

Flood Risk Assessment
May 2024
Version 3

Land at Hermitage Park
Harts Farm Way
Havant
PO9 1FA

FORSA ENERGY

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H8492-001	Conceptual Drainage Layout

APPENDICES

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Appendix II	Workings

NON TECHNICAL SUMMARY

Site Area	0.32ha
Existing / Historic Use	Brownfield
Proposed Use	Gas Energy Generating Plant
Flood Zone	Indicative: Flood Zone 1 (Low Risk) rising to Flood Zone 3 (High Risk) accounting for climate change. Assessed Fluvial Flood Risk: 1:100 Year Fluvial Event: No flooding now or in future (2122). 1:1000 Year Fluvial Event: No flooding. Assessed Tidal Flood Risk: 1:200 Year Tidal Event: No flooding now or in future (2055). 1:1000 Year Tidal Event (2022): No Flooding. 1:1000 Year Tidal Event (2055): Minor flooding (0.14m). Flood mitigation and management measures outlined to reduce residual flood hazards to an acceptable level throughout the development lifetime. Safe access achievable throughout all return period flood events now and in the future.
Groundwater Flooding	Low Risk
Infrastructure Failure	Raised Waterways: Low Flood Defences: Low Reservoirs: Low
Overland Flow - Flooding	Very Low Risk
Sewer Flooding	Very Low Risk
Change to Site Surface Finishings (Y/N)	Yes. Whilst no uplift in the runoff coefficient is anticipated to arise from proposals, full surface water management is proposed in line with best practice for new development.
Infiltration Potential?	No. Elevated groundwater precludes the use of infiltration as the primary means of surface water disposal. SuDS based attenuation proposed to maximise infiltration at source.
Attenuation Storage Proposed	84m ³ . Detention basin on southern boundary.
Potential Receptor for Surface Water Discharges	SuDS based drainage will promote infiltration at source, with excess runoff discharged at restricted (<i>modified greenfield</i>) rates to local watercourses via an existing connection present on the southern boundary and following upstream attenuation, discharge control and water quality treatment.
Climate Change Allowance	Tidal: to 2055. Fluvial: 20% to 2055. Rainfall: 25% (Central allowance).

1.0 INTRODUCTION

1.1 Background

- 1.1.1 Amber Planning Ltd. has been appointed by Forsa Energy Gas Holdings Ltd. to prepare a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment in support of an application for a Gas Energy Generating Plant, access and associated infrastructure within a c.0.32ha plot of land at Hermitage Park, Harts Farm Way, Havant, PO9 1FA. The Havant area falls within the administrative remit of Havant Borough Council.
- 1.1.2 Reference to Environment Agency (EA) online Flood Maps indicates the property to be situated entirely within Flood Zone 1 (Low Risk) for fluvial / tidal flooding, to be unaffected by flooding associated with infrastructure failure and to be external to Groundwater Source Protection Zones. The plot is indicated to be partially affected by surface water flooding.
- 1.1.3 Planning was originally granted for the facility in 2017 (APP/17/00511) which was amended in 2018 (APP/18/01281). A resubmission was then granted permission in 2021 to extend the timeframe of the extant permission (APP/21/00809). At this time the property was allocated for development under Policy HB2: Havant and Bedhampton Employment Allocations (Harts Farm Way North - sub section BD9), Figure 001. This land allocation is understood to have been informed by a Strategic Flood Risk Assessment.
- 1.1.4 A site specific Drainage Assessment was prepared in support of the aforementioned applications which was deemed to be acceptable by the Lead Local Flood Authority. The current application represents a variation to the original permitted layout with this supporting technical document now upgraded to a Flood Risk Assessment to take account of future flood zones.
- 1.1.5 This Flood Risk Assessment has been prepared in accordance with the National Planning Policy Framework (NPPF) Section 14 and its Planning Practice Guidance (PPG). The requirements of the Environment Agency, Havant Borough Council and Hampshire County Council have also been accounted for within this study.

1.2 Objectives

- 1.2.1 The objectives of this Flood Risk Assessment are to:
- Review national and local planning policy documents and identify any issues they raise, and which need to be addressed in relation to flooding and hydrology;
 - Review readily available information on flooding using data provided by the EA and, where available, the Strategic Flood Risk Assessment (SFRA);
 - Evaluate the background hydrology;
 - Consider the impacts of the development on pre-developed rates and volumes of surface water runoff;
 - Recommend the mitigation and / or management measures required to prevent detrimental impacts to surface water flooding or hydrology at the site or within downstream receptors;
 - Identify opportunities for the incorporation of Sustainable Drainage Systems (SuDS); and
 - Provide recommendations for the design and delivery of surface water management. This includes the design of a drainage scheme which accounts for the requirements of the Environment Agency and the Lead Local Flood Authority.
- 1.2.2 Local development framework documents, including strategic policy and technical studies, have been reviewed as input to this study.

1.3 Confidentiality

- 1.3.1 Amber Planning has prepared this report solely for the use of The Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Amber Planning; a charge may be levied against such approval.

2.0 SOURCES OF INFORMATION

2.1 General

2.1.1 In preparing this assessment background information has been sought from the following sources:

- Communities and Local Government (Dec. 2023). National Planning Policy Framework¹;
- Communities and Local Government (*Living Document*). Planning Practice Guidance²;
- UK Government Guidance (May 2022). Flood Risk Assessments: Climate Change Allowances³;
- CIRIA (2015). C753: The SUDS Manual;
- Havant Borough Council website, Planning Policy Page⁴;
- Havant Borough Council (2011). Local Plan (Core Strategy);
- Havant Borough Council (2014). Local Plan (Allocations) and Online Policy Maps⁵;
- Hampshire County Council (2020): Local Flood and Water Management Strategy;
- Partnership for Urban South Hampshire (2016): Strategic Flood Risk Assessment Update;
- Havant Borough Council (2018). Strategic Flood Risk Assessment (Local Plan Sites);
- Partnership for South Hampshire (2024). Strategic Flood Risk Assessment;
- Partnership for South Hampshire (2024). Strategic Flood Risk Assessment Flood Maps⁶;
- Partnership for South Hampshire (2024). Strategic Flood Risk Assessment: *Technical Note*;
- Various Authors (2010). North Solent Shoreline Management Plan;
- Gov.uk website⁷;
- Defra Magic online mapping, geographical and environmental data⁸;
- British Geological Survey online mapping⁹;
- Centre for Ecology and Hydrology Flood Estimation Handbook (FEH) Web Service, hydrometric data¹⁰;
- Waterco Consultants Ltd. (2018). Drainage Strategy Harts Farm Way, Havant;
- Topographical Survey; and
- OS Mapping data¹¹.

2.2 Planning Context - National Planning Policy

National Planning Policy Framework

2.2.1 The National Planning Policy Framework (NPPF) Section 14: Meeting the Challenge of Climate Change, Flooding and Coastal Change, and its Planning Policy Guidance (PPG) document provide guidance on the consideration of flood risk, drainage and water quality within development design. According to the NPPF:

'A site-specific flood risk assessment is required for:

¹ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

² <https://www.gov.uk/government/collections/planning-practice-guidance>

³ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-2>

⁴ <https://havant.gov.uk/planning-policy>

⁵ <https://maps.havant.gov.uk/havant.aspx>

⁶ <https://pcc.dynamicmaps.co.uk/MapThatPublic/Default.aspx#>

⁷ www.gov.uk

⁸ <http://magic.defra.gov.uk/MagicMap.aspx>

⁹ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

¹⁰ <https://fehweb.ceh.ac.uk/GB/map>

¹¹ www.promap.co.uk

- All development within Flood Zones 2 (Medium Risk) and 3 (High Risk);

In Flood Zone 1, an assessment should accompany all proposals involving:

- Sites of 1ha or more;
- Land identified by the Environment Agency as having critical drainage problems;
- Land identified in a Strategic Flood Risk Assessment as being at increased flood risk in future; or
- Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'

2.3 Planning Context – Havant Local Plan

2.3.1 The Local Plan sets out the vision for future development in the Borough, identifies what areas should be developed, and what requirements and standards developers should meet in their proposals. Havant Borough Council's Local Plan is made up of the following documents:

- Local Plan (Core Strategy) adopted 2011.
- Local Plan (Allocations) adopted 2014.

Local Plan: Core Strategy (2011)

2.3.2 Policies within Havant Borough Council's Core Strategy relevant to the consideration of Flood Risk and Drainage are as follows:

- CS15: Flood and Coastal Erosion Risk
- CS16: High Quality Design

2.3.3 The property is allocated for development under Policy HB2: Havant and Bedhampton Employment Allocations (Harts Farm Way North - sub section BD9), Figure 001. This land allocation is understood to have been informed by a Strategic Flood Risk Assessment. Review of the live Policy Mapping on Havant Borough Council's website indicates this strategic land allocation to remain in place.

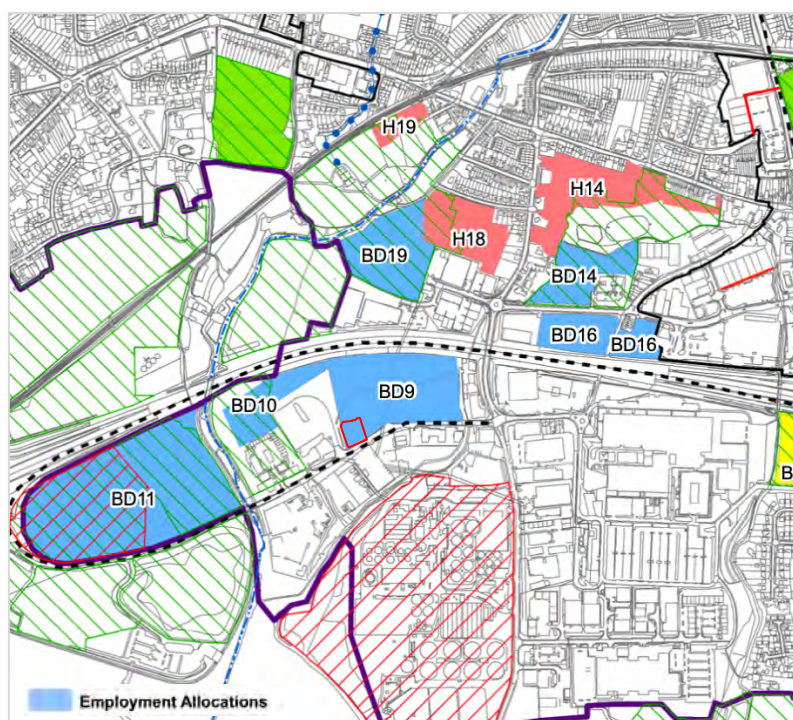


Figure 001a: Excerpt from Adopted Havant and Bedhampton Proposals Map (2011)



Figure 001b: Excerpt from Adopted Havant and Bedhampton Online Proposals Map

Emerging Local Plan: The Building a Better Future Plan

- 2.3.4 The new Local Plan '*The Building a Better Future Plan*' for Havant will set out how the Borough should be developed for a minimum 15 year period to 2040. This Plan is currently in a period of pre-submission consultation with adoption expected by 2025. The current Local Plan documents will remain in place until the new Local Plan is adopted.

Strategic Flood Risk Assessment

- 2.3.5 The Strategic Flood Risk Assessment (SFRA) reports evaluate the extent and nature of flooding in the district, consider the implications for land use planning and set out the criteria for submitting future planning applications and guiding development control decisions.
- 2.3.6 These documents have been reviewed as input to this study.

3.1 Site Setting

Property Address	Land at Hermitage Park, Harts Farm Way, Havant, PO9 1FA
National Grid Reference	470610, 105825
Area	0.32ha

Table 001: Site Setting

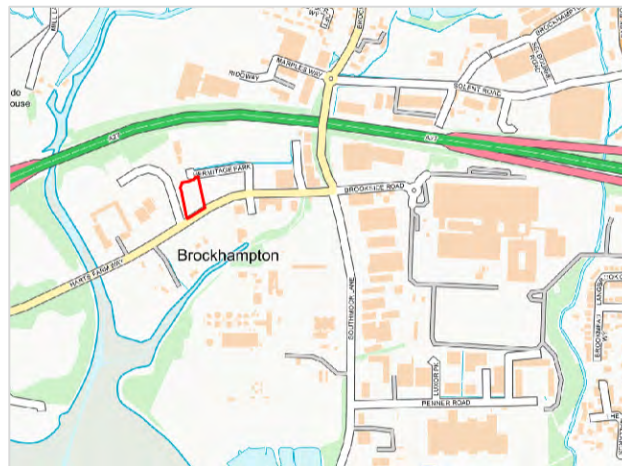


Figure 002: Site Location Plan

This panel shows a wider aerial view of the site location. A red outline highlights the area shown in the right panel. Labels include 'Solent Road' at the top, 'A27' on a road to the left, and 'Harts Farm Way' running through the site area.

Figure 003: Existing Site Layout – Aerial Photograph

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3.3 Surrounding Area

Direction	Description
North	Industrial Estate, A27, park land, Hermitage Stream, Bedhampton beyond.
East	Industrial Estate; towns of Havant and Langstone beyond.
South	Industrial Estate, Brockhampton Stream, sewerage works and Langstone Harbour / The Solent beyond.
West	Industrial estate, Hermitage Stream, park land, A27 and suburbs of Portsmouth beyond.

Table 002: Site Surrounds

3.4 Proposed Layout

3.4.1 The application relates to the construction of a Gas Energy Generating Plant, access and associated infrastructure and includes the following elements:

- Engine Units x 5
- Transformer
- DNO Kiosk / Substation
- Gas kiosk
- Switch Room Container
- Clean / waste oil tanks
- Welfare Cabin
- Stone Chippings



Figure 004: Proposed Layout

3.4.2 The proposals involve no significant material change to the ground profile aside from the input of formalised level surfaces, as outlined above. Figure 004 provides a summary of the proposed layout, with full details contained within Drawing FE/017/593: *Site Layout*, located to the rear of this report. The proposals are non-residential in nature, with an anticipated lifetime of c.30 years.

3.5 Topography

- 3.5.1 Topographic survey data indicates ground levels within the application area to be fairly uniform ranging between 3.54m AOD and 3.88m AOD, reducing in generally southerly and westerly direction. Surface elevations within the area of development are located at or above 3.60m AOD.
- 3.5.2 An embankment is present along the entire southern site boundary the crest level of which is set between 3.97m AOD and 4.20m AOD and which ties into higher ground (>3.90m AOD) in the east. At its western end, this bank ties into higher ground (4.00m AOD) adjacent to the watercourse on the western boundary. A second bank then continues north along the western boundary; the crest level of which is located at between >3.90m to <4.15m AOD and ties into higher ground further north, which is located at 4.6m AOD. Moving further north a low point (c.3.7m AOD) appears to be present within the bank over a distance of c. 20m after which levels rise again to meet higher ground (4.4m AOD – 4.7m AOD) at the western end of Hermitage Park.
- 3.5.3 Ground levels at the site access onto Hermitage Park are located at 4m AOD reducing slightly to c.3.83m AOD moving east.
- 3.5.4 A patch of lower ground is present to the south of Harts Farm Way which is located at <3m AOD and which appears to be associated with an electrical sub-station facility. The surrounding ground appears to be elevated relative to this plot (>3.0m AOD – <4.0m AOD), suggesting that it has been cleared / stripped at some point.

3.6 Hydrogeology

- 3.6.1 Regional geological mapping indicates the bedrock geology to comprise the Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations – Chalk, overlain by superficial deposits of Alluvium - Clay, silt, sand and gravel between 0.0m and c.7.9m thick in this locale.
- 3.6.2 Borehole data is available in this location, a summary of which is provided below, with full copies presented at Appendix I: *Data*.
- 3.6.3 A series of boreholes (SU70NW101 A-I) is located 65m west which dates from March 1971. These record alluvium deposits up to 7.9m bgl, underlain by chalk to depth, max. 22.0m bgl. Groundwater is encountered at various depths: 0.0m bgl to 2.43m bgl (recorded data: 0.0m, 0.15m, 0.61m, 0.91m, 2.13m and 2.43m bgl). Ground levels of 2.45m AOD are noted in this locale. Where groundwater is present, this tends to be at the interface between the upper soil layer and underlying clay / alluvial geology. It is therefore considered that this is perched water rather than main groundwater.
- 3.6.4 Borehole SU70NW98 is situated 20m north and dates from September 1967. It records chalk and flint debris to c.4.6m bgl overlain by a 0.5m layer of topsoil and flint. Groundwater ingress is noted at 1.83m bgl rising to a standing water level of 0.76m bgl.
- 3.6.5 Borehole SU70NW97 is situated 105m north and is from the same drilling suite as the previous borehole. This records firm brown clay to a depth c.4.5ft (1.4m) bgl underlain by chalk and flint to 20 ft (6m) bgl. Groundwater ingress is noted at 2m bgl rising to a standing water level of 1.83m bgl.
- 3.6.6 Borehole SU70NW99, situated 75m east, dates from September 1967, and records underlying chalk and flint geology to 4.6m bgl, overlain by medium shingle and flint soils (1.52m thick). No groundwater entry is recorded, with this stated as nil.

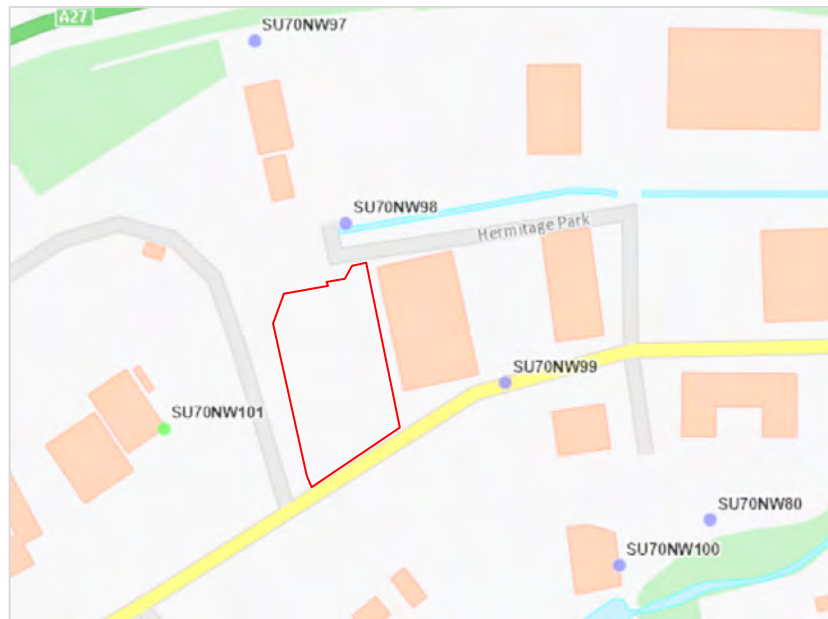


Figure 005: British Geological Survey Borehole Location Map

- 3.6.7 Mapping data downloaded from Defra's Magic website indicates the property to be external to Groundwater Source Protection Zones. Based on the above data, groundwater is indicated to be elevated. Whilst surface extrusion is considered unlikely, further consideration of the potential impacts on surface water management systems and storage facilities is required.

3.7 Tidal Flooding

- 3.7.1 The property is located approximately 225m east of the tidal Havant Stream, 450m north east of Langstone Harbour and 7km north east of the Solent. Although EA flood mapping indicates the property to be at **Low Risk** of tidal flooding, detailed tidal flood mapping accounting for climate change indicates an increased flood risk over time, with the application area indicated to be affected by tidal flooding in the future.

General Tidal Levels

- 3.7.2 National Tidal and Sea Level Facility (NTSLF)¹² Tide Tables have been reviewed to ascertain the general tidal levels for Portsmouth, the results of which are summarised in Table 003. This data has been corrected to account for chart datum, with all levels converted to m AOD also using data downloaded from the NTSLF¹³ (for Portsmouth).

Location	MHWS*	MLWS*	Range (m)	MHWN*	MLWN*	Range
Solent (m AOD)	1.99	-2.00	3.99	1.14	-0.83	1.97

Table 003: Solent Tide Data

*All levels in m AOD

- 3.7.3 A standard rule of twelfths approximation has been applied to the calculated tidal ranges to derive basic tidal curves, which are summarised in Figures 006a and 006b.

¹² <https://ntslf.org/tides/hilo>

¹³ <https://ntslf.org/tides/datum>

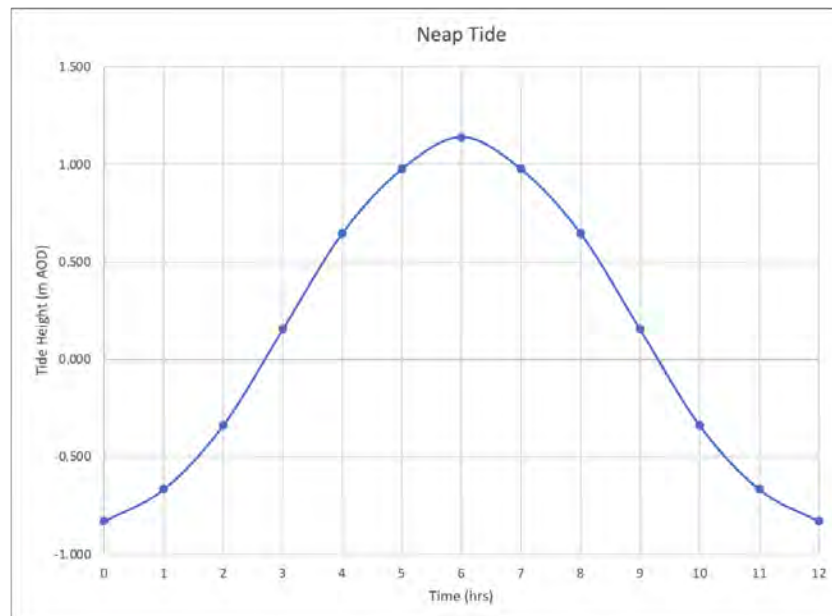


Figure 006a: Tidal Curve - Neap Tide: Portsmouth Harbour

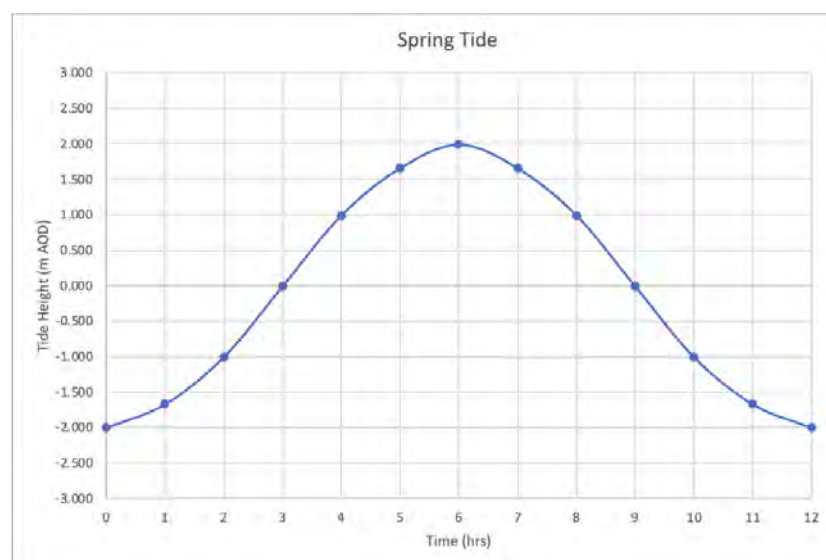


Figure 006b: Tidal Curve – Spring Tide: Portsmouth Harbour

Tidal Flood Levels

- 3.7.4 Tidal Flood Levels have been extracted from the Partnership for South Hampshire (PfSH) SFRA Technical Note (2024). These are understood to have been derived from the 2015 Southampton Water Coastal Model. This data understood to incorporate updated climate change allowances in accordance with current UK guidance¹⁴ to 2055 and 2122 (South Eastern Basins).
- 3.7.5 The 2055 flood levels have been utilised within this assessment, based on an anticipated development lifetime of <30 years. The results are summarised in Table 004 for Hayling Island, the nearest flood node.
- 3.7.6 The SFRA Technical note states the following in relation to the tidal flood levels within estuarine areas:
- 3.7.7 *'Depending on coastal location, the extreme water level changes. For example, in estuary areas the water level will be different and therefore a factor is applied in the model to account for this.'*

¹⁴ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-1>

Return Period	Hayling Island Flood Level (m AOD)
200 Year (2022)	3.26
200 Year (2055) Higher Central	3.50
200 Year (2055) Upper End	3.57
1000 (2022)	3.42*
1000 Year (2055) Upper End	3.74

Table 004: Tidal Flood Levels * Interpolated owing to no data for 2022 event

- 3.7.8 It is noted that the flood levels are the same for the 'with' and 'without' flood defences scenarios. This suggests a low standard of protection to be afforded by the coastal flood defences.
- 3.7.9 Topographical analysis indicates no inundation of the property for existing or future 200 year tidal flood events (2022-2055) based on a development lifetime <30 years. Whilst the SFRA flood mapping¹⁵ (Figure 007) indicates minor flooding for the future 200 year flood event, this is potentially caused either by the presence of low points within the site not picked up by the topographical survey or discrepancies within the LiDAR data which is less accurate than site specific survey data and which has error tolerances of c. +/- 5cm – 15cm (50mm-150mm).
- 3.7.10 In reality no flow path exists to the property from the south or west during an existing or future 200 year tidal flood event owing to the presence of embankments the crest levels of which are located at or above 3.90m AOD and which would prevent the passage of water into the property via the southern or western boundaries.

