing					Strata Details							Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
				0.15		From driller's logs: CONCRETE CORE.								
0.30	ES			(0.30)		Black, slightly silty, sandy GRAVEL. Gravel is angular to sub-angular, fine to coarse clinker and ash with rare flint, brick, burnt shale, and slag. MADE GROUND.								
0.50	ES			0.45										
0.70	D			0.60		Multi-coloured mottled, slightly sandy, gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse, clinker, brick, flint, concrete and burnt shale. MADE GROUND.								
0.80	ES			0.75		Multicoloured, slightly silty, sandy GRAVEL. Gravel is angular to sub-angular, brick and rare flint and concrete. MADE GROUND.								
				(0.55)		Multicoloured mottled, black, slightly clayey sandy GRAVEL. Gravel is angular to sub-angular, fine to coarse basalt, brick, clinker, flint and rare ceramics. MADE GROUND.						1		
1.40	D ES			1.30		Very soft to soft, dark brown to yellowish brown with depth, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium clinker, brick, and flint. <i>Occasional gravel below 1.6m bgl</i>								
1.90	D ES			(1.30)								2		
2.40	D ES			2.60										
2.70	D ES			(0.35)		Light greyish brown mottled, slightly silty, slightly sandy CHALK GRAVEL. MADE GROUND.								
				2.95										
3.20	D ES			(1.05)		Firm, slightly black mottled, yellowish brown, slightly sandy, gravelly CLAY. Gravel is angular to sub-angular, fine to coarse chalk, clinker, flint and rare fine brick. MADE GROUND. <i>Low recovery (35%) from 3.0 - 4.0m bgl</i>						3		
				4.00		End of Borehole at 4.00m						4		
												5		
												6		
												7		
												8		
												9		
												10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	No rootlets observed.					
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
												0	0.00	No groundwater strikes recorded
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														



Weather:	Termination:		Sheet 1 of 1
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Samples & In Situ Testing			Strata Details						Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill/ Installation		
0.20	ES			0.15		From driller's logs: CONCRETE CORE.	1				
0.50	ES			(0.35)		Red, slightly silty, slightly sandy GRAVEL AND COBBLES. Gravel and cobbles are angular to sub-angular, fine to coarse brick, with rare flint and clinker. MADE GROUND.					
0.80	D ES			0.50		Multicoloured mottled, slightly clayey sandy GRAVEL. Gravel is angular to sub-angular, fine to coarse chalk, brick, flint, clinker and ash. Occasional clayey pockets. Hydrocarbon odour at 0.6m bgl with black staining. MADE GROUND.	2				
1.40	D ES			0.70		Brown, slightly silty, gravelly SAND/sandy CLAY. Gravel is angular to rounded, fine to coarse flint, with rarer brick and clinker. MADE GROUND.					
1.90	D ES			(0.70)		Soft, slightly black mottled, yellowish brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is angular to sub-angular, fine to coarse flint with rarer clinker and brick. MADE GROUND.	3				
2.40	ES			1.40		Black and yellowish brown mottled, slightly sandy, CLAYEY gravel. Gravel is angular to sub-angular, fine to coarse chalk, clinker flint and brick. Pockets of clinker at 1.4, 2.0, and 3.9 - 4.0m bgl. MADE GROUND.					
2.50	D			(0.95)		Low recovery (30%) from 3.0 - 4.0m bgl	4				
2.90	D ES			2.35							
3.70	D			(1.65)			End of Borehole at 4.00m			5	
3.90	ES										4.00
											7
											8
											9
											10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks: No rootlets observed.					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)						
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
					0.00 1.00	1.00 4.00	PLAIN SLOTTED	33 33				0	0.00	No groundwater strikes recorded
									Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.					

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Classification based on SPT “N” values:

The inferred undrained strength of the cohesive soils was based on the SPT “N” blow counts, derived from the relationship suggested by Stroud (1974) and classified using Table B.1.1. (Ref: Stroud, M. A. 1974, “The Standard Penetration Test – its application and interpretation”, Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).

Table B.1.1 SPT “N” Blow Count Cohesive Classification

Classification	Undrained Cohesive Strength C_u (kPa)
Extremely low	<10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high	> 300

Note: (Ref: BS EN ISO 14688-2:2004+A1:2013 Clause 5.3.)

The relative density of granular soils was classified based of the relationship given in Table B.1.2.

The *UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing*, NA 3.7 SPT test, BS EN 1997-2:2007, Annex F states “Relative density descriptions on borehole records should also be based on uncorrected SPT N values, unless significantly disturbed, using the density classification in BS 5930:2015, Table 7.

Table B.1.2 SPT “N” Blow Count Granular Classification

Classification	SPT “N” blow count (blows/300mm)
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	Greater than 50

Note: (Ref: The Standard Penetration Test (SPT): Methods and Use, CIRIA Report 143, 1995)

Appendix B.2 Interpretation

Table B.2.1 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
DPI	MG 0.20 – 1.40 GRAVEL	15 – 35	Medium dense to dense
	MG 1.40 – 2.00 Gravelly CLAY	11 – 19	Medium to high ($C_u = 55 - 95\text{kPa}$)
	HEAD ¹ 2.00 – 4.20 Gravelly CLAY	4 – 7	Low ($C_u = 20 - 35\text{kPa}$)
	HEAD ¹ 4.20 – 5.20 CLAY	11 – 19	Medium to high ($C_u = 55 - 95\text{kPa}$)
DP2	MG 0.20 – 1.90 Gravelly SAND	4	Very loose
	MG 1.90 – 3.30 Gravelly CLAY	4	Very low ($C_u = <20\text{kPa}$)
	MG ¹ 3.30 – 4.20 Gravelly CLAY	4 – 7	Low ($C_u = 20 - 35\text{kPa}$)
	HEAD ¹ 4.20 – 6.00 CLAY	11 – 22	Medium to high ($C_u = 55 - 110\text{kPa}$)
DP3	MG 0.20 – 0.70 GRAVEL	15 – 18	Medium dense
	MG 0.70 – 2.50 Gravelly CLAY	<1	Extremely low ($C_u = <10\text{kPa}$)
	MG ¹ 2.50 – 4.80 Gravelly CLAY	4	Very low ($C_u = <20\text{kPa}$)
	HEAD ¹ 4.80 – 6.00 CLAY	11 – 19	Medium to high ($C_u = 55 - 95\text{kPa}$)
DP4	MG 0.20 – 1.40 GRAVEL	4 – 11	Loose to medium dense
	MG ¹ 1.40 – 5.00 Gravelly CLAY	4 – 7	Low ($C_u = 20 - 35\text{kPa}$)
	HEAD ¹ 5.00 – 6.00 Gravelly CLAY	7	Low ($C_u = 35\text{kPa}$)

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
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Note: ¹ Ground conditions inferred past the base of windowless sampler boreholes. Rig efficiency: 78.58%

Table B.2.2 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
HEAD	18 - 24	20 - 26	90 - 75	18 - 20	CI	Low	Low

Note: BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)

NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2

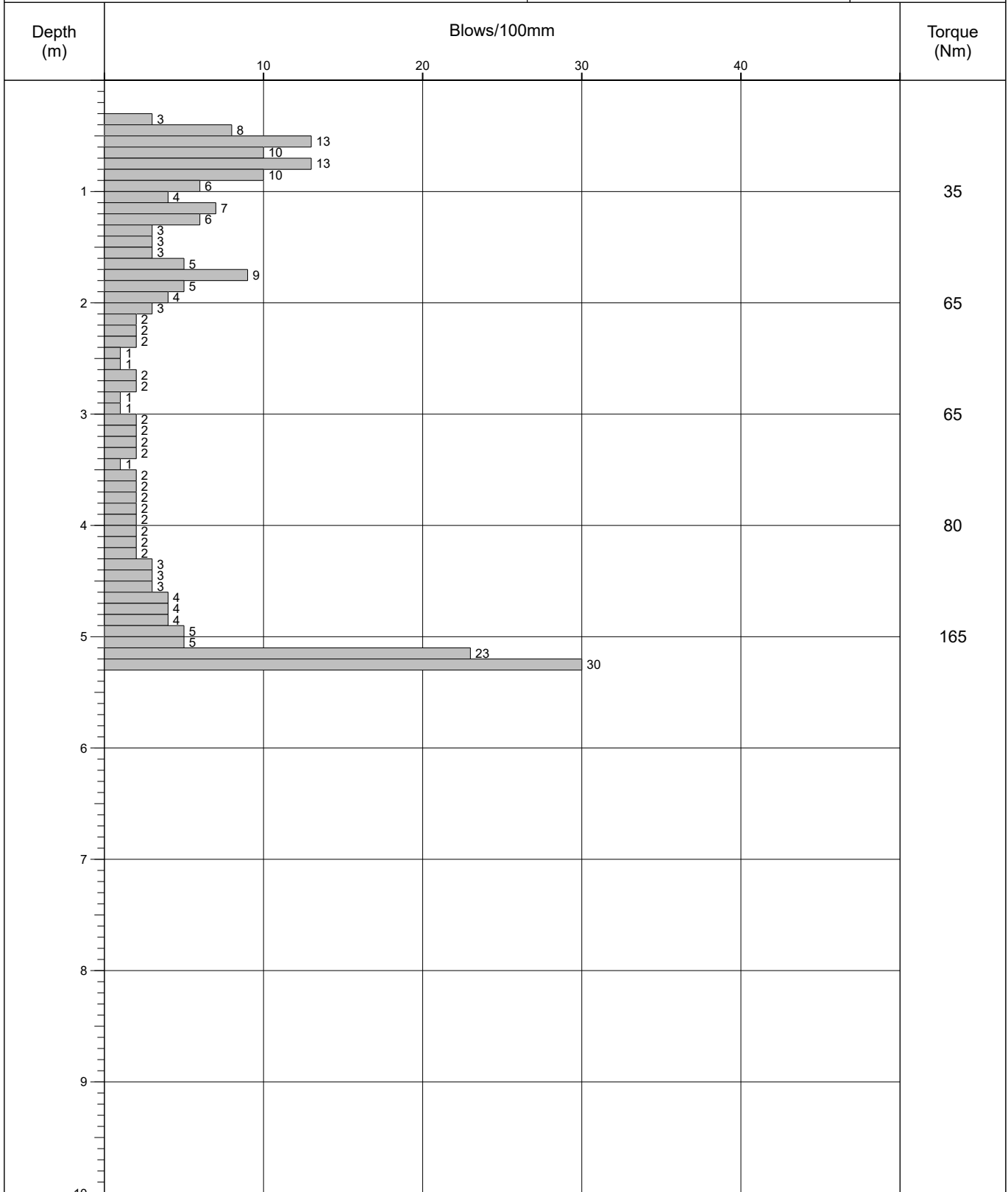
Soils Classification based on British Soil Classification System

The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.

(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Project Name:	Warehouse Extension, Unit 3	Project No.	17974	Co-ords:		Hole Type	DP
Location:	Station Approach, North Street, Emsworth, Hampshire PO10 7PW	Level:	m AOD			Scale	1:50
Client:	Racquet Sports Group Ltd.	Dates:	18-11-2019			Logged By	



Remarks	Fall Height	750mm	Cone Base Diameter	50.5mm
	Hammer Weight	63.5kg	Final Depth	5.2m
	Probe Type	DPSH-B	Energy Ratio (Er)	78.58%

Project Name:	Warehouse Extension, Unit 3	Project No.	17974	Co-ords:		Hole Type	DP
Location:	Station Approach, North Street, Emsworth, Hampshire PO10 7PW	Level:	m AOD			Scale	1:50
Client:	Racquet Sports Group Ltd.	Dates:	18-11-2019			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)	
	10	20	30	40		
0	2				5	
0.1	3					
0.2	3					
0.3	1					
0.4	1					
0.5	0					
0.6	1					
0.7	0					
0.8	1					
0.9	1					
1	0				35	
1.1	1					
1.2	1					
1.3	0					
1.4	1					
1.5	0					
1.6	1					
1.7	0					
1.8	1					
1.9	0					
2	1				75	
2.1	1					
2.2	1					
2.3	0					
2.4	1					
2.5	0					
2.6	1					
2.7	0					
2.8	1					
2.9	1					
3	1				135	
3.1	1					
3.2	1					
3.3	1					
3.4	1					
3.5	2					
3.6	2					
3.7	1					
3.8	2					
3.9	2					
4	3				135	
4.1	2					
4.2	3					
4.3	2					
4.4	3					
4.5	3					
4.6	3					
4.7	3					
4.8	4					
4.9	4					
5	4				135	
5.1	4					
5.2	5					
5.3	5					
5.4	6					
5.5	6					
5.6	6					
5.7	6					
5.8	8					
5.9	7					
6	8				135	
6.1	4					
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
7					135	
7.1						
7.2						
7.3						
7.4						
7.5						
7.6						
7.7						
7.8						
7.9						
8					135	
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9					135	
9.1						
9.2						
9.3						
9.4						
9.5						
9.6						
9.7						
9.8						
9.9						
10					Remarks	
Fall Height		750mm	Cone Base Diameter			50.5mm
Hammer Weight		63.5kg	Final Depth			6m
Probe Type		DPSH-B	Energy Ratio (Er)			78.58%



