PENTIR ENERGY STORAGE

Flood Consequence Assessment and Drainage Assessment

HLEF03937
Pentir Energy Storage
003
March 2024

rpsgroup.com

Quality Management

Version	Status	Authored by	Reviewed by	Approved by	Review date
001	Draft	Louisa Anscomb	Francesca Caggiano / Anna-Lisa Morse	Jonathan Morley	29/11/2023
002	Draft	Anna-Lisa Morse	Francesca Caggiano	Jonathan Morley	04/01/2024
003	Updates to council and clients comments	Anna-Lisa Morse	Francesca Caggiano	Jonathan Morley	25/03/2024

Approval for issue

	Jonathan Morley	25 March 2023

Prepared by:

RPS

20 Farringdon Street
London, EC4A 4AB

Prepared for:

Lightsource bp

Contents

Tables

Figures

Appendices

1 SCOPE OF WORK

1.1 Background

1.1.1 RPS was commissioned to prepare a Flood Consequence Assessment (FCA) and Drainage Assessment of a site near *Rhyd-y-groes, Pentir, Gwynedd, Wales, LL56 4QE*, in relation to the Proposed Development of an Energy Storage System (ESS) and associated access/egress.

Assessment Procedure

1.1.2 The aim of the FCA is to outline the potential for the site to be impacted by flooding, the impacts of the Proposed Development on flooding in the vicinity of the site, and the proposed measures which could be incorporated into the development to mitigate the identified risk.

1.1.3 The report has been prepared in accordance with the guidance detailed in the Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15): Development and Flood Risk. Reference has also been made to the CIRIA SuDS manual (C753), BRE Digest 365 Soakaway Design, the Gwynedd Council Strategic Flood Consequence Assessment (SFCA) and Gwynedd Council Local Flood Risk Management Strategy (LFRMS).

1.1.4 This report has been prepared in consultation with the Natural Resource Wales (NRW) and the Lead Local Flood Authority (LLFA). The site is not located within an Internal Drainage Board (IDD) District.

1.1.5 This report is not intended to provide formal details of the final drainage design for the development. However, it provides information regarding the capabilities of the conceptual surface water drainage strategy to meet the requirements of the PPW.

1.1.6 The desk study was undertaken by reference to information provided / published by the following bodies:

- Natural Resource Wales (NRW);
- Gwynedd Council (GC);
- British Geological Survey (BGS);
- DataMapWales;
- Ordnance Survey (OS); and
- Welsh Water.

1.2 Limitations

1.2.1 The report is based on publicly available hydrological and flood risk data extracted from the National Resources Wales website (DataMapWales). The report, therefore, provides a desktop assessment.

2 SOURCES OF INFORMATION

2.1 Introduction

2.1.1 Table 1 below lists the key information cited in the preparation of this report.

Table 1. Key Information Consulted during preparation of the Report

Information Sources		
Source	**Data**	**Information consulted/provided**
Site Setting and Hydrology	• OS Mapping 1:25 000 (online) Available at: http://bing.com/maps • Flood Estimation Handbook (FEH) Webservice (online) Available at: https://fehweb.ceh.ac.uk/GB/map • National Resources Wales (NRW) Natural Environment mapping (online) Available at: https://naturalresources.wales/evidence-and-data/maps/browse-map-of-data-about-the-natural-environment/?lang=en	Area information, rivers and other watercourses, general Site environs, built environment, catchment information.
Site Geology and Hydrogeology	• British Geological Survey (BGS) (online) GeoIndex. Available at: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/ • The National Soils Research Institute Soilscapes viewer (online) • Available at: http://www.landis.org.uk/soilscapes/	Site and area geology and hydrogeology.
NRW	• NRW data holdings, customer service and engagement team • DataMapWales (online) Available at: https://datamap.gov.wales/ • NRW Flood Risk mapping (online) Available at: https://naturalresources.wales/flooding/check-your-flood-risk-by-postcode/?lang=en	Current flood risk, local flood defences, flood levels, supplementary geology and groundwater information.
Flood Consequence Assessment and Planning Guidance	• Planning Policy Wales • Technical Advice Note (TAN) 15	Flood zoning for the Site as used by the NRW in Wales.

2.1.2 Table 2 below lists the reports consulted during the preparation of this report.

Table 2. Reports Consulted during preparation of the document

Reports Consulted		
Source	**Data**	**Information consulted/provided**
Gwynedd Council	The Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026	The document outlines local planning policies.
Gwynedd Council	Gwynedd Council Local Flood Risk Management Strategy	The document identifies areas where there is significant flood risk from local sources and strategies in place to try and reduce these.

Gwynedd Council	Gwynedd Council Strategic Flood Consequence Assessment	The document identifies areas where there is significant flood risk from local sources, namely ordinary watercourses, surface water runoff and groundwater.

2.2 Planning Policy and Guidance

Planning Policy Wales Edition 11, 2021

2.2.1 Planning Policy Wales Edition 11 sets out the land use planning policies of the Welsh Government. Chapter 6 – Distinctive and Natural Places outlines the Welsh Government's objectives in terms of addressing water and flood risk.

2.2.2 Section 6.6 of Planning Policy Wales addresses water and flood risk. The relevant guidance is summarized below:

- The planning system should:
  - protect and improve water resources by promoting and encouraging increased efficiency and demand management of water as part of new developments;
  - ensure that the infrastructure on which communities and businesses depend is adequate to accommodate Proposed Development so as to minimise risk to human health and the environment and prevent pollution at source;
  - ensure sustainable drainage systems are an integral part of design approaches for new development; and
  - ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals.
- Water resources and quality must be taken into account from an early stage in the process of identifying land for development and redevelopment.
- New development should be located and implemented with sustainable provision of water services in mind, using design approaches and techniques which improve water efficiency and minimise adverse impacts on water resources, including the ecology of rivers, wetlands and groundwater and thereby contributing towards ecological resilience.
- Planning authorities should secure better management of drainage and surface water so as to tackle these issues by:
  - ensuring sustainable drainage systems are incorporated into development enabling surface water to be managed close to or at source; and
  - ensuring connection to the sewer in sewered areas and by minimising the proliferation of private sewage systems.
- New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres also require approval from the SuDS Approval Body (SAB) before construction can commence. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.
- The provision of SuDS must be considered as an integral part of the design of new development and considered at the earliest possible stage when formulating proposals for new development.
- Planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers. Surface water flooding will

affect choice of location and the layout and design of schemes and these factors should be considered at an early stage in formulating development proposals.

- Development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.
- In areas of flood plain currently unobstructed, where water flows in times of flood, built development should be wholly exceptional and limited to essential transport and utilities infrastructure.
- Development should not cause additional run-off, which can be achieved by controlling surface water as near to the source as possible by the use of SuDS.
- The ability of emergency services to respond to flood events should be taken into account when considering if a development in a flood risk area is appropriate. This may involve consultation with emergency planners, local resilience forums and other professional partners such as fire rescue, police and ambulance services.

2.2.3 Planning Policy Wales is supplemented by a series of Technical Advice Notes (TAN). TAN15 provides technical guidance on development and flood risk.

Technical Advice Note (TAN) 15: Development and Flood Risk

2.2.4 TAN 15 provides technical guidance to supplement the policy set out within Planning Policy Wales in relation to development and flooding. The guidance relates to sustainability principles and provides a framework to allow risks arising from river flooding, coastal flooding and additional run off from developments to be assessed.

2.2.5 In relation to flood risk, TAN 15 indicates that the Assembly has a duty to ensure that development is sustainable and does not create problems for future generations. Managing flooding has an important role to ensure sustainable development by guiding developments to locations with little or no risk from river, tidal or coastal flooding, managing consequences of flooding where developments can be justified and making provision for climate change.

2.2.6 TAN 15 confirms that each planning authority in Wales must prepare a Development Plan for its area. The development plans provide locational guidance for development, detailed site-specific policies, and identification of proposals for development. Catchment Flood Management Plans aim to take a holistic approach to flood management at a catchment scale and can provide guidance on managing risk to future developments. The information provided in local development plans and catchment flood management plans will aid with the application of the Justification Test.

Requirements of TAN 15

2.2.7 A Flood Consequence Assessment, to support a development application, should be proportionate to the risk and appropriate to the scale, nature and location of the development. The following will need to be considered:

- The consequences of flooding on the development, the consequences of the development on flood risk elsewhere and if appropriate mitigation measures can be incorporated into the design.
- Mechanisms of flooding, including sources of floodwater, how floodwater enters and flows across a site, height, and speed of floodwaters.
- Uncertainties in estimating flood events including use of historical records and forecasting.

- Security of Proposed Developments over their lifetime and ensuring those using the development have an awareness of the potential risks from flooding.
- Description of consequences under a range of extreme events including: mechanisms, sources, depths, speed, rate of rise, overland flood routes, velocity, access and egress, impacts on natural heritage, impact on flood risk in surrounding areas.
- Structural adequacy of defences to contain flows and withstand overtopping and if required the suitability of implementing a buffer zone adjacent to defences.
- Measures required to ensure flooding is managed to acceptable levels and ensure that the impact upon flood risk elsewhere in the flood plain is managed.

TAN15 updates

2.2.8 Updates to TAN15 are scheduled to come in to force in early 2024. These include updated modelling to incorporate the risk of climate change in Fluvial/Tidal Flood Zones. As well as the addition of Surface Water and Small Watercourses Flood Zones which also incorporate climate change.

2.2.9 This update takes precedent over current guidance as it provides more recent modelling, and the guidance will be in force following completion of the development. Therefore, although current guidance is referenced the updated guidance has been followed within this report.

2.3 Local Planning Policy

The Anglesey and Gwynedd Local Development Plan

2.3.1 The Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 was adopted on the 31st July 2017. The Local development plan contains the following Policies relating to flood risk and drainage:

Policy Pcyff 2: Development Criteria

A Proposal should demonstrate its compliance with:

1. *Relevant policies in the Plan;*
2. *National planning policy and guidance.*

Additionally, planning permission will be refused where the Proposed Development would have an unacceptable adverse impact on:

3. *The health, safety or amenity of occupiers of local residences, other land and property uses or characteristics of the locality due to increased activity, disturbance, vibration, noise, dust, fumes, litter, drainage, light pollution, or other forms of pollution or nuisance;*

Policy Pcyff 3: design and place shaping

Proposal, including extensions and alterations to existing buildings and structures will only be permitted provided they conform to all of the following criteria, where relevant:

1. Its drainage systems are designed to limit surface water run-off and flood risk and prevent pollution;

Policy Pcyff 6: Water Conservation

Proposals should incorporate water conservation measures where practicable, including Sustainable Urban Drainage Systems (SUDS). All proposals should implement flood minimisation or mitigation measures where possible, to reduce surface water run-off and minimise its contribution to flood risk elsewhere.

Proposals greater than 1,000 m² or 10 dwellings should be accompanied by a Water Conservation Statement.

Strategic Policy PS 5: Sustainable Development

Development will be supported where it is demonstrated that they are consistent with the principles of sustainable development. All proposals should:

1. *Alleviate the causes of climate change and adapting to those impacts that are unavoidable in accordance with Strategic Policy PS 6;*
2. *Give priority to effective use of land and infrastructure, prioritizing wherever possible the reuse of previously developed land and buildings within the development boundaries of Sub Regional Centre, Urban and Local Service Centres, Villages or in the most appropriate places outside them in accordance with Strategic Policy PS 17, PS 13 and PS 14;*
3. *Reduce the effect on local resources, avoiding pollution and incorporating sustainable building principles in order to contribute to energy conservation and efficiency; using renewable energy; reducing / recycling waste; using materials from sustainable sources; and protecting soil quality;*
4. *Reduce the amount of water used and wasted; reducing the effect on water resources and quality; managing flood risk and maximizing use of sustainable drainage schemes; and progressing the objectives of the Western Wales River Basin Water Management Plan.*

Strategic Policy PS 6: Alleviating and Adapting to the Effects of Climate Change

In order to adapt to the effects of climate change, proposals will only be permitted where it is demonstrated with appropriate evidence that they have fully taken account of and responded to the following:

1. *Implementing sustainable water management measures in line with the objectives in the Western Wales River Basin Management Plan;*
2. *Locating away from flood risk areas, and aim to reduce the overall risk of flooding within the Plan area and areas outside it, taking account of a 100 years and 75 years of flood risk in terms of the lifetime of residential and non-residential development, respectively, unless it can be clearly demonstrated that there is no risk or that the risk can be managed;*
3. *Be able to withstand the effects of climate change as much as possible because of its high standards of sustainable design, location, layout and sustainable building methods (in line with Policy PCYFF 3);*
4. *Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems (in line with Policy pcyff 6).*

Local Flood Risk Management Strategy

2.3.2 A Local Flood Risk Management Strategy (LFRMS) was produced in 2013 by Gwynedd Council as LLFA. The LFRMS aims to understand the risks of various flooding sources that Gwynedd may face, take proactive steps to mitigate these risks, raise awareness across communities and prepare for any such event. Local flood risk is any flood risk that derives from surface runoff, groundwater, or ordinary watercourses. Relevant information has been referenced throughout this report.

Strategic Flood Consequence Assessment

2.3.3 The Gwynedd Council SFCA identifies and maps flood risk from all sources at a borough-wide scale as well as providing guidance on producing site specific FCAs. Relevant information from the SFCA has been referenced throughout this FCA report.

2.4 Climate Change

2.4.1 TAN15 states that when considering new development proposals, it is necessary to take account of the potential impact of climate change over the lifetime of development. The Proposed Development has a lifetime of 40 years. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change.

2.4.2 In line with TAN15, the climate change allowances have been informed by latest available information on climate change projections and different scenarios of carbon dioxide (CO_2) emissions to the atmosphere. Allowances are provided for different epochs (periods) of time over the next century. This guidance will be reviewed when more up-to-date climate change research is available.

2.4.3 Both the central and upper end allowances should be assessed to understand the range of impact. As a minimum, proposals should be assessed against the central allowance to inform design levels. It is recommended that the 2080s changes are used when considering any time beyond 2115.

2.4.4 Table 3, presents the expected change to Extreme Rainfall Intensity. The climate change allowances are based on UKCP09.

Table 3. Change to Extreme Rainfall Intensity Compared to a 1961-90 Baseline

Change to Extreme Rainfall Intensity			
Applies across all of Wales	Total potential change anticipated for '2020s' 2015- 2039)	Total potential change anticipated for '2050s' (2040- 2069)	Total potential change anticipated for the '2080s' (2070-2115)
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	20%

2.4.5 The allowances are consistent with the A1B (medium) emissions scenario derived from latest research projects and converted into regionalised data of climate change on flood flows for the 2020s, 2050s and 2080s time-horizon, and for the B1 (low) and A1F1 (high) emissions scenarios for the 2080s time-horizon.

2.4.6 Runoff and attenuation calculation for any development design would have to take into account the above change in climate change policy. The upper estimate should be used to inform drainage design. Taking into consideration the development lifetime, an onerous climate change allowance of 40% has been used.

3 CONSULTATION

3.1 Natural Resource Wales

3.1.1 Consultation has been undertaken with the NRW. The NRW indicated that they have no detailed modelled data for the area. Additionally, there was no evidence of historic flooding for the area. For the full response is included as Appendix A.

3.2 Welsh Water

3.2.1 The public sewer network within the vicinity of the site is operated by Welsh Water. Consultation with Welsh Water has identified that there is no sewer network located at the site and there are no records of sewer flooding at the site. The information provided by Welsh Water is included as Appendix B.

3.3 Lead Local Flood Authority

3.3.1 The site is within the administrative boundary of Gwynedd Council. Consultation has been undertaken with the LLFA regarding details of historic flooding, any flooding modelling or mapping, any details of any known water drainage issues within the vicinity of the site and any known surface water drainage issues within the vicinity of the site. A response is currently awaited from Gwynedd Council.

3.3.2 Comments within the Screening Opinion response from Gwynedd Council also identified Ordinary Watercourse Consents will be required for any works that may affect the flow of the on-site ordinary watercourse and that the Water Environment Unit should be contacted for further advice on these matters. The council also advises that the developer should avoid installing / erecting any structures within 3m of the watercourse as this may prevent future maintenance.

3.4 Internal Drainage Board

3.4.1 The site is not located within an IDB District.

4 SITE SETTING

4.1 Site Location

4.1.1 The site is located in Pentir, Gwynedd Wales at National Grid Reference 255560, 367949, and is irregular in shape. The ESS area comprises 2.57 hectares (ha). The site location is presented in Figure 1.

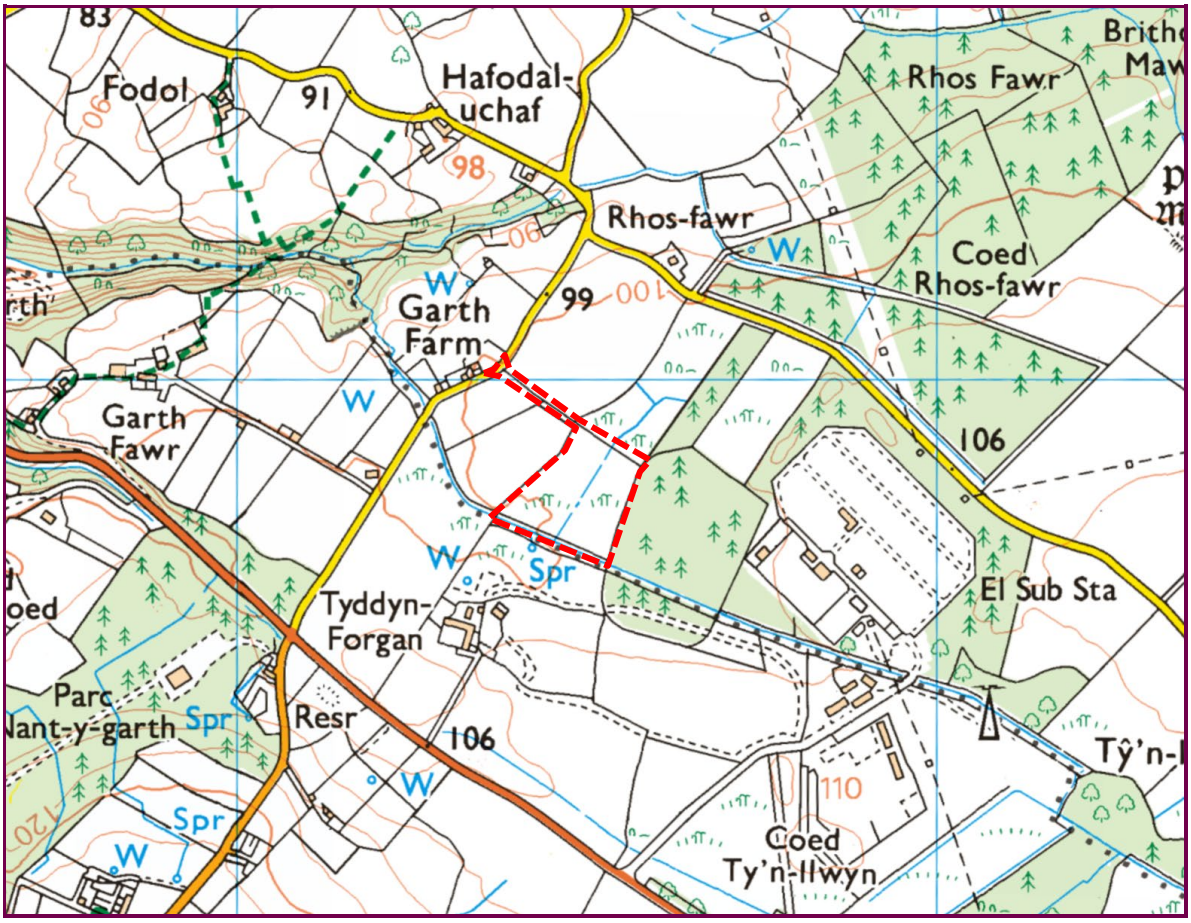


Figure 1 Site Location

4.2 Existing Land Use

4.2.1 The site is currently occupied by agricultural fields bound by hedgerows, shrubs and mature trees.

4.2.2 Vehicular and pedestrian access is taken via an unnamed road located to the west of the site, in turn accessed from B4547 to the south or Fodolydd Lane to the north.

4.3 Surrounding Land Uses

4.3.1 The site is located within a predominantly rural area. To the east is located Pentir Substation and an area of woodland and to the south by an ordinary watercourse with agricultural land beyond, to the west by further agricultural land and to the north by Coed Rhos-fawr woodland.

4.3.2 The site is not located in any designated sensitive areas (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI)) and there are no designated sensitive areas within close proximity to the site.

4.4 Topographical survey

4.4.1 A topographic survey was undertaken reference TSA-23-2602 Revision A dated November 2023 (and Revision B dated December 2023) by Tower Survey Associates and is presented in Appendix C. The elevations in the north of the site ranges between 102.53 metres above ordnance datum (mAOD) and 103.31 (mAOD). In the south of the site elevations range between 99.5 (mAOD) and 101.10 (mAOD). A watercourse present within the site is recorded with bed levels between 0.20m and 0.60m lower than top of bank levels.

4.5 Existing Drainage

4.5.1 Welsh Water operate the public drainage system in the site area. Due to the agricultural nature of the site, it is considered there are no public sewer mains in the vicinity.

5 PROPOSED DEVELOPMENT

5.1.1 The ESS energy storage units comprise of 96no, battery units in 24 blocks of 4 and ancillary infrastructure units including twin and single skids, an intake substation, a transformer and storage containers. A copy of the development plans are available in Appendix D.

5.1.2 An underground cable route corridor will connect the cable from the substation on site to the Pentir National Grid Substation adjacent to the east of the site providing a connection to the National Grid Substation. A planning application to permit the cable route will be submitted separately following further surveying and assessment.

5.1.3 A series of access tracks will be developed across the site. It is anticipated that the access tracks will be constructed from gravel to retain an impermeable surface in order to improve permeability.

5.1.4 Vehicular and pedestrian access to the site would be via an unnamed road located to the west of the site. The unnamed road could be accessed via the south off of the B4547 or via Fodolydd lane located to the north.

5.1.5 The ESS and associated ancillary infrastructure is classified as ‘highly vulnerable’ development within TAN15.

5.1.6 The potential to provide surface water attenuation, including the use of Sustainable Drainage Systems (SuDS), has been considered as part of the preliminary design process (see Section 11 – Surface Water Management).

6 HYDROLOGICAL SETTING

6.1 Nearby Watercourses

6.1.1 OS Mapping indicates an unnamed ordinary watercourse bisects the centre of the site, conveying flow from north to south across the site. The watercourse has a small catchment, with OS mapping indicating the watercourse commences flow within the field to the north of the ESS site.

6.1.2 The on-site watercourse discharges to a second ordinary watercourse present along the southern boundary of the site and flows in a westerly direction towards Afon Elwy, a designated NRW designated Main River. It is assumed the watercourse is culverted as it runs underneath the unnamed road in which access to the site is taken.

6.1.3 A third ordinary watercourse is located some 315m to the north of the site and is also assumed to be culverted as it runs underneath the unnamed road in which access to the site is taken.

6.1.4 No significant artificial watercourses / features (e.g. canals, reservoirs) have been identified within 1km of the site.

6.1.5 A map of the nearby hydrological features is shown in Figure 2.

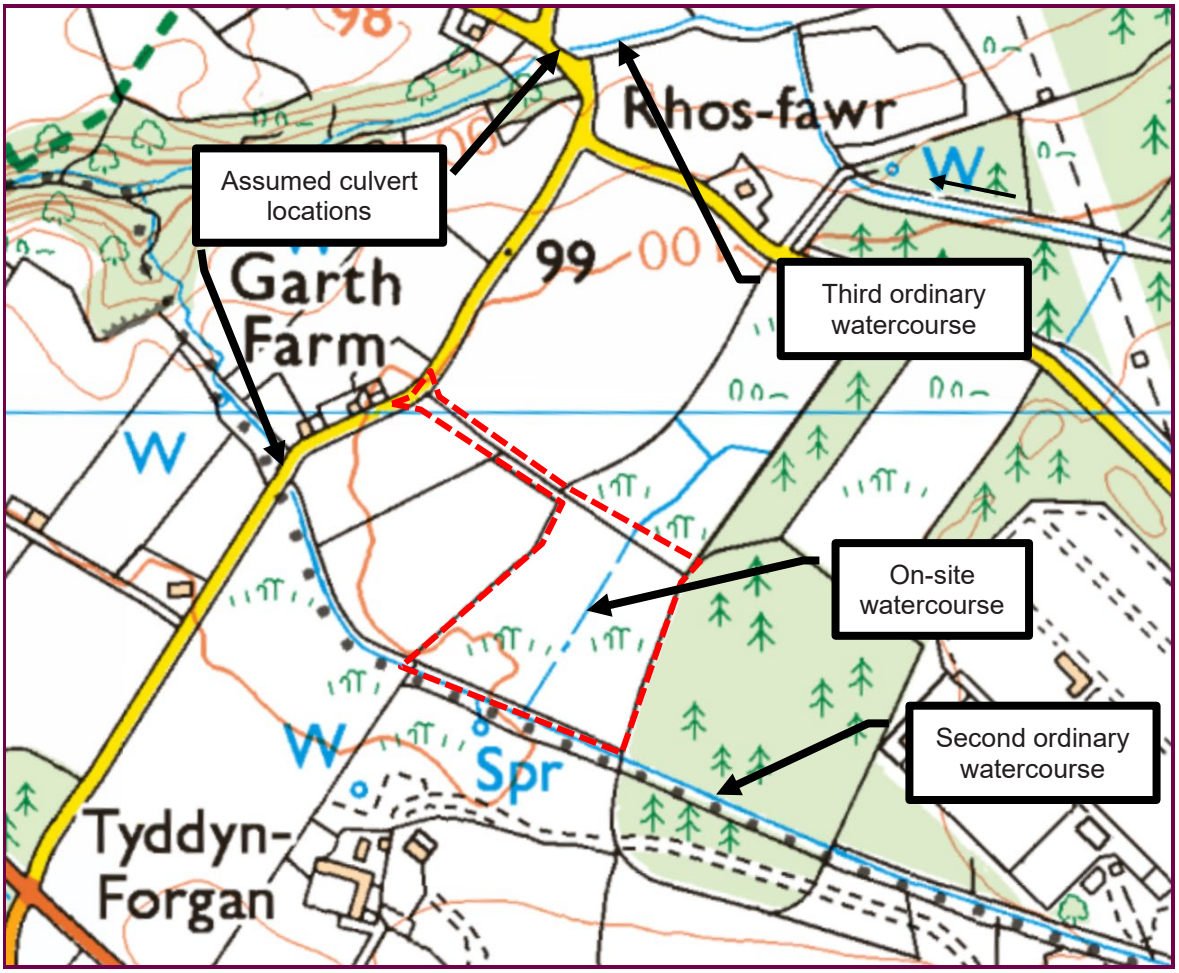


Figure 2. Location of watercourses at and in proximity of the site

6.2 Fluvial/Coastal Flood Risk Classification

Development Advice Mapping

6.2.1 The Welsh Assembly Government produces Development Advice Maps (DAM) to accompany TAN 15. These maps show the degree of flood risk which is to be applied to the Site for the planning process and thus establish the suitability of the Site for development. These maps are based upon the Natural Resource Wales flood maps and similarly they can be modified through the presentation of data (i.e. hydraulic modelling) to illustrate that a Site is within a different flood zone. The development advice zones are listed below, alongside their attributed planning actions:

6.2.2 The development advice zones are listed below, alongside their attributed planning actions:

- **Zone A**: Areas considered to be at little or no risk of fluvial or tidal/coastal flooding. Flood risk within this zone does not need to be considered further.
- **Zone B**: Areas known to have been flooded in the past evidenced by sedimentary deposits. Areas within this zone are further checked against the 0.1% flood level.
- **Zone C1**: Based on Environment Agency 0.1% flood outline and are areas of the floodplain developed served by significant flood defence infrastructure.
- **Zone C2**: Based on the Environment Agency 0.1% flood outline and areas of the floodplain without significant flood defence infrastructure.

6.2.3 The Development Advice Map indicates that the majority of the site is located within Zone A with a smaller extent within the centre and along the southern boundary of the site located within Zone B. It is assumed the area of Zone B is associated with an extents of alluvial superficial deposits within the site and its immediate proximity.

6.2.4 The Development Advice Map for the site is presented in Figure 3 below.

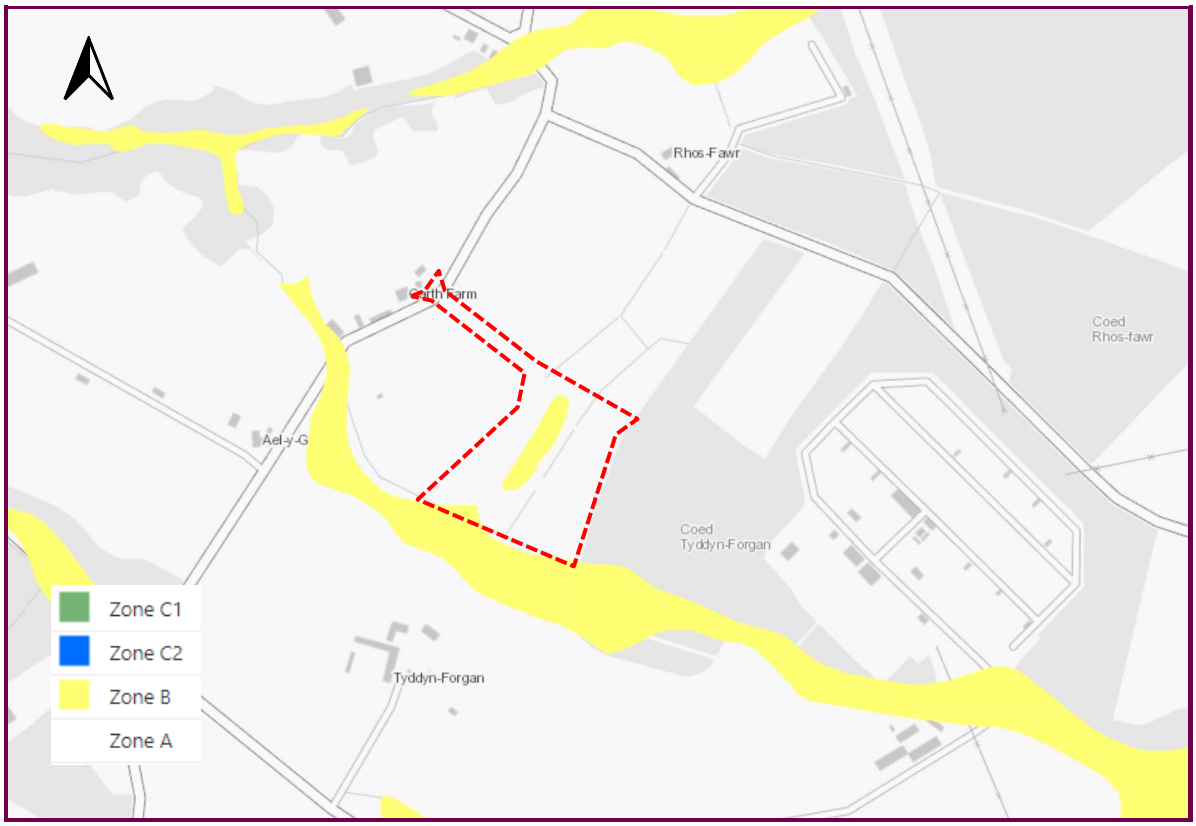


Figure 3. NRW Development Advice Map

TAN15 Updates

6.2.5 RPS notes a revised TAN15 is due to be implemented in 2024. This will be supported by the new Flood Map for Planning (FMfP), which includes climate change information to show how this will affect flood risk extents over the next century. It shows the potential extent of flooding assuming no defences are in place.

6.2.6 The FMfP has no official status for planning purposes until the revised TAN 15 is implemented. However, given the completion of the development is likely to extend beyond this date and it provides more up to date assessment of the risk it takes precedent over current guidance. As such mitigation has been referenced in line with the findings of this data.

6.2.7 The climate change data is taken from the 'central estimate' epochs and as such is considered an appropriate assessment of future risk of the Proposed Development in line with TAN15 guidance.

6.2.8 Flood Zones are divided into the following categories:

- **Flood Zone 1** (Rivers) are areas with a less than 0.1% (1 in 1000) chance of flooding from rivers each year, including the effects of climate change.
- **Flood Zone 2** (Rivers) are areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers each year, including the effects of climate change.
- **Flood Zone 3** (Rivers) are areas with more than 1% (1 in 100) chance of flooding from rivers each year, including the effects of climate change.

6.2.9 The Flood Map for Planning is presented within Figure 4 and shows the site and associated access/egress to be located entirely within Flood Zone 1.

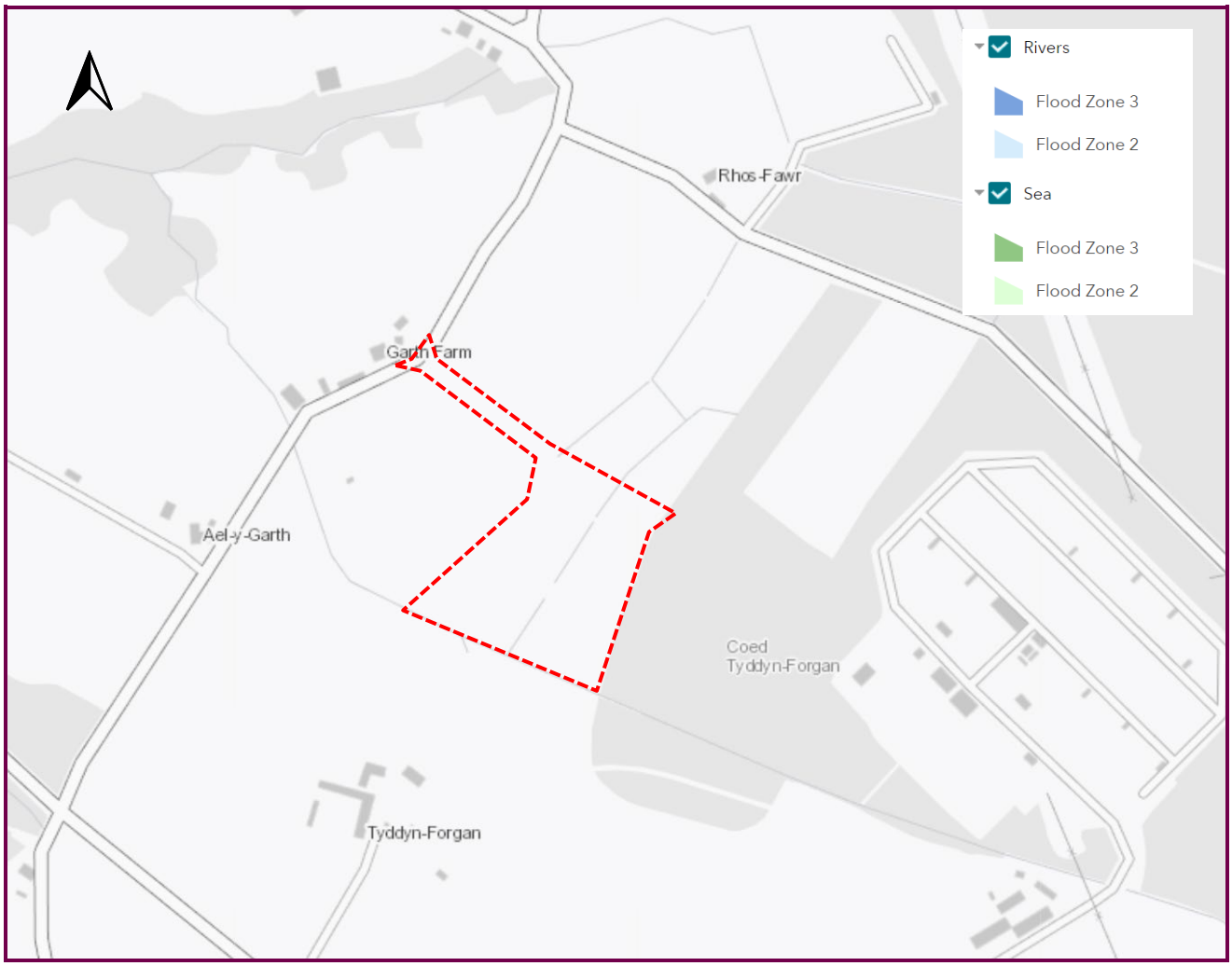


Figure 4. Flood Map for Planning (NRW)

Flood Warnings

6.2.10 The NRW Data Map for Wales indicates that the site is not located within a Flood Warning area.

Flood Defences

6.2.11 NRW Flood Map for Planning demonstrates no flood defences within the site or to its immediate proximity.

Historical Flood Events

6.2.12 NRW Flood Map for Planning does not show any recorded flood events within the site or to its immediate proximity.

6.3 Surface Water Flood Risk Classification

Flood Risk from Surface Water and Small Watercourses

6.3.1 The NRW Flood Risk from Surface Water and Small Watercourses classifications are divided into the following categories:

- **High risk** – areas which have a chance of flooding greater than 1 in 30 year (3.3%);

- **Medium risk** – areas which have a chance of flooding between 1 in 100 year (1%) and 1 in 30 (3.3%);
- **Low risk** – areas which have a chance of flooding between 1 in 1000 year (0.1%) and 1 in 100 year (1%); and,
- **Very low risk** – areas which have a chance of flooding less than 1 in 1000 year (0.1%).

6.3.2 The NRW Flood Risk from Surface Water and Small Watercourses mapping is presented within Figure 5 and demonstrates the majority of the site is deemed to be at very low risk of surface water flooding.

6.3.3 The far southern extent of the ESS site has a marginal extent at low risk of flooding, associated with surface water pooling along the route of the watercourse that runs along the southern boundary of the site. Flood depths are up to 150mm. No development is proposed in this extent of the site.

6.3.4 The unnamed road in which the site is accessed has a low to high risk of flooding from surface water. During the high risk event, flood depths up to 0.9m are present within the road, increasing to 1.2m during the low risk scenario.

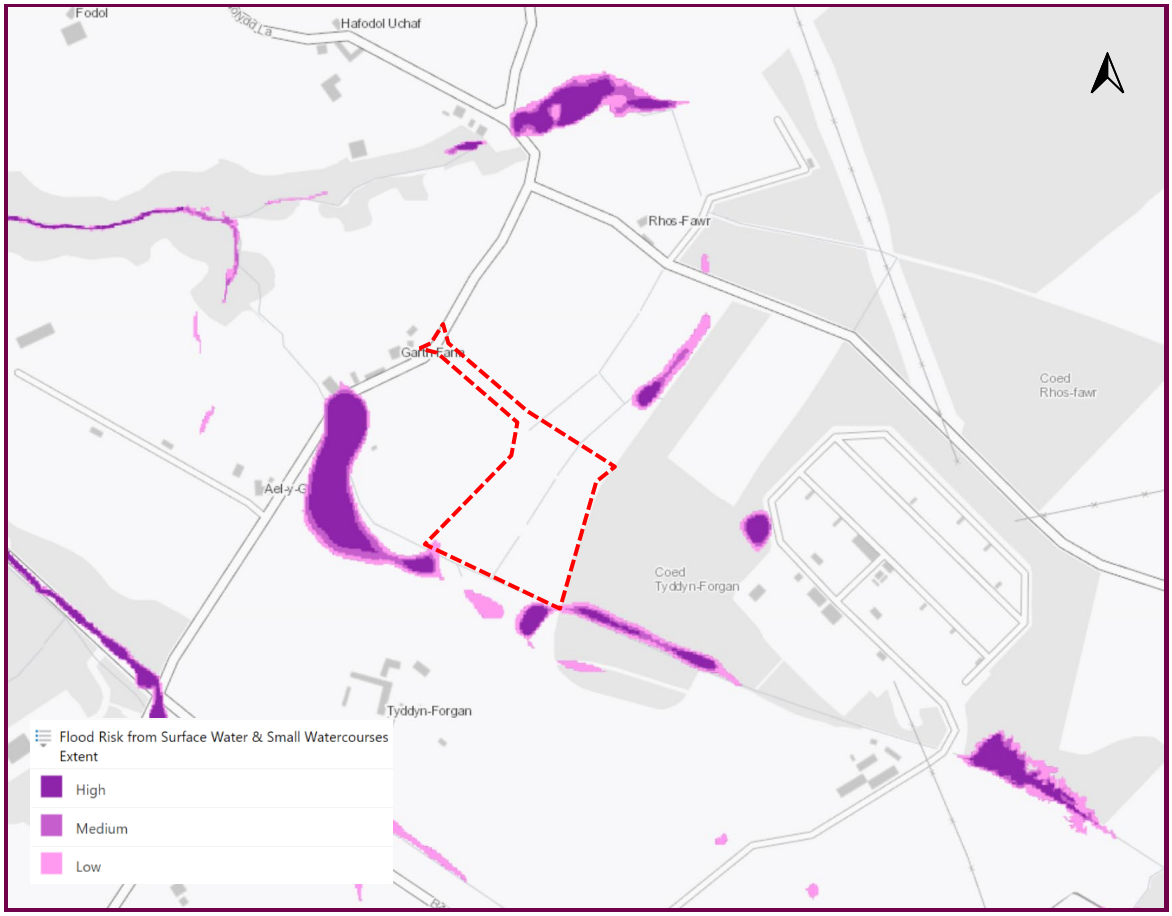


Figure 5. Surface Water Flood Risk Map (NRW)

TAN15 Future Risk

6.3.5 The NRW's new Flood Map for Planning includes Flood Zones for surface water and small watercourses with consideration for climate change and how it will affect flood risk extents over the next century. As stated, the FMfP has no official status for planning purposes until the revised TAN 15 is implemented.

6.3.6 Mapping has been displayed in Figure 6 to show how the new modelling work undertaken and climate change may impact the site in the future. The extent of the risk shows that risk generally reflects that of the present day, albeit slightly larger extents at risk of flooding from this source. The southern extent of the ESS is shown to be marginally located within Flood Zone 2.

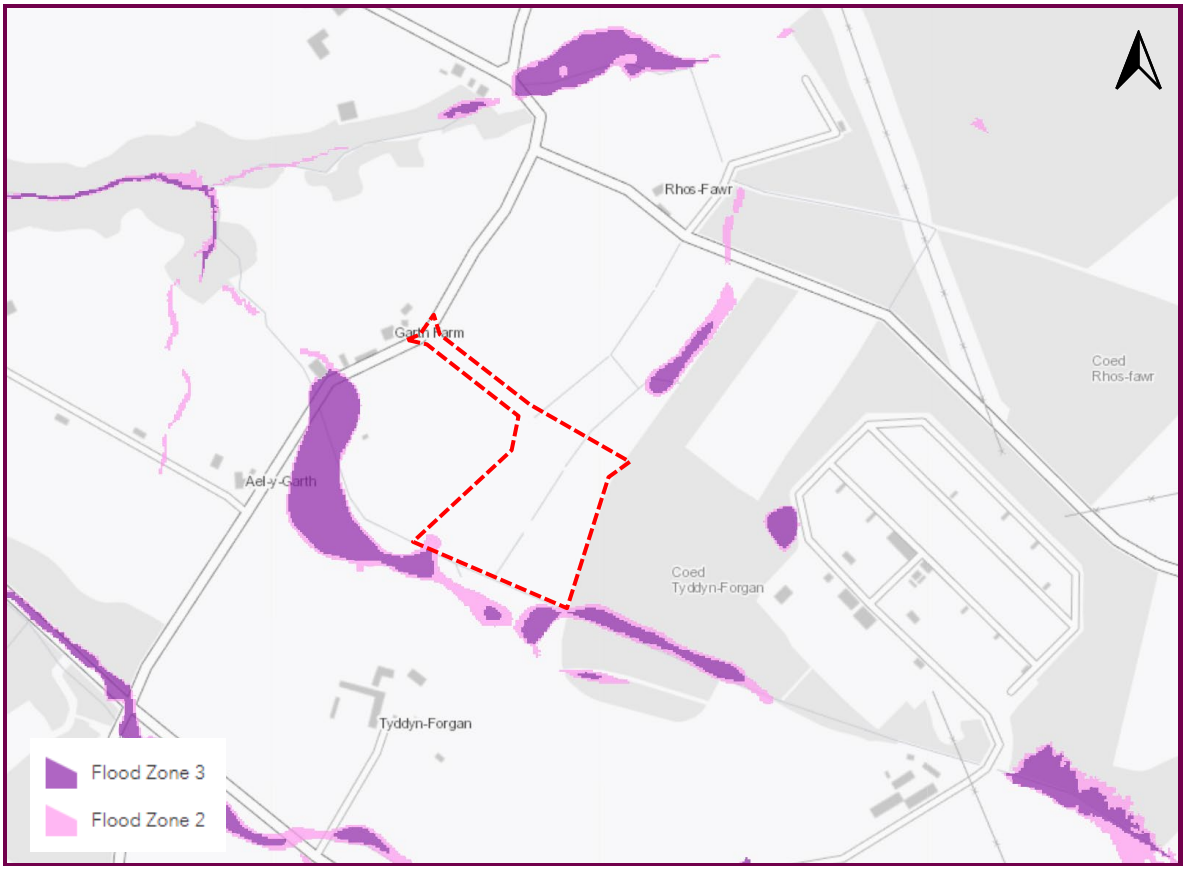


Figure 6. Flood Map for Planning Surface Water and Small Watercourses (NRW)

6.4 Reservoir Flooding

6.4.1 NRW Flood Map for Planning shows the site is not located within the reservoir flood risk extent.

6.5 Local Authority Information

Local Authority Flood Risk Assessment

6.5.1 The Anglesey & Gwynedd Joint Local Development Plan – Strategic Flood Consequence Assessment (SFCA) was published in March 2016. It provides an overview of flood risk from various sources within the borough. The report holds no specific flood risk information directly related to the site or its immediate proximity.

Local Flood Risk Management Strategy

6.5.2 The Gwynedd Local Flood Risk Management Strategy was published in February 2013. It provides an overview of flood risk from various sources within the borough. Information relevant to this assessment is summarised below:

- There are no recorded historic flood extents within the site boundary or to its immediate proximity.

- Groundwater flooding is not considered to be significant source of flooding in the local area.

7 HYDROGEOLOGICAL SETTING

7.1 Bedrock Geology

7.1.1 BGS Geology Viewer (1:50,000 scale) shows the western extent of the site is underlaid by a bedrock geology of Padarn Tuff Formation (Tuff and felsic). The eastern extent of the site is underlaid by Minffordd Formation (sandstone and conglomerate, interbedded).

7.1.2 Numerous boreholes are located adjacent to the site at Pentir Substation; however these are private and confidential. There are no publicly accessible BGS borehole records within a 1km radius of the site boundary.

7.2 Superficial Deposits

7.2.1 Majority of the site is underlain by superficial deposits of Devensian Till (Diamicton). Within the central extent of the site and along the site's southern boundary of the site there is also an isolated area of Alluvium deposits (clay, silt, sand and gravel).

7.3 Aquifer Designation

7.3.1 BGS Aquifer Designation mapping shows bedrock deposits are categorised as a Secondary A Aquifer which generally support water supply and base river flow on a local scale. The underlying superficial geology deposits are classified as Secondary A Aquifers and Secondary Undifferentiated. Secondary Undifferentiated Aquifers have varying characteristics in different locations.

7.3.2 BGS Aquifer Designation mapping shows superficial deposits as being Secondary (undifferentiated). Secondary (undifferentiated).

7.4 Surface Protection Zones

7.4.1 The NRW natural environment mapping shows the site is located within an area of medium – high, groundwater vulnerability and is not located within a Source Protection Zone.

7.5 Soils Classification

7.5.1 The Cranfield Soil and Agrifood Institute Soilscapes mapping shows soils within the local area of the site to be classified as Soilscape 19; slowly permeable wet very acid upland soils with a peaty surface. The site is also identified to have impeded drainage by Soilscapes.

8 FLOOD RISK VULNERABILITY CLASSIFICATION AND JUSTIFICATION TEST

8.1.1 In accordance with TAN15, Energy Storage System developments are classified as 'highly vulnerable'. The site is located within DAM Zone A and B. In line with Table 4 below and with TAN 15, all types of development are considered acceptable within Zone A and B.

Table 4. Flood Risk Vulnerability and Zone Compatibility

Flood Zone	Vulnerability Calassification		
	Emergency Services	Highly Vulnerable	Less Vulnerable
Zone A	Permitted	Permitted	Permitted
Zone B	If site levels are greater than flood levels, no need to consider risk further	If site levels are greater than flood levels, no need to consider risk further	If site levels are greater than flood levels, no need to consider risk further
Zone C1	Yes – if justification test applied	Yes - if justification test applied	Yes - if justification test applied
Zone C2	Not permitted	Not permitted	Yes - if justification test applied

Justification Test

8.1.2 The site is classified as highly vulnerable and is considered to be suitable within DAM Zone A and Zone B. As such, development is not subject to the Justification Test.

9 FLOOD RISK AND MITIGATION

9.1.1 The key sources of flooding that could potentially impact the site are discussed below:

9.2 Fluvial / Tidal Flooding

9.2.1 The NRW Flood Map for Planning, as presented in Figure 4, indicates that majority of the site is located within Flood Zone 1. The annual probability of flooding is classified as are areas with a less than 0.1% (1 in 1,000) chance of flooding from rivers each year, including the effects of climate change in the absence of any defences.

9.2.2 The Development Advice Mapping, presented within Figure 3 shows the site is predominantly located within Zone A with a small area of Zone B.

9.2.3 The Proposed Development is classified within TAN 15 as 'highly vulnerable' and is considered to be suitable within DAM Zone A and Zone B.

9.2.4 Overall, the risk of flooding from fluvial and tidal sources is deemed to be low and no mitigation measures are required.

9.3 Flooding From Sewers

9.3.1 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.

9.3.2 Welsh Water confirmed that there is no sewer network located at the site. The topographical survey also did not record evidence of a private drainage system on-site.

9.3.3 The site has therefore been assessed to have a low risk of flooding from this source. and no mitigation measures are required.

9.4 Surface Water Flooding

9.4.1 Surface water flooding can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.

9.4.2 NRW Surface Water from Surface Water Mapping indicates the majority of the site has a very low risk of flooding.

9.4.3 Surface water flooding shown along the unnamed road is likely due to limitations within NRW surface water flood model which omits culverts that convey flows under the road. As such, surface water flooding in reality is expected to be less than shown on NRW mapping.

9.4.4 The site is therefore assessed to have a very low risk of flooding from this source and no mitigation measures are required.

9.5 Groundwater Flooding

9.5.1 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures. BGS mapping indicates that the site is situated on superficial deposits of Devensian till, Peat and Alluvium, underlain by Padarn Tuff Formation bedrock in the west and Minffordd Formation in the east.

9.5.2 The National Soils Research Institute Soilscapes viewer classifies the site is as 'slowly permeable wet very acid upland soils with a peaty surface'.

9.5.3 Due to the type of development proposed, potential for groundwater flooding has been deemed as low and no mitigation measures are required.

9.6 Other Sources

9.6.1 The risk of flooding associated with reservoirs, canals and other artificial structures is considered to be low given the absence of any such structures in the site vicinity.

9.7 Proposed Mitigation

9.7.1 A 6m easement is currently proposed between the majority of proposed development and an on-site ordinary watercourse to enable future maintenance. The only development proposed within this easement are access tracks crossing the watercourse and it is expected an Ordinary Watercourse Consent will be required prior to construction taking place.

10 SURFACE WATER MANAGEMENT

10.1.1 Surface water arising from a developed site should as far as is practicable be managed in a sustainable manner to mimic the natural hydrology of the site while reducing the risk of flooding and elsewhere, taking climate change into account.

10.1.2 Generally, this type of development is considered to have a design life of 40 years. Therefore, for the purposes of this assessment, taking into account NRW climate change allowances a 40% increase in peak rainfall intensity has been included as climate change allowance, which caters up to the year 2115. No climate change guidance is available beyond 2115.

10.2 Greenfield runoff rates

10.2.1 The existing runoff rate has been calculated using the Interim Code of Practice for Sustainable Drainage Systems (ICP SuDS) Method. Existing greenfield runoff rates are presented in Table 5 below. ICP SuDS calculations are included as Appendix E.

Table 5. Greenfield runoff rate (l/s/ha)

Return Period (years)	Runoff Rate (l/s/ha)
1 in 1	3.0
Q_{BAR}	3.4
1 in 30	6.0
1 in 100	7.5

Q_{BAR} = mean annual flood low
l/s = litres per second

10.2.2 The development site is bisected by an ordinary watercourse running from north to south within the site. As such, the Proposed Development has been split into two catchments, one either side of the watercourse. Based on the attenuation proposed, the impermeable area has been taken for the entirety of the ESS site, split between the two catchments. Impermeable areas and associated greenfield runoff rates are presented within Table 6 below.

Table 6 Catchment details

Catchment	Western catchment	Eastern catchment
Impermeable area	7,468 m^2	2,312 m^2
Greenfield runoff rate	2.4 l/s	0.7 l/s

Consideration of Drainage Hierarchy

10.2.3 The PPG advises of the following hierarchy for the disposal of surface water;

1. Infiltration;
2. To a surface water body;
3. To a surface water sewer, highway drain or another drainage system; or
4. To a combined sewer.

10.2.4 The drainage hierarchy has been considered as follows.

Infiltration

10.2.5 BGS bedrock geology mapping records the western extent being underlaid by Padarn Tuff Formation. The eastern extent is underlaid by Minffordd Formation. Bedrock deposits are classified as Secondary A Aquifers generally support water supply and base river flow on a more local scale and superficial deposits are classified as Secondary Undifferentiated Aquifers which have varying characteristics in different locations.

10.2.6 The Cranfield Soil and Agrifood Institute Soilscapes mapping shows soils within the local area of the site to be classified as Soilscape19; slowly permeable wet very acid upland soils with a peaty surface. The site is also identified to have impeded drainage by Soilscapes.

10.2.7 Soakaway testing has not been undertaken at the site, however, in order to not affect the quality of the groundwater, especially in the event of a fire, infiltration measures are not proposed as part of the development. The attenuation calculations take in to account the impermeable area for the entirety of the ESS site. As such, alternative methods of surface water discharge have been assessed for the site.

To a Surface Water Body

10.2.8 There is an unnamed ordinary watercourse running from north to south within the site boundary in which surface water from impermeable areas of the site can be discharged. If this method is taken forward, appropriate discharge consents will be required for this watercourse from the LLFA prior to construction.

10.3 Attenuation Requirements

10.3.1 The on-site watercourse was surveyed in October 2023 by Tower Survey Associates reference TSA-23-2602 Revision B and is presented within Appendix C. Bed levels of the on-site watercourse were recorded to be extremely shallow, generally less than 0.5m below top of bank levels across the site.

10.3.2 The on-site watercourse outfalls to a second watercourse running along the site's southern boundary. Watercourse locations are presented within Figure 2. At the outfall point, the second watercourse has a bed level of 99.92mAOD. In order to achieve a gravity based solution, it is proposed to deepen the on-site watercourse to achieve a 1 in 100 gradient. Final design is to be undertaken at detailed design stage.

Gravel base

10.3.3 It is proposed that gravel bases underlying the ESS would be utilised for surface water attenuation. Gravel bases have been assumed to be 400mm deep with a 30% void ratio in order to provide sufficient surface water attenuation within the site. The gravel base will not alter the underlying condition beyond the topsoil; what would otherwise be topsoil will be replaced by gravel, which has 30% more porosity and storage capacity than the existing topsoil.

10.3.4 The gravel base will be required to be lined to prevent groundwater entering the attenuation feature and avoid potential contamination of groundwater in the event of a fire It is proposed the base of the gravel is to be laid at a gradient of 1/500 to enable surface water to be adequately conveyed to the discharge point.

10.3.5 Surface water from each catchment is to be restricted as close as practicable to the 1 in 1-year greenfield runoff rate prior to discharge via a suitable flow control device. Penstock valves are proposed at the outfall for the respective catchments which can be operated in an emergency situation (e.g. fire) to prevent contaminated water entering the watercourse. The final containment solution will be detailed at detailed design stage.

10.3.6 Conceptual drainage calculations have been undertaken using the industry standard MicroDrainage software. Calculations are presented within Appendix E to assess attenuation requirements for the 1 in 100-year rainfall event plus a 40% uplift to account for climate change. Approximately 825m^3 of attenuation will be required for the western catchment and 256m^3 for the eastern catchment, based on the 1 in 1-year greenfield runoff rate being achieved and considering the entirety of the ESS area as impermeable. A conceptual drainage strategy drawing is presented within Appendix F. Calculations and proposals are subject to detailed design.

Access Tracks

10.3.7 Internal access tracks will not be tarmac or other hardstanding type surface, in order to improve permeability. The prevention for contaminated runoff to infiltrate in the ground, especially in the event of an emergency (e.g. fire), will result in the requirement for the access track to be lined. As such, these areas have been included within impermeable areas of conceptual drainage calculations presented within Appendix E.

10.4 Pollution Mitigation

10.4.1 The CIRIA SuDS Manual (2015) provides pollution hazard indices from an assortment of land uses and the pollution mitigation indices for a number of SuDS techniques. It is noted that the pollution hazard indices are not cumulative, and that the mitigation should be designed to the maximum pollutant use. Furthermore, it is not anticipated that there would be coarse sediments for removal at the site, therefore specific design for this purpose would not be required.

10.4.2 The SuDS Manual also notes that in systems where multiple SuDS features are incorporated, the subsequent treatment stages are considered to perform at 50% of their optimum pollution mitigation, due to the reduced inflow concentrations. The maximum pollution mitigation indices have been included for each SuDS feature below, followed by an evaluation of the total mitigation provided by the treatment stages, taking into account the 50% efficiency of the second and tertiary stages. Finally, mitigation indices are limited to a maximum value of >0.95.

10.4.3 It can be seen from Table 7 below that the proposed permeable paving along the access road (non infiltrating), and gravel base (denoted as an infiltration trench from table 26.4 due to similar properties) will provide mitigation that combined exceeds the maximum pollution hazard indices generated by the roofs of the buildings and the internal road network, thereby sufficiently treating the runoff that will be generated post-development prior to discharge into the fluvial network.

Table 7. Pollution Hazard and Mitigation Indices

Land Use / SuDS Feature	Total Suspended Solids (TSS)	Metals	Hydrocarbons
	Proposed Land Uses		
Low traffic roads	0.5	0.4	0.4
Commercial roofs	0.3	0.2	0.05
	Mitigation		
Permeable paving (non-infiltrating)	0.7	0.6	0.7

Gravel base	0.4	0.4	0.4
Mitigation accounting for 50% efficiency of second and third stage			
Paving, gravel base (latter at 50% efficiency) combined	>0.95	>0.95	>0.95

10.5 Event Exceedance

10.5.1 The proposed indicative surface water drainage concept provides storage up to the 1 in 100 year plus climate change event. In an event exceeding this magnitude, detailed drainage design will identify mitigation measures to ensure that the resulting above-ground flooding will be confined low vulnerability areas and will not affect the buildings on site or significantly increase flood risk to off-site locations.

10.5.2 Event exceedance planning will be undertaken as part of the final design process. Suitable mitigation measures will be incorporated into the development to ensure water is retained on-site should surcharging of on-site drains occur during extreme rainfall events.

10.6 SuDS Maintenance

10.6.1 Table 8, Table 9 and Table 10 below shows a typical drainage maintenance plan suitable for proposed components, subject to detailed design (extracted from SuDS Manual C753).

Table 8 Inlet and Outlet Headwalls Maintenance Requirements

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Litter removal	As required
	Inspect vegetation above and around headwall and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from aprons	Annually
	Flap valves and grilles: Check for and clear obstructions	Quarterly
Remedial Actions	Repair of erosion or other damage around headwalls	As required
Monitoring	Inspect structures for evidence of poor operation	Monthly/after large storms
	Inspect structures, pipework etc. for evidence of physical damage	Monthly/after large storms

	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly
	Check flap valves	Half yearly

Table 9. Gravel Base Maintenance

Maintenance schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly, or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect gravel for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from gravel	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the gravel (if applicable), using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required

Table 10. Flow Control Manhole Suggested Maintenance Schedule

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Inspect vegetation above and around flow control chamber and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Remove sediment from flow control chambers	Annually
	Flow control devices: Check for and clear obstructions	Quarterly
Remedial Actions	Repair of Penstock and flow control device	As required
Monitoring	Inspect structures for evidence of poor operation	Monthly/after large storm
	Inspect structures, flow control and pipework etc. for evidence of physical damage	Monthly/after large storm

Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

10.7 Management of Fire Water

10.7.1 In order to manage the risk associated with a highly unlikely fire event, the development will include a provision for the supply of fire water via a nearby hydrant. Consultation with the fire service has confirmed that the development can use this hydrant in the event of a fire.

10.7.2 An onsite fire containment strategy will be incorporated into the overall site drainage design at detailed design stage. However, the conceptual drainage strategy detailed in this report confirms the feasibility of the measures proposed to ensure that the development does not affect the quality of groundwater and surface water in the local area. This is ensured through the implementation of lined gravel bases and access track and the installation of penstock valves at the outfall of each catchment which can be operated in an emergency situation (e.g. fire) to prevent contaminated water entering the watercourse and the groundwater table. The final containment solution will be detailed at detailed design stage.

10.8 Construction Stage Drainage

10.8.1 During construction of the development, the building contractor will be responsible for management and disposal of rainwater runoff generated from the site in its temporary condition.

10.8.2 The contractor shall develop a formal site management plan, which will address pollution management and control in relation to site plant and vehicles, raw materials storage and waste generation, to ensure that all surface water runoff generated in the temporary condition will be free of contamination.

10.8.3 The site will be subject to topsoil strip and bulk earthworks to prepare the site to the correct level for development. The contractor shall provide temporary drainage measures to contain runoff within the development site boundary ensuring that this is sized appropriately, and that means to remove excess surface water are available for use at all times.

11 SUMMARY AND CONCLUSIONS

11.1.1 A site-specific Flood Consequence Assessment following the guidance of the Planning Policy Wales and TAN 15 has been undertaken for a ESS on land at Rhyd-y-groes, Pentir, Gwynedd, Wales.

11.2 Flood Risk

11.2.1 The site is located within DAM Zone A and B and is located within Flood Zone 1 (fluvial and tidal) and is assessed to have a low risk of flooding from this source and all other forms of flooding.

11.2.2 The development is classified within TAN 15 as 'highly vulnerable' and 'less vulnerable' development and is considered to be suitable at this location.

11.3 Surface Water Management

11.3.1 A surface water management strategy has been produced to incorporate appropriate management techniques that will mitigate potential increase in runoff from the Proposed Development.

11.3.2 Surface water from the ESS and associated ancillary infrastructure is to be attenuated within a gravel base underlying the entirety of the ESS site and the implementation of permeable paving along the access road. Both measures are required to be lined to prevent any potential contamination to the groundwater and surface water. Flows are to be discharged to the ordinary watercourse at the 1 in 1-year greenfield runoff rate, or as close as reasonably practicable. The proposed drainage strategy will provide sufficient storage capacity to attenuate runoff up and including the 1 in 100-year plus 40% climate change event. The final drainage strategy will be detailed at detailed design stage subject to confirmation of invert levels.

APPENDICES

Appendix A

NRW Response

Louisa Anscomb

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 04 October 2023 15:36
To: Louisa Anscomb
Subject: ATI 26034a - Flood Information Data Request - Rhyd-y-groes, Pentir, Gwynedd, LL56 4QE - LL56 4QE/HLEF 03937

Hello Louisa

Your data request has been logged with the above reference.

Unfortunately we have no detailed models available for this area. We also have no evidence historic flooding.

Self Service Open Data:

You can now make the most of open data provided **free online:**

- Please see the Flooding pages on the NRW website for the NRW Flood Risk Map Viewer and the Development Advice Map/Flood Map for Planning. You will find many spatial risk layers including the Flood Risk Assessment Wales (FRAW) maps, reservoir hazard data, Recorded Flood Extents, flood defences and more.

- **DataMapWales**: Spatial data is free to download, view and use within your own GIS system. The flood datasets include: Flood Risk Assessment Wales (FRAW) Maps, Flood Map for Planning (FMfP), Recorded Flood Extents, Flood Defences, Areas Benefitting from Flood Defences, FMfP TAN 15 Defences Zones and LIDAR data.

- Please note that you can find a GIS layer of our flood models in the Flood Map for Planning viewer. This is not an exhaustive list but does give a good idea as to the most relevant models for an area. This can be accessed via the following link: https://flood-map-for-planning.naturalresources.wales/. Select the 'Detailed Map' tab and the layer in question is called 'NRW Local Model Manager'.

Please Note the Following:

- Extreme Sea Level Information around the Welsh coastline is available from the Coastal Flood Boundaries (2018) dataset. This can be accessed from the following location: Coastal Flood Boundaries (CFB) | DataMapWales (gov.wales).
- All information supplied will need to be verified by the recipient **PRIOR** to using in a Flood Consequences Assessment (FCA). We would expect to see a review of hydrology, in-channel survey, floodplain topography etc. to demonstrate the data is suitable for the purposes of producing an FCA. Please see our website for further information on Modelling for Flood Consequence Assessments and Developing hydraulic models for flood risk.
- Climate change allowances will need to be applied carefully to ensure compliance with Flood and coastal erosion risk management: adapting to climate change | GOV.WALES.

- For Coastal and Estuarine sites NRW will require assessment of wave overtopping. It is up to the developer to justify why an assessment *isn't* required.

- Shoreline Management Plan (SMP) information is available on our website via our Flood Risk Viewer Map and also on Welsh Government's DataMapWales Portal. You may need to consider the policy implications of the SMP when assessing the suitability and sustainability of new development on your site of interest. For proposed development sites in Gwynedd & Anglesey a Local Development Plan Policy (POLICY ARNA 1: Coastal Change Management) sets out how the Local Planning Authority will consider new development proposals within a Coastal Change Management Area. We recommend that you contact the relevant Planning Authority for further information and guidance in relation to this.

- **Pre-application Advice:** As part of our advice service to developers, NRW offer a free initial opinion on your proposal. However, in cases where you would like to access any extra advice that falls outside of our statutory duties, we can only offer this as part of our Discretionary Planning Advice Service (DPA Service). For more information regarding free service and our discretionary planning can be found in the following links: Welsh Version / English version.

  Your request for our free or charged discretionary advice service needs to be accompanied by the relevant 'Request Form' which is available to download from our website. You will then need to send the form to northplanning@cyfoethnaturiolcymru.gov.uk who will coordinate our response.

Regards

Kathy Banner
Swyddog Trwyddedu Data / Data Licensing Officer
Cyswllt Cyfoeth / Customer Hub
Ffôn/Phone: 02922 783727
Symudol / Mobile: 07817 883574)
Dyddiau gweithio / Working day: Tues - Thurs
Hi Hithau / She Her

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.
Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

From: Louisa Anscomb <Louisa.Anscomb@rpsgroup.com>
Sent: 18 September 2023 11:28
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: Flood Information Data Request/LL56 4QE/HLEF 03937

Good Morning,

We wish to enquire with you regarding the flood information for a site near Rhyd-y-groes, Pentir, Gwynedd, Wales, LL56 4QE.

Could we please request the following information if available:

- Modelled flood levels and depths or all modelled scenarios including climate change.
- Flood Hazard Mapping
- Historic Flood outlines
- Details of nearby flood defences, the type of defence, condition of the defences and level of protection they provide to the site
- Flood defence breach mapping

Please let me know if you require any further information.

Please find site location attached for your reference.

Kind regards,

Louisa

Louisa Anscomb (She/Her)
Graduate Consultant
RPS | Consulting UK & Ireland
20 Farringdon Street
London, EC4A 4AB, United Kingdom
T +44 20 3691 0500
E louisa.anscomb@rpsgroup.com

Follow us on: rpsgroup.com | LinkedIn | Facebook | Instagram | YouTube

Appendix B

Welsh Water Consultation

RE: Sewer Flood History Enquiry: LL56 4QE/HLEF 03937

SS Sewerage Services <Sewerage.Services@dwrcymru.com>
To Louisa Anscomb

CONFIDENTIAL

Our ref: 2789860

Good afternoon Louisa

Thank you for your email below, and I hope you find my response helpful.

I can confirm that we have no sewer network at a site near Rhyd-y-groes, Pentir, Gwynedd, Wales, LL56 4QE, so we have no record of any sewer flooding.

If there's anything else I can help you with, please feel free to contact me on 03300413307 ext 50037 anytime between 9am to 4pm Monday to Thursday and 9am to 3.30pm on Fridays.

Kind regards

Jessica Western
Customer Care Officer | Sewerage Services | Dwr Cymru Welsh Water
Linea | Cardiff | T: 03300 413307 Ext: 50037 | www.dwrcymru.com

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

From: Louisa Anscomb <[redacted]>
Sent: Monday, September 18, 2023 11:28 AM
To: Sewerage Services <Sewerage.Services@dwrcymru.com>
Subject: Sewer Flood History Enquiry: LL56 4QE/HLEF 03937

******** External Mail ********
Good Morning,

Please could you advise if you have any records to sewer flooding at a site near Rhyd-y-groes, Pentir, Gwynedd, Wales, LL56 4QE.

The site location is provided below for your reference.

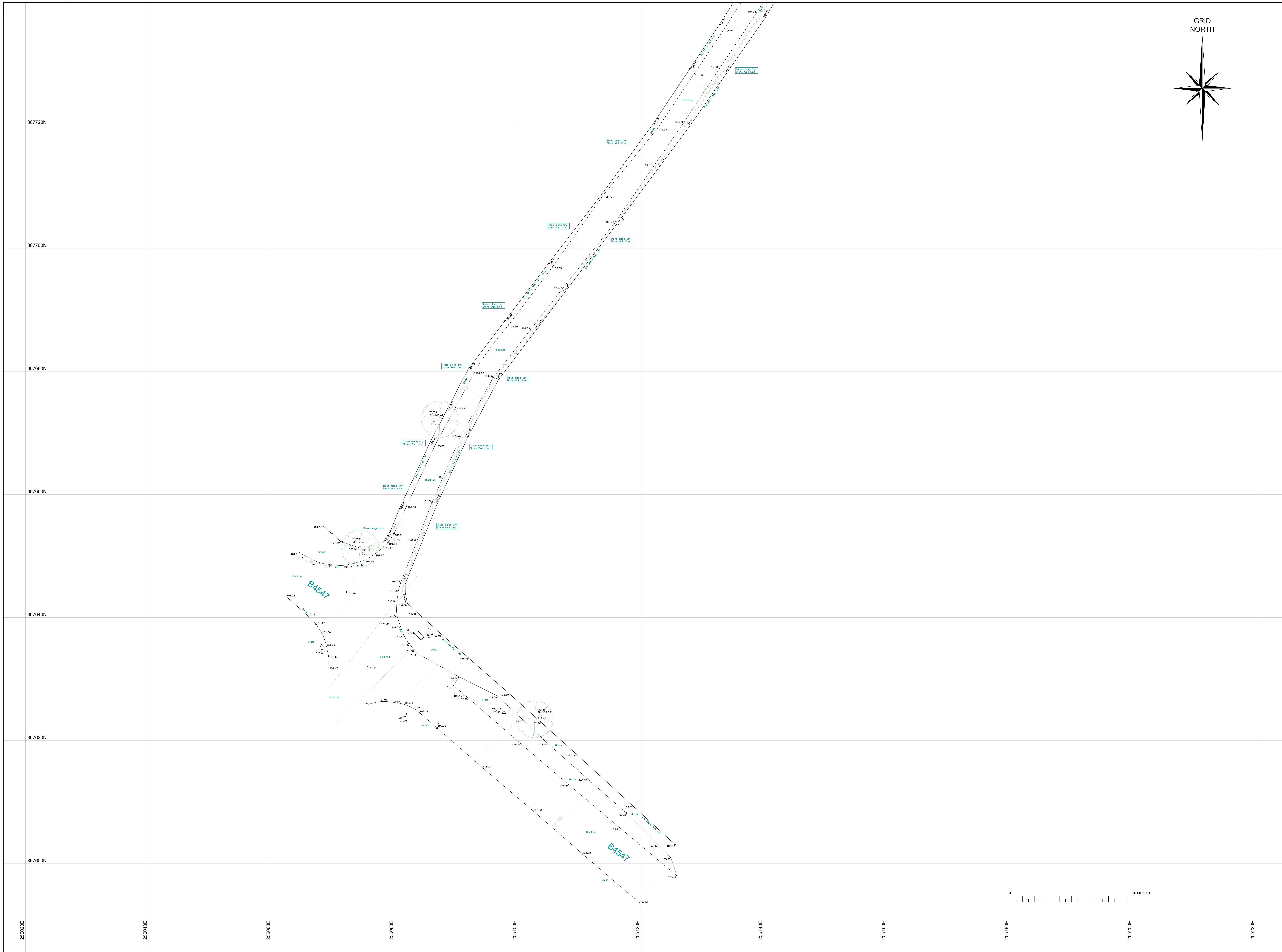
Please let me know if you have any queries.

King regards,

Louisa

Appendix C

Topographic Survey



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION. NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY
3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.
4. IF IN DOUBT ASK.

LEGEND

30.29	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

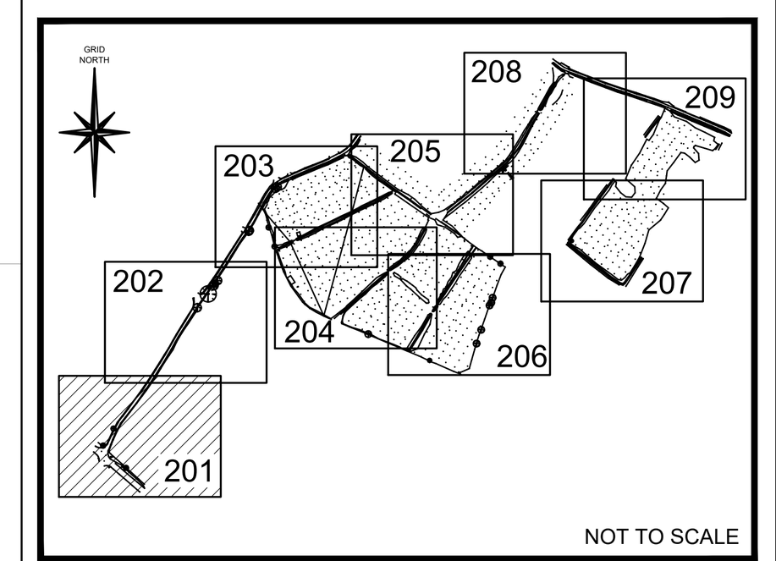
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

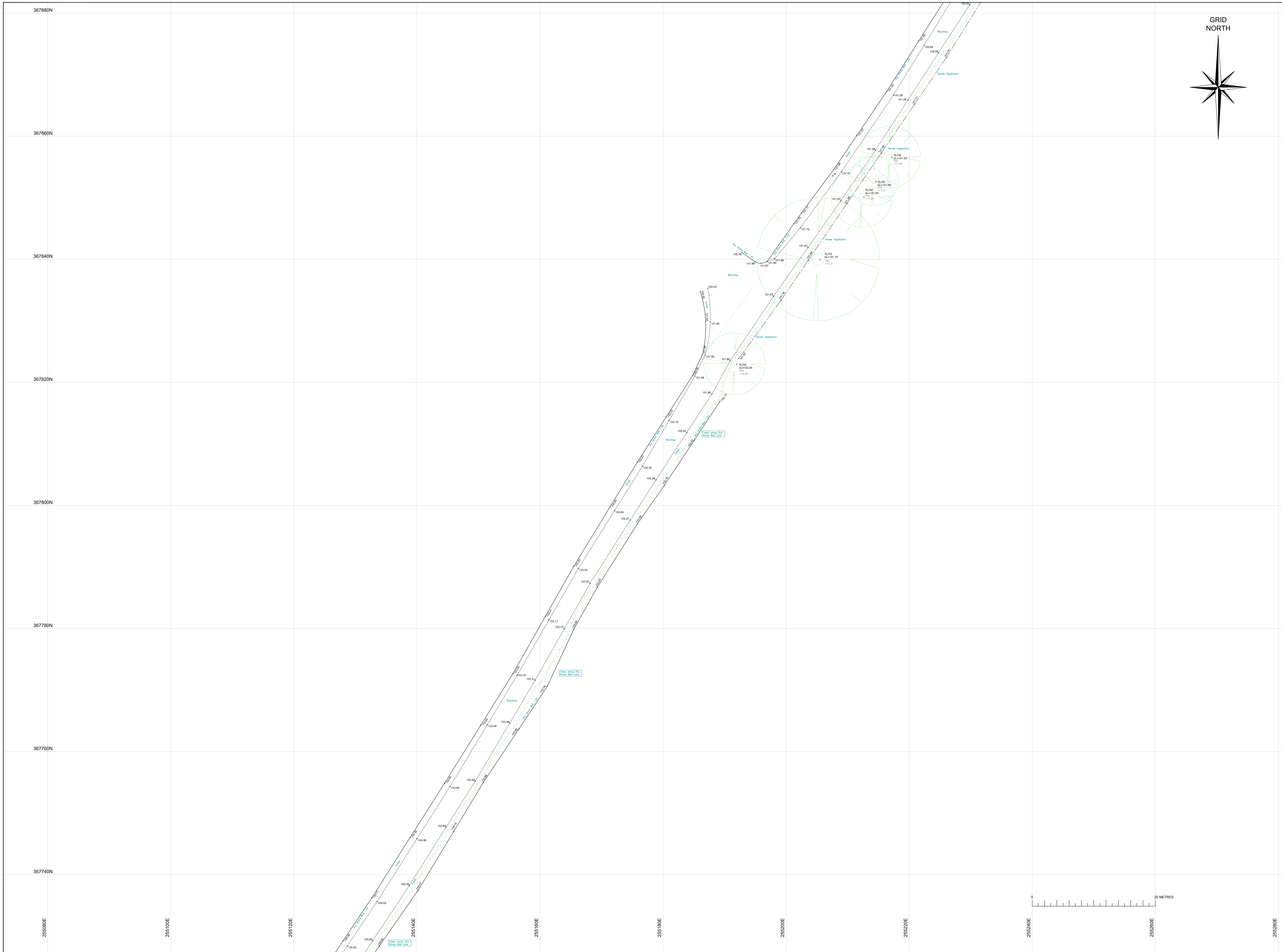
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 1 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	NR	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER: TSA-23-2602/201
REVISION: A

CAD REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

   A) SURVEY GRID (HORIZONTAL):

   THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

   FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

   SHIFT: NOT REQUIRED
   SCALE: LSF = 0.99986
   ROTATION: NOT REQUIRED.

   THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

   THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

   (FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

   B) VERTICAL DATUM:

   ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

   C) GNSS CONTROL:

   THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

   METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

   MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
   NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY

3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.

4. IF IN DOUBT ASK.

LEGEND

30.29 +	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		
C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

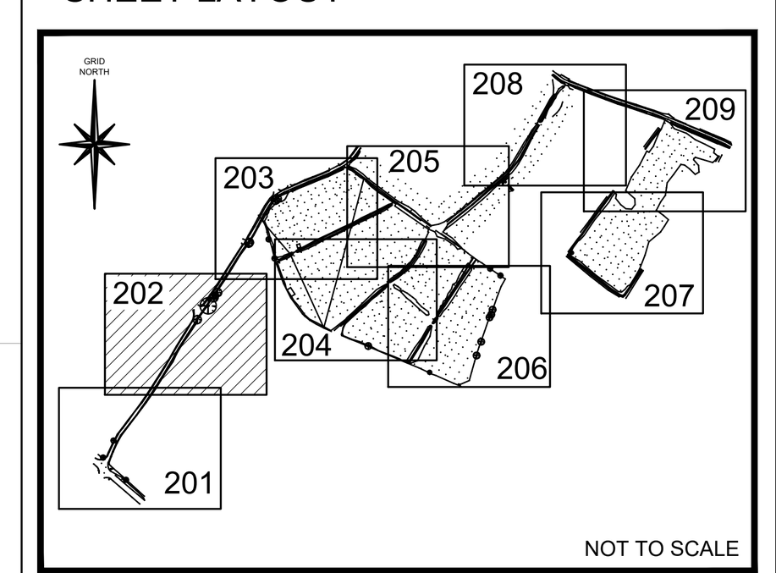
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

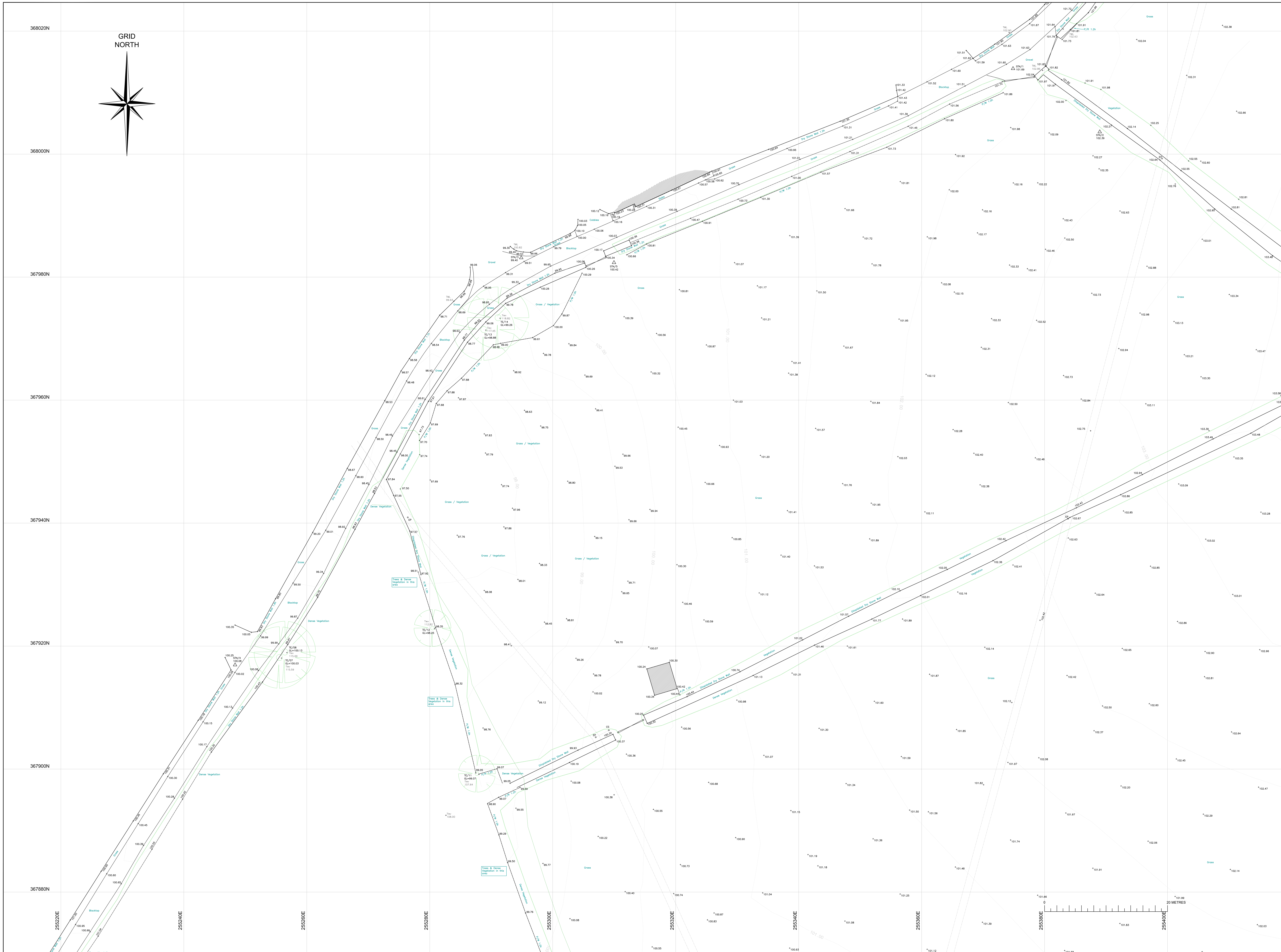
PROJECT TITLE
PENTIR, NORTH WALES

DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 2 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	NR	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER	REVISION
TSA-23-2602/202	A

CAD REFERENCE	CTB REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02	\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY

3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.

4. IF IN DOUBT ASK.

LEGEND

Symbol	Description	Symbol	Description
30.29 +	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

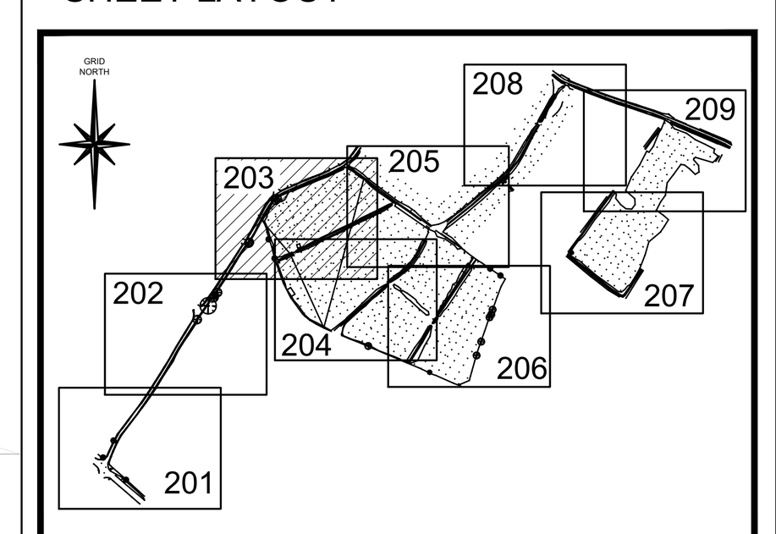
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



NOT TO SCALE

GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

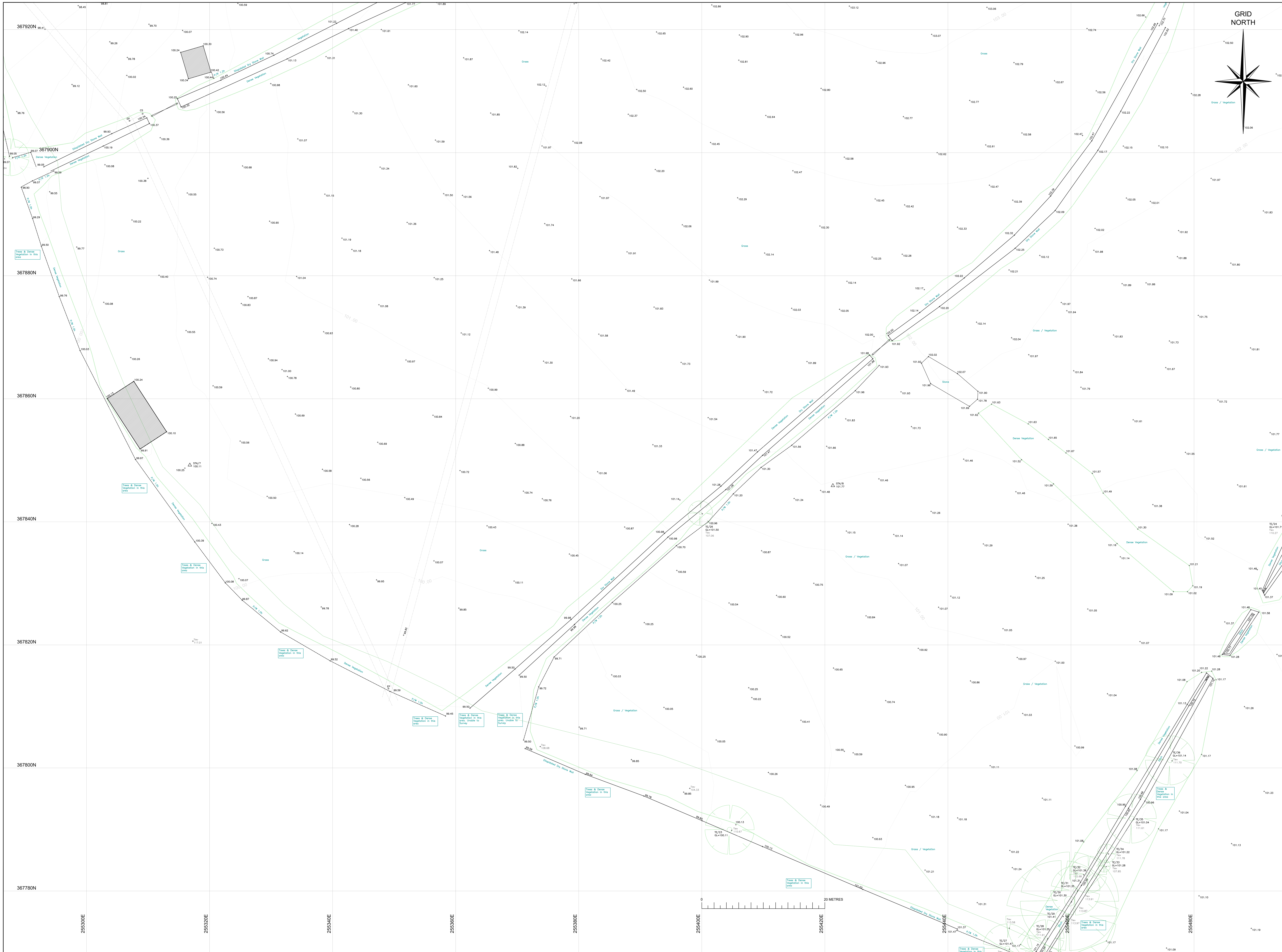
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 3 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	NR	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER: TSA-23-2602/203
REVISION: A

CAD REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY

3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.

4. IF IN DOUBT ASK.

LEGEND

30.29 +	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

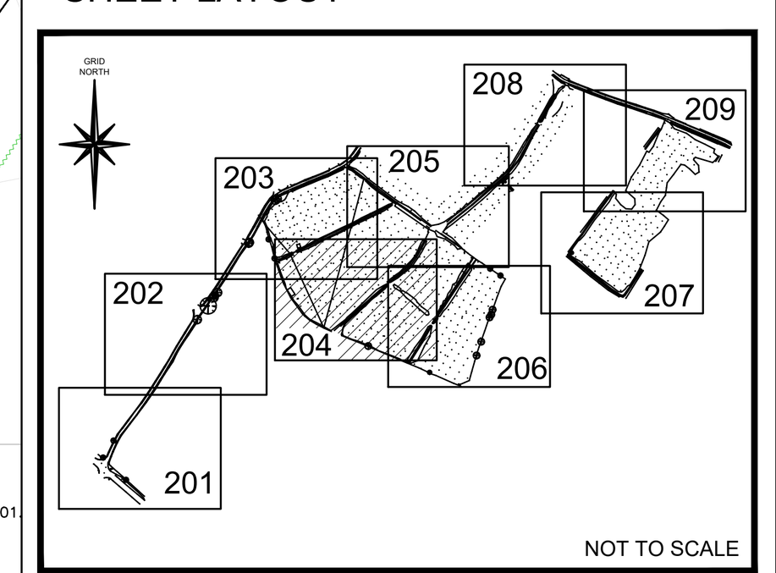
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

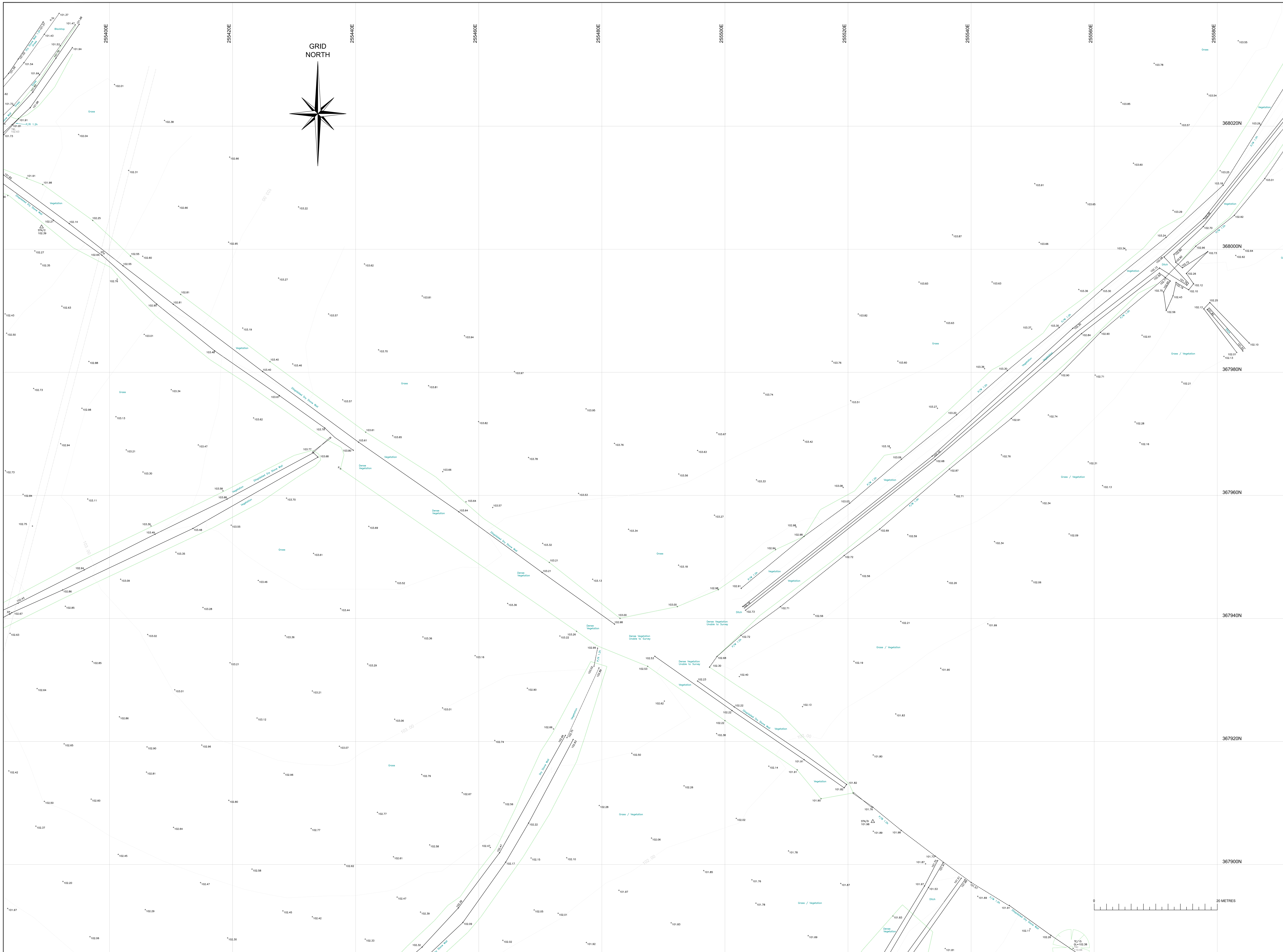
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 4 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	NR	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER: TSA-23-2602/204
REVISION: A

CAD REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE “TRIMBLE VRS NOW” NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY
3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.
4. IF IN DOUBT ASK.

LEGEND

30.29	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

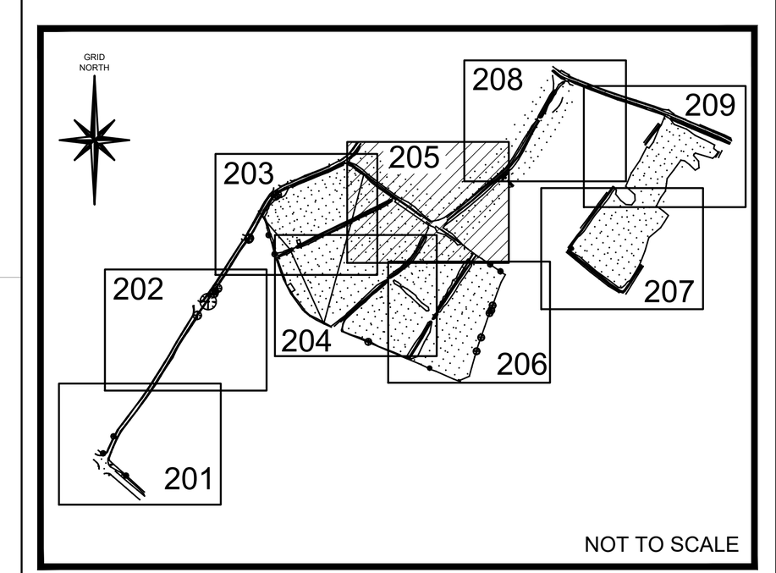
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE “TREES LARGER THAN DIAMETER “X” OR “ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS”. (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING “OFF SITE” TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD
DESCRIPTION	REV	DATE	DRWN	CHKD	APPR

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

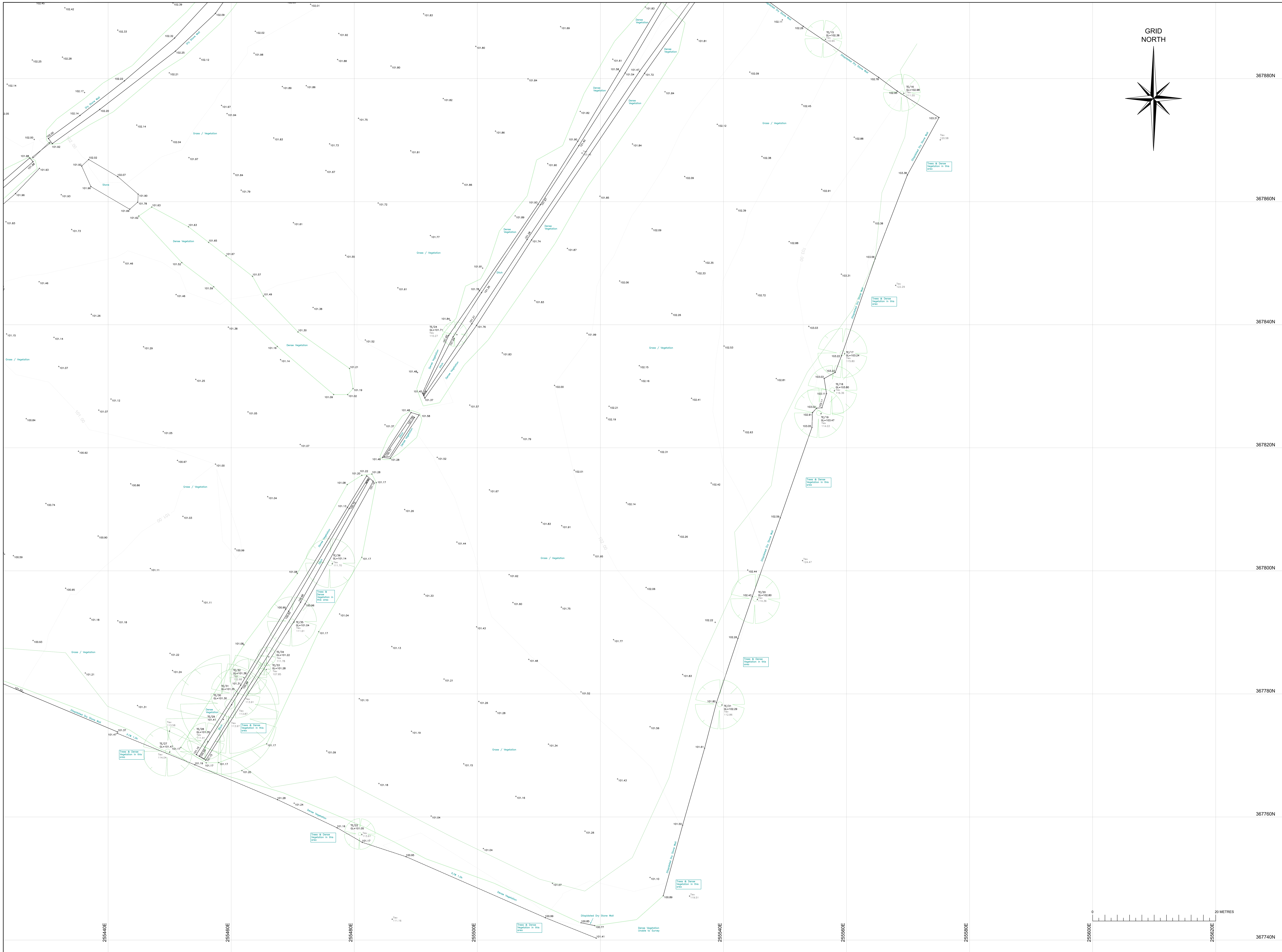
PROJECT TITLE
PENTIR, NORTH WALES

DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 5 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	AC	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER	REVISION
TSA-23-2602/205	A

CAD REFERENCE	CTB REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02	\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY
3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.
4. IF IN DOUBT ASK.

LEGEND

30.29 SPOT LEVEL
STN/4 SURVEY STATION
SAPLING
BUSHES/SHRUB
HEDGE/AREA OF UNDERGROWTH
TREE (INDICATIVE ONLY)
BUILDING
99.90 CONTOUR
R/W RETAINING WALL
GATE
OVERHEAD CABLE
CANOPY
FENCE WITH DESCRIPTION

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

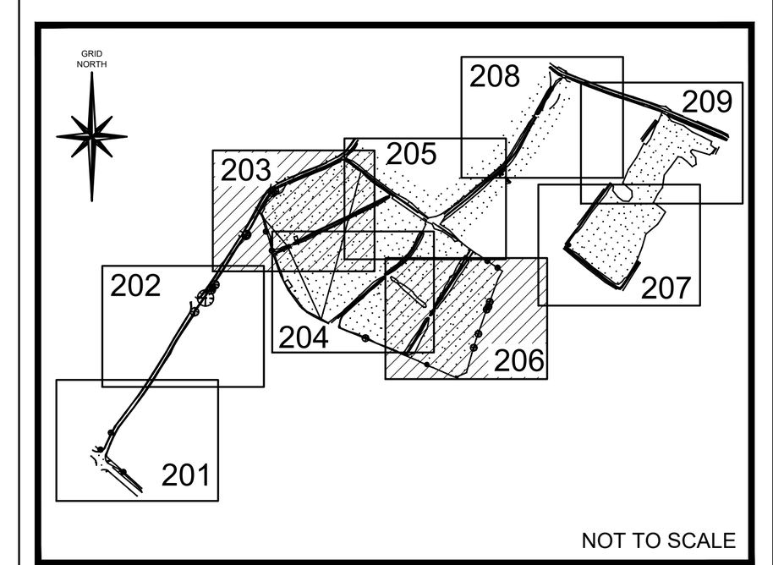
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

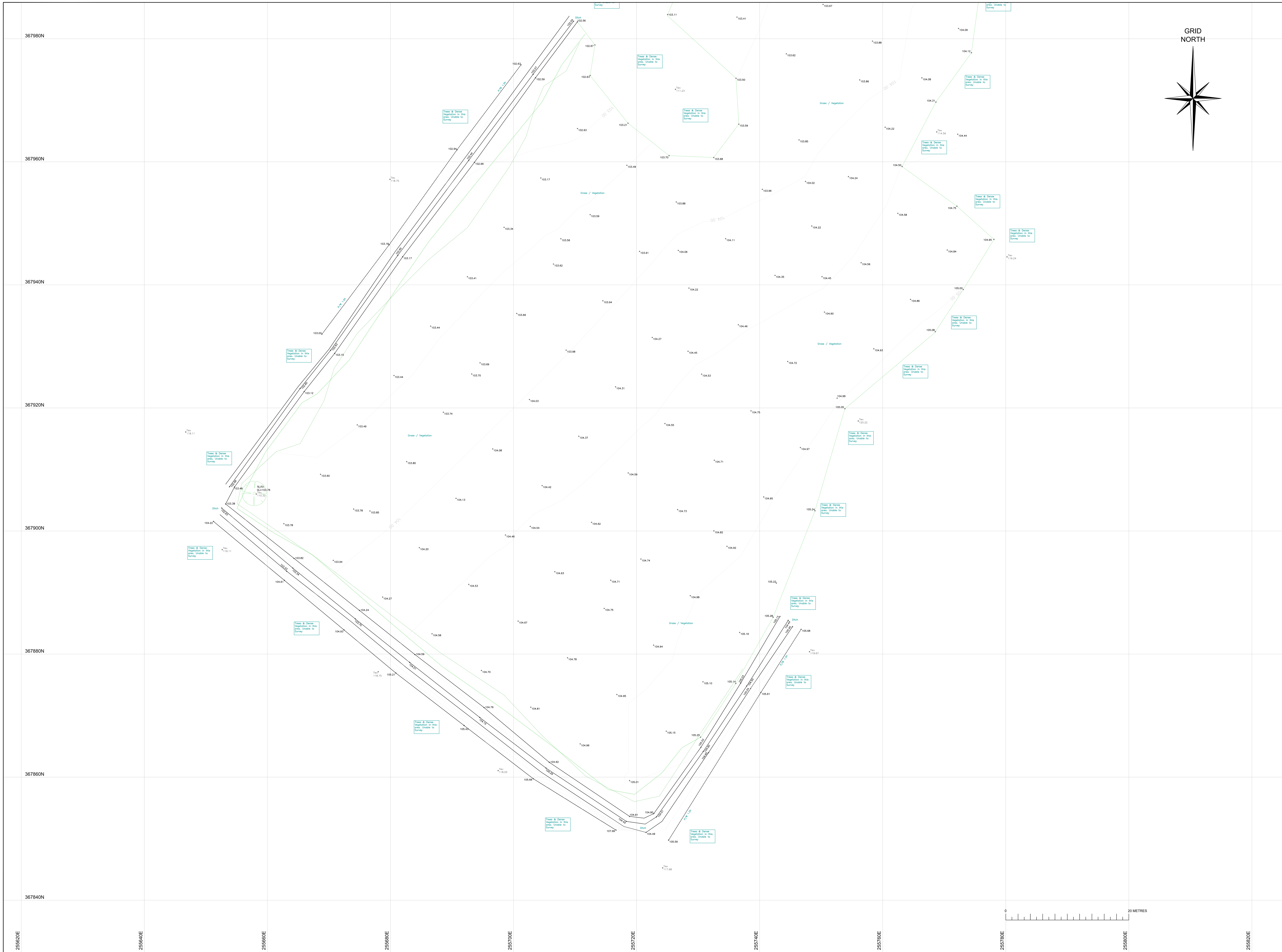
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 6 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	NR	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER	REVISION
TSA-23-2602/206	A

CAD REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY
3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.
4. IF IN DOUBT ASK.

LEGEND

30.29	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

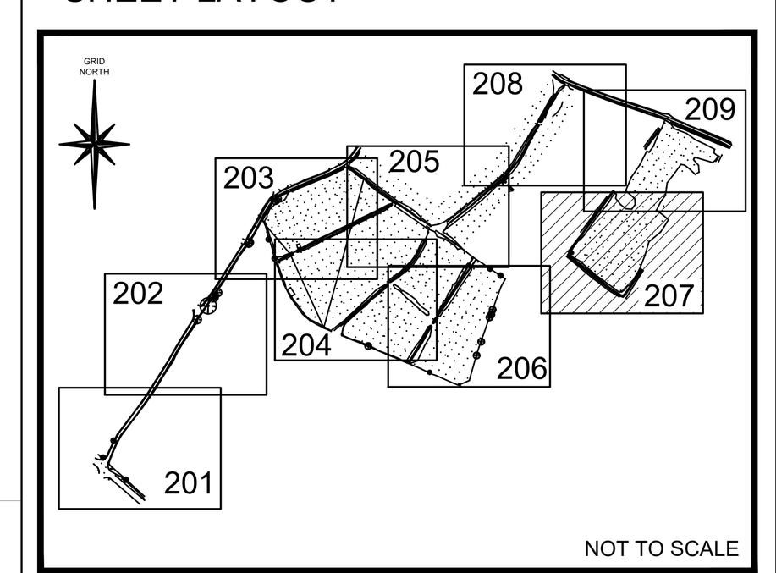
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS

18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005

info@towersurveys.biz
www.towersurveys.associates

Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

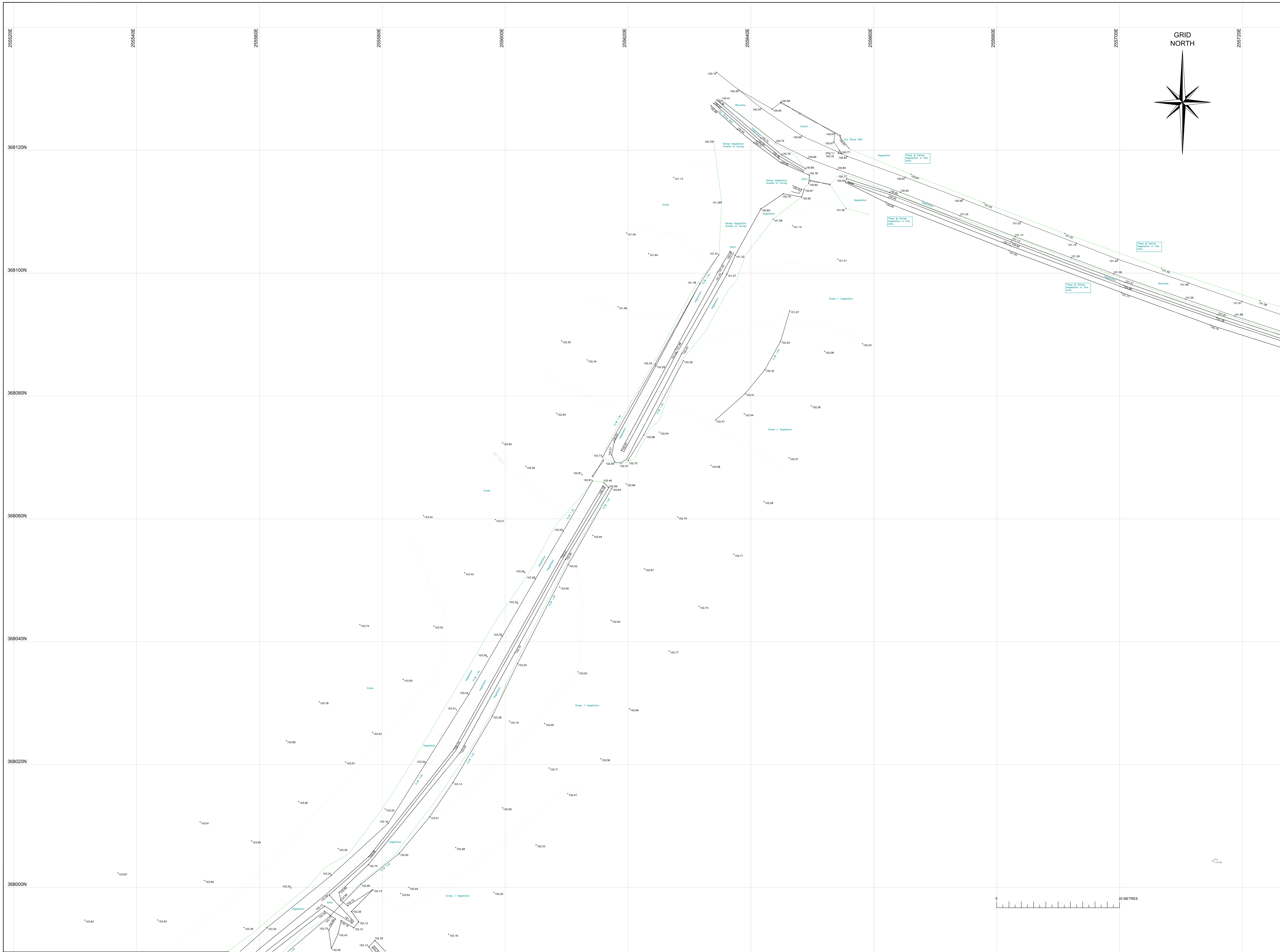
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 7 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	AC	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER	REVISION
TSA-23-2602/207	A

CAD REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY

3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.

4. IF IN DOUBT ASK.

LEGEND

30.29 SPOT LEVEL
STN/4 SURVEY STATION
SAPLING
BUSHES/SHRUB
HEDGE/AREA OF UNDERGROWTH
TREE (INDICATIVE ONLY)
BUILDING
99.90 CONTOUR
R/W RETAINING WALL
GATE
OVERHEAD CABLE
CANOPY
FENCE WITH DESCRIPTION

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

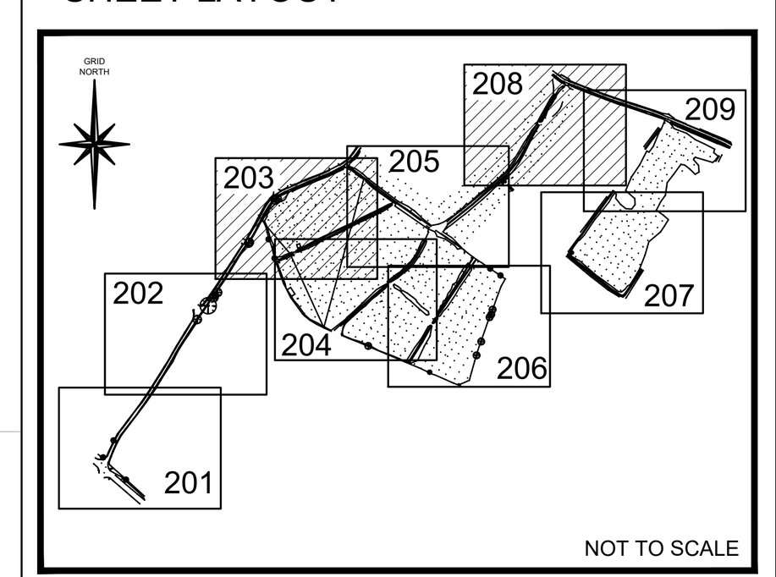
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

SHEET LAYOUT



GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

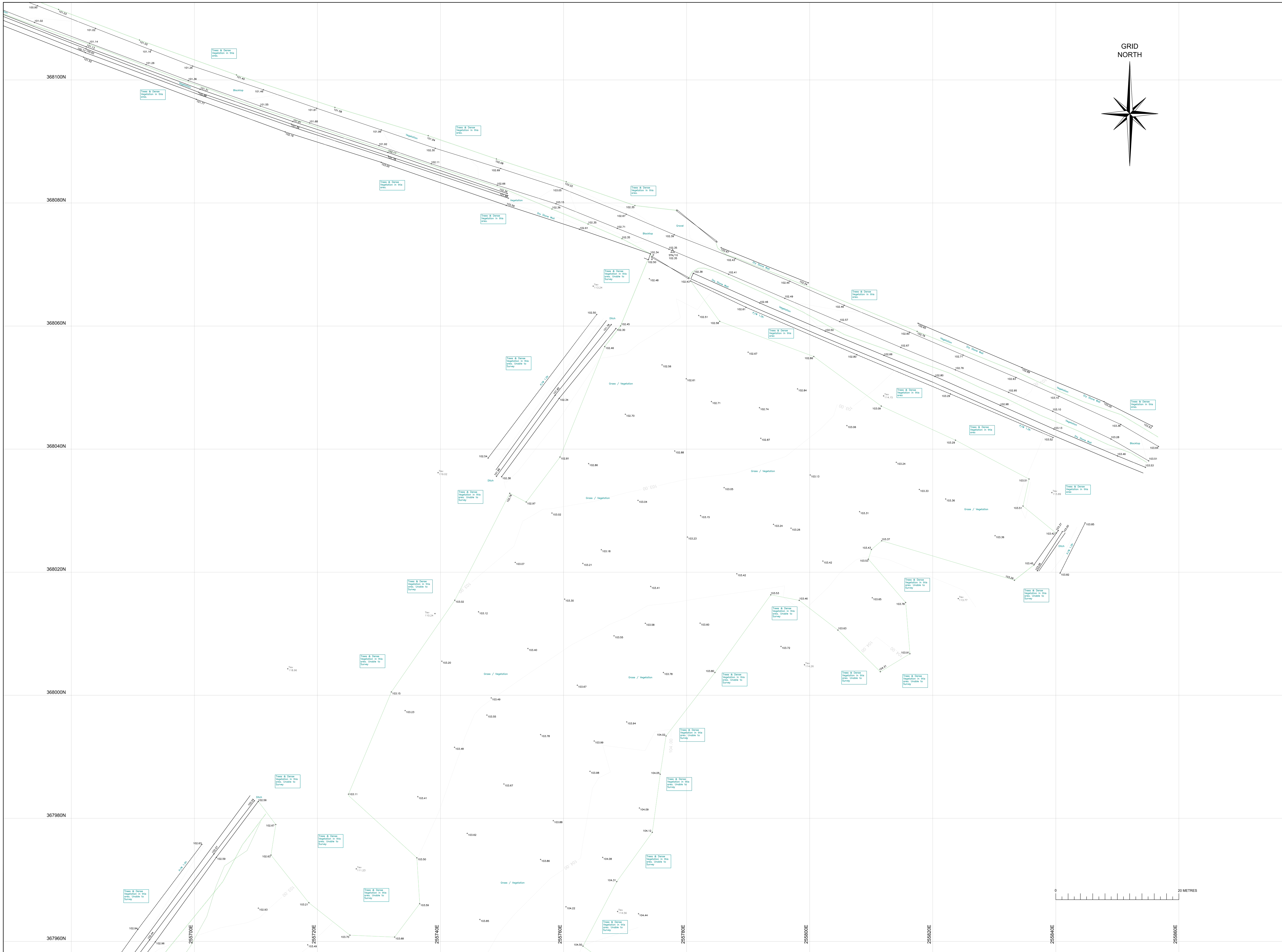
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 8 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	AC	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER: TSA-23-2602/208
REVISION: A

CAD REFERENCE
\\2023Projects\TSA-23-2602/TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/9, WITH CO-ORDINATES 255524.02E 367906.99N AS FOLLOWS:

SHIFT: NOT REQUIRED
SCALE: LSF = 0.99986
ROTATION: NOT REQUIRED.

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GNSS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) NEW OS NET USING OSGM15 TRANSFORMATION PARAMETERS.

C) GNSS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 NEW OS NET USING OSTN15 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE “TRIMBLE VRS NOW” NETWORK RTK SYSTEM HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 23RD OCTOBER 2023

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS ASSOCIATES HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
NAMELY: TSA-23-2602_201-209 - TOPOGRAPHICAL SURVEY

3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.

4. IF IN DOUBT ASK.

LEGEND

Symbol	Description	Symbol	Description
30.29	SPOT LEVEL	99.90	CONTOUR
STN/4	SURVEY STATION	R/W	RETAINING WALL
	SAPLING		GATE
	BUSHES/SHRUB		OVERHEAD CABLE
	HEDGE/AREA OF UNDERGROWTH		CANOPY
	TREE (INDICATIVE ONLY)		
	BUILDING		
	FENCE WITH DESCRIPTION		

C/B	CLOSE BOARDED	P/R	POST AND RAIL
I/R	IRON RAILING	P/Bw	POST AND BARBED WIRE
P/W	POST AND WIRE	W/M	WIRE MESH

ABBREVIATIONS

B	BOLLARD	RE	RODDING EYE
BT	BRITISH TELECOM IC	RF/RG	ROOF/RIDGE LEVEL
CATV	CABLE TELEVISION IC	RNP	ROAD NAME PLATE
CC	CONTROL CABINET	RS	ROAD SIGN
CL	COVER LEVEL	RWP	RAINWATER PIPE
COL	COLUMN	SC	STOP COCK
CTV	CABLE TELEVISION POINT	SFL	SOFFIT LEVEL
DK	DROP KERB	SGY	STRIP GULLY
EV	EAVES LEVEL	SP/B	SIGN POST/BOARD
EP	ELECTRICITY POLE	ST	STOP TAP
ER	EARTH ROD	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	SW	STORM WATER
FH	FIRE HYDRANT	TAP	WATER TAP
FL	FLOOD LIGHT	TCB	TELEPHONE CALL BOX
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TL	TRAFFIC LIGHT
GL	GROUND LEVEL	Tlev	TOP OF TREE LEVEL
IC	INSPECTION COVER	TP	TELEPHONE POLE
KB	KERB	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MH	MANHOLE	WL	WATER LEVEL
PI	PIPE	WM	WATER METER
P	POST	WO	WASH OUT

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	255374.86	368013.90	101.69	SURVEY NAIL
STN/2	255388.96	368003.61	102.39	PEG & NAIL
STN/3	255294.88	367983.14	99.40	SURVEY NAIL
STN/4	255248.33	367916.93	100.08	SURVEY NAIL
STN/5	255309.96	367982.36	100.42	SURVEY NAIL
STN/7	255316.79	367849.21	100.11	PEG & NAIL
STN/8	255421.30	367845.88	101.77	PEG & NAIL
STN/9	255524.02	367906.99	101.98	PEG & NAIL
STN/10	255777.72	368072.11	102.35	SURVEY NAIL
STN/11	255654.43	368119.65	100.76	SURVEY NAIL
STN/12	255068.15	367635.34	101.58	SURVEY NAIL
STN/13	255097.75	367624.57	102.33	PEG & NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

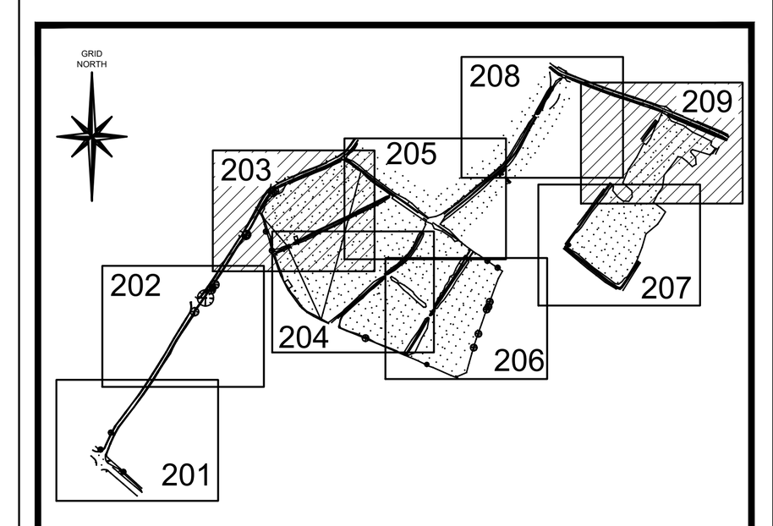
No.	CIRC.	SPREAD	HEIGHT
TE/01	0.6	4.0	6.0
TE/02	TB	10.0	14.0
TE/03	2.1	20.0	15.0
TE/04	1.6	10.0	15.0
TE/05	1.2	8.0	15.0
TE/06	2.1	10.0	15.0
TE/07	1.6	10.0	15.0
TE/08	1.6	10.0	15.0
TE/09	TB	6.0	15.0
TE/10	0.7	6.0	10.0
TE/11	0.8	6.0	8.0
TE/12	0.8	6.0	14.0
TE/13	1.8	10.0	18.0
TE/14	1.8	10.0	19.0
TE/15	1.2	6.0	8.0
TE/16	1.3	6.0	8.0
TE/17	TB	8.0	12.0
TE/18	TB	8.0	12.0
TE/19	0.9	6.0	10.0
TE/20	1.0	8.0	11.0
TE/21	0.9	8.0	10.0
TE/22	0.8	5.0	12.0
TE/23	MB	8.0	10.0
TE/24	TB	4.0	8.0
TE/25	0.8	6.0	8.0

No.	CIRC.	SPREAD	HEIGHT
TE/26	MB	4.0	5.0
TE/27	1.2	8.0	12.0
TE/28	TB	6.0	10.0
TE/29	1.2	18.0	12.0
TE/30	TB	16.0	12.0
TE/31	1.0	8.0	12.0
TE/32	TB	6.0	12.0
TE/33	0.7	2.0	6.0
TE/34	0.6	3.0	10.0
TE/35	MB	8.0	10.0
TE/36	MB	8.0	10.0

TREE NOTES:

A) TB – TWIN BOLES.
B) CIRC – CIRCUMFERENCE MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY).
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE “TREES LARGER THAN DIAMETER “X” OR “ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS”. (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING “OFF SITE” TREES).

SHEET LAYOUT



NOT TO SCALE

GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS ASS' SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR HATCHING ARE INDICATIVE ONLY, SUCH AS; ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR
TREE DETAILS AMENDED	A	DATE	AC	NJD	NJD

DRAWING STATUS

INFORMATION

Tower Surveys Associates
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
RICS
18 - 20
THE ROPEWALK
NOTTINGHAM
NG1 5DT
TEL: +44 (0)7786 650 005
info@towersurveys.biz
www.towersurveys.associates
Regulated by RICS

CLIENT
LIGHTSOURCE BP

PROJECT TITLE
PENTIR, NORTH WALES

DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 30/10/23
SHEET 9 OF 9

DRAWN	AC	DATE	OCTOBER 2023
PROJECT ENGINEER	NJD		
CHECKED	AC	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER: TSA-23-2602/209
REVISION: A

CAD REFERENCE
\\2023Projects\TSA-23-2602\TSA-23-2602_201-209_Issue02

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb

Appendix D

Development Plans

GBR_Pentir_Indicative BESS Layout_02

Area 25,900 m2 (6.40 acres)

- Site Boundary
- BESS Security Fence
- Site Access
- BESS Enclosure x 4
- Twin MV Skid
- Single MV Skid
- Backup Generator
- BESS Monitoring House
- BESS Intake Substation
- GRP
- Transformer
- Spares Container
- Spares Container
- Access Road
- Toilet
- CCTV

METERS
0 100 200 300 400 500

Scale 1:12500

ISO full bleed A3 (420.00 x 297.00 MM)

DA			02.11.2023
DRAWN	CHECKED	APPROVED	DATE

PROJECT NAME & ADDRESS:
Location: Pentir
Postcode:

NOTES:
-
-
-
-

Paper Size:	Scale:	Sheet:
A3	1:2500	1

CAPACITY:

DRAWING TITLE:
GBR_Pentir_Indicative BESS Layout_02

DRAWING NUMBER:	STATUS:
BESS_LYT	

lightsource bp

Lightsource Renewable Development Limited,
7th Floor, 33 Holborn, London, EC1N 2HU
General: +44 (0) 333 200 0755
Web: www.lightsourcebp.com
info@lightsourcebp.com

Appendix E

MicroDrainage Greenfield Runoff Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.300
Area (ha)	1.000	Urban	0.000
SAAR (mm)	1200	Region Number	Region 9

Results l/s

QBAR Rural	3.4
QBAR Urban	3.4
Q2 years	3.2
Q1 year	3.0
Q30 years	6.0
Q100 years	7.5

Unit 7, Woodrow Business Centre
Woodrow Way
Manchester, M44 6NN

Date 27/11/2023 08:03 | Designed by ANNALISA.MORSE
File Grenfield Runoff Rate e... | Checked by
Innovyze | Source Control 2020.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3208 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.688	0.088	0.0	0.7	0.7	62.9	O K
30 min Summer	9.722	0.122	0.0	0.7	0.7	87.8	Flood Risk
60 min Summer	9.763	0.163	0.0	0.7	0.7	116.9	Flood Risk
120 min Summer	9.796	0.196	0.0	0.7	0.7	140.3	Flood Risk
180 min Summer	9.816	0.216	0.0	0.7	0.7	154.6	Flood Risk
240 min Summer	9.830	0.230	0.0	0.7	0.7	165.1	Flood Risk
360 min Summer	9.851	0.251	0.0	0.7	0.7	179.9	Flood Risk
480 min Summer	9.866	0.266	0.0	0.7	0.7	190.6	Flood Risk
600 min Summer	9.877	0.277	0.0	0.7	0.7	198.7	Flood Risk
720 min Summer	9.886	0.286	0.0	0.7	0.7	205.1	Flood Risk
960 min Summer	9.899	0.299	0.0	0.7	0.7	214.4	Flood Risk
1440 min Summer	9.914	0.314	0.0	0.7	0.7	224.9	Flood Risk
2160 min Summer	9.922	0.322	0.0	0.7	0.7	230.7	Flood Risk
2880 min Summer	9.922	0.322	0.0	0.7	0.7	230.8	Flood Risk
4320 min Summer	9.917	0.317	0.0	0.7	0.7	226.9	Flood Risk
5760 min Summer	9.911	0.311	0.0	0.7	0.7	223.2	Flood Risk
7200 min Summer	9.910	0.310	0.0	0.7	0.7	222.0	Flood Risk
8640 min Summer	9.908	0.308	0.0	0.7	0.7	221.2	Flood Risk
10080 min Summer	9.908	0.308	0.0	0.7	0.7	220.6	Flood Risk
15 min Winter	9.698	0.098	0.0	0.7	0.7	70.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.679	0.0	43.2	27
30 min Summer	99.122	0.0	55.7	41
60 min Summer	66.266	0.0	99.9	72
120 min Summer	40.111	0.0	112.9	130
180 min Summer	29.731	0.0	115.8	190
240 min Summer	23.992	0.0	115.2	250
360 min Summer	17.696	0.0	112.6	370
480 min Summer	14.247	0.0	109.5	488
600 min Summer	12.038	0.0	106.5	608
720 min Summer	10.488	0.0	104.0	728
960 min Summer	8.435	0.0	100.1	966
1440 min Summer	6.202	0.0	94.8	1444
2160 min Summer	4.564	0.0	204.5	2160
2880 min Summer	3.674	0.0	196.3	2740
4320 min Summer	2.700	0.0	181.2	3420
5760 min Summer	2.184	0.0	362.9	4200
7200 min Summer	1.876	0.0	376.7	5040
8640 min Summer	1.667	0.0	366.4	5880
10080 min Summer	1.515	0.0	348.4	6752
15 min Winter	141.679	0.0	47.9	27

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.737	0.137	0.0	0.7	0.7	98.5	Flood Risk
60 min Winter	9.783	0.183	0.0	0.7	0.7	131.1	Flood Risk
120 min Winter	9.820	0.220	0.0	0.7	0.7	157.4	Flood Risk
180 min Winter	9.842	0.242	0.0	0.7	0.7	173.7	Flood Risk
240 min Winter	9.859	0.259	0.0	0.7	0.7	185.7	Flood Risk
360 min Winter	9.883	0.283	0.0	0.7	0.7	202.8	Flood Risk
480 min Winter	9.900	0.300	0.0	0.7	0.7	214.9	Flood Risk
600 min Winter	9.913	0.313	0.0	0.7	0.7	224.2	Flood Risk
720 min Winter	9.923	0.323	0.0	0.7	0.7	231.5	Flood Risk
960 min Winter	9.938	0.338	0.0	0.7	0.7	242.4	Flood Risk
1440 min Winter	9.956	0.356	0.0	0.7	0.7	255.2	Flood Risk
2160 min Winter	9.968	0.368	0.0	0.7	0.7	263.7	Flood Risk
2880 min Winter	9.971	0.371	0.0	0.7	0.7	265.7	Flood Risk
4320 min Winter	9.962	0.362	0.0	0.7	0.7	259.5	Flood Risk
5760 min Winter	9.955	0.355	0.0	0.7	0.7	254.5	Flood Risk
7200 min Winter	9.951	0.351	0.0	0.7	0.7	251.7	Flood Risk
8640 min Winter	9.947	0.347	0.0	0.7	0.7	248.9	Flood Risk
10080 min Winter	9.943	0.343	0.0	0.7	0.7	246.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	99.122	0.0	58.3	41
60 min Winter	66.266	0.0	108.7	70
120 min Winter	40.111	0.0	116.7	128
180 min Winter	29.731	0.0	115.6	188
240 min Winter	23.992	0.0	113.7	246
360 min Winter	17.696	0.0	109.3	364
480 min Winter	14.247	0.0	106.3	482
600 min Winter	12.038	0.0	104.1	600
720 min Winter	10.488	0.0	102.5	716
960 min Winter	8.435	0.0	100.3	950
1440 min Winter	6.202	0.0	98.7	1414
2160 min Winter	4.564	0.0	206.4	2096
2880 min Winter	3.674	0.0	200.4	2744
4320 min Winter	2.700	0.0	190.8	3848
5760 min Winter	2.184	0.0	398.3	4448
7200 min Winter	1.876	0.0	395.6	5408
8640 min Winter	1.667	0.0	379.9	6320
10080 min Winter	1.515	0.0	364.3	7264

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 255528 367953 SH 55528 67953
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.239

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.080	4	8	0.080	8	12	0.080

Model Details

Storage is Online Cover Level (m) 10.000

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.00000	Diameter/Width (m)	100.0
Safety Factor	2.0	Length (m)	23.9
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	9.600		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0046-7000-0400-7000
Design Head (m)	0.400
Design Flow (l/s)	0.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	46
Invert Level (m)	9.600
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	0.7
Flush-Flo™	0.119	0.7
Kick-Flo®	0.270	0.6
Mean Flow over Head Range	-	0.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.7	1.200	1.1	3.000	1.7	7.000	2.6
0.200	0.7	1.400	1.2	3.500	1.8	7.500	2.7
0.300	0.6	1.600	1.3	4.000	2.0	8.000	2.8
0.400	0.7	1.800	1.4	4.500	2.1	8.500	2.9
0.500	0.8	2.000	1.4	5.000	2.2	9.000	2.9
0.600	0.8	2.200	1.5	5.500	2.3	9.500	3.0
0.800	0.9	2.400	1.6	6.000	2.4		
1.000	1.0	2.600	1.6	6.500	2.5		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3088 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.688	0.088	0.0	2.1	2.1	206.4	O K
30 min Summer	9.723	0.123	0.0	2.4	2.4	287.9	Flood Risk
60 min Summer	9.763	0.163	0.0	2.4	2.4	383.3	Flood Risk
120 min Summer	9.796	0.196	0.0	2.4	2.4	460.0	Flood Risk
180 min Summer	9.816	0.216	0.0	2.4	2.4	507.4	Flood Risk
240 min Summer	9.831	0.231	0.0	2.4	2.4	541.7	Flood Risk
360 min Summer	9.851	0.251	0.0	2.4	2.4	590.8	Flood Risk
480 min Summer	9.866	0.266	0.0	2.4	2.4	625.6	Flood Risk
600 min Summer	9.878	0.278	0.0	2.4	2.4	652.3	Flood Risk
720 min Summer	9.887	0.287	0.0	2.4	2.4	673.7	Flood Risk
960 min Summer	9.900	0.300	0.0	2.4	2.4	705.6	Flood Risk
1440 min Summer	9.916	0.316	0.0	2.4	2.4	742.0	Flood Risk
2160 min Summer	9.925	0.325	0.0	2.4	2.4	763.2	Flood Risk
2880 min Summer	9.926	0.326	0.0	2.4	2.4	765.9	Flood Risk
4320 min Summer	9.923	0.323	0.0	2.4	2.4	759.0	Flood Risk
5760 min Summer	9.919	0.319	0.0	2.4	2.4	750.5	Flood Risk
7200 min Summer	9.919	0.319	0.0	2.4	2.4	748.5	Flood Risk
8640 min Summer	9.918	0.318	0.0	2.4	2.4	746.9	Flood Risk
10080 min Summer	9.917	0.317	0.0	2.4	2.4	745.5	Flood Risk
15 min Winter	9.698	0.098	0.0	2.4	2.4	231.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.679	0.0	114.1	27
30 min Summer	99.122	0.0	165.1	41
60 min Summer	66.266	0.0	301.3	72
120 min Summer	40.111	0.0	354.5	130
180 min Summer	29.731	0.0	378.1	190
240 min Summer	23.992	0.0	387.8	250
360 min Summer	17.696	0.0	386.6	370
480 min Summer	14.247	0.0	377.9	488
600 min Summer	12.038	0.0	369.0	608
720 min Summer	10.488	0.0	360.1	728
960 min Summer	8.435	0.0	343.6	966
1440 min Summer	6.202	0.0	319.1	1444
2160 min Summer	4.564	0.0	692.6	2160
2880 min Summer	3.674	0.0	659.4	2628
4320 min Summer	2.700	0.0	597.7	3336
5760 min Summer	2.184	0.0	1164.3	4144
7200 min Summer	1.876	0.0	1218.4	4968
8640 min Summer	1.667	0.0	1220.5	5800
10080 min Summer	1.515	0.0	1160.8	6656
15 min Winter	141.679	0.0	130.9	27

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	9.737	0.137	0.0	2.4	2.4	322.7	Flood Risk
60 min Winter	9.783	0.183	0.0	2.4	2.4	429.9	Flood Risk
120 min Winter	9.820	0.220	0.0	2.4	2.4	516.3	Flood Risk
180 min Winter	9.843	0.243	0.0	2.4	2.4	569.8	Flood Risk
240 min Winter	9.859	0.259	0.0	2.4	2.4	608.8	Flood Risk
360 min Winter	9.883	0.283	0.0	2.4	2.4	665.0	Flood Risk
480 min Winter	9.900	0.300	0.0	2.4	2.4	705.4	Flood Risk
600 min Winter	9.913	0.313	0.0	2.4	2.4	736.2	Flood Risk
720 min Winter	9.924	0.324	0.0	2.4	2.4	760.6	Flood Risk
960 min Winter	9.939	0.339	0.0	2.4	2.4	796.8	Flood Risk
1440 min Winter	9.958	0.358	0.0	2.4	2.4	840.0	Flood Risk
2160 min Winter	9.970	0.370	0.0	2.4	2.4	869.1	Flood Risk
2880 min Winter	9.973	0.373	0.0	2.4	2.4	876.5	Flood Risk
4320 min Winter	9.966	0.366	0.0	2.4	2.4	860.6	Flood Risk
5760 min Winter	9.961	0.361	0.0	2.4	2.4	847.1	Flood Risk
7200 min Winter	9.957	0.357	0.0	2.4	2.4	839.0	Flood Risk
8640 min Winter	9.953	0.353	0.0	2.4	2.4	830.2	Flood Risk
10080 min Winter	9.949	0.349	0.0	2.4	2.4	820.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	99.122	0.0	181.4	41
60 min Winter	66.266	0.0	334.1	70
120 min Winter	40.111	0.0	381.7	128
180 min Winter	29.731	0.0	394.4	188
240 min Winter	23.992	0.0	392.6	246
360 min Winter	17.696	0.0	381.3	364
480 min Winter	14.247	0.0	369.6	482
600 min Winter	12.038	0.0	360.6	598
720 min Winter	10.488	0.0	353.6	716
960 min Winter	8.435	0.0	342.7	950
1440 min Winter	6.202	0.0	328.1	1412
2160 min Winter	4.564	0.0	701.2	2084
2880 min Winter	3.674	0.0	675.2	2740
4320 min Winter	2.700	0.0	628.3	3504
5760 min Winter	2.184	0.0	1287.7	4392
7200 min Winter	1.876	0.0	1316.7	5336
8640 min Winter	1.667	0.0	1270.1	6304
10080 min Winter	1.515	0.0	1211.6	7176

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 255528 367953 SH 55528 67953
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.783

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.261	4	8	0.261	8	12	0.261

Model Details

Storage is Online Cover Level (m) 10.000

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.00000	Diameter/Width (m)	100.0
Safety Factor	2.0	Length (m)	78.3
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	9.600		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0082-2400-0400-2400
Design Head (m)	0.400
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	9.600
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.4
Flush-Flo™	0.130	2.4
Kick-Flo®	0.291	2.1
Mean Flow over Head Range	-	2.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	4.0	3.000	6.1	7.000	9.2
0.200	2.3	1.400	4.3	3.500	6.6	7.500	9.5
0.300	2.1	1.600	4.5	4.000	7.0	8.000	9.9
0.400	2.4	1.800	4.8	4.500	7.4	8.500	10.2
0.500	2.7	2.000	5.0	5.000	7.8	9.000	10.5
0.600	2.9	2.200	5.3	5.500	8.2	9.500	10.7
0.800	3.3	2.400	5.5	6.000	8.5		
1.000	3.7	2.600	5.7	6.500	8.9		

Appendix F

Conceptual Drainage Strategy

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

PRELIMINARY

SUBJECT TO DETAILED DESIGN

This drawing illustrates a sketch proposal only and as such is subject to detailed site investigation including ground conditions/contaminants, drainage, design and planning/density negotiations. The layout maybe based upon an enlargement of an OS sheet or other small scale plans and its accuracy will need to be verified by Survey. Full risk analysis under the CDM Regulations has not been undertaken.

KEY

- Surface water drainage
- Surface water headwall
- Infrastructure areas
- 6m watercourse easement
- Western catchment
- Eastern catchment

Gravel base CL 102.20 (TBC) IL 101.80 (TBC)

Gravel base CL 102.05 (TBC) IL 101.65 (TBC)

based on a 1/100 gradient, the watercourse bed level can be deepened to 101.35mAOD at this location

Gravel base CL 102.05 (TBC) IL 101.65 (TBC)

Gravel base CL 102.10 (TBC) IL 101.70(TBC)

watercourse centreline

Gravel base CL 101.53 (TBC) IL 101.13 (TBC)

Gravel base CL 101.37 (TBC) IL 100.97 (TBC)

Gravel base CL 101.37 (TBC) IL 100.97 (TBC)

Gravel base CL 101.50 (TBC) IL 101.10 (TBC)

Indicative location of perforated filter drain running along leeward extent of gravel base. Located to capture and convey surface water flows within the gravel base towards the flow control. Indicative location only, to be confirmed upon detailed design.

Levels of the gravel base are subject to detailed design. However, for illustrative purposes indicative cover and invert levels of the gravel bases have been assumed.

Penstock valves to be placed on drainage outfalls for each catchment, subject to detailed design.

6m easement from watercourse, assumed from centreline of the watercourse

In order to achieve a gravity based solution, it is proposed to deepen the on-site watercourse.

Based on a proposed gradient of 1/100 the bed level of the on-site watercourse can be lowered to 100.29mAOD at this location.

The on-site watercourse outfalls into the adjacent watercourse at this location. The adjacent watercourse has a surveyed bed level of 99.92mAOD at this point.

Deepening of the on-site watercourse will be limited to the adjacent watercourses' bed level to maintain flows under gravity.

Impermeable areas are to be split into two catchments, the western catchment and eastern catchment.

Catchment details		
	Western	Eastern
impermeable area	7468 m^2	2312 m^2
greenfield runoff rate	2.4 l/s	0.7 l /s
attenuation required	825 m^3	256 m^3

Surface water attenuation can be provided within lined 400mm deep gravel bases with 30% void ratio, to be laid at a gradient of 1/500. It is expected the gravel bases can be lifted at the lower edge from existing ground levels to enable outfalls to be located at a higher level than the receiving on-site watercourse (which itself is to be deepened).

Surface water flows from each catchment are to be discharged at the 1 in 1 year greenfield runoff rate via a suitable flow control device. For indicative purposes, a hydrobrake flow control device has been used. Additional design elements, such as outflow control, is to be confirmed at detailed drainage design.

Rev	Description	By	Ckd	Date
D	Added references to penstocks	AM	FC	22.03.24
C	Updated to latest layout	AM	FC	04.01.24
B	Updated to client comment	AM	FC	18.12.23
A	Updated with additional topo information	AM	FC	13.12.23

A TETRA TECH COMPANY

20 Farringdon Street, London, EC4A 4AB
T: +44 20 3691 0500 E: rpshydrologyservices@rpsgroup.com

Client: Lightsource BP

Project: Pentir Energy Storage System

Title: Conceptual Drainage Strategy

Status: draft

Scale: 1:500 @A1

Date Created: 20.11.23

Task Team Manager: FC

Information Author: AM

Task Information Manager: FC

Document Number: DR01

RPS Project Number: HLEF03937

Revision: D

rpsgroup.com

O:\Environment\01_Projects\HLEF - Floodh\LEF 03937 - Pentir Solar Farm BESS\7. CAD\HLEF03937 Pentir Drainage Concept REV C bound.dwg