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environmental risk assessment

Hydrogeological Risk Assessment
East Sussex National Hotel and Golf Resort
Little Horsted
Uckfield
East Sussex

Final Report

on behalf of

PJ Brown (Civil Engineering) Ltd

Report fc37267
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EXECUTIVE SUMMARY

Firth Consultants has been commissioned by PJ Brown (Civil Engineering) Ltd to conduct a Hydrogeological Risk Assessment (HRA) for the proposed remodelling of land at the East Sussex National Hotel and Golf Resort, Little Horsted, East Sussex. The proposed area to be re-modelled forms three distinct areas, namely the Eastern, Western and Southern areas (hereafter referred to as 'the site') and is currently occupied by three academy holes. The re-modelling will be conducted using a combination of re-used top soil from the site and imported inert waste material to form a 9 hole par 3 golf course, a footgolf course, a 3G synthetic grass football pitch and a dedicated short game area with an extensive native planting scheme.

The site has been part of the East Sussex Golf Course since the mid 1980's. Parts of the site are underlain by either the Lower Tunbridge Wells Sand and the Tunbridge Wells Sand Formation which are both classified as Secondary A aquifers. These aquifers are limited in extent in the vicinity of the site which limits their potential as a viable water supply resource. Where present, these are underlain by greater than 50m thickness of low permeability Wadhurst Clay (unproductive strata generally considered to be an aquiclude) which overlies the Ashdown Formation Secondary A aquifer. Head deposits which are present over the majority of the Southern area of the site are classified as a Secondary (undifferentiated) aquifer however these are likely to be acting as an aquitard rather than an aquifer. Elsewhere, the site is directly underlain by the Wadhurst Clay, which forms the majority of the area covered by the proposed scheme.

The main surface water body in the vicinity of the site is Little Horsted Stream which flows through the wider golf course and is located immediately south of the Southern area of the site. Little Horsted Stream flows to the north-west where it joins the River Uck approximately 2km downstream of the site. Several other surface water features such as small streams / drainage channels, a series of linked ponds, a drainage culvert and a wetland area are located in close proximity to the three site areas and ultimately flow south / south-west and join the Little Horsted Stream.

A conceptual site model (CSM) for controlled waters receptors was developed for the proposed re-modelling of the site. This identified the following plausible contaminant linkages:

- Risk to either the Lower Tunbridge Wells Sand or Tunbridge Wells Sand Formation Secondary A aquifers from leaching of contaminants from overlying inert waste;
- Risk to the Little Horsted Stream from leaching, dissolved phase migration via groundwater or perched groundwater and flow via surface water drainage; and
- Risk to the Little Horsted Stream from leaching and dissolved phase migration via surface water drainage.

All of the identified contaminant linkages above were considered to pose a low risk to controlled waters receptors and therefore it was concluded that the proposed scheme is unlikely to cause a significant risk to controlled waters.

A surface water monitoring programme has been recommended which includes baseline monitoring of surface water quality conducted prior to the re-modelling of the site followed by quarterly monitoring. The provision of baseline data will enable control levels and compliance limits to be derived for comparison with water quality data collected during the earthworks phase.

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1 INTRODUCTION

Firth Consultants Ltd has been commissioned by PJ Brown (Civil Engineering) Ltd to conduct a Hydrogeological Risk Assessment (HRA) for the remodelling of land at the East Sussex National Hotel and Golf Resort, Little Horsted, East Sussex (hereafter referred to as "the site").

1.1 Background and Objectives

The site, which is currently occupied by three academy holes, will be re-modelled to form a 9 hole par 3 golf course, a foot-golf course, a 3G synthetic grass football pitch and a dedicated short game area with an extensive native planting scheme.

The site can effectively be split into three distinct development areas:

- Eastern Area: The 9 hole par 3 golf course, which includes the 3G football pitch in its western most part;
- Western Area: The chipping green; and
- Southern Area: The driving range.

The re-modelling will be conducted using a combination of re-used top-soil from the site and imported inert waste material (deposited on-site as a recovery activity).

Part of the site is located on a Secondary A aquifer and therefore it is anticipated that a HRA will be required to support the application for an environmental permit for the permanent deposit of waste on land as a recovery activity. The objectives of the HRA work are to:

- Assess the risk to controlled waters receptors associated with the proposed permanent deposit of waste at the site; and
- Provide recommendations for further work as required.

1.2 Scope of Work

In order to meet the objectives outlined above the following work has been undertaken:

- Review of all existing data relevant to the site including planning permissions, topographic, geological and hydrogeological maps and available British Geological Survey (BGS) borehole logs. An Envirocheck report was also obtained and is provided in Appendix 1;

- Development of a hydrogeological conceptual site model (CSM) and qualitative assessment of risks;
- Preparation of a report that describes the work conducted and makes recommendations for further work as required.

1.3 Available Information

The following reports and information relating to the site have been used to prepare this HRA:

- Hydrogeo Ltd, 2018. Flood Risk Assessment East Sussex National Golf Club. December 2018.
- Flood Risk Construction Management Plan East Sussex National Golf Club. October 2021.
- Weller Designs, 2019. EIA Screening Request, East Sussex National Hotel and Golf Resort. February 2019.
- Ged Duckworth Limited, 2022a. Conceptual Site Model and Environmental Setting and Site Design East Sussex National Golf Club. March 2022.
- Ged Duckworth Limited, 2022b. East Sussex National Golf Course - Surface Water Monitoring and Control. March 2022.

In addition, several plans and cross sections by Weller Designs Limited showing the proposed areas and profiles were reviewed.

1.4 Guidance

The HRA has been conducted in accordance with relevant Environment Agency (EA) guidance, in particular the following:

- EA, 2018. Groundwater risk assessment for your environmental permit. Available at https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit Last updated 3 April 2018
- EA, 2017a. Protect groundwater and prevent groundwater pollution. Available at https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution Last updated 14 March 2017

- EA, 2017b. Groundwater protection technical guidance. Available at https://www.gov.uk/government/publications/groundwater-protection-technical-guidance/groundwater-protection-technical-guidance Last updated 14 March 2017

1.5 Report Format

This report provides a HRA based on the proposed re-profiling of the site in relation to the environmental setting. Section 2 describes the site setting and ground conditions, including geography, hydrology, geology and hydrogeology and Section 3 summarises the intended site development plans. Section 4 presents the conceptual site model (CSM) of risk and Section 5 provides conclusions and recommendations.

2 SITE SETTING AND GROUND CONDITIONS

2.1 Geography

The site is on part of the East Sussex National Hotel and Golf Resort in Little Horsted, located approximately 3 km south of Uckfield, East Sussex south of the A22 Uckfiled Bypass, centred at National Grid Reference (NGR) 547930,117865 (Figure 1). The site has a total area of 14.82 ha and comprises three main areas as described below:

- Eastern Area: An elongated area trending west – east located immediately north-east of the Hotel with approximate dimensions of 600 m x 150 m. This area is surrounded by High Wood with the A22 Bypass beyond to the north, an arable field to the east with Harvey's Lane beyond, a series of ponds and current golf holes to the south and the golf hotel and club house to the west. The topography ranges from 49 mAOD in the north-east to 30 mAOD in the south-west. This area is the proposed location of a 9 hole par 3 golf course and 3G football pitch;
- Western Area: A roughly circular area approximately 100m in diameter to the south-west of the golf hotel and club house largely surrounded by landscaped areas of the golf course. The topography ranges from 33 mAOD in the north and centre to 31 mAOD in the south and west. This area is proposed to be a chipping green; and
- Southern Area. A roughly rectangular area trending north - south located south of the Hotel with approximate dimensions of 200 m x 350 m. The area is largely surrounded by landscaped areas of the golf course with a stream and small ponds to the south-west and arable fields and Bradford's Farm to the south-east. The topography ranges from approximately 26 mAOD in the east to 18 mAOD in the west. This area is currently used as a driving range which will be improved as part of the proposals.

2.2 Site History

The history of the site is indicated on Ordnance Survey (OS) maps (Envirocheck report, included as Appendix 1) and is summarised in this Section. The site was originally part of the Little Horsted Estate and in 1878 the site was predominantly open fields with the exception of High Wood located in the centre of the Eastern Site Area. By 1899 Lime Pits were located to the south of the Southern Area and two springs are evident; one between the Western and Southern areas, south-west of Hunnington's Farm and one east of the Southern area, adjacent to Hunnington's Cottage. Wells are also indicated next to

Hunnington's Farm (south of the Eastern area), Hunnington's Cottage and Bradford's Farm to the east.

There was little change on the site and the surrounding area until the mid-1980's when the East Sussex Golf Course was built (shown in maps dated 1987 to 1993) and the A22 Uckfield Bypass had been constructed. The Golf Course included the series of ponds between the Eastern and Southern areas, main footpaths and some of the wooded areas had been cleared or reduced including part of High Wood that was on the Eastern area. The springs are no longer evident at this time. Between 1993 and 2000 the main club house building had been built to the north of the Western area and in approximately 2006 the hotel resort was added.

2.3 Hydrology

Little Horsted Stream flows through the East Sussex National Golf Course Resort and is located immediately south of the Southern area of the site. The whole site (all three areas) is located within the catchment of Little Horsted Stream which flows to the northwest where it joins the River Uck approximately 2km from the site which flows south west joining the River Ouse. The Little Horsted Stream was classified in 2019 as "Bad" for ecological quality and a "Fail" for chemical quality whereas the River Uck (Ridgewood Stream to Ishurst) was classified as "Poor" for ecological quality and a "Fail" for chemical quality. Both water bodies had a failed chemical classification due to the presence of mercury and polybrominated diphenyl ethers (PBDE) (EA, 2022). Note that mercury and PBDE (a flame retardant) are widespread in surface water bodies in England (EA, 2021a,b).

Several other surface water features such as small streams / drainage channels, a series of linked ponds, a drainage culvert and a wetland area are located in close proximity of the three site areas and ultimately flow south / south-west and join the Little Horsted Stream.

There is one licensed surface water abstraction within 1 km of the site which relates to an abstraction from the Little Horsted Stream on the wider golf course used for spray irrigation (Figure 1). There are four active licensed discharge consents to surface water within 1 km of the site (Figure 1). Three of these relate to the discharge of final/treated sewage effluent and one related to the discharge of sewage and trade effluent combined.