Project Name:	Warehouse Extension, Unit 3	Project No.	17974	Co-ords:		Hole Type	DP
Location:	Station Approach, North Street, Emsworth, Hampshire PO10 7PW	Level:	m AOD			Scale	1:50
Client:	Racquet Sports Group Ltd.	Dates:	18-11-2019			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
0	12				5
1	1				
2	1				15
3	1				20
4	2				52
5	3				65
6	5				160
7					
8					
9					
10					
Remarks		Fall Height	750mm	Cone Base Diameter	50.5mm
		Hammer Weight	63.5kg	Final Depth	6m
		Probe Type	DPSH-B	Energy Ratio (Er)	78.58%

Project Name:	Warehouse Extension, Unit 3	Project No.	17974	Co-ords:		Hole Type	DP
Location:	Station Approach, North Street, Emsworth, Hampshire PO10 7PW	Level:	m AOD			Scale	1:50
Client:	Racquet Sports Group Ltd.	Dates:	18-11-2019			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
0					
0.1					
0.2					
0.3					
0.4					
0.5					
0.6					
0.7					
0.8					
0.9					
1.0					10
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
2.0					50
2.1					
2.2					
2.3					
2.4					
2.5					
2.6					
2.7					
2.8					
2.9					
3.0					45
3.1					
3.2					
3.3					
3.4					
3.5					
3.6					
3.7					
3.8					
3.9					
4.0					55
4.1					
4.2					
4.3					
4.4					
4.5					
4.6					
4.7					
4.8					
4.9					
5.0					55
5.1					
5.2					
5.3					
5.4					
5.5					
5.6					
5.7					
5.8					
5.9					
6.0					60
6.1					
6.2					
6.3					
6.4					
6.5					
6.6					
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4					
7.5					
7.6					
7.7					
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6					
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5					
9.6					
9.7					
9.8					
9.9					
10.0					
Remarks		Fall Height	750mm	Cone Base Diameter	50.5mm
		Hammer Weight	63.5kg	Final Depth	6m
		Probe Type	DPSH-B	Energy Ratio (Er)	78.58%



Laboratory Report



Contract Number: 46737

Client Ref: **17974**Report Date: **28-11-2019**Client PO: **17974**

Client **Soils Limited**
Thomas Telford House
Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Contract Title: **Unit 3 Emsworth (Warehouse Extension)**
For the attention of: **Tim Rudkin**

Date Received: **25-11-2019**Date Completed: **28-11-2019**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	2
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	2
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

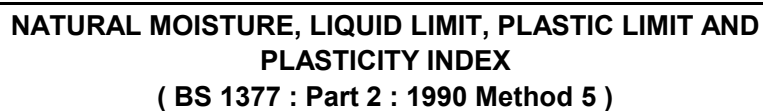
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)

Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd

Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk



Contract Number

46737

Site Name

Unit 3 Emsworth (Warehouse Extension)

Date Tested

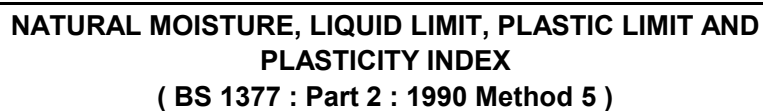
27/11/2019

DESCRIPTIONS

[illegible]

Operators	Checked	28/11/2019	Wayne Honey (Administrative/Quality Assistant)
Darren Bourne	Approved	28/11/2019	Paul Evans (Quality/Technical Manager)





**Tim Rudkin**

Soils Ltd
Unit 11
Sun Valley Business Park
Winnall Close
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Hampshire
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e: tr@soilslimited.co.uk

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Croxley Green
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Watford,
Herts,
WD18 8YS

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f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-73500

Project / Site name:	Unit 3 Emsworth - Warehouse Extension	Samples received on:	25/11/2019
Your job number:	17974	Samples instructed on:	25/11/2019
Your order number:	17974	Analysis completed by:	29/11/2019
Report Issue Number:	1	Report issued on:	29/11/2019
Samples Analysed:	6 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-73500

Project / Site name: Unit 3 Emsworth - Warehouse Extension

Your Order No: 17974

Lab Sample Number				1370480	1370481	1370482	1370483	1370484
Sample Reference				WS1	WS2	WS2	WS3	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.70	0.80	2.70	0.80	1.90
Date Sampled				28/11/2019	28/11/2019	28/11/2019	28/11/2019	28/11/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	15	16	17	2.5	18
Total mass of sample received	kg	0.001	NONE	0.60	0.90	0.40	0.70	0.60

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	8.2	8.1	8.7	8.3
Total Sulphate as SO ₄	%	0.005	MCERTS	0.028	-	-	0.034	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.015	0.012	0.012	0.035	0.017
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	15.2	-	-	35.4	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.1	-	-	2.6	-
Total Sulphur	%	0.005	MCERTS	0.015	-	-	0.054	-
Ammonium as NH ₄	mg/kg	0.5	MCERTS	< 0.5	-	-	< 0.5	-
Ammonium as NH ₄ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	-	-	< 0.05	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	-	-	< 2.0	-

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	5.7	-	-	15	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	2.9	-	-	7.5	-

Analytical Report Number: 19-73500

Project / Site name: Unit 3 Emsworth - Warehouse Extension

Your Order No: 17974

Lab Sample Number				1370485				
Sample Reference				WS3				
Sample Number				None Supplied				
Depth (m)				2.70				
Date Sampled				28/11/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	16				
Total mass of sample received	kg	0.001	NONE	0.40				

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5				
Total Sulphate as SO ₄	%	0.005	MCERTS	-				
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.034				
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-				
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-				
Total Sulphur	%	0.005	MCERTS	-				
Ammonium as NH ₄	mg/kg	0.5	MCERTS	-				
Ammonium as NH ₄ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-				
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-				

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	-				
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-				

Analytical Report Number : 19-73500

Project / Site name: Unit 3 Emsworth - Warehouse Extension

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1370480	WS1	None Supplied	2.70	Brown loam and clay with gravel.
1370481	WS2	None Supplied	0.80	Brown loam and clay with gravel.
1370482	WS2	None Supplied	2.70	Brown loam and clay with gravel.
1370483	WS3	None Supplied	0.80	Brown loam and clay with gravel.
1370484	WS3	None Supplied	1.90	Brown loam and clay with gravel.
1370485	WS3	None Supplied	2.70	Brown loam and clay with gravel and chalk.

Analytical Report Number : 19-73500

Project / Site name: Unit 3 Emsworth - Warehouse Extension

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammonium as NH ₄ in soil	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 °C)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Table C.I.I CSM Revised Post Testing

Source	Identified Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Information			Comments	Proposed Investigation
				Severity	Probability	Risk		
Made Ground – Embankment and former sidings Onsite source of potential contamination	Soil gas	Inhalation of Vapour/gases	Site Workers/Site Maintenance	Minor	Unlikely	Very low	Soil chemical analysis undertaken on samples of Made Ground did not record concentrations in exceedance of relevant screening values for commercial end-use scenario.	No remedial measures necessary with respect to protection of human health of end-users. Contractors to make their own risk assessments in line with CDM.
			End Users	Minor	Unlikely	Very low		
			Off-site Users	Minor	Unlikely	Very low		
	None	Migration via surface runoff	Surface Water	Minor	None	None	Following CIRIA 665 guidance, four soil gas rounds were undertaken across a period of approximately four weeks. Sites gassing regime established as CS1, for which no gas protection measures are required in design.	Soil gas risk assessment identified sites gassing regime as CS1
			Surface Water	Minor	None	None		
		Migration in solution via groundwater	Shallow Aquifer	Minor	Unlikely	Very low		
			Deep Aquifer	Minor	None	None		
			Buried structures	Minor	Low	Very low		
			Buried Services	Minor	Low	Very low		
	Soil gas	Migration of gases via permeable soils	Site Workers/Site Maintenance	Minor	Unlikely	Very low		
			End Users	Minor	Unlikely	Very low		
			Off-site Users	Minor	Unlikely	Very low		
			Building and confined spaces	Minor	Unlikely	Very low		
Builders Yard/Works On-site historic and current site usage	Soil gas	Inhalation of Vapour/gases	Site Workers/Site Maintenance	Minor	Unlikely	Very low	Soil chemical analysis undertaken on samples of Made Ground did not record concentrations in exceedance of relevant screening values for commercial end-use scenario.	No remedial measures necessary with respect to protection of human health of end-users. Contractors to make their own risk assessments in line with CDM.
			End Users	Minor	Unlikely	Very low		
			Off-site Users	Minor	Unlikely	Very low		
	None	Migration via surface runoff	Surface Water	Minor	None	None	Following CIRIA 665 guidance, four soil gas rounds were undertaken across a period of approximately four weeks. Sites gassing regime established as CS1, for which no gas protection measures are required in design	Soil gas risk assessment identified sites gassing regime as CS1
			Surface Water	Minor	None	None		
		Migration in solution via groundwater	Shallow Aquifer	Minor	Unlikely	Very low		
			Deep Aquifer	Minor	None	None		
			Buried structures	Minor	Low	Very low		
			Buried Services	Minor	Low	Very low		
	Soil gas	Migration of gases via permeable soils	Site Workers/Site Maintenance	Minor	Unlikely	Very low		
			End Users	Minor	Unlikely	Very low		
			Off-site Users	Minor	Unlikely	Very low		
			Building and confined spaces	Minor	Unlikely	Very low		

Appendix C.2 Chemical Laboratory Results

**Tim Rudkin**

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e: reception@i2analytical.com

Analytical Report Number : 19-73496

Project / Site name:	Unit 3 Emsworth - Warehouse Extension	Samples received on:	25/11/2019
Your job number:	17974	Samples instructed on:	25/11/2019
Your order number:	17974	Analysis completed by:	02/12/2019
Report Issue Number:	1	Report issued on:	03/12/2019
Samples Analysed:	5 soil samples		

Signed: Karolina Marek

Karolina Marek
Technical Reviewer (Reporting Team)

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 19-73496

Project / Site name: Unit 3 Emsworth - Warehouse Extension

Your Order No: 17974

Lab Sample Number				1370457	1370458	1370459	1370460	1370461
Sample Reference				WS1	WS3	WS3	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.40	3.20	0.50
Date Sampled				18/11/2019	18/11/2019	18/11/2019	18/11/2019	18/11/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.9	11	15	16	12
Total mass of sample received	kg	0.001	NONE	0.90	0.90	1.0	0.80	1.2

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.3	8.2	8.2	8.4
Organic Matter	%	0.1	MCERTS	0.6	4.1	2.4	2.6	2.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.56	0.24	< 0.05	0.51
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.64
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.27	< 0.05	< 0.05	0.80
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.22	< 0.05	< 0.05	0.54
Phenanthrene	mg/kg	0.05	MCERTS	0.45	4.3	0.88	1.3	10
Anthracene	mg/kg	0.05	MCERTS	0.16	1.1	0.20	0.28	4.0
Fluoranthene	mg/kg	0.05	MCERTS	1.8	10	2.0	4.0	54
Pyrene	mg/kg	0.05	MCERTS	1.9	9.2	2.0	3.7	52
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.4	5.9	1.3	3.3	41
Chrysene	mg/kg	0.05	MCERTS	1.4	5.6	1.5	2.4	29
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.8	6.1	1.3	2.8	37
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.0	2.9	1.2	2.3	26
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.4	5.6	1.3	3.2	42
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.56	2.1	0.48	1.0	14
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	0.16	0.45	< 0.05	< 0.05	3.2
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.79	2.3	0.58	1.2	16

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	13.0	56.8	12.9	25.5	332
-----------------------------	-------	-----	--------	------	------	------	------	-----

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.3	18	26	19	9.0
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	0.8	1.6	1.6	1.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.1	< 0.2	0.4	0.3	0.5
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	24	25	61	11
Copper (aqua regia extractable)	mg/kg	1	MCERTS	51	92	120	35	40
Lead (aqua regia extractable)	mg/kg	1	MCERTS	45	66	360	92	52
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	1.7	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30	22	25	48	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	21	45	39	36	18
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	51	180	180	75	61

Petroleum Hydrocarbons

TPH Texas (C6 - C8)	mg/kg	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH Texas (C8 - C10)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Texas (C10 - C12)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	2.0
TPH Texas (C12 - C16)	mg/kg	4	MCERTS	< 4.0	8.3	< 4.0	< 4.0	34
TPH Texas (C16 - C21)	mg/kg	10	MCERTS	15	50	< 10	13	190
TPH Texas (C21 - C40)	mg/kg	10	MCERTS	30	99	25	33	640
TPH Texas (C6 - C40)	mg/kg	10	NONE	45	160	25	46	860

Analytical Report Number : 19-73496

Project / Site name: Unit 3 Emsworth - Warehouse Extension

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1370457	WS1	None Supplied	0.50	Brown loam and clay with gravel.
1370458	WS3	None Supplied	0.50	Brown loam and clay with gravel.
1370459	WS3	None Supplied	1.40	Brown loam and clay with gravel.
1370460	WS3	None Supplied	3.20	Brown loam and clay with gravel.
1370461	WS4	None Supplied	0.50	Brown loam and clay with gravel and chalk.