The site and surrounding area is within Flood Zone 1, the lowest risk category, where the chance of flooding from both rivers and sea has been assessed as less than 0.1% (1 in 1000) in any year. However several areas associated with the ponds, drainage features and the Little Horsted Stream on the wider golf course area have a higher risk of flooding up to greater than 1 in 30 (3.3%) years (Hydrogeo, 2018).

Data from the nearest weather station (Shoreham Airport which is located approximately 29km south-west of the site) indicates that the average annual rainfall for the area for the period 1981 to 2010 was 722.7 mm (Met Office, 2022).

2.4 Geology

The BGS online geology viewer (BGS, 2022) and the 1:50,000 Bedrock and Superficial Deposits Geology map, Sheet 319 / 334, Lewes and Eastbourne (BGS, 2006) indicates that the site is located on the Wealden Group. In the vicinity of the site this comprises the Lower Tunbridge Wells Sand to the west and the Tunbridge Wells Sand Formation to the east (both described as fine to medium grained Sandstone, Siltstone and Mudstone) and the Wadhurst Clay Formation in the Western and Southern areas (described as soft, dark grey thinly-bedded mudstones with beds of pale grey siltstone, fine-grained sandstone, shelly limestone, clay ironstone and rare pebble beds). The Wadhurst Clay Formation is underlain by the Ashdown Formation which is described as siltstones and silty fine-grained sandstones with finely-bedded mudstone units commonly divided by thin pebble beds (BGS, 2022).

Superficial Head deposits (described as clay, silt, sand and gravel) overlie the bedrock predominantly in the south and east of the site. Alluvial deposits (described as clay, silt, sand and gravel) occur on the wide golf course area to the west and south west of the Western and Southern site areas.

The bedrock dips to the south-west bisected by east-west trending faults in the wider area. Nearby BGS borehole logs (TQ41NE23 at 547150,118050 and TQ41NE22 at NGR 546770,117860) indicate that the Tunbridge Wells Sand Formation is between 8.5 to 16 m thick and the Wadhurst Clay Formation 53 to 64 m thick. The underlying Ashdown Formation is greater than 35 m thick and has been recorded up to 210 m thick (BGS, 2006).

The surface geology is shown on Figure 2 and summarised in Table A below. A geological cross-section is shown in Figure 3.

Table A: Summary of Geology at the Site

Formation	Description	Eastern Area	Western Area	Southern Area
Alluvial Deposits	Clay, silt, sand and gravel	Absent	Absent	Largely absent
Head	Clay, silt, sand and gravel	Largely absent	Absent	Present
Lower Tunbridge Wells Sand (LTWS)	Thinly interbedded silty fine-grained sandstones and siltstone with rare beds of clay or silty clay to thickly bedded, fine to medium grained sandstone	Present in far west	Present	Absent
Tunbridge Wells Sand Formation (TWSF)	Fine to medium grained sandstone, siltstone and silty sand with finely bedded mudstones and thin limestones	Present in far east	Absent	Largely absent
Wadhurst Clay Formation	Soft, dark grey thinly-bedded mudstone / shale with beds of pale grey siltstone, fine-grained sandstone, shelly limestone, clay ironstone and rare pebble beds. Stained red at junction with TWSF	Present underlying the Head or Tunbridge Wells Sand and Tunbridge Wells Sand Formation but present at surface in the centre of the Eastern area. Likely to be between 53 to 64 m thick		
Ashdown Formation	Siltstones and silty fine-grained sandstones with finely-bedded mudstone units commonly divided by thin pebble beds	Present – up to 210 m thick		

2.5 Hydrogeology

2.5.1 Aquifer classifications

The Lower Tunbridge Wells Sand (LTWS) and the Tunbridge Wells Sand Formation (TWSF) are both classified by the Environment Agency as Secondary A aquifers. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Whereas the Wadhurst Clay Formation is classified as unproductive strata (largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them). The underlying Ashdown Formation is also classified as a Secondary A aquifer.

Limited Alluvial deposits which outcrop to the west of the Southern area are classified as a Secondary A aquifer whereas the Head deposits which overlie the majority of the Southern area (overlying the Wadhurst Clay Formation) are classified as a Secondary (undifferentiated) aquifer (which are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type and

have only a minor value, EA, 2017a). Given the presence of springs (as shown on historical OS maps – see Section 2.2 and shown on Figure 2) at or near the junction of the LTWS / TWSF with the adjacent Head deposits suggests that these are considerably less permeable and therefore acting as an aquitard in the vicinity of the site rather than an aquifer.

Where present the LTWS and TWSF aquifers and to a lesser degree the Head deposits aquifer are separated from the deeper Ashdown Formation aquifer by the Wadhurst Clay Formation which generally acts as an aquiclude and confines the Ashdown Formation (BGS & EA, 2000). A nearby well (TQ41NE22 at NGR 546770,117860) installed in the Ashdown Formation recorded artesian conditions in this aquifer in July 1988.

2.5.2 Source protection zones and licensed abstractions

The site is not located within a groundwater source protection zone the nearest of which is located approximately 8km south-west of the site (Defra and EA, 2022) associated with the Chalk outcrop around Lewes. The Envirocheck report (Appendix 1) indicates that there are two groundwater abstractions located within 2 km of the site the details of which are provided in Table B below. The location of the golf course abstraction to the west of the site is shown on Figure 1.

Table B: Groundwater abstractions within 2km of the site

NGR	Distance / Direction from site	License No:	Details	Point	License Holder
546780, 117830	748 / W	10/41/291203	Golf Courses: Spray Irrigation - Direct	Little Horsted (Borehole)	Swynson Ltd
548500, 116100	1423 / SE	10/41/291205	Holiday Sites, Camp Sites & Tourist Attractions: Make-Up or Top Up Water	Halland	Bentley Wildfowl and Motor Museum Ltd

Note: Daily and annual abstraction rates were not supplied.

The log for the golf course abstraction (TQ41NE22 at NGR 546770,117860, Appendix 2) indicates that the water is being abstracted from the underlying Ashdown Formation below 73 mbgl (approximately -53 mAOD). The lithology is not provided on the BGS log for the abstraction at the Bentley Wildfowl and Motor Museum (TQ41NE26 at MRG 548500,116100) however given that well is located on the Tunbridge Wells Sand Formation and the depth of the well is 30 mbgl it is likely that the abstraction is from the Tunbridge Wells Sand Formation.

2.5.3 Discharge consents

There are three licensed discharge consents to land / soakaway within 1 km of the site (Envirocheck report, Appendix 1) which all relate to the discharge of final/treated sewage effluent; one at Hunningtons Cottages (66 m east of the site) and two at Old Farm (850 and 913 m south-west of the site).

2.5.4 Hydraulic Properties

The water bearing units of the Wealden Group contain a variety of lithologies, grain-sizes and degree of cementation from hard sandstone to poorly consolidated sands therefore groundwater flow can be both intergranular and fracture flow and varies greatly in rate. Data for the Tunbridge Wells Sand Formation is limited however reported transmissivities vary from 6 to 39.5 $m^2.d^{-1}$ with a geometric mean of 19 $m^2.d^{-1}$. A hydraulic conductivity of 4 $m.d^{-1}$ was recorded at one location. (BGS & EA, 2000).

The underlying Ashdown Formation is usually considered the more useful aquifer of the Wealden Group as transmissivities are higher ranging from 1 to 1662 $m^2.d^{-1}$ with a geometric mean of 86 $m^2.d^{-1}$ (BGS & EA, 2000).

2.5.5 Groundwater Levels

Groundwater levels in the Head, Lower Tunbridge Wells Sand and the Tunbridge Wells Sand Formation are unknown beneath the site. Information from nearby BGS borehole logs (TQ41NE23 at 547150,118050 and TQ41NE22 at NGR 546770,117860) indicates that groundwater in the Lower Tunbridge Wells Sand outcrop to the west of the site was encountered at shallow depths of between 1.3 and 3 mbgl (approximately 19 to 27 mAOD) in July 1988. A well installed in the Tunbridge Wells Sand Formation to the south-west of the site (TQ41NE12 at NGR 546260,117560) recorded a similar water level of 22.6 mAOD in November 1947 (at 12.5 mbgl). Another well installed in the Tunbridge Wells Sand Formation but in the outcrop to the east of the site (TQ41NE20 at NGR 548470, 117650) recorded a water level of 31.4 mAOD in October 1949 (at 8.8 mbgl).

Seasonal fluctuation of the water table in the Tunbridge Wells Formation was recorded in a nearby BGS well (TQ41NE12 at NGR 546260,117560) where the water level ranged from 21.02 to 23.84 mAOD in 1976. A similar fluctuation of 2m was recorded at a well in Frant (approximately 20km north-east of the site) (BGS & EA, 2000).

Groundwater levels in the underlying Ashdown Formation which is separated from the Lower Tunbridge Wells Sand / Tunbridge Wells Sand Formation and confined by the Wadhurst Clay Formation range from 19 to 21.2 mAOD (11 mbgl to 1.2 m above ground level) and is artesian at some locations (i.e. TQ41NE22 at NGR 546770,117860).

Due to limited outcrops of Lower Tunbridge Wells Sand / Tunbridge Wells Sand Formation in the vicinity of the site and the presence of the Wadhurst Formation aquiclude below, groundwater flow direction in this aquifer is likely to be controlled by topography and will flow towards topographic lows such as the series of ponds between the Eastern and Southern areas or the stream to the west of the Western area of the site. Commonly a spring line is associated with the junction of the Tunbridge Wells Sand and the underlying Wadhurst Clay (BGS, 2022). Therefore groundwater in the Lower Tunbridge Wells Sand / Tunbridge Wells Sand Formation is likely to flow predominantly south or southwest in the Eastern and Western areas and to the west in the Southern area of the site (where the aquifer is present).

2.6 Baseline Groundwater Quality

No groundwater analytical data are available for the site or the Lower Tunbridge Wells Sand / Tunbridge Wells Sand Formation aquifers in the vicinity of the site.

3 PROPOSED DEVELOPMENT

It is proposed to re-model the site re-using stripped topsoil from the site, along with imported inert waste material to form a 9 hole par 3 course, foot-golf course, 3G synthetic grass football pitch and a dedicated short game area with an extensive native planting scheme. This will be achieved in the following manner:

- The existing topsoil will be carefully stripped prior to the commencement of earthworks, stored during the importation phases and then replaced at surface prior to seeding.
- It is estimated that 255,579 m^3 of inert waste will be required to achieve the permitted final levels and will be completed within three years. Waste pre-acceptance, acceptance and rejection procedures will be set out in the sites Environmental Management System as well as quarantine procedures.
- The proposed earthworks will alter the existing ground levels by an average height change of approximately 1 to 1.5 m. This is only with regards to where imported materials are to be used (other areas will remain at existing levels). The proposed site layout together with elevations are provided in Appendix 3.
- The proposed drainage upon completion of the earthworks and planting, largely comprises shallow lateral drains with 80mm diameter perforated pipes which discharge into the current surface water drainage system which for the Eastern area is the vegetated detention basin / pond located to the south, for the Western area is a catch basin pipe to the east and for the Southern area is an existing wetland to the south-west. From these drainage features the water flows in the south-west direction discharging to the Little Horsted Stream.

4 RISK ASSESSMENT

A conceptual site model (CSM) of risk has been developed for the proposed scheme. This identifies potential sources, pathways and controlled waters receptors and determines which combination of these are plausible contaminant linkages. Plausible contaminant linkages are then qualitatively assessed to determine whether the proposed scheme could pose an unacceptable risk to waters resources.

4.1 Sources

Potential sources of contamination are divided into on-site and off-site sources and are described below.

4.1.1 On-site

Potential on-site sources of contamination are considered below:

- **Existing on-site soils**. Top soils at the site will be re-used as infill material. These soils are not considered a potential source.
- **Inert waste material**. The site will accept inert waste material. Only material that meets the WAC criteria for inert waste will be accepted. The leachate concentrations for WAC for inert waste are generally greater than drinking water standards and Environmental Quality Standards (EQS). This material has therefore been considered as a potential source for consideration in the risk assessment.

4.1.2 Off-site

Potential off-site sources of contamination that could impact water quality beneath and surrounding the site are:

- **Historic landfills**. Two areas of historic landfill were identified by the Envirocheck report (Appendix 1) as follows;
    - one located adjacent to Hunnington's Farm between the Eastern and Southern areas accepted unknown waste between December 1970 and December 1975, and;
    - one located east of the Western area on the northern side of the proposed roadway. Waste type and dates of filling are unknown.
- **Discharge of final/treated sewage effluent.** There is one consent for discharge of final/treated sewage effluent to ground at Hunningtons Cottages located 66 m east

of the Southern area. This is likely located on the Tunbridge Wells Sand Formation and is potentially up-hydraulic gradient of the site.

These off-site sources are not considered further in the risk assessment but given their potential to impact water quality they should be considered when assessing any baseline water quality data (see Section 5.2.2).

4.2 Receptors

Potential waters resources receptors are described below:

- **Groundwater**. The Lower Tunbridge Wells Sand and the Tunbridge Wells Sand Formation are both classified as Secondary A aquifers. These are considered plausible Controlled Waters receptors. It is noted that these aquifers are limited in extent in the vicinity of the site which limits their potential as a viable water supply resource. These aquifers are underlain by greater than 50m thickness of low permeability Wadhurst Clay (unproductive strata generally considered to be an aquiclude) and therefore the underlying Ashdown Formation Secondary A aquifer is not considered to be a plausible receptor. The Head deposits which are present over the majority of the Southern area of the site are classified as a Secondary (undifferentiated) aquifer however these are likely to be acting as an aquitard rather than an aquifer and are likely to be relatively thin therefore the Head deposits are not considered to be a sensitive receptor and are not considered further in this assessment as a receptor.
- **Groundwater abstractions**. There are two licensed groundwater abstractions within 2km of the site (Section 2.5.2). One is licensed for spray irrigation and abstracts from the deeper Ashdown Formation (which as described above is not considered a plausible receptor) and one is licensed for make-up or top up water and abstracts from the Tunbridge Wells Sand Formation but from what is considered to be up-hydraulic gradient of the site. These abstractions are not considered plausible receptors and are not considered further for this assessment.
- **Surface water**. The main surface water body in the vicinity of the site is Little Horsted Stream which flows through the wider Golf Course area and is located immediately south of the southern area of the site. Little Horsted Stream flows to the north-west where it joins the River Uck approximately 2km downstream of the site. There are several other surface water drainage features over the wider Golf Course area which ultimately flow into the Little Horsted Stream. As previously discussed (Section 2.5.5) it is likely that shallow groundwater from the discrete outcrops of the Lower Tunbridge Wells Sand, the Tunbridge Wells Sand Formation and to a lesser

degree the Head deposits emerge at the junction with the underlying low permeability Wadhurst Clay and, following the topography, flow into the nearby drainage features. Therefore surface water is considered a plausible receptor. It is noted that Little Horsted Stream was classified in 2019 as “Bad” for ecological quality and a “Fail” for chemical quality.

- **Surface water abstractions.** There is one licensed surface water abstraction within 1 km of the site which relates to an abstraction from the Little Horsted Stream on the wider golf course used for spray irrigation. Given that this abstraction is used for spray irrigation it is not considered a sensitive receptor and is not considered further for this assessment.

4.3 Pathways

Possible pathways linking the potential on-site sources to the identified receptors are:

- **Leaching of contaminants to groundwater**. Potential contamination in the imported infill could partition to the dissolved phase in pore water in the unsaturated zone. Leached contaminants could then migrate downwards through the unsaturated zone beneath the site into the LTWS and TWSF aquifers with infiltrating rainwater. The unsaturated zone thickness beneath the imported waste deposits varies across the site from an estimated 1m to 17m thickness (See Table C below). Attenuation processes (sorption, diffusion, dispersion, mineralisation and degradation) will tend to reduce the concentrations of contaminants as they migrate through the unsaturated zone. Dilution at the groundwater table will further reduce concentrations.
- **Leaching of contaminants directly into surface water drainage features**. The majority of the site is proposed to be underlain by shallow lateral drains with 80mm diameter perforated pipes which will discharge into current surface water drainage features on the wider golf course area, i.e. the vegetated detention basin / pond south of the Eastern area and culvert and the wetland area to the south-west of the southern area of the site. Given that the drains will be shallow and that the surface deposits will be composed of original stripped top soil means that water entering the drainage system will have had minimal contact with the imported waste and will thus largely be composed of rainwater.
- **Dissolved phase migration in groundwater**. Groundwater in the discrete outcrops of the LTWS and TWSF aquifers and to a lesser degree the Head deposits is likely to flow to the south and west following the topography. Attenuation processes (sorption, diffusion, dispersion, mineralisation and degradation) will tend

to reduce the concentrations of contaminants as they migrate along the groundwater pathway. Based on the geological mapping, the LTWS and TWSF aquifers do not extend to the Little Horsted Stream, i.e. there is no direct groundwater flow path to the stream. As described below, groundwater must discharge to surface and then flow to the stream via overland flow or surface drainage.

- **Dissolved phase migration in perched groundwater**. This pathway will only occur where the waste directly overlies the Wadhurst Clay aquiclude (and to a lesser extent the Head Deposits). Due to proposed shallow drainage system the amount of leachate / perched water that will accumulate at the base of waste / top of Wadhurst Clay Formation is likely to be minimal. However where present it will likely flow with the topography of the top of the Wadhurst Clay / Head and discharge to the surface water drainage system i.e. for the Eastern area this will be the vegetated detention basin / pond located south of the Eastern area and for the Southern area this will be the wetland area to the west / south-west (as per the current site drainage).
- **Overland flow of groundwater to surface water features**. Where the groundwater from the discrete outcrops of the LTWS and TWSF aquifers and to a lesser degree the Head deposits meets the underlying low permeability Wadhurst Clay it is likely to emerge as springs where it will follow the topography and flow into the nearby drainage features on the wider golf course area. Dilution at the surface water features will further reduce concentrations.
- **Groundwater inflow into drainage culverts**. A drainage culvert is located in the vicinity of the southern area which connects the drainage ponds to the north with Little Horsted Stream to the south. Head deposits are considered to lie directly on the low permeability Wadhurst Clay Formation in this area of the site therefore it is possible that any groundwater in the Head deposits discharges to this culvert. However it is considered likely that the Head deposits in the vicinity of the site have a low permeability and are acting as an aquitard rather than an aquifer therefore the amount of groundwater and groundwater flow within these deposits are considered to be minimal therefore this pathway is not considered to be significant and is not considered further in this assessment.

4.4 Plausible Contaminant Linkages

Table C lists the possible source-pathway-receptor combinations and makes a qualitative assessment of the risk from each. Contaminant linkages rated with a risk of “low” are considered highly unlikely to create an unacceptable risk and do not require further

consideration. Contaminant linkages rated with a risk of “medium” or “high” require further assessment or risk mitigation. Each site area is discussed separately.

Table C Assessment of contaminant linkages

Source	Pathway	Receptor	Risk	Justification
EASTERN AREA				
Parts underlain by Secondary A aquifers – i.e. Western part underlain by LTWS and Eastern part underlain by TWSF				
Inert waste material	Leaching	Lower Tunbridge Wells Sand Secondary A aquifer – Western part only	Low	The majority of imported material will be placed above current ground levels (30 to 41 mAOD) and therefore above the current water table (likely to be 24 to 26 mAOD). Therefore there is likely to be between 4 to 17 m (average of approximately 12m) of unsaturated zone beneath the base of the waste and the water table. Attenuation processes (sorption, diffusion, dispersion, mineralisation and degradation) will reduce the concentrations of contaminants as they migrate through the unsaturated zone plus dilution at the groundwater table will further reduce concentrations. Also leachate concentrations generated from the imported inert material will be low. This material therefore poses negligible risk to the aquifer.
		Tunbridge Wells Sand Formation Secondary A aquifer – Eastern part only	Low	The majority of imported material will be placed above current ground levels (33 to 49 mAOD) and therefore above the current water table (likely to be 32 to 37 mAOD). Therefore there is likely to be between 1 to 17 m (average of approximately 9m) of unsaturated zone beneath the base of the waste and the water table. Attenuation processes (sorption, diffusion, dispersion, mineralisation and degradation) will reduce the concentrations of contaminants as they migrate through the unsaturated zone plus dilution at the groundwater table will further reduce concentrations. Also leachate concentrations generated from the imported inert material will be low. This material therefore poses negligible risk to the aquifer.
	Leaching, dissolved phase migration via groundwater and flow via surface water drainage	Little Horsted Stream	Low	Groundwater within the LTWS and TWSF beneath this area likely flows south-west (following the angle of dip on the base of the aquifer) and discharges to drainage ditches where the LTWS/TWSF meets the lower permeability Head and / or underlying Wadhurst Clay aquiclude. Given that leachate concentrations generated from the imported material will be low, the potential for further reduction of concentrations along the groundwater flow pathway due to natural attenuation, and dilution at the stream the risk to surface water is considered low.
	Leaching and dissolved phase migration via surface water drainage	Little Horsted Stream	Low	The proposed surface water drainage for this area comprises shallow lateral drains with 80mm diameter perforated pipes which discharge into the current surface water vegetated detention basin / pond located south of the Eastern area. Surface water from the pond then drains via a series of ponds into a culvert which discharges into the Little Horsted Stream. Given that the drains will be shallow and that the surface deposits will be composed of original stripped surface soils means that water entering the drainage system will have had minimal contact with the imported waste and thus largely composed of rainwater. Plus dilution within the surface water drainage system from other parts of the site wider golf course and at the stream will further reduce concentrations. Therefore the risk to surface water is considered low.

Source	Pathway	Receptor	Risk	Justification
Part underlain by unproductive strata - i.e. Central part underlain by Wadhurst Clay Formation				
Inert waste material	Leaching, dissolved phase migration via perched groundwater and flow via surface water drainage	Little Horsted Stream	Low	Due to the proposed shallow drainage system the amount of leachate at the base of waste / top of Wadhurst Clay Formation is likely to be minimal. If it does accumulate it will likely flow with the topography of the top of the Wadhurst Clay and discharge to the surface water drainage system which leads to the vegetated detention basin / pond located south of the Eastern area (as per the current site drainage). Leachate concentrations generated from the imported material will be low plus dilution at the pond and at Little Horsted stream will further reduce concentrations therefore the risk to surface water is considered low.
	Leaching and dissolved phase migration via surface water drainage	Little Horsted Stream	Low	The proposed surface water drainage for this area comprises shallow lateral drains with 80mm diameter perforated pipes which discharge into the current surface water vegetated detention basin / pond located south of the Eastern area. Surface water from the pond then drains via a series of ponds into a culvert which discharges into the Little Horsted Stream. Given that the drains will be shallow and that the surface deposits will be composed of original stripped surface soils means that water entering the drainage system will have had minimal contact with the imported waste and thus largely composed of rainwater. Plus dilution within the surface water drainage system from other parts of the site wider golf course and at the stream will further reduce concentrations. Therefore the risk to surface water is considered low.
WESTERN AREA - All underlain by Secondary A aquifer LTWS				
Inert waste material	Leaching	Lower Tunbridge Wells Sand Secondary A aquifer – Western part only	Low	The majority of imported material will be placed above current ground levels (31 to 35 mAOD) and therefore above the current water table (likely to be 24 to 26 mAOD). Therefore there is likely to be between 5 to 11 m (average of approximately 8m) of unsaturated zone beneath the base of the waste and the water table. Attenuation processes (sorption, diffusion, dispersion, mineralisation and degradation) will reduce the concentrations of contaminants as they migrate through the unsaturated zone plus dilution at the water table will further reduce concentrations. Leachate concentrations generated from the imported inert material will also be low. This material therefore poses negligible risk to the aquifer.
	Leaching and dissolved phase migration via groundwater and flow via surface water drainage	Little Horsted Stream	Low	Groundwater within the LTWS beneath this area likely flows south-west however the presence of a historical spring to the east indicates that groundwater in the east of this area may flow towards this spring. Where the groundwater meets the less permeable Wadhurst Clay and or Head deposits the groundwater will emerge and follow the topography towards the current drainage features on the wider golf course, e.g. the ponds to the east. Given the potential for the reduction of concentrations along the groundwater flow pathway due to natural attenuation and dilution at the surface drainage features and the stream results in a low risk to surface water.
	Leaching and dissolved phase migration via surface water drainage	Little Horsted Stream	Low	The proposed surface water drainage for this area comprises a shallow drain with 80mm diameter perforated pipe which discharges into the current surface water drainage system which is thought to discharge to the Little Horsted Stream. Given that the drains will be shallow and that the surface deposits will be composed of original stripped surface soils means that water entering the drainage system will have had minimal contact with the imported waste and thus largely composed of rainwater. Plus dilution within the surface water drainage system from other parts of the site wider golf course and at the stream will further reduce concentrations. Therefore the risk to surface water is considered low.

Source	Pathway	Receptor	Risk	Justification
SOUTHERN AREA				
South-East part underlain by Secondary A aquifer TWSF				
Inert waste material	Leaching	Tunbridge Wells Sand Formation Secondary A aquifer – Eastern part only	Low	The majority of imported material will be placed above current ground levels (24 to 27 mAOD) and therefore above the current water table (likely to be 24 to 26 mAOD). Therefore there may be up to 3m of unsaturated zone beneath the base of the waste and the water table. Attenuation processes (sorption, diffusion, dispersion, mineralisation and degradation) will reduce the concentrations of contaminants as they migrate through the unsaturated zone plus dilution at the groundwater table will further reduce concentrations. Also leachate concentrations generated from the imported inert material will be low. This material therefore poses negligible risk to the aquifer.
	Leaching and dissolved phase migration via groundwater and flow via surface water drainage	Little Horsted Stream	Low	Groundwater within the TWSF beneath this area likely flow south-west. Where the groundwater in the TWSF meets the less permeable Wadhurst Clay and or Head deposits it will likely follow the topography of the top of the Wadhurst Clay / Head deposits towards the current drainage features i.e. the wetland area to the south-west or the Little Horsted Stream to the south. If it flows to the west is it likely to flow through the base of the waste deposits. Given that leachate concentrations generated from the imported material will be low and dilution will occur at the surface drainage features and at the stream results in a low risk to surface water.
Majority of Southern Area underlain by unproductive aquifer – Wadhurst Clay Formation (and Head deposits)				
Inert waste material	Leaching, dissolved phase migration via perched groundwater and flow via surface water drainage	Little Horsted Stream	Low	Due to the proposed shallow drainage system the amount of leachate at the base of waste / top of Wadhurst Clay Formation is likely to be minimal. If is does accumulate it will likely flow with the topography of the top of the Wadhurst Clay / Head deposits and discharge to the surface water drainage system which is likely to be the wetland area in the south-west (as per the current site drainage). Leachate concentrations generated from the imported material will be low plus dilution at the wetland and at Little Horsted stream will further reduce concentrations therefore the risk to surface water is considered low.
	Leaching and dissolved phase migration via surface water drainage	Little Horsted Stream	Low	The proposed surface water drainage for this area comprises shallow lateral drains with 80mm diameter perforated pipes which discharge into the current surface water drainage i.e. the wetland area in the south-west of the site area. Surface water from the wetland drains into the Little Horsted Stream. Given that the drains will be shallow and that the surface deposits will be composed of original stripped surface soils means that water entering the drainage system will have had minimal contact with the imported waste and thus largely composed of rainwater. Plus dilution within the surface water drainage system from other parts of the site wider golf course and at the stream will further reduce concentrations. Therefore the risk to surface water is considered low.

4.5 Risk Evaluation

The main plausible contaminant linkages identified for the site are as follows:

- Risk to either the Lower Tunbridge Wells Sand or Tunbridge Wells Sand Formation Secondary A aquifers from leaching of contaminants from overlying inert waste;
- Risk to the Little Horsted Stream from leaching, dissolved phase migration via groundwater or perched groundwater and flow via surface water drainage; and
- Risk to the Little Horsted Stream from leaching and dissolved phase migration via surface water drainage.

All of the identified contaminant linkages above are considered to pose a low risk to controlled waters receptors.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

It is concluded that the proposed scheme is unlikely to cause a significant risk to controlled waters.

5.2 Recommendations

In order to demonstrate that the proposed scheme poses no significant risk to controlled waters a programme of monitoring at the site is recommended. Given that groundwater in the upper aquifers on site (i.e. LTWS and TWSF) likely discharges to the current surface water features on the wider golf course area, the surface waters are likely to be representative of groundwater quality. A programme of surface water monitoring is described in detail in the Surface Water Monitoring and Control report (Ged Duckworth, 2022) and is summarised below.

5.2.1 Sample Locations

As described in the Surface Water Monitoring and Control report, surface water sampling will be undertaken quarterly from the following four locations (see Figure 5):

1. Little Hortsed Stream upstream of the site;
2. The pond to the south of the Eastern area;
3. The discharge from the culvert that runs from the ponds at Hunnington's Farm to the Little Horsted Stream; and
4. Little Horsted Stream downstream of the site where the public footpath crossed the stream.

5.2.2 Baseline monitoring

Baseline surface water quality sampling and analysis will be required to help determine surface water control levels and compliance limits for monitoring during and after the re-modelling works. It is recommended that at least three rounds of monthly baseline sampling are conducted prior to earthworks commencing. The analytical suite for the surface water sampling is described in the Surface Water Monitoring and Control report.

5.2.3 Operational monitoring

It is proposed that surface water quality sampling and analysis be conducted on a quarterly basis. This monitoring should be conducted on the same locations as the baseline monitoring and for the same analytical suite.

5.2.4 Control Levels and Compliance Limits

Control levels and compliance limits are dependent on baseline surface water quality and will therefore be derived following the collection of baseline monitoring data and presented in a Site Monitoring Plan.

5.2.5 Contingency Actions

Should a compliance limit be exceeded contingency measures will be required. This will initially be repeat sampling and if this confirms the initial result then investigative action will be taken to identify the cause of the breach of compliance limit. Should the breach be caused by infill material at the site then action will be taken to limit the discharge of contaminants to groundwater/surface water. For example, this could involve testing and excavation of suspect material for off-site disposal. Details of contingency plans will be provided in the Site Monitoring Plan.

6 REFERENCES

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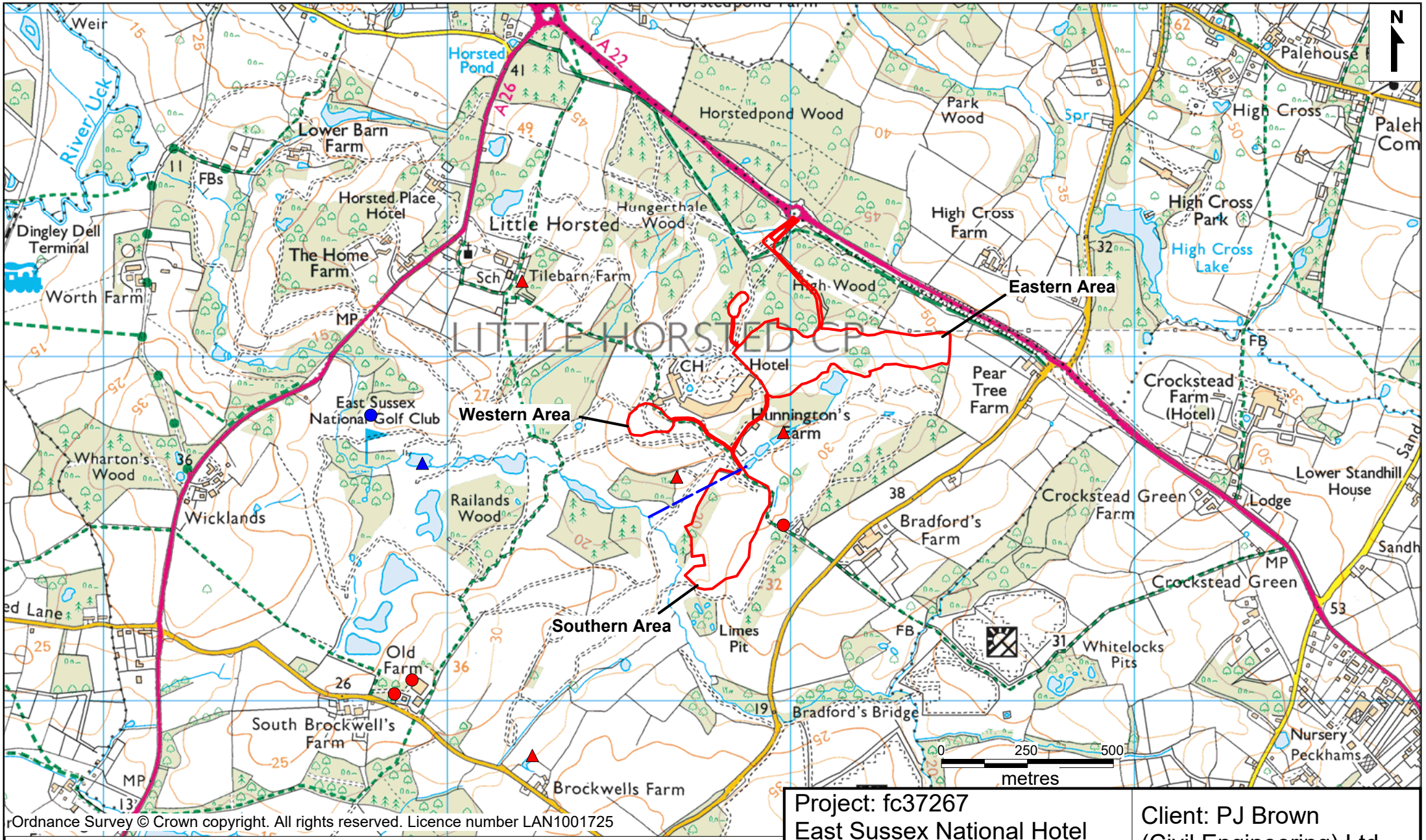
FIGURES



Site

Culverted watercourse

Licensed groundwater abstraction

Licensed surface water abstraction

Consented discharge to land/soakaway

Consented discharge to surface water

Project: fc37267
East Sussex National Hotel and Golf Resort

Client: PJ Brown (Civil Engineering) Ltd

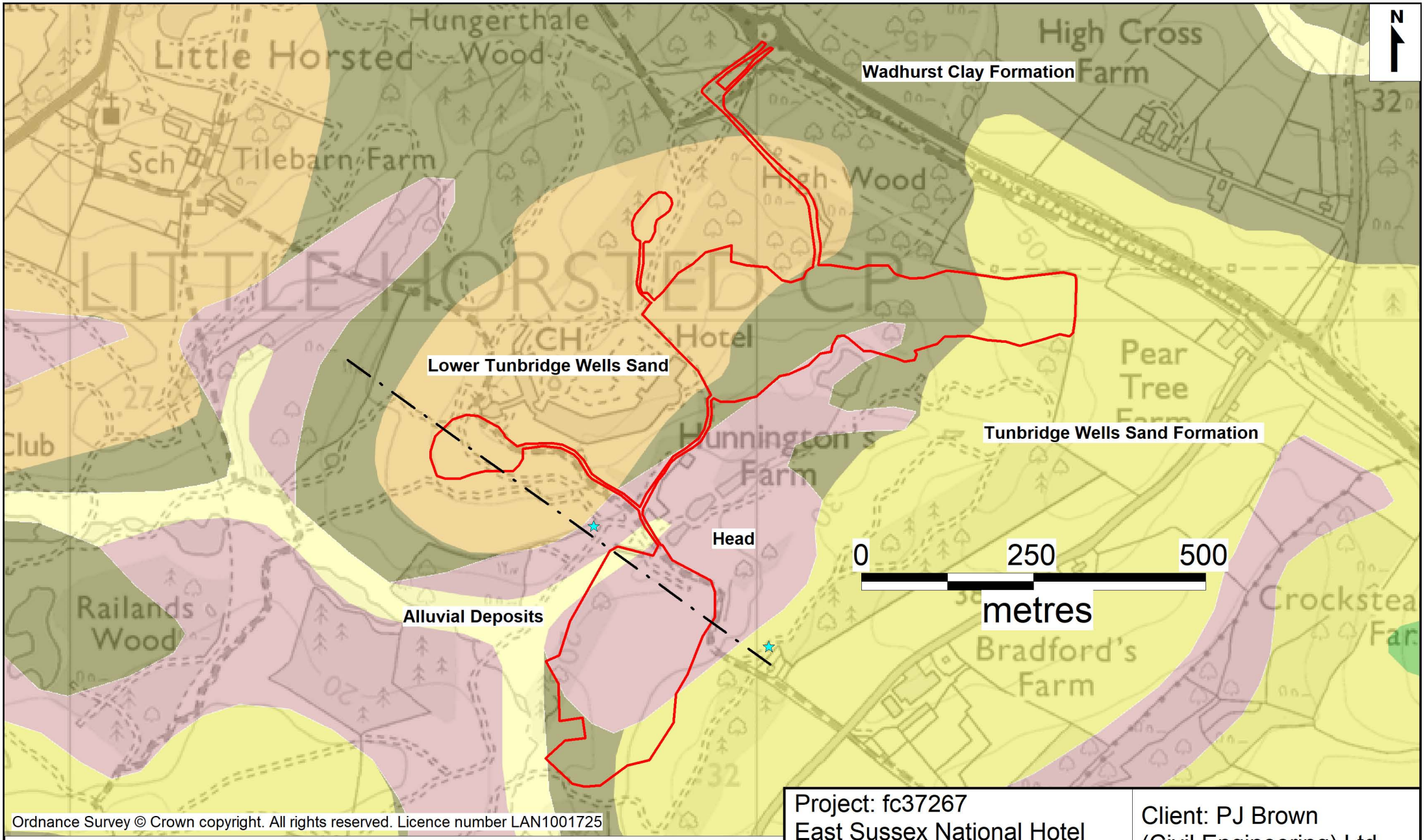
firth consultants
environmental risk assessment
12 Dowry Square
Bristol, BS8 4SH
Tel: 0117 373 0825
www.firthconsultants.co.uk

Figure 1

Scale: as shown

Date: 18/03/22

Site location



Site

Line of geological cross-section (Figure 3)

Spring marked on historic map

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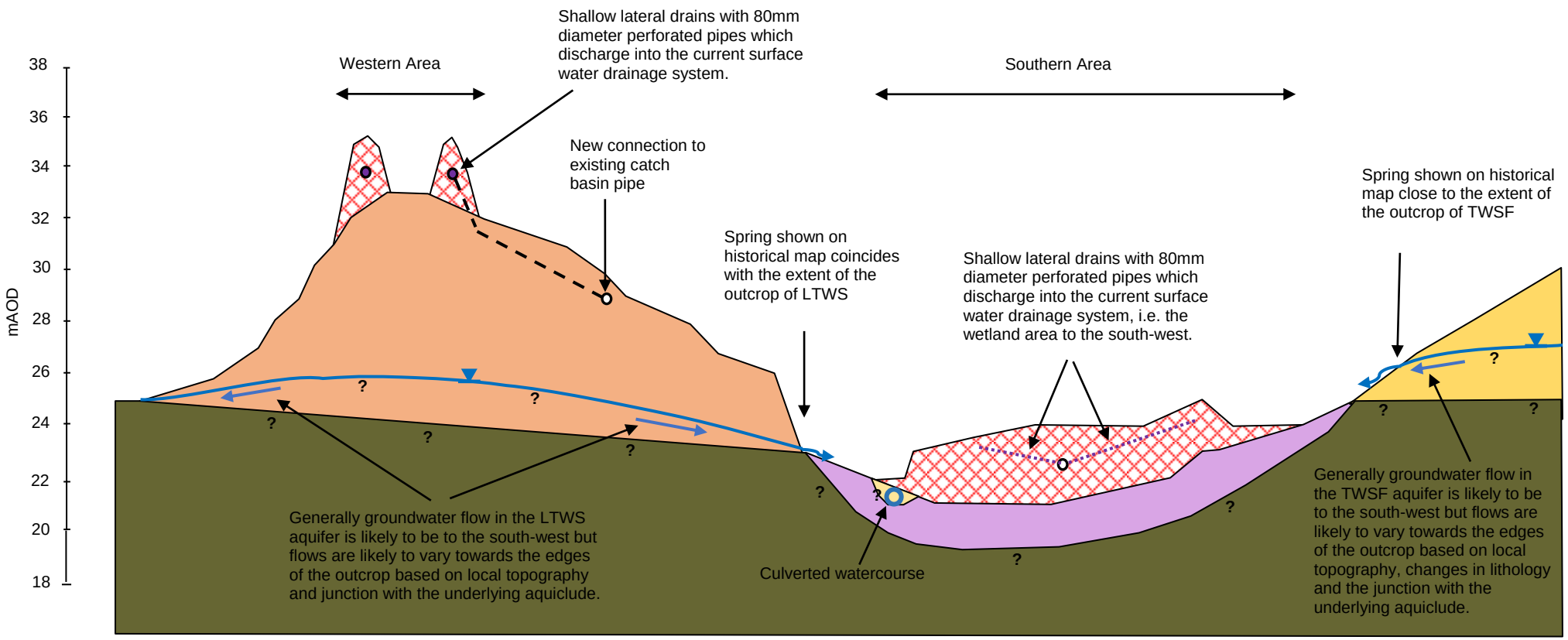
Figure 2

Scale: as shown

Date: 18/03/22

Geology



Legend

- Proposed imported material
- Alluvium
- Head
- Lower Tunbridge Wells Sand
- Tunbridge Wells Sand Formation
- Wadhurst Clay Formation
- Water Table
- Localised groundwater flow direction

100 m

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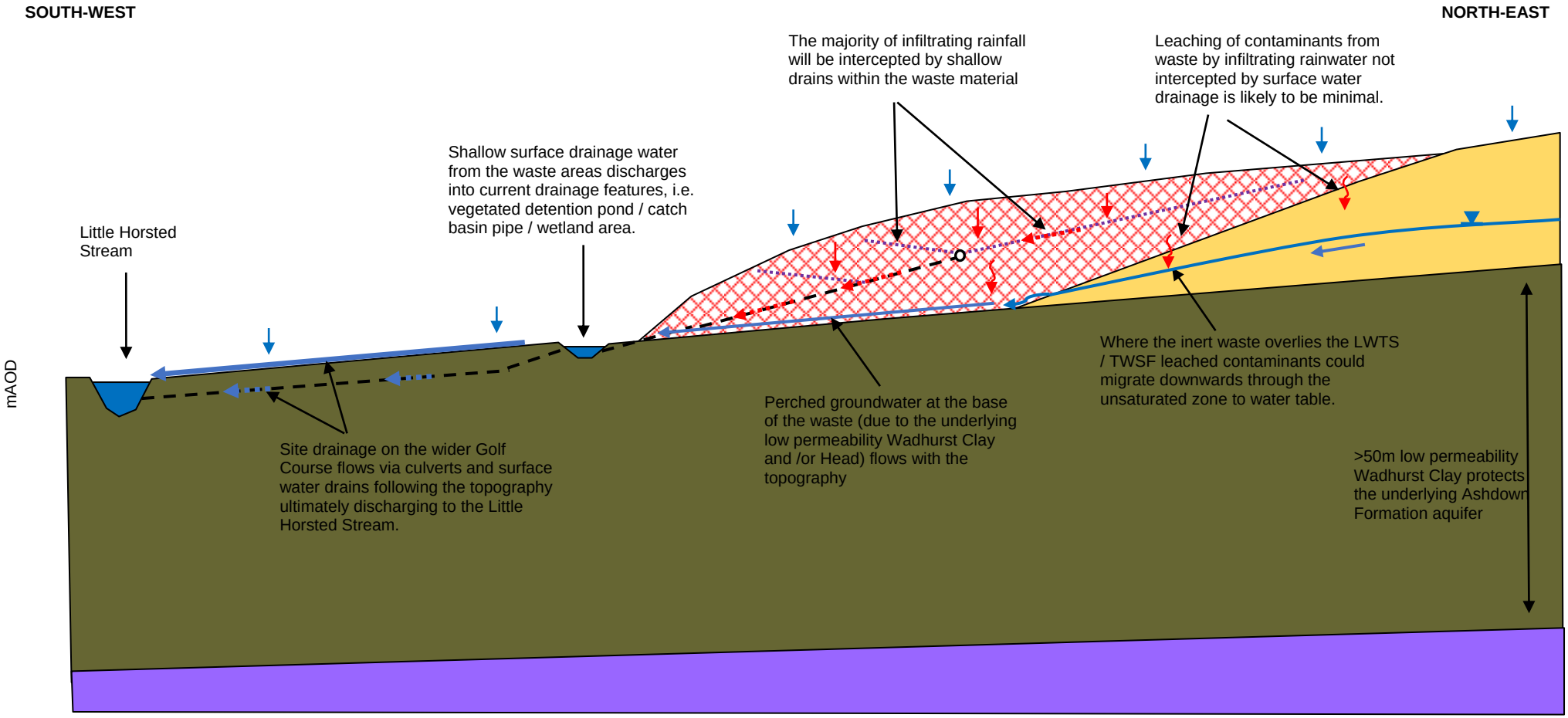
Figure 3

Scale: As shown

Date: 16/03/22

Geological cross-section showing proposed imported material



Legend

- Made Ground
- Tunbridge Wells Sand Formation and Lower Tunbridge Wells Sand
- Wadhurst Clay Formation & Head
- Ashdown Formation
- Water table
- Groundwater flow direction

Project: fc37267 East Sussex National Hotel and Golf Resort	Client: PJ Brown (Civil Engineering) Ltd
Figure 4	Schematic conceptual site model
Scale: NTS	
Date: 16/03/22	

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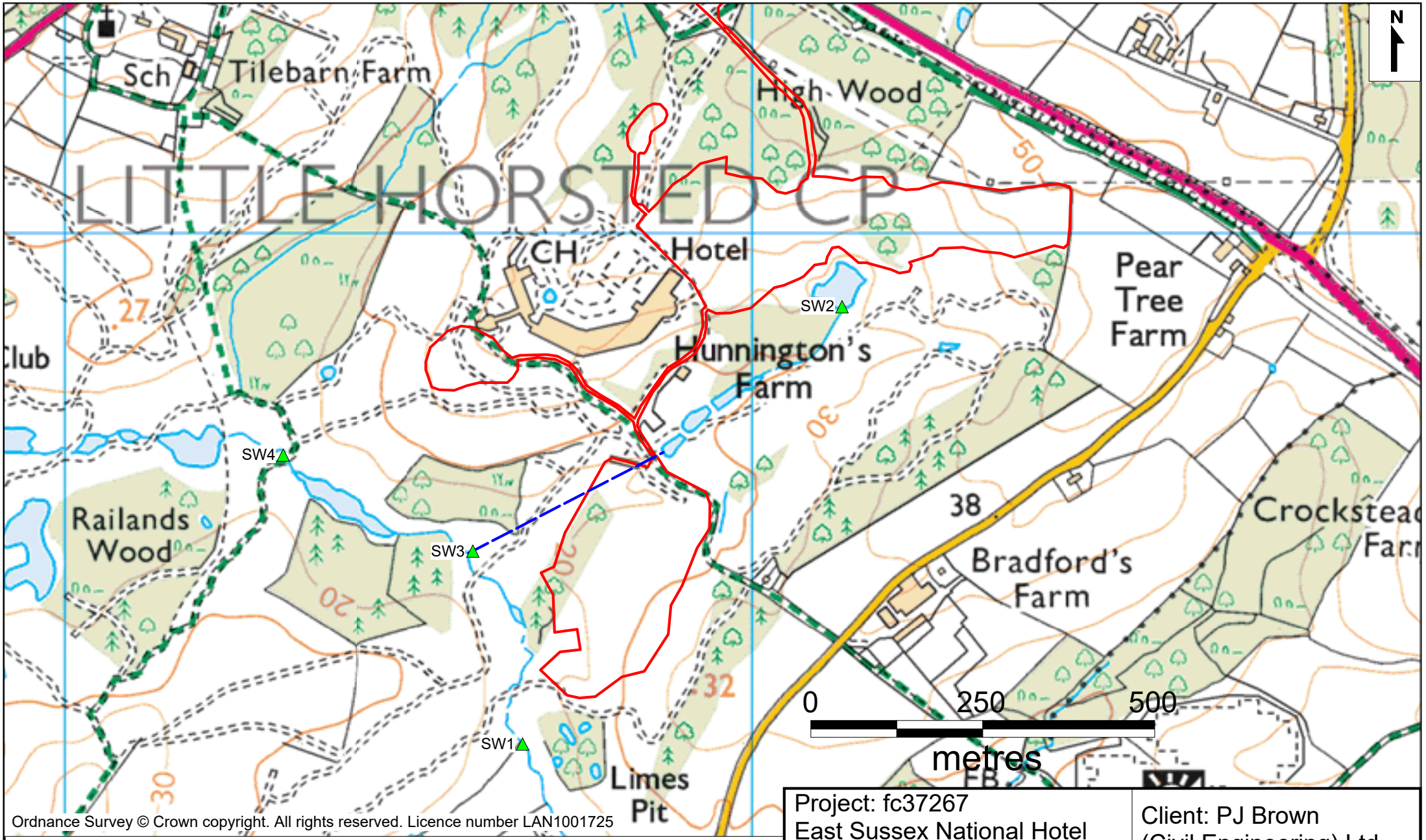

Site

Culverted watercourse

Proposed surface water sampling location

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Figure 5

Scale: as shown

Date: 25/03/22

Proposed surface water sampling locations

APPENDIX 1
Envirocheck Report

APPENDIX 2
BGS Logs

TQ 41 NE/12 and 13

4626 1756

and 4630 1765

319/90 Wicklands, Little Horsted

12 (a) (Disused). W.S.Sx. III, p. 145. Surface +115. Shaft 50 × 2¼. R.W.L. +71½. *Before 1881.*

R.W.L. +74. *Nov. 1947.*

13 (b) (Sealed). W.S.Sx. III, p. 145. Surface +120. Shaft. Water struck at +106. R.W.L. +102. *Before 1881.*

(b)	TW	...	...	53	53

(b)	TW 53	Marly clay & sandstone	35	35
		Blue clay	6	41
		Sand (and sandstone?)	12	53

pp E. A. Edmonds 1964

(a)	TW 50	Sand	50	50

A. TQ 4623-1756 B. TQ 4630 1765

319/90 Wicklands, Little Horsted TQ41/8A+B

(a) (Disused). W.S.Sx. III, p. 145. Surface +115. Shaft 50 × 2¼. R.W.L. +71½. *Before 1881.*

R.W.L. +74. *Nov. 1947.*

(b) (Sealed). W.S.Sx. III, p. 145. Surface +120. Shaft. Water struck at +106. R.W.L. +102. *Before 1881.*

(b)	TW	...	...	53	53

(b)

TW 53

Marly clay & sandstone	35	35
Blue clay	6	41
Sand (and sandstone?)	12	53

PP E. A. Edmonds 1964

(a)

TW 50

Sand	50	50

ADD. INFO.

WATER LEVELS

319/90A

IGS REF: 319/90A

1976 R.W.L.

MAX : 23.84M O.D.

MIN : 21.02M O.D.

} water levels abstracted from W.A. returns. S.D 2/77.

TQ 41NE/20
4847 1765

319/276 Bradford Cottages, Little Horsted

Surface +132. Lining tubes: 43¼ x 4 in from surface. Water struck at +73. +103. Recovered to +103 in 10 min. Suction +76. Yield 200 g.p.h. (8 h. test). I/c engine. *Harper, Oct. 1949.*

Sand entered. Suction +96. *Before May 1957.*

TW) WdC)	...	...	61	61

No strata details

Revised classn by B Young 9/76

Eastern.
S.W.A.

NN –

GEORGE STOW CO. LTD.

Waterworks Engineers

READING ROAD – HENLEY-on-THAMES. OXON.

TQ41/85A

319

RECORD OF WELL (SHAFT OR BOREHOLE)

DATE COMPLETED 9th August 1988

TQ41NE 22

All depths to be measured below Ground Level

Work carried out for Green Construction Ltd

Locality (Exact Site) Little Horsted, Nr. Uckfield, National Grid No. TQ46771 – 786

Level of Ground Surface above Sea Level (O.D.) ..... m.

Depth of Shaft ..... m. Diameter ..... mm.

Depth of Bore 107 m. Diameter: At Top 457 mm. At Bottom 300 mm.

Details of Permanent Lining Tubes

Diameter		Length Inserted						
457	mm.	73	m.	Plain	m.	Slotted	Top At 5 m	above Ground
300	"	72–75	"		75–103	"	"	"
300	"	103–106	"			"	"	"
	"		"			"	"	"
	"		"			"	"	"
	"		"			"	"	"

Water Struck at depth of (in m.) 1.3m

Rest Level of Water ~~below~~ above Ground Level + 1.2 m.

Yield on 10 ~~Hours~~ Days test. Pumping 12 litres per sec. Date 23.7.88

Pump Water level 70 m. below Ground Level.

Time of Recovery Borehole recovered to artesian flow after 36 hours

Remarks A typical pump test was not possible on this site due to a large concentration of fine sand which damaged two pumps whilst clearance pumping only. Artesian flow believed to come from 73m

See back for Strata Record.

DETAILS OF STRATA

TQ41NE 22

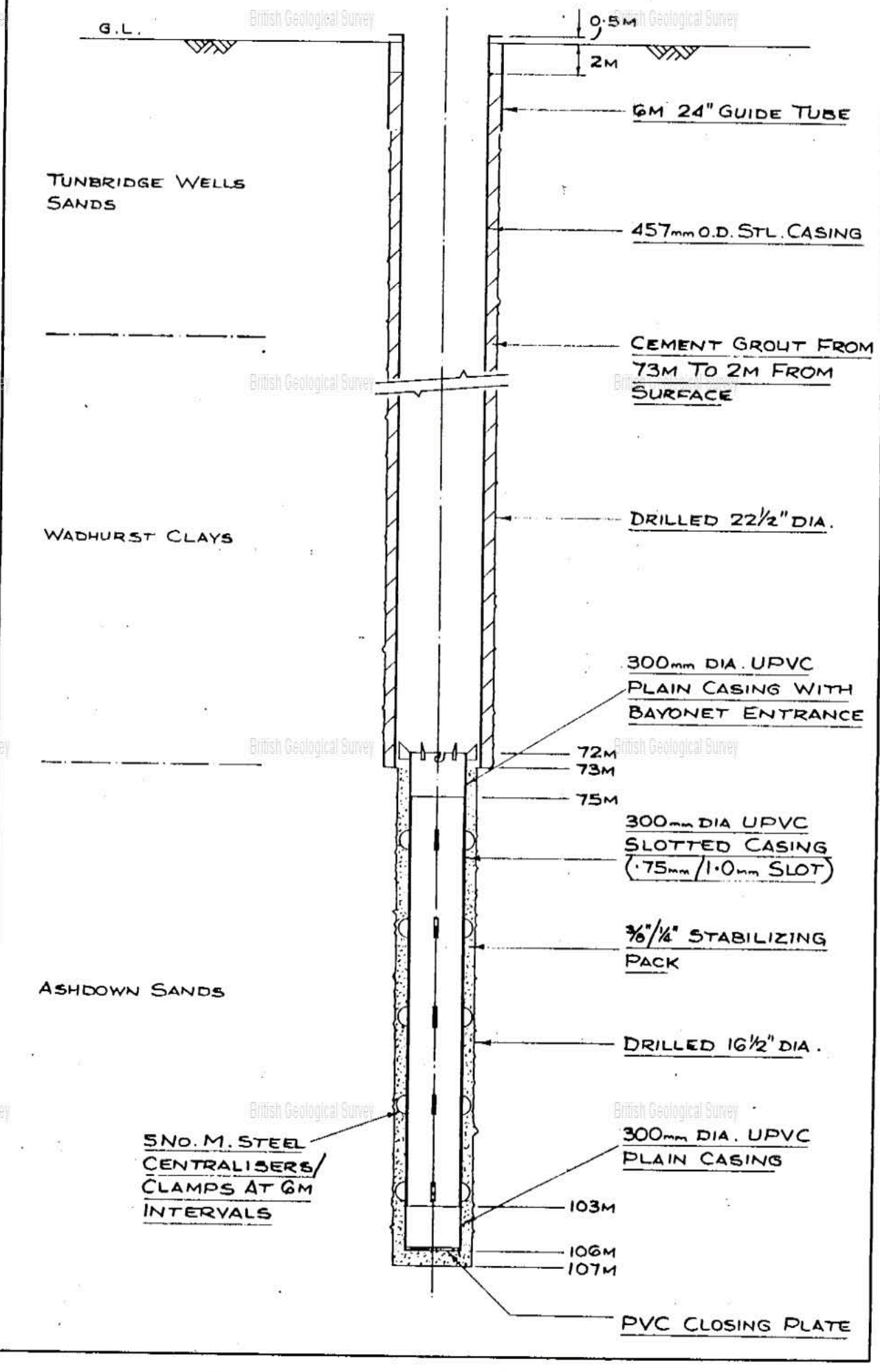
GEOLOGICAL CLASSIFICATION	NATURE OF STRATA (and any additional remarks)	THICKNESS METRES	DEPTH METRES
Tunbridge Wells Sands	Top soil	.2	.2
	Sand & clay beds	5.8	6
Wadhurst Clay	Soft sand	2.5	8.5
	Soft clay	63.9	72.4
Ashdown Sands	Fine sands and shale	34.6	107

TQ 41 NE 22

TQ41/85A

IRRIGATION WATER SUPPLY B/HOLE

UCKFIELD GOLF COURSE



GEORGE STOW & Co. LTD.,

WATERWORKS ENGINEERS,

HENLEY-ON-THAMES,

OXON.

DRAWN.	DATE.
MAC	9.8.88

SCALE.	ISSUE.	DRAWING No.
1:250 & 1:20	2	4828/88

Eastern S.U.A.

NN 870134

TQ 41/85B

GEORGE STOW CO. LTD.

Waterworks Engineers

READING ROAD – HENLEY-on-THAMES. OXON.

319

RECORD OF WELL (SHAFT OR BOREHOLE)

DATE COMPLETED 22 Augusy 1988

TQ41NE 23

All depths to be measured below Ground Level

Work carried out for GREEN CONSTRUCTION LIMITED NGR TQ 47150 18050

Locality (Exact Site) LITTLE HORSTED, NR. UCKFIELD

Level of Ground Surface above Sea Level (O.D.) --- m.

Depth of Shaft -- m. Diameter -- mm.

Depth of Bore 97.15 m. Diameter: At Top 457 mm. At Bottom 300 mm.

Details of Permanent Lining Tubes

Diameter		Length Inserted Plain		Slotted		Top At		above/below Ground Level
457	mm.	67.5 m.		m.		.5 m		
300	"	63.5 - 66.5	"	66.5 - 90.5	"	"		"
300	"	90.5 - 92.5	"		"	"		"
	"		"		"	"		"
	"		"		"	"		"
	"		"		"	"		"

Water Struck at depth of (in m.) 3

Rest Level of Water ~~below~~ Ground Level 11 m.

Yield on 72 ~~Days~~ Hours test. Pumping 4.6 litres per sec. Date 7 September 1988

Pump Water level 18.40 m. below Ground Level.

Time of Recovery Borehole had recovered after 28 hours

Remarks Due to large quantity of silt/sand in the water the borehole was pumped by air-lift and a maximum yield and drawdown was not obtained. Borehole was backfilled from 97.15 - 92.5 in the hope that it might reduce sand inflow which was believed to come largely from this area.

See back for Strata Record.

DETAILS OF STRATA

TQ 41 NE 23

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA (and any additional remarks)	THICKNESS METRES	DEPTH METRES
Tonbridge Wells	Fine sands	9.59	9.59
	Clay/Sand	1.61	11.20
	Grey Clay	.36	11.56
	Fine Sands/Sandstone	.96	12.52
	Fine Sands	1.56	14.08
	Clay/Sand	.31	14.39
	Clay/Shale	.61	15.00
	Shale	1.00	16.00
Wadhurst Clay	Shale	53.00	69.00
Ashdown Sand	Sand	24.00	93.00
	Black coal like deposit	.40	93.40
	Dark Shale	3.75	97.15

DETAILS OF STRATA

TQ 41 NE 23

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA (and any additional remarks)	THICKNESS METRES	DEPTH METRES
Tonbridge Wells	Fine sands	9.59	9.59
	Clay/Sand	1.61	11.20
	Grey Clay	.36	11.56
	Fine Sands/Sandstone	.96	12.52
	Fine Sands	1.56	14.08
	Clay/Sand	.31	14.39
	Clay/Shale	.61	15.00
	Shale	1.00	16.00
Wadhurst Clay	Shale	53.00	69.00
Ashdown Sand	Sand	24.00	93.00
	Black coal like deposit	.40	93.40
	Dark Shale	3.75	97.15

British Geological Survey

HYDROGEOLOGY RESEARCH GROUP

319

TQ41/89

Form WR-38 (BGS)

BOREHOLE RECORD

SOUTHERN EA

TQ41NE/26

A SITE DETAILS		
Borehole drilled for		
Location	BENTLEY WILDFOWL RESERVE	
NGR (8 fig.)	TQ 485 161	Please attach site plan
Ground Level (if known)	—	
Drilling Company	—	
Date of Drilling	Commenced —	Completed

B CONSTRUCTION DETAILS

Borehole Datum (if not ground level) _____ above / m below GL

TOTAL DEPTH 30M

(point from which all measurements of depth are taken e.g. flange, edge of chamber, etc.)

Borehole drilled diameter _____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

Casing material _____ diameter _____ mm from _____ to _____ m/depth
and type (e.g. if plain steel, plastic slotted)

_____ diameter _____ mm from _____ to _____ m/depth

_____ diameter _____ mm from _____ to _____ m/depth

_____ diameter _____ mm from _____ to _____ m/depth

Grouting details _____

Water struck at _____ m (depth below datum — mbd)

_____ m (depth below datum — mbd)

Rest water level on completion _____ mbd

C TEST PUMPING SUMMARY (Please supply full details on Forms WR-39)

Test Pumping Datum _____ m above / below borehole datum (mbd)
(if different from borehole datum)

Pump Suction depth _____ mbd

Water Level (Start of Test) _____ mbd

Water Level (End of Test) _____ mbd

Pumping rate _____ m^3/d:l/s

for _____ days/hours

Recovery to _____ mbd in _____ mins: hrs: days
(from end of pumping)

Date(s) of measurements _____

Please supply chemical Analysis if available.

D STRATA LOG

Geological Classification	Description of strata	Thickness	Depth
(BGS only)		m	m
	(continue on separate page if necessary		

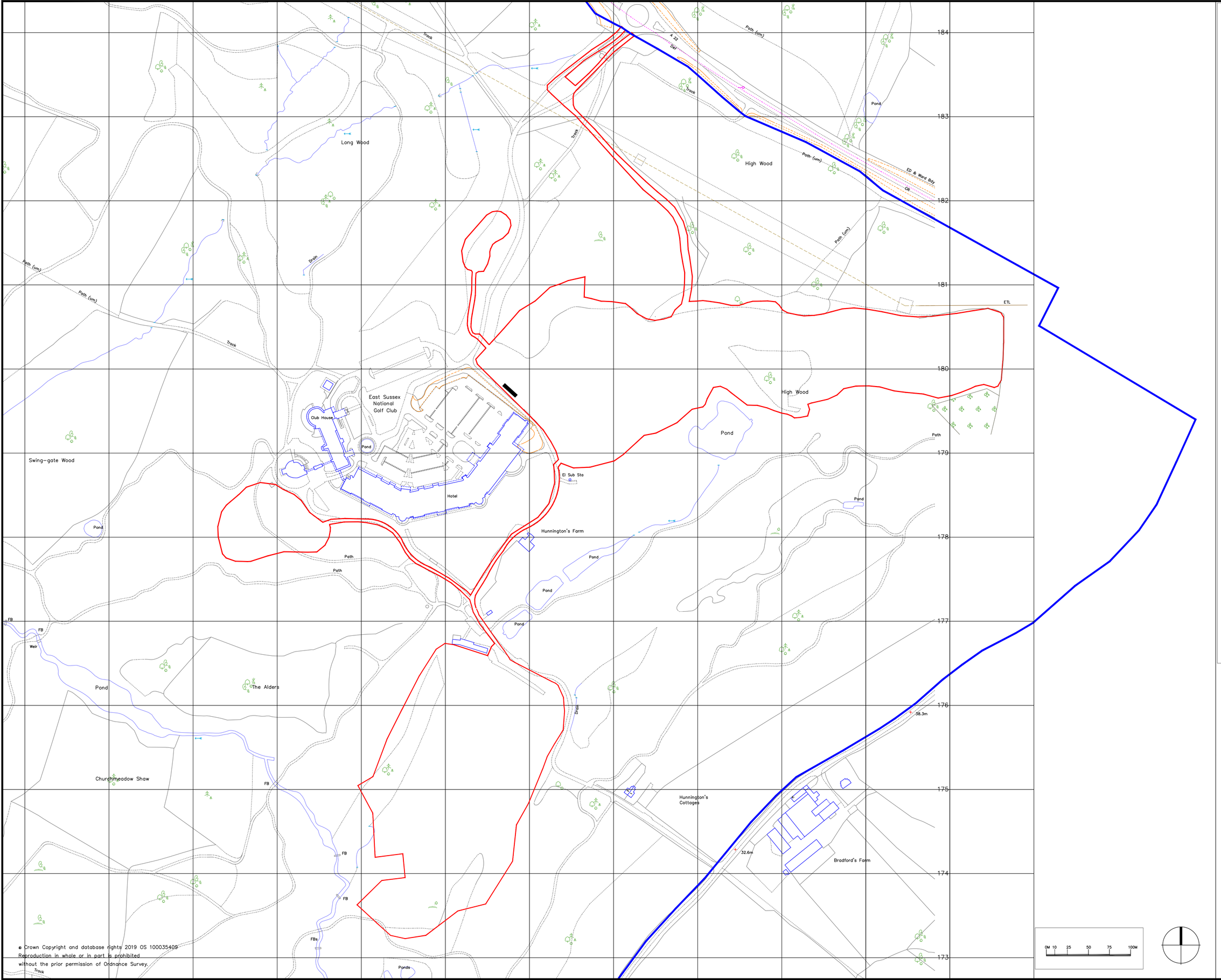
Other comments (e.g. gas encountered, saline water intercepted, etc.)

DETAILS ORIGINALLY OBTAINED FROM EA OFFICE AT PEVENSEY FOR AQUIFER PROPERTIES MANUAL & RECORDED DIGITALLY AS LMC/C/0025 (10652)

FOR OFFICIAL USE ONLY

FILE	CONSENT NO.	NGS REF NO.
LIC NO.	PURPOSE	NRA REF NO.
DATE REC:	COPY TO:	ENTERED BY:

APPENDIX 3
Proposed Development Plan



0M 10 25 50 75 100M

KEY:

- Application Boundary
- Ownership Boundary

NOTES:

1. This drawing is to be read in conjunction with all relevant contract drawings and specifications with any conflicting information to be brought to the attention of Weller Designs Ltd before works commence on site.

2. Do not scale from this drawing, always work to noted dimensions.

3. All given dimensions in mm.

DATE	DRAWN	DESCRIPTION OF REVISION	REVISION LETTER	CHECKED BY
15.03.2020	DW	Site Boundary Amended to remove link to Harvey Lane	C	DW
08.03.2019	DW	Site Boundary Amended Slightly	B	BW
28.06.18	BA	Site Boundary Amended	A	DW

DRAWING STATUS

PLANNING

Weller Designs Limited Golf Course Architects

Bishopsmead House, Bishops Mead, West Street, Farnham, Surrey, GU9 7DU
Tel/Fax: 01252 712127 Email: info@wellerdesigns.co.uk Web: www.wellerdesigns.co.uk

PROJECT TITLE :

East Sussex National

PROJECT NUMBER : WD800

PLOT DATE : 15.03.2020

DRAWING SCALE : 1:2000@A1

APPROVED BY : DW

PAPER SIZE : A1

DRAWN BY : BA

DRAWING TITLE :

Application Boundary Plan

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DRAWING NUMBER : WD800ABP01

REVISION LETTER : C

DRAWING FILE LOCATION :
C:\LOCKDOWN WORK 25th MARCH 2020\East Sussex National\Drawings\WD800_ESN Drawing Set 4 31.03.20_recover.dwg

KEY:

- Application Boundary
- Existing Contours
- Proposed Contours
- Play Line – Golf
- Play Line – Footgolf
- Footpath
- Proposed Haul Road
- Golf Course Green
- Golf Course Apron
- Golf Course Fairway
- Golf Course Tee
- Golf Course Bunker
- Footgolf green
- Footgolf Tee
- 3G Games Pitch
- Changing Facilities
- Existing Vegetation to be removed

NOTES:

1. This drawing is to be read in conjunction with all relevant contract drawings and specifications with any conflicting information to be brought to the attention of Weller Designs Ltd before works commence on site.

2. Do not scale from this drawing, always work to noted dimensions.

3. All given dimensions in mm.

DATE	DRAWN	DESCRIPTION OF REVISION	REVISION LETTER	CHECKED BY
15.04.2020	BA	Additional details on 3g plus overflow car park	D	DW
13.05.2019	BA	Removed Aerial from background	C	DW
08.03.2019	DW	Features moved from trees , grading adjusted	B	BW
28.06.18	BA	Hole 9 relocated & Changing facilities amended.	A	DW

DRAWING STATUS

PLANNING

Weller Designs Limited Golf Course Architects

Bishopsmead House, Bishops Mead, West Street, Farnham, Surrey, GU9 7DU
Tel/Fax: 01252 712127 Email: info@wellerdesigns.co.uk Web: www.wellerdesigns.co.uk

PROJECT TITLE :

East Sussex National

PROJECT NUMBER :	PLOT DATE :
WD800	15.04.20
DRAWING SCALE : 1:1000	APPROVED BY : DW
PAPER SIZE : A1	DRAWN BY : BA

DRAWING TITLE :

Grading Plan

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DRAWING NUMBER :	REVISION LETTER :
WD800G01	D

DRAWING FILE LOCATION :

C:\LOCKDOWN WORK 25th MARCH 2020\East Sussex National\Drawings\WD800_ESN Drawing Set 4 31.03.20_recover.dwg