Analytical Report Number : 19-73496

Project / Site name: Unit 3 Emsworth - Warehouse Extension

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH Texas (Soil)	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method	L064-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Appendix C.3 General Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

1.1 Introduction

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

1.2 General Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

1.2.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

- EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
 - EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
 - EA CLEA Bulletin (2009).
 - CLEA software version 1.04 (2009)
 - Toxicological reports and SGV technical notes.
-

The CLEA guidance and tools:

1. do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
 2. do not cover risks to the environment, such as groundwater, ecosystems or buildings.
 3. do not provide a definitive test for telling when human health risks are significant.
 4. are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.
-

1.3 Soil Guideline Values (2009)

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination.

SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to

chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues.

SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less than the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.4 Ongoing development of CLEA based guidance

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published. Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

-
- GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
-
- SGV reports may give values that differ from the GAC's used in this report.
-
- These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.
-

1.5 Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

ICRCL 70/90: *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.*

1.6 Other Generic Assessment Criteria

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH) are used for example. In the case of Lead, Category 4 screening levels (C4SLs) have replaced the AtRisk Soil SSV.

1.6.1 EIC/AGS/CL: AIRE

The report represents the collaborative effort of risk assessors from 26 EIC and AGS member companies to produce generic assessment criteria (GAC) for soils for human health risk assessment. The project involved the collation and review of physico-chemical data, toxicological data and information on background

exposure for 44 contaminants sometimes encountered on land affected by contamination in the UK and the derivation of GAC for 351 of these using the CLEA model (v1.06). The GAC are intended to complement soil guideline values (SGV) produced by the Environment Agency of England and Wales and the 2nd edition GAC produced by LQM and CIEH (Nathanail et al, 2009). All three sets of assessment criteria have been derived in general accordance with the Environment Agency of England and Wales Contaminated Land Exposure Assessment (CLEA) guidance and thus the combined efforts of these three groups have resulted in a useful set of screening criteria for the assessment of risks to human health from soil contamination for more than 120 potentially contaminative substances.

1.6.2 Category 4 screening levels (C4SLs) (2014)

A new statutory DEFRA guidance recently (i.e. August 2014) published some GACs with a more pragmatic (but still strongly precautionary) approach in their derivation called the Category 4 screening levels (C4SLs). These values provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land. They are intended as generic screening values, (ii) they describe a level of risk that whilst above 'minimal' is still 'low' and (iii) they provide a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated. These values were derived for four generic land uses: residential, commercial, allotments, and public open space.

1.6.3 LQM/CIEH Suitable 4 Use Level (S4UL) (2015)

The new S4UL's ((Nathanail *et al*, 2015), was developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants. The S4ULs were:

- based on Health Criteria Values, updated to reflect changes since 2009
- derived for the standard CLEA land uses and the two public open space scenarios developed by Defra SP1010
- developed for ca 85 substances (those previously covered by the LQM/CIEH GAC and the SGV substances);
- Compliant with SR2 and the long standing principle of 'suitable for use' and reflecting changes to exposure parameters produced by Defra SP1010.

For derivation of these Generic Assessment Criteria reference must be made to: Nathanail, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (3rd edition)*. Land Quality Press. 2015.

1.7 Standard Land-use Scenarios

The standard land-use scenarios used to develop conceptual exposure models are presented in the following sections:

1.7.1 Residential

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

-
- Critical receptor is a young female child (zero to six years old)
 - Exposure duration is six years.
 - Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
 - Building type is a two-storey small terraced house.
-

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur.

1.7.2 Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption.

Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

-
- Critical receptor is a young female child (zero to six years old)
 - Exposure duration is six years.
 - Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
 - There is no building.
-

1.7.3 Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

-
- Critical receptor is a working female adult (aged 16 to 65 years old).
 - Exposure duration is a working lifetime of 49 years.
 - Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
 - Building type is a three-storey office (pre 1970).
-

1.7.4 Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

-
- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
-
- Predominantly used by children for playing and may be used for activities such as a football kick about
-
- Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
-
- older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
-
- ingestion rate 75 mg.day^{-1}
-

1.7.5 Public Open Space Park

This generic scenario refers to any public park that is more than 0.5ha in area:

-
- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% cover)
-
- Female child age classes 1-6
-
- Soil ingestion rate of 50 mg.day^{-1}
-
- Occupancy period outdoors = 2 hours.day^{-1}
-
- Exposure frequency of 170 days.year⁻¹ for age classes 2-18 and 85 days.year⁻¹ for age class 1
-
- Outdoor exposure pathways only (no tracking back).
-

1.8 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

-
- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
-
- Developing more accurate parameters using site data.
-

1.9 Current Criteria

Table 1 presents the current Generic Assessment Criteria and reference should be made to the original publications if needed.

1.10 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) and Category 4 screening levels (C4SLs) (2014) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CL:AIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CL:AIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

Treatment of Hot-Spots

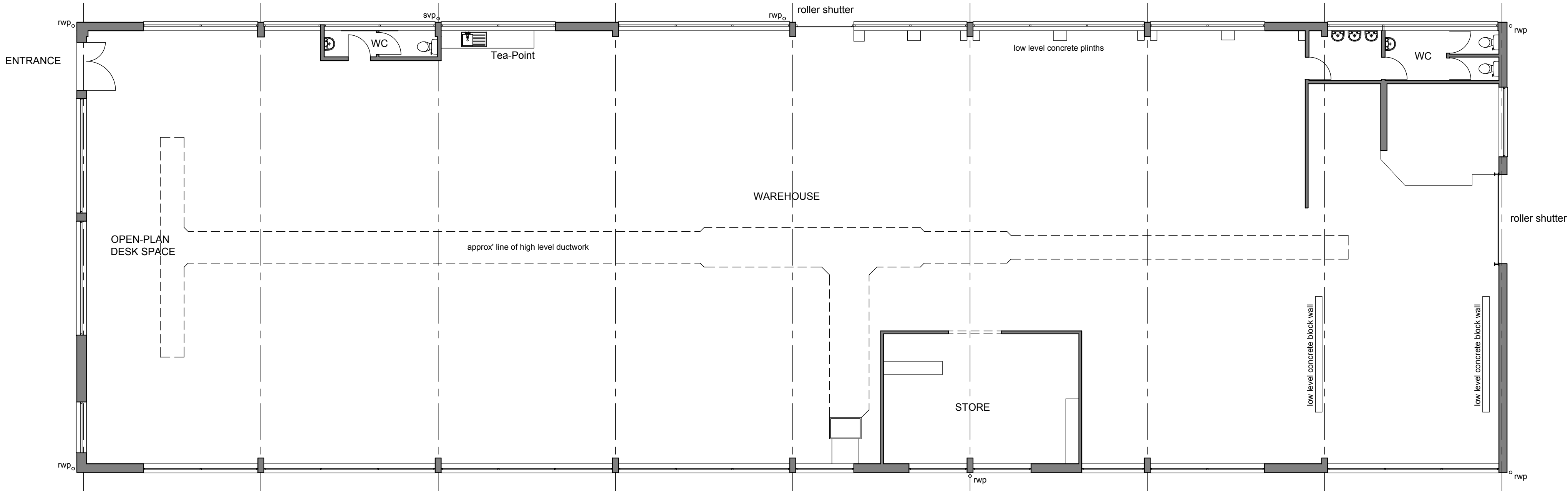
- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
 - Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.
-

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date	
			With			Without			Allotments			Commercial			Residential			Park						
			SOM	1.0	2.5	6	1	2.5																6
Type	Contaminants	Species	Year	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
	Antimony		2010						550						7500						EIC/AGS/ CL:AIRE	EIC/AGS/ CL:AIRE	2010	
Metals	Arsenic		2014			37			40			49			640			79		168	C4SL	DEFRA	2014	
			2015			37			40			40			640			79		170	S4UL	LQM/CIEH	2015	
	Beryllium		2015			1.7			1.7			35			12			2.2		63	S4UL	LQM/CIEH	2015	
	Boron		2015			290			11000			45			240000			21000		46000	S4UL	LQM/CIEH	2015	
	Cadmium		2015			11			85			1.9			190			120		532	S4UL	LQM/CIEH	2015	
	Chromium	III	2014			26			149			4.9			410			220		880	C4SL	DEFRA	2014	
			2015			910			910			18000			8600			1500		33000	S4UL	LQM/CIEH	2015	
			VI	2014			21			21			170			49			23		250	C4SL	DEFRA	2014
		VI	2015			6			6			1.8			33			7.7		220	S4UL	LQM/CIEH	2015	
	Copper		2015			2400			7100			520			68000			12000		44000	S4UL	LQM/CIEH	2015	
	Lead					200			310			80			2330			630		1300	C4SL	DEFRA	2014	
	Mercury	Elemental	2012			1.0			1.0			26			26							SGV	DEFRA	2012
			2015			1.2			1.2			21			58			16		30	S4UL	LQM/CIEH	2015	
			2012			170			170			80			36000							SGV	DEFRA	2012
			2015			40			56			19			1100			120		240	S4UL	LQM/CIEH	2015	
			Methyl	2012			11			11			8			410							SGV	DEFRA
			2015			11			15			6			320			40		68	S4UL	LQM/CIEH	2015	
	Nickel		2012			130			130			230			1800							SGV	DEFRA	2012
			2015			130			180			53			980			230		800	S4UL	LQM/CIEH	2015	
	Selenium		2012			350			350			120			13000							SGV	DEFRA	2012
			2015			250			430			88			12000			1100		1800	S4UL	LQM/CIEH	2015	
	Vanadium		2015			410			1200			91			9000			2000		5000	S4UL	LQM/CIEH	2015	
	Zinc		2015			3700			40000			620			730000			81000		170000	S4UL	LQM/CIEH	2015	
	BTEX & MTBE	Benzene	2012			0.33			0.33			0.07			95							SGV	DEFRA	2012
2014					0.87			3.3			0.18			98			140		230	C4SL	DEFRA	2014		
2015			0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	S4UL	LQM/CIEH	2015	
Toluene			2012			610			610			120			4400						SGV	DEFRA	2012	
		2015	130	290	660	880	1900	3900	22	51	120	65000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015	
Ethylbenzene			2012			350			350			90			2800						SGV	DEFRA	2012	
		2015	47	110	260	83	190	440	16	39	91	4700	13000	27000	24000	24000	25000	17000	22000	27000	S4UL	LQM/CIEH	2015	
Xylenes		o-xylene	2012			250			250			160			2600							SGV	DEFRA	2012
			2015	60	140	330	88	210	480	28	67	160	6600	15000	33000	41000	42000	43000	17000	24000	33000	S4UL	LQM/CIEH	2015
		m-xylene	2012			240			240			180			3500							SGV	DEFRA	2012
			2015	59	140	320	82	190	450	31	74	170	6200	14000	31000	41000	42000	43000	17000	24000	32000	S4UL	LQM/CIEH	2015
		p-xylene	2012			230			230			160			3200							SGV	DEFRA	2012
		2015	56	130	310	79	180	310	29	69	160	5900	14000	30000	41000	42000	43000	17000	23000	31000	S4UL	LQM/CIEH	2015	
Petroleum Hydrocarbons Fractions	Aliphatic >C5 - C6		2015	42	78	160	42	78	160	730	1700	3900	3200	5900	12000	570000	590000	600000	95000	130000	180000	S4UL	LQM/CIEH	2015
	Aliphatic >C6 - C8		2015	100	230	530	100	230	530	2300	5600	13000	7800	17000	40000	600000	610000	620000	150000	220000	320000	S4UL	LQM/CIEH	2015
	Aliphatic >C8 - C10		2015	27	65	150	27	65	150	320	770	1700	2000	4800	11000	13000	13000	13000	14000	18000	21000	S4UL	LQM/CIEH	2015
	Aliphatic >C10 - C12		2015	130	330	760	130	330	770	2200	4400	7300	9700	23000	47000	13000	13000	13000	21000	23000	24000	S4UL	LQM/CIEH	2015
	Aliphatic >C12 - C16		2015	1100	2400	4300	1100	2400	4400	11000	13000	13000	59000	82000	90000	13000	13000	13000	25000	25000	26000	S4UL	LQM/CIEH	2015
	Aliphatic >C16 - C35		2015	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aliphatic >C35 - C44		2015	65000	92000	140000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aromatic >C5 - C7		2015	70	140	300	370	690	1400	13	27	57	26000	46000	86000	56000	56000	56000	76000	84000	92000	S4UL	LQM/CIEH	2015
	Aromatic >C7 - C8		2015	130	290	660	860	1800	3900	22	51	120	56000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015
	Aromatic >C8 - C10		2015	34	83	190	47	110	270	8.6	21	51	3500	8100	17000	5000	5000	5000	7200	8500	9300	S4UL	LQM/CIEH	2015
	Aromatic >C10 - C12		2015	74	180	380	250	590	1200	13	31	74	16000	28000	34000	5000	5000	5000	9200	9700	10000	S4UL	LQM/CIEH	2015
	Aromatic >C12 - C16		2015	140	330	660	1800	2300	2500	23	57	130	36000	37000	38000	5100	5100	5000	10000	10000	10000	S4UL	LQM/CIEH	2015
Aromatic >C16 - C21		2015	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	S4UL	LQM/CIEH	2015	

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date		
			Allotments						Commercial			Residential						Park							
			With home-grown produce			Without home-grown produce			1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6					
Type	Contaminants	Species	Year	SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
	Aromatic >C21 - C35		2015		1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aromatic >C34 - C44		2015		1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aliphatic + Aromatic >C44 - C70				1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
Polycyclic Aromatic Hydrocarbons (PAH's) (mg/kg)	Acenaphthene		2015		210	510	1100	3000	4700	6000	34	85	200	84000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Acenaphthylene		2015		170	420	920	2900	4600	6000	28	69	160	83000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Anthracene		2015		2400	5400	11000	31000	35000	37000	380	950	2200	520000	54000	540000	74000	74000	74000	150000	150000	150000	S4UL	LQM/CIEH	2015
	Benzo(a)anthracene		2015		7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015
	Benzo(a)pyrene		2014				5			5.3			5.7			76			10		21	C4SL	DEFRA	2014	
			2015		2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015
	Benzo(b)fluoranthene		2015		2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015
	Benzo(ghi)perylene		2015		320	340	250	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	S4UL	LQM/CIEH	2015
	Benzo(k)fluoranthene		2015		77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	S4UL	LQM/CIEH	2015
	Chrysene		2015		15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	S4UL	LQM/CIEH	2015
	Dibenz(a,h)anthracene		2015		0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	S4UL	LQM/CIEH	2015
	Fluoranthene		2015		280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	S4UL	LQM/CIEH	2015
	Fluorene		2015		170	400	860	2800	3800	4500	27	67	160	63000	68000	71000	9900	9900	9900	20000	20000	20000	S4UL	LQM/CIEH	2015
	Indeno(1,2,3-cd)pyrene		2015		27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	S4UL	LQM/CIEH	2015
	Naphthalene		2015		2.3	5.6	13	2.3	5.6	13	4.1	10	24	190	460	1100	4900	4900	4900	1200	1900	3000	S4UL	LQM/CIEH	2015
	Phenanthrene		2015		95	220	440	1300	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	S4UL	LQM/CIEH	2015
	Pyrene		2015		620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	S4UL	LQM/CIEH	2015
	Coal Tar(Bap as surrogate matter)		2015		0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	S4UL	LQM/CIEH	2015
Chloroalkanes & alkenes	1,2 Dichloroethane		2015		0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	S4UL	LQM/CIEH	2015
	1,1,1 Trichloroethane		2015		8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000	76000	100000	S4UL	LQM/CIEH	2015
	1,1,2,2 Tetrachloroethane		2015		1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	S4UL	LQM/CIEH	2015
	1,1,1,2 Tetrachloroethane		2015		1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100	S4UL	LQM/CIEH	2015
	Tetrachloroethene		2015		0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	810	1100	1500	S4UL	LQM/CIEH	2015
	Tetrachloromethane (Carbon Tetrachloride)		2015		0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015
	Trichloroethene		2015		0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015
	Trichloromethane		2015		0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015
	Vinyl Chloride (chloroethene)		2015		0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	S4UL	LQM/CIEH	2015
Explosives	2,4,6 Trinitrotoluene		2015		1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	S4UL	LQM/CIEH	2015
	RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)		2015		120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000	51000	53000	S4UL	LQM/CIEH	2015
	HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)		2015		5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000	23000	24000	S4UL	LQM/CIEH	2015
Pesticides	Aldrin		2015		5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	S4UL	LQM/CIEH	2015
	Dieldrin		2015		0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	S4UL	LQM/CIEH	2015
	Atrazine		2015		3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	S4UL	LQM/CIEH	2015
	Dichlorvos		2015		0.032	0.066	0.14	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	S4UL	LQM/CIEH	2015
	Alpha - Endosulfan		2015		7.4	18	41	160	280	410	1.2	2.9	6.8	5600	7400	8400	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015
	Beta - Endosulfan		2015		7	17	39	190	320	440	1.1	2.7	6.4	6300	7800	8700	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015
	Alpha -Hexachlorocyclohexanes		2015		0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	S4UL	LQM/CIEH	2015
	Beta -Hexachlorocyclohexanes		2015		0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65									

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date	
			With			Without			Allotments			Commercial			Residential			Park						
			home-grown produce			home-grown produce																		
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
Type	Contaminants	Species	Year																					
Phenols & Chlorophenols	1,2,3,4,-Tetrachlorobenzene		2015	15	36	78	24	56	120	4.4	11	26	1700	3080	4400	830	830	830	1500	1600	1600	S4UL	LQM/CIEH	2015
	1,2,3,5,- Tetrachlobenzene		2015	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49	120	240	78	79	79	110	120	130	S4UL	LQM/CIEH	2015
	1,2,4, 5,- Tetrachlobenzene		2015	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42	72	96	13	13	13	25	26	26	S4UL	LQM/CIEH	2015
	Pentachlrobenzene		2015	5.8	12	22	19	30	38	1.2	3.1	7	640	770	830	100	100	100	190	190	190	S4UL	LQM/CIEH	2015
	Hexachlorobenzene		2015	1.8	3.3	4.9	4.1	5.7	6.7	0.47	1.1	2.5	110	120	120	16	16	16	30	30	30	S4UL	LQM/CIEH	2015
	Phenols		2012	420			420			280			3200			SGV			DEFRA			2012		
			2015	120	200	380	440	690	1200	23	42	83	440	690	1300	440	690	1300	440	690	1300	S4UL	LQM/CIEH	2015
	Chlorophenols (4 Congeners)		2015	0.87	2	4.5	94	150	210	0.13	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	S4UL	LQM/CIEH	2015
	Pentachlorophenols		2015	0.22	0.52	1.2	27	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	S4UL	LQM/CIEH	2015
	Others	Carbon Disulphide		2015	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	S4UL	LQM/CIEH
Hexachloro-1,3-Butadiene			2015	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	S4UL	LQM/CIEH	2015
Sum of PCDDs, PCDFs and dioxin-like PCB's.			2012	8			8			8			240			SGV			DEFRA			2012		
NOTE																								
Priority		Guideline (mg kg ⁻¹)																						
1		Site Specific Assessment Criteria (SSAC) (Soils Limited)																						
2		2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014)																						
3		2012: Soil Guideline Value (SGV) (Environment Agency, 2009)																						
4		2015: Suitable 4 Use Level (S4UL) (Nathanail et al, 2015)																						
For Generic Risk Assessment, the values in Bold have priority																								
Table reviewed February 2018																								

Appendix D Information Provided by the Client



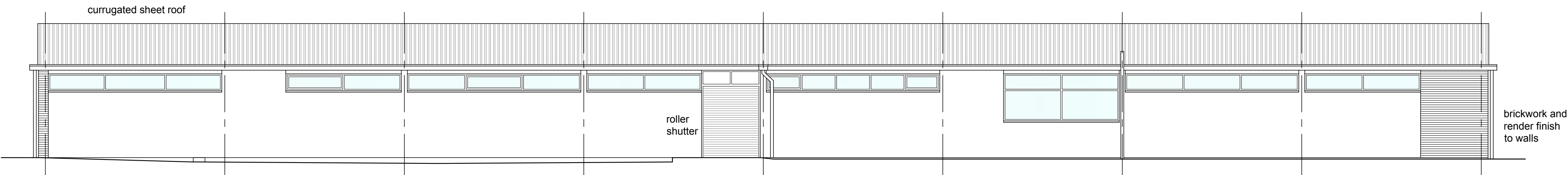
Floor Plan



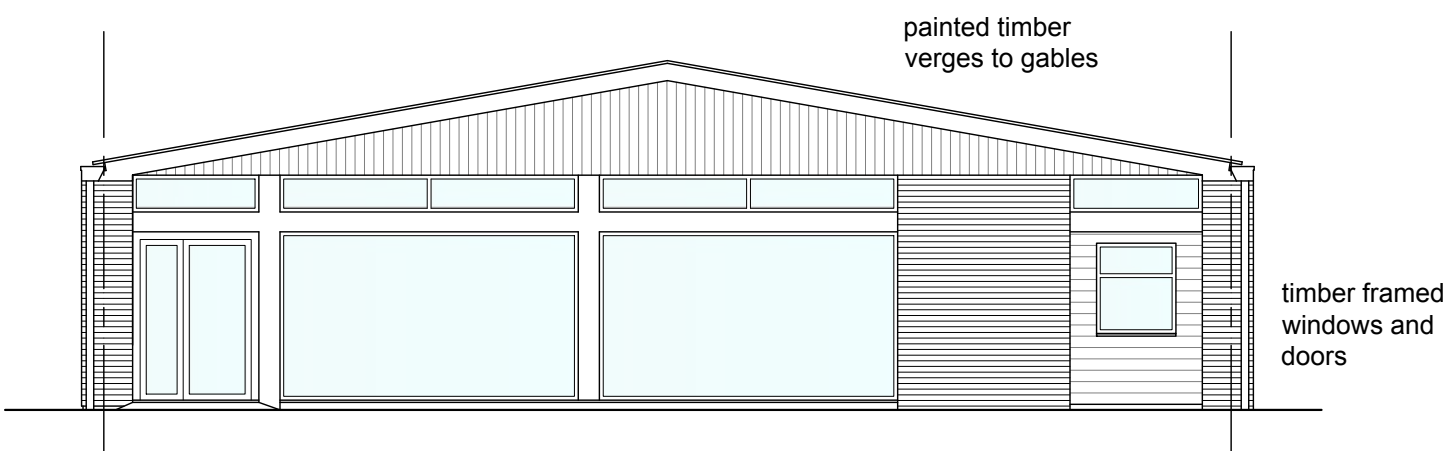
Site Location Plan 1:1250

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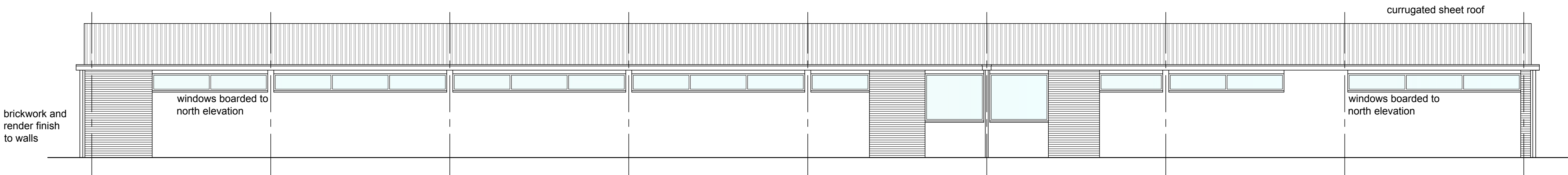
Scale 1/1250 (in metres)



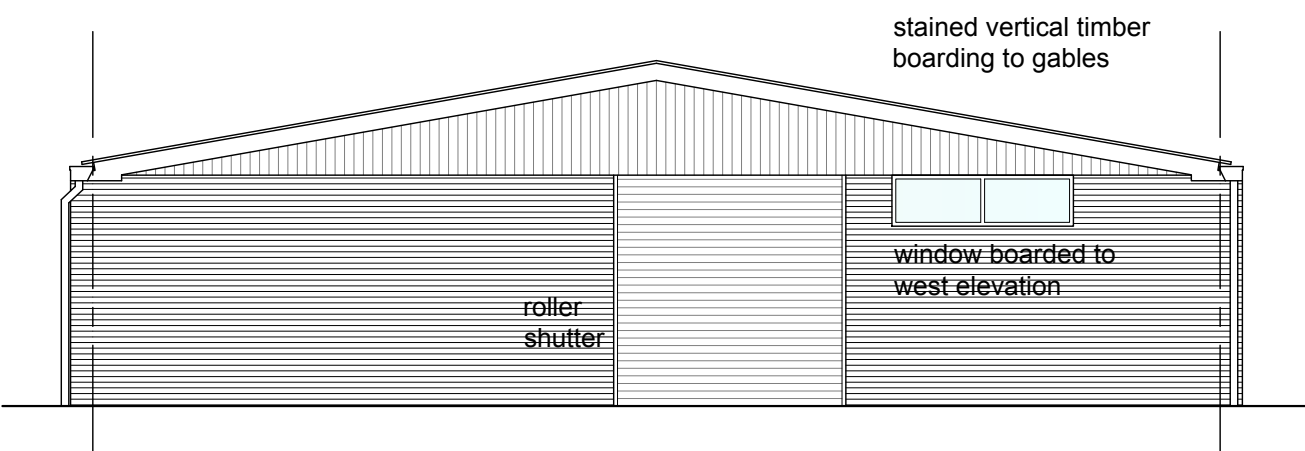
South Elevation



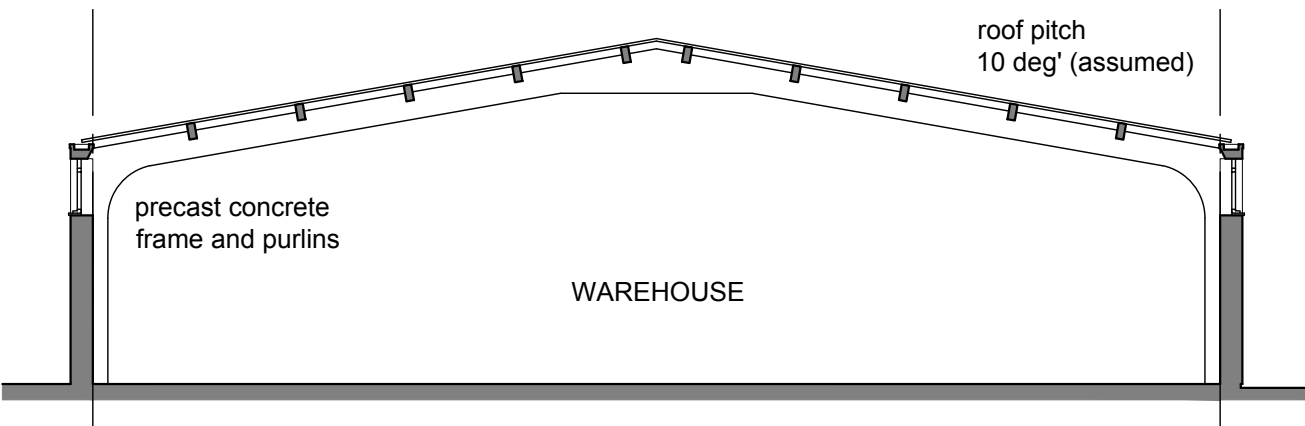
East Elevation



North Elevation



West Elevation



Cross Section

Scale 1/100 (in metres)

Notes
Report any discrepancies to the author.
Do not scale from this drawing.
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Full topographical site survey required.
Full survey of existing mechanical and electrical installations required.

Revision Notes:

Rev: Date: Description:

Date: Sept 2018

Scale @ A1: 1:100 / 1:1250

Status: Preliminary
Drawn: mp
Checked: dm

Project: Proposed Extension
The Racquet Depot, Emsworth

Drawing Title: Plans and Elevations
As Existing

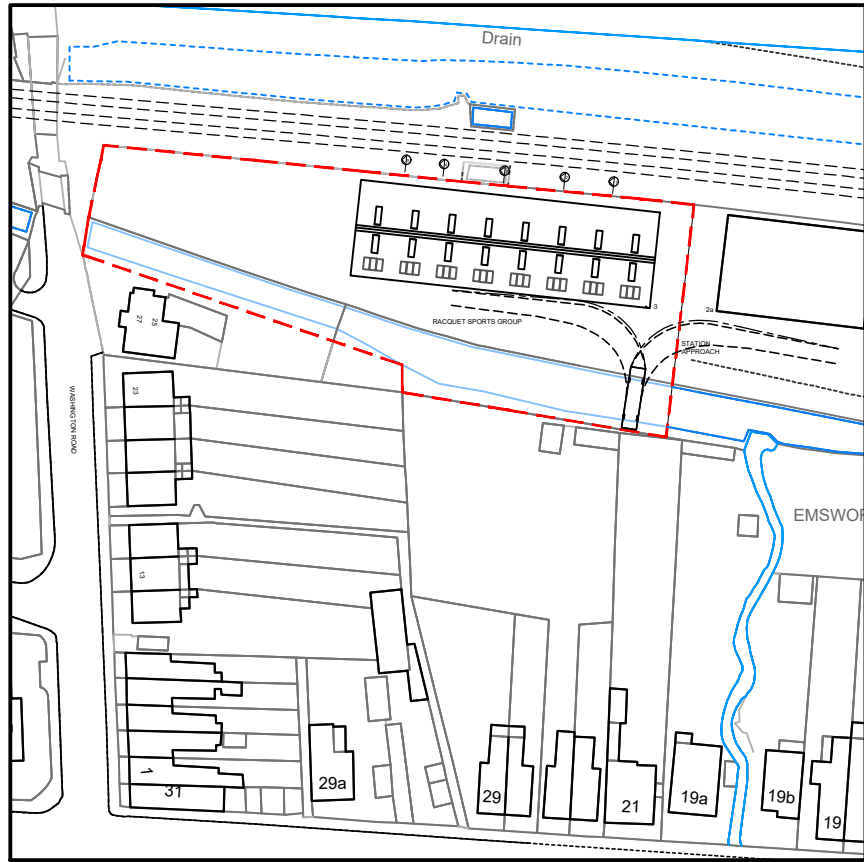
Client: Racquet Sports Group

Project: 1727
Dwg No: 002
Rev:

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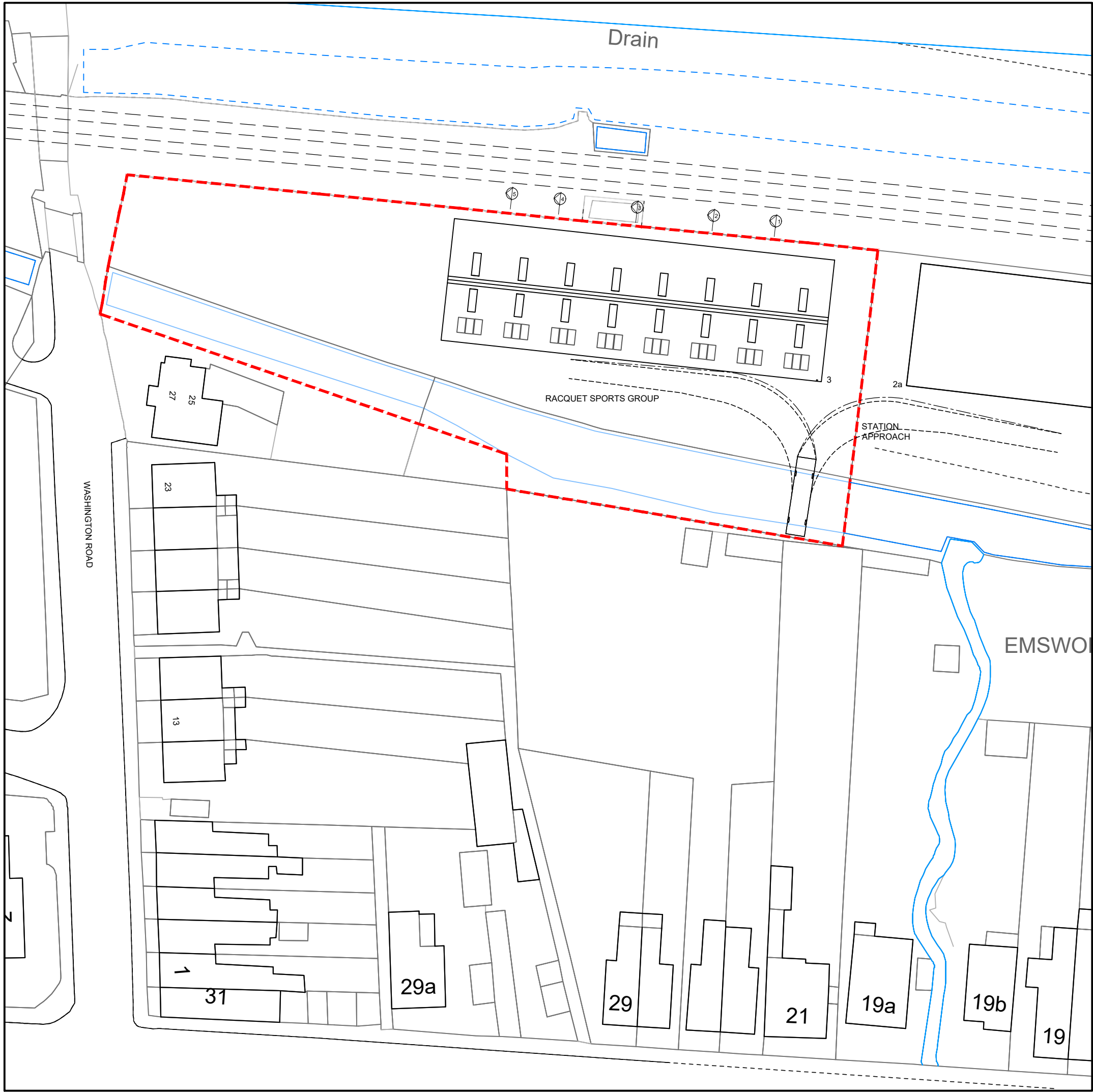


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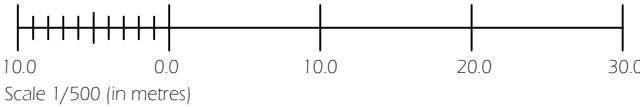


SITE LOCATION PLAN @ 1/1250

STREETWISE LICENCE NO.: 100047474



SITE BLOCK PLAN @ 1/500



Revision Notes:		
Rev:	Date:	Description:
.	.	.

Date: Feb. 2019		
Scale @ A2: 1/1250 & 1/500		
Drawing Status: Planning	Drawn: MS	Checked: MP

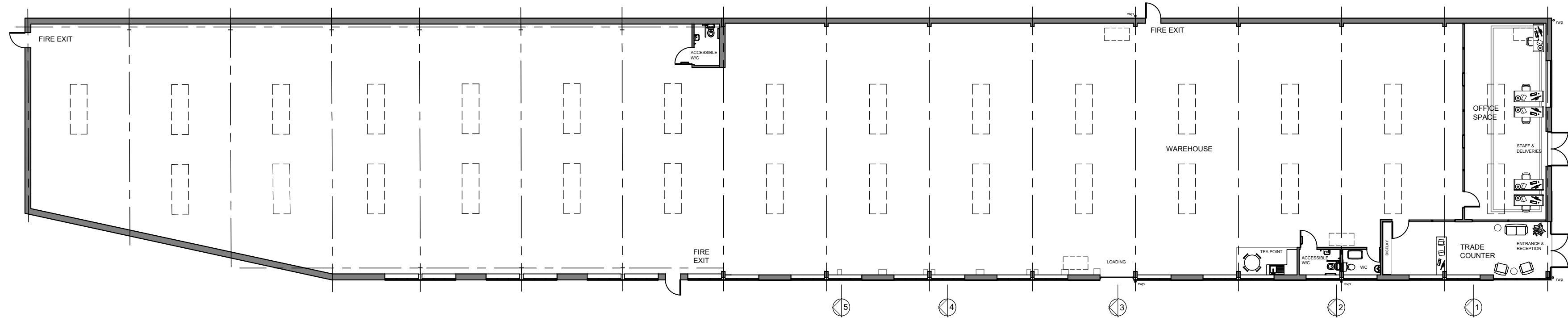
Project: Site Re-Development & Extension
Drawing Title: Proposed Location & Block Plans
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Client: Raquet Sports Group		
.		
Project: 1727	Dwg No: D00	Rev: .

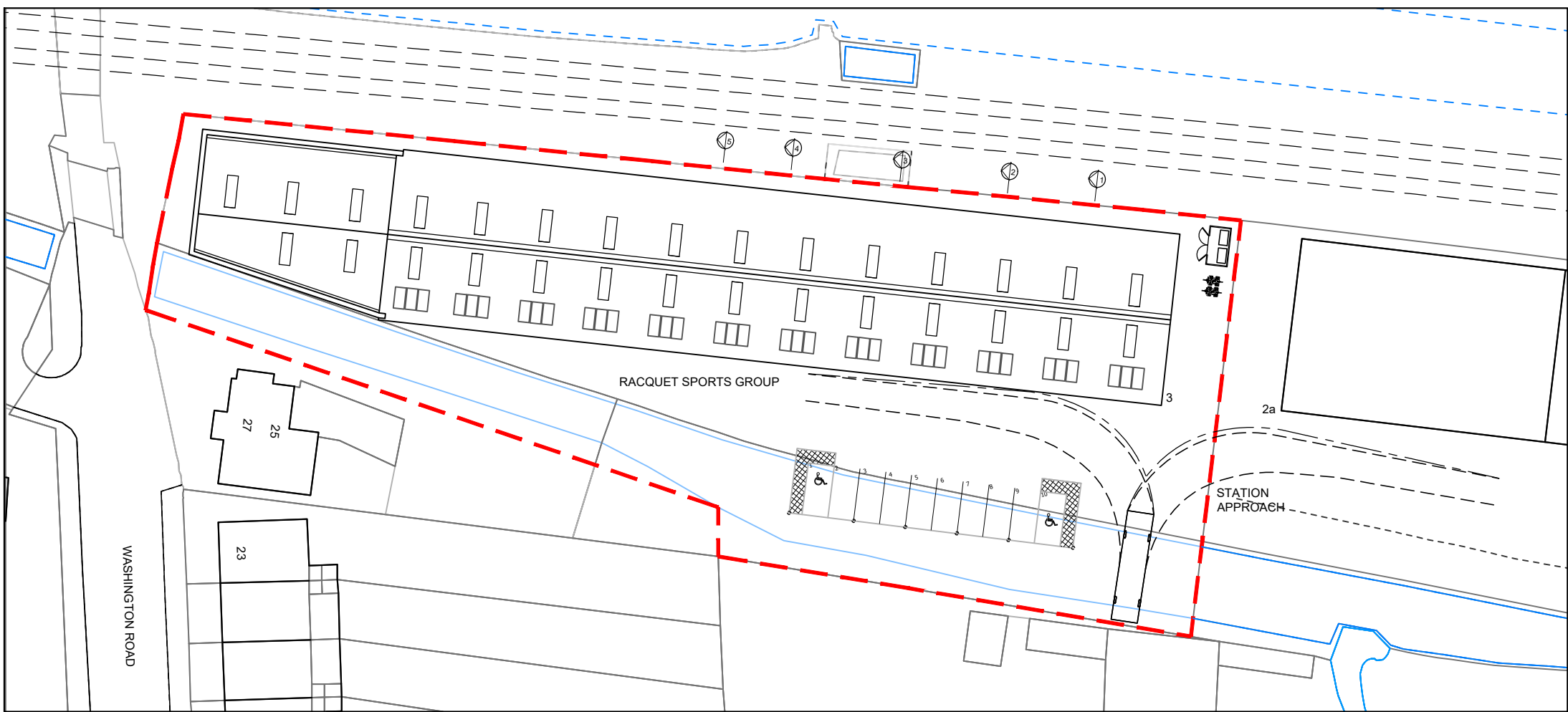
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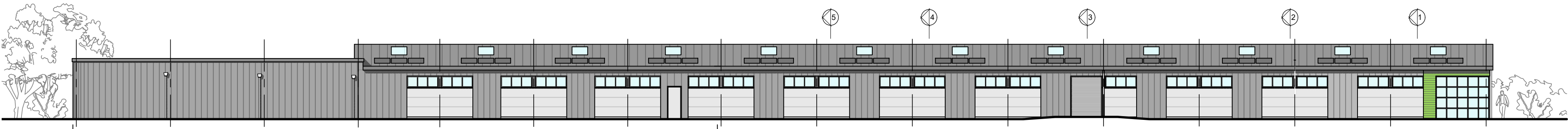
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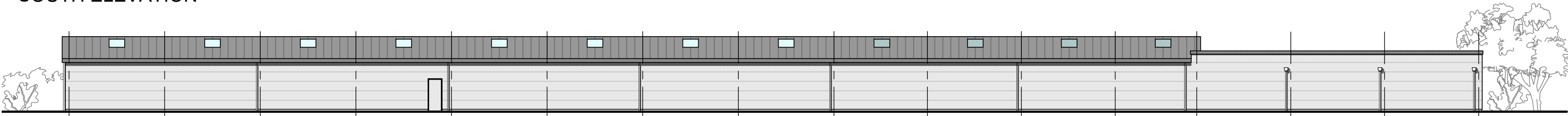
FLOOR PLAN
Gross Internal Area: Existing Warehouse 725m²
Proposed Extension = 575m² approx.



PROPOSED SITE PLAN 1:500
Scale 1/500 (in metres)

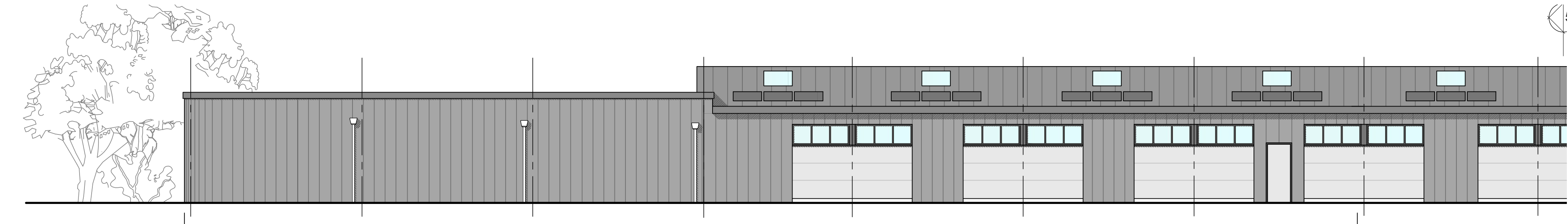


SOUTH ELEVATION



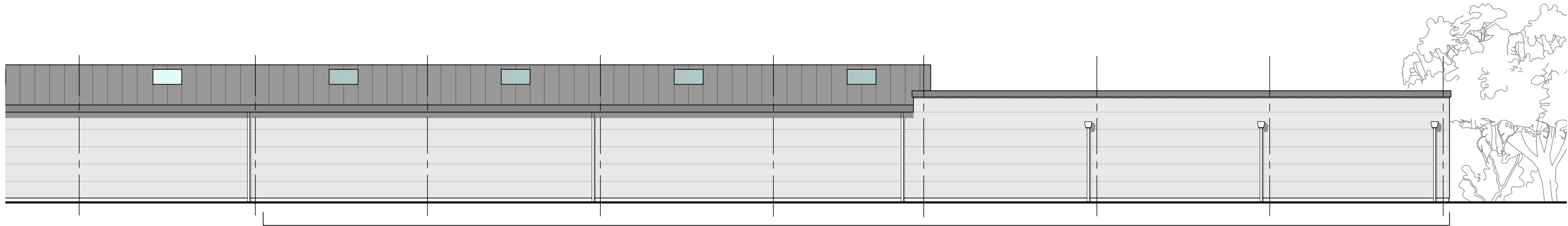
NORTH ELEVATION

PROPOSED ELEVATIONS 1:200
Scale 1/200 (in metres)



PROPOSED EXTENSION

SOUTH ELEVATION



NORTH ELEVATION

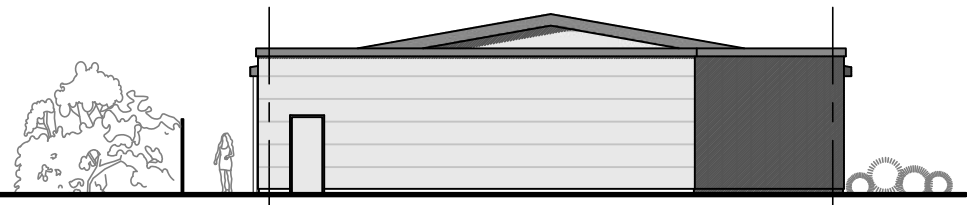
EXTENSION ELEVATIONS 1:100
Scale 1/100 (in metres)

EXTERNAL MATERIAL AND COLOURS

ELEMENT	MATERIAL	COLOUR
WALLS	TRAPEZOIDAL INSULATED VERTICAL PANELS	GREY
	MICRO-RIB INSULATED HORIZONTAL PANELS	GREY & GREEN
ROOF	TRAPEZOIDAL INSULATED ROOF PANELS	GREY
WINDOWS & DOORS	DOUBLE-GLAZED ALUMINIUM	GREY
FASCIAS & SOFFITS	PRESSED METAL	GREY
RAINWATER GOODS	PPC ALUMINIUM	BLACK



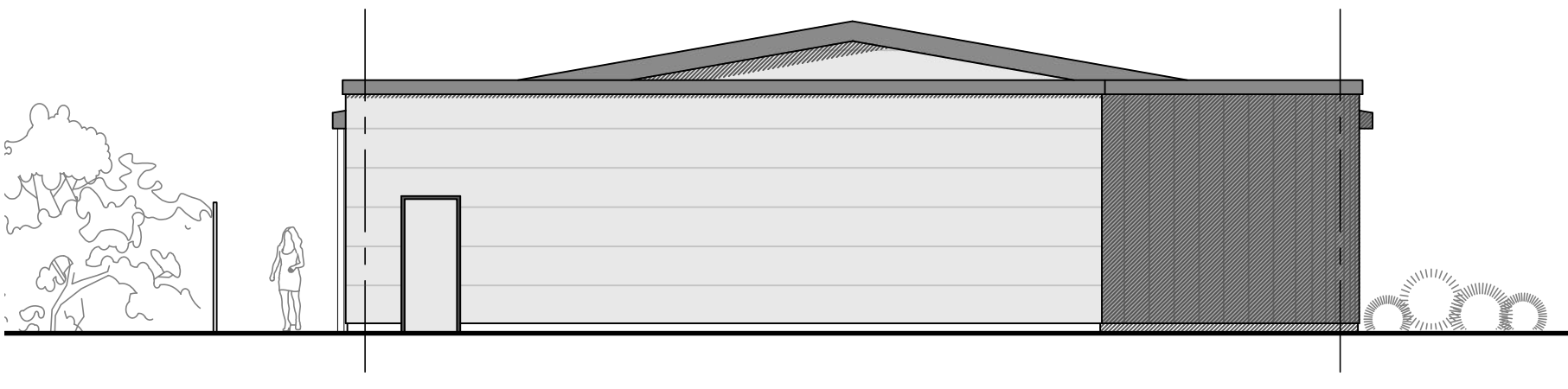
WEST ELEVATION



EAST ELEVATION



WEST ELEVATION



EAST ELEVATION

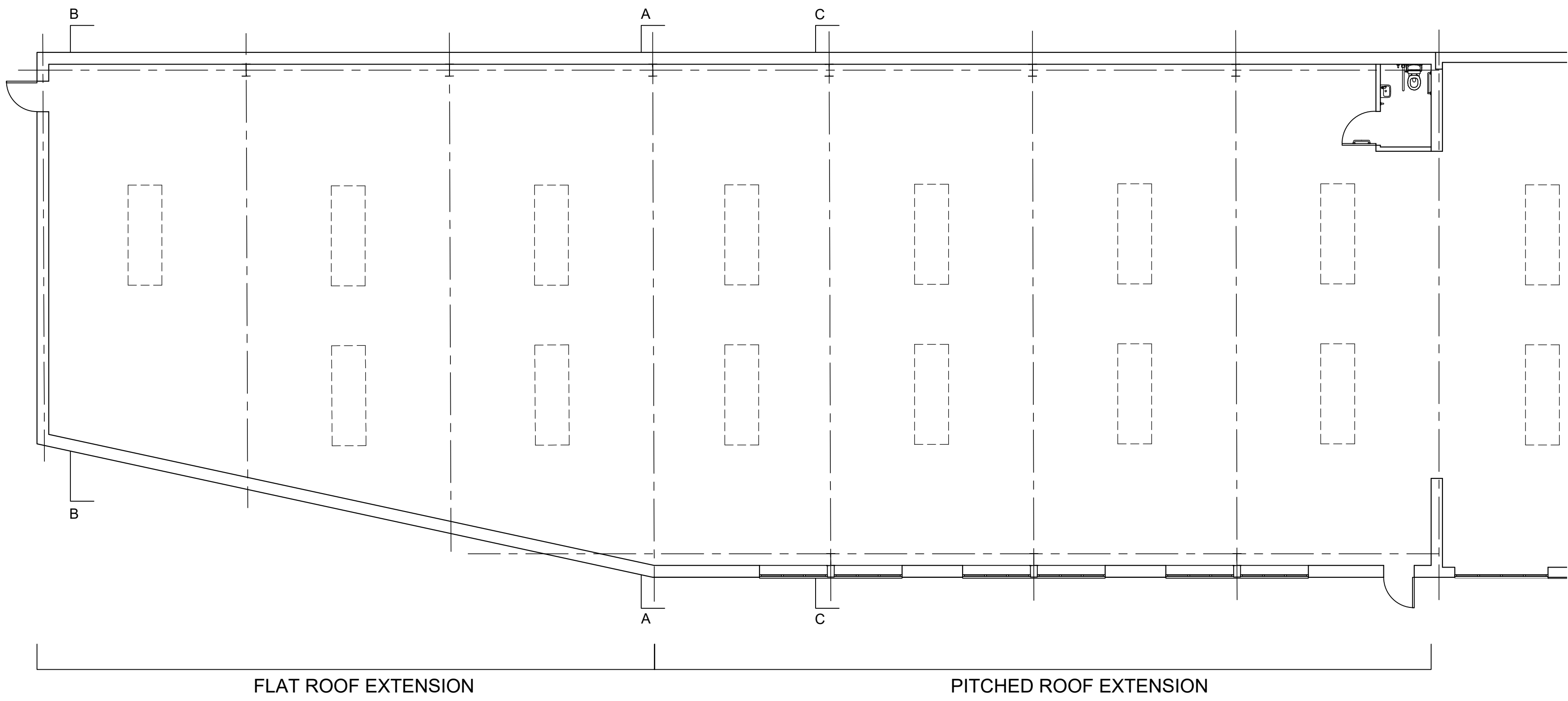
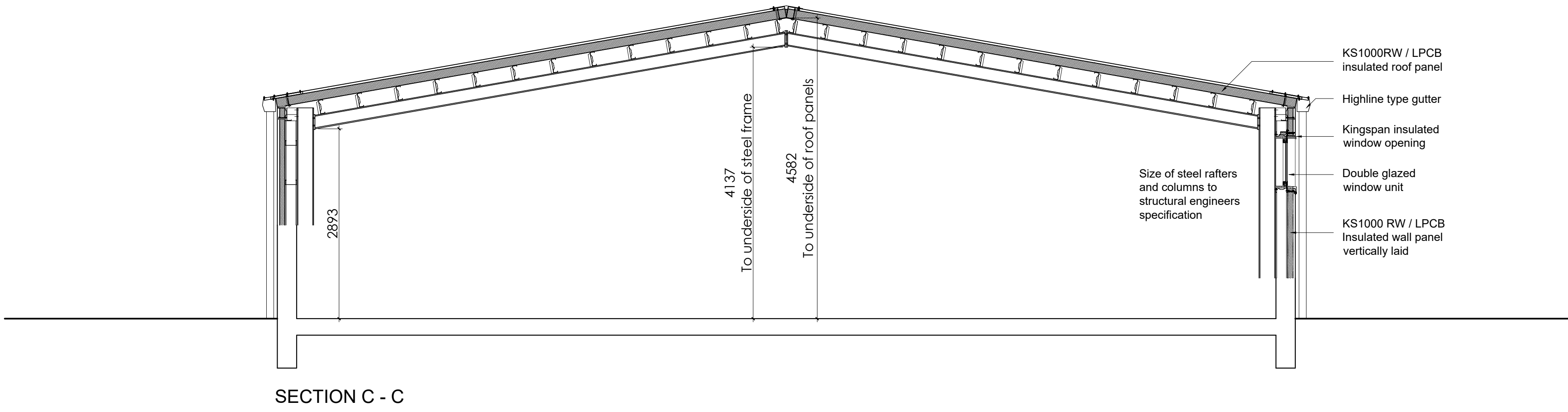
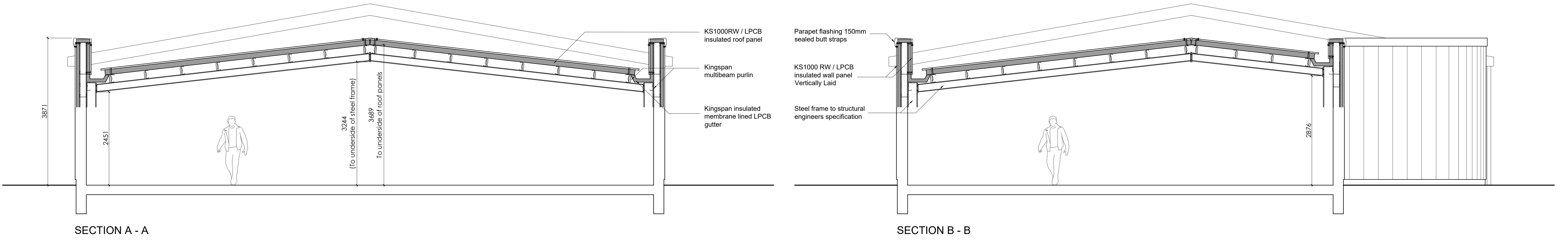
Notes
Report any discrepancies to the author.
Full survey of existing mechanical and electrical installations required.
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Rev:	Date:	Description:
A	05/02/19	Client amendments
B	22/02/19	Client amendments

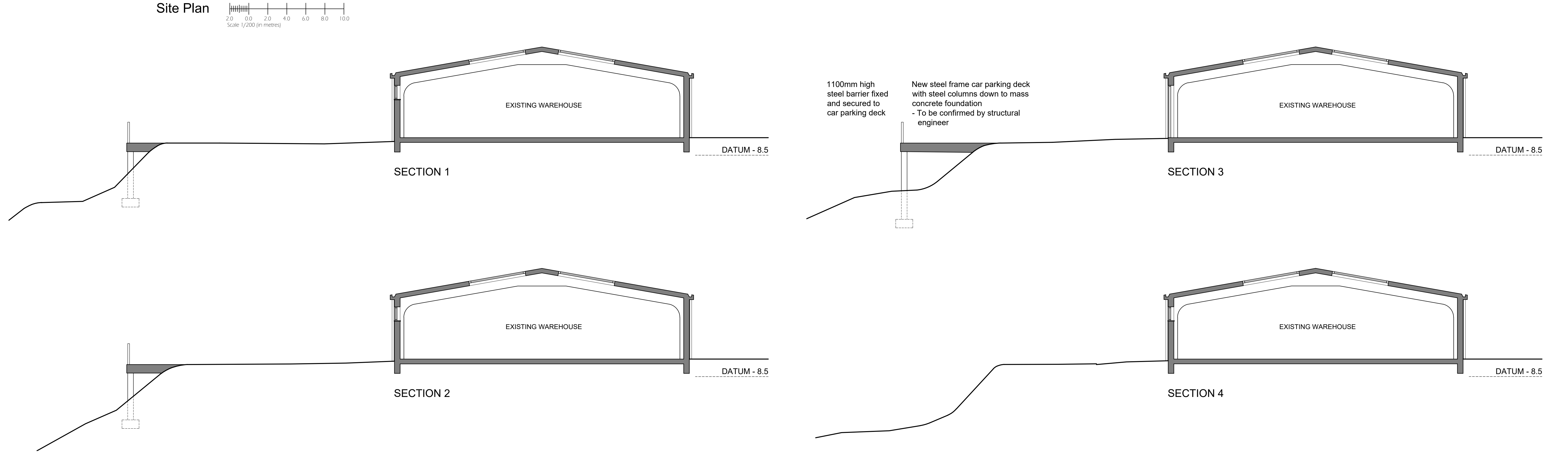
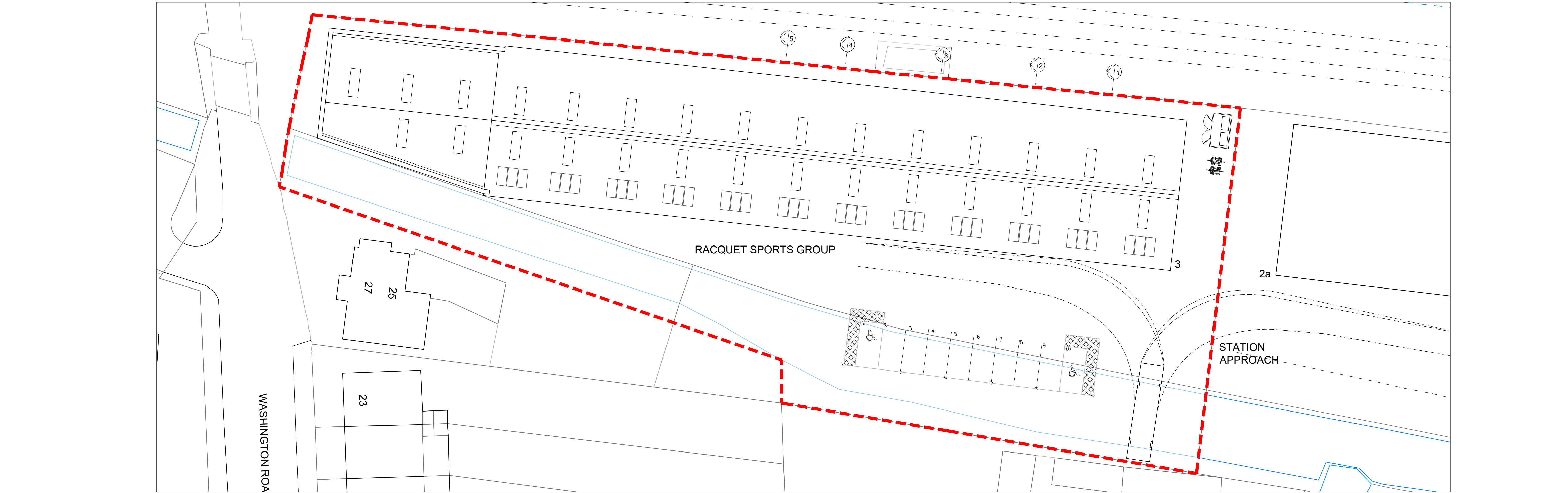
Date:	Dec. 2018
Scale @ A1:	1/100 & 1/200
Status:	Planning
Drawn:	MS
Checked:	MP

Project:	Site Re-development & Extension
Drawing Title:	Proposed Warehouse Extension

Client:	Racquet Sports Group
Project:	1727
Dwg No:	D03
Rev:	B



Notes Report any discrepancies to the author. Full survey of existing mechanical and electrical installations required. This drawing is copyrighted to Temple Ford Design LTD.	Revision Notes:			Date: Feb. 2019		Project: Site Re-development & Extension		Client: Racquet Sports Group		Temple Ford Design Ltd architects  T 023 8027 6393 E templeforddesign@gmail.com W templeforddesign.co.uk	
	Rev:	Date:	Description:	Scale @ A1: 1/50 & 1/100		Drawing Title: Sections Through Extension		Project: 1727	Dwg No: D04		Rev: .
				Status: Planning	Drawn: MS	Checked: MP					



Notes

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Full survey of existing mechanical and electrical installations required.

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Revision Notes:

Rev:	Date:	Description:

Date: Dec. 2018

Scale @ A1: 1/100 & 1/200

Status: Planning	Drawn: MS	Checked: MP
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Project: Site Re-development & Extension

Drawing Title: Proposed Sections & Site Plan

Client: Racquet Sports Group

Project: 1727	Dwg No: D05	Rev: .
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Temple Ford Design Ltd architects

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DATE FEB. 20, 2019

DESIGN AND ACCESS STATEMENT FOR AN EXTENSION TO EXISTING WAREHOUSE

**ADDRESS: RACQUET SPORTS GROUP, UNIT 3 STATION APPROACH, EMSWORTH, HAMPSHIRE,
PO10 7PW**



Figures 1 & 2 Existing Warehouse front & rear

Client and Brief

The existing property is a detached single storey warehouse that was built in the mid-20th Century. The accommodation comprises the main entrance area to the front elevation which opens onto the office area. Beyond that is the open plan storage area of the warehouse as well as 2x w/c's, one near the entrance and one to the rear. There is a further two entrances into the warehouse, a roller shutter door to the side elevation which is currently used for deliveries, and one larger roller shutter door to the rear.

The warehouse has a corrugated sheet finish to the main roof, a combination of red facing brickwork and render to all the external walls. The existing windows and doors are a mixture of timber and uPVC throughout. The existing warehouse structure is formed by a pre-cast concrete frame and concrete purlins, all of which is intended to be retained.

The owners of the property have appointed Temple Ford Design Ltd to prepare existing and proposed drawings for a planning application.

Planning History

There is currently a planning application under review for the refurbishment of the existing warehouse. The summary of the proposed changes in relation to that application are as follows:

The proposed changes are to comprise the replacement of all of the existing cladding, to both the roof and the walls, with new insulated cladding panels. In the roof will be a series of rooflights to both the south and north elevation. Photovoltaic panels will also be installed on the south elevation to capitalise on harnessing renewable solar energy. All of the existing windows and doors are to be replaced with new aluminium double glazed units. All of the existing concrete frame and purlins are intended to be retained, along with the smaller roller shutter door to the south elevation. The position of the existing entrance is to remain and lead into the new trade counter area which is defined by a clear glass partition part overlooking each of the storage and office areas within the warehouse. The office area position is to remain with the addition of a new frosted glass partition facing the storage area. The existing toilets are to be retained with one becoming an accessible w/c.

Summary of proposed changes

The proposed changes are to comprise a new extension as a continuation from the existing warehouse with the addition of a flat roof extension with surrounding parapet wall at the end. The structure of both the pitched and flat roof sections will consist of a steel frame with the roof and walls to be clad in insulated cladding panels and the doors and windows will be aluminium double glazed. In the roof will be a series of rooflights and photovoltaic panels. The flat roof extension will also have a parapet wall, the construction of which will match the rest of the extension.

A new parking platform will also be constructed near the entrance to the site and trade counter to provide sufficient parking for both employee's and visitors. A biodiversity survey will also be carried out when it is required.

Context

Station Approach/Sultan Road is located on the northern outskirts of Emsworth, found between Portsmouth and Chichester. The Racquet Sports Group site backs directly onto the train tracks that lead to Emsworth train station a little down the road. The nearby buildings approaching the site mainly comprise single and double storey office & warehouse buildings. As the site is at the end of the road there are no directly adjacent neighbours and no overlooking issues.

Areas

Gross internal area of existing warehouse = 725 square metres

Gross internal area of proposed extension = 575 square metres

Concept

The proposal has been carefully considered and designed to provide the client with a modern, well insulated warehouse which gives them enough working & storage space for their current requirements and future aspirations.

The proposed extension is a continuation in form of the existing warehouse with a flat roof section which is subservient in form and scale. There will be no overlooking issues and it cannot be seen from the main road. The design is in context with the type and style of the surrounding properties with the proposed materials intended to blend with the existing architectural language.

The extension will provide secure, sustainable and resilient design, improved accommodation and no loss of amenity to adjoining properties. The applicant kindly requests approval of the proposal.

Existing Plans and Elevations

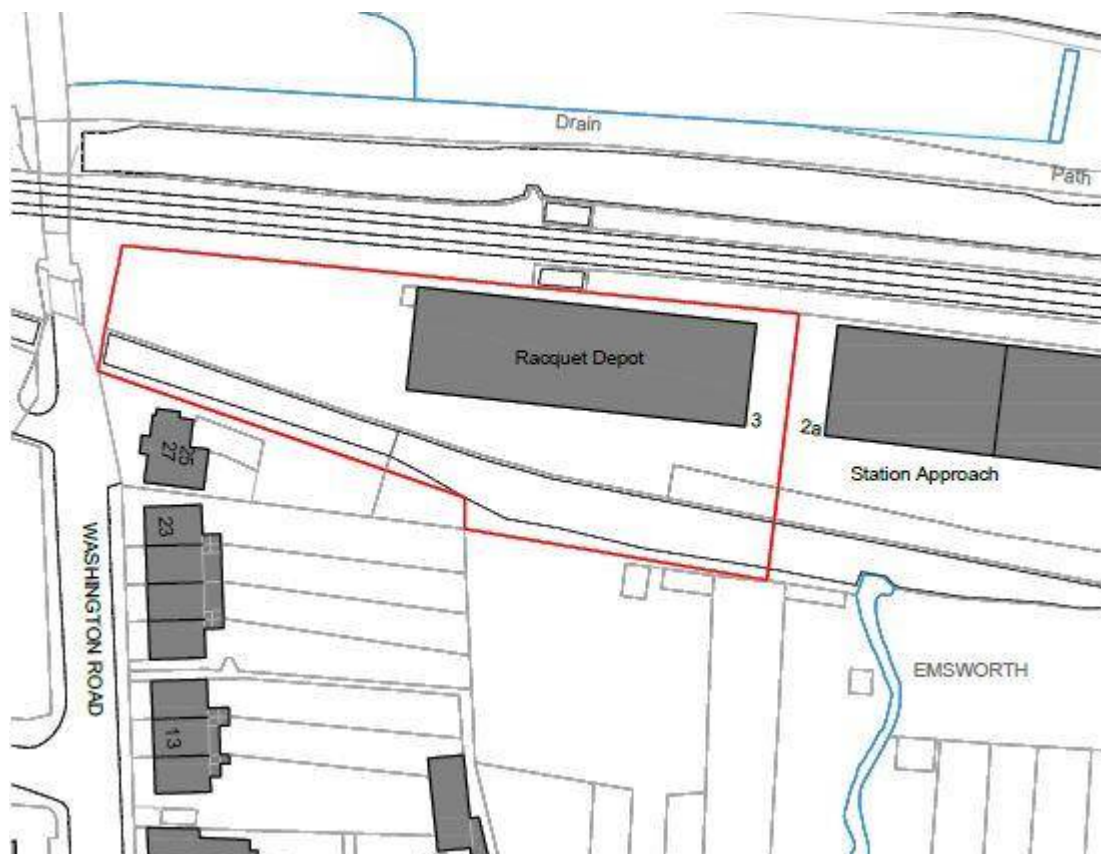


Figure 3 Existing Site Plan

Racquet Sports Group, Emsworth

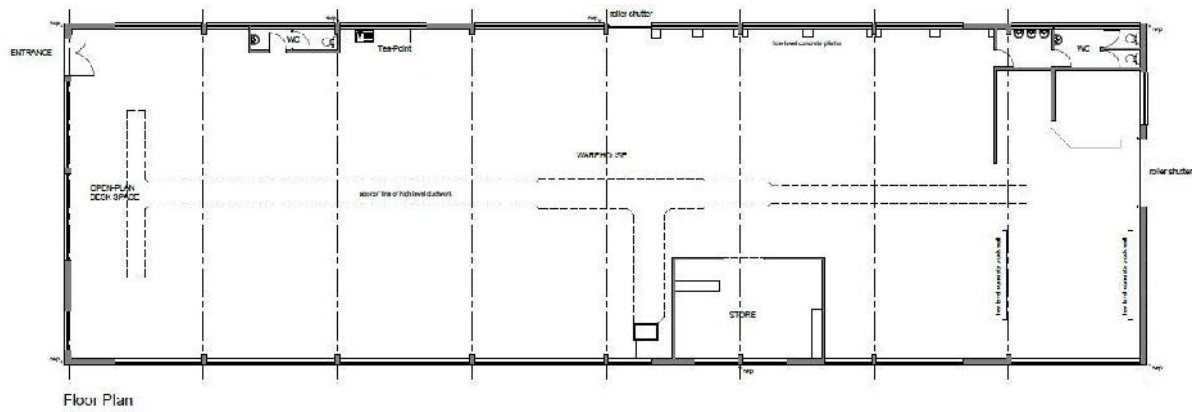
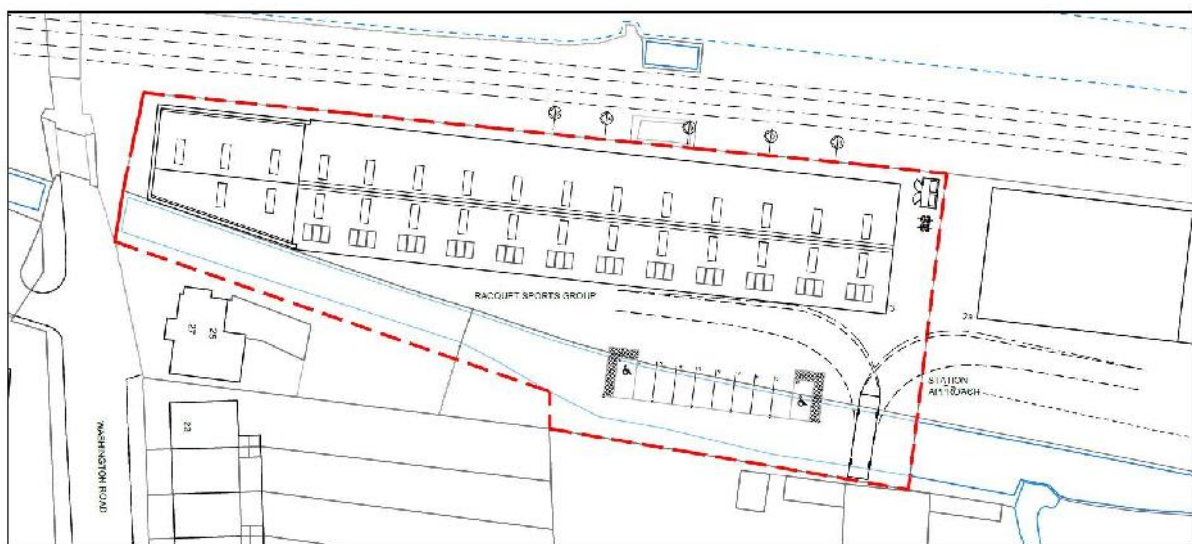


Figure 4 Existing Floor Plan



Figure 5 Existing Elevations

Proposed Plans and Elevations



PROPOSED SITE PLAN 1:500
Figure 6 Proposed Site Plan

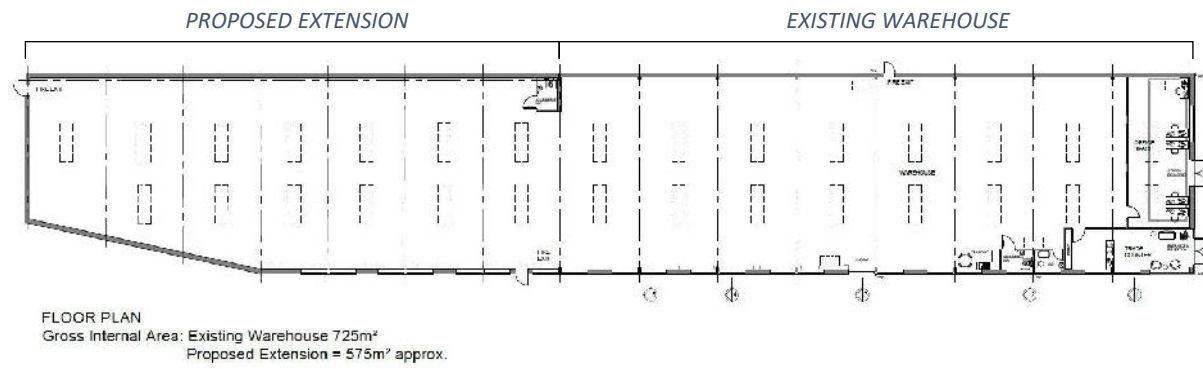


Figure 7 Proposed Floor Plan

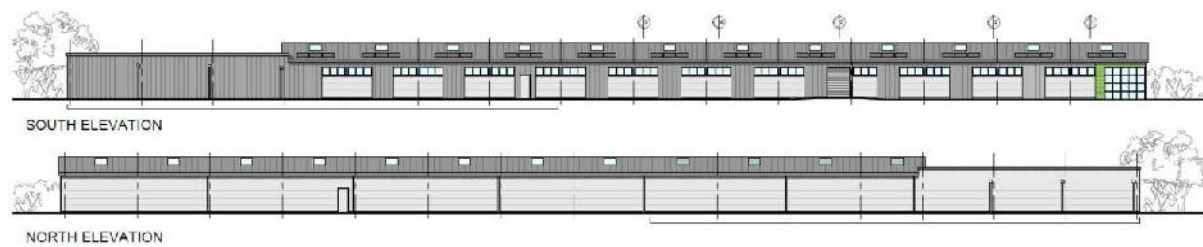


Figure 8 Proposed Elevations



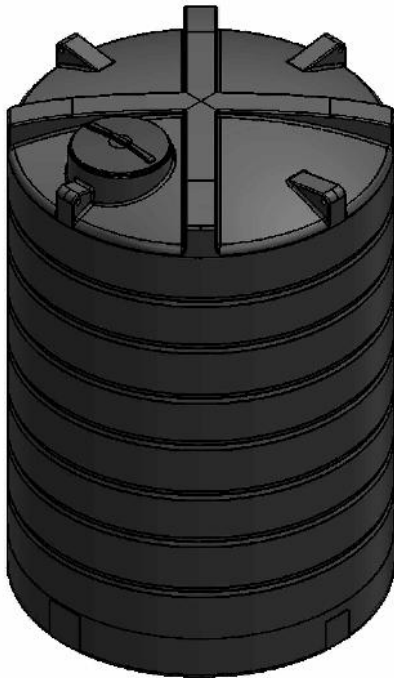
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Geotechnical & Environmental Consultants

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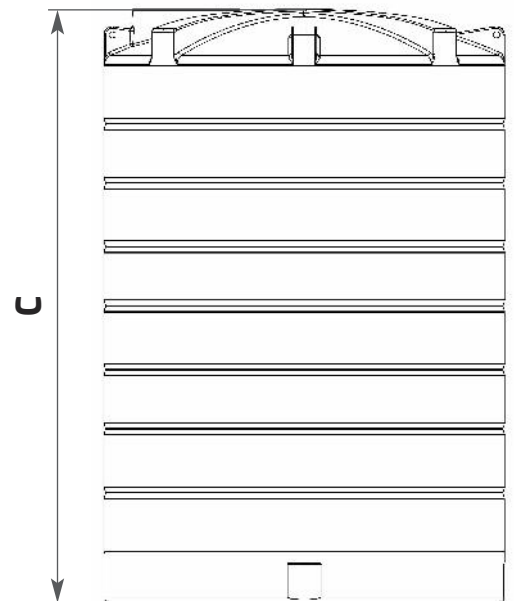
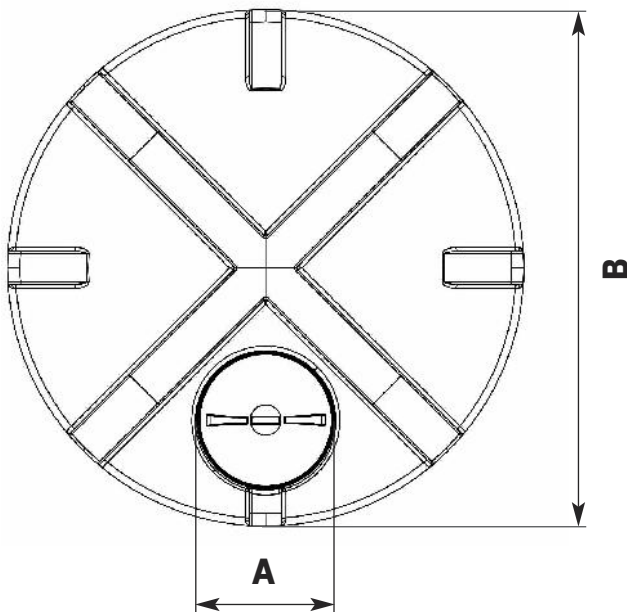
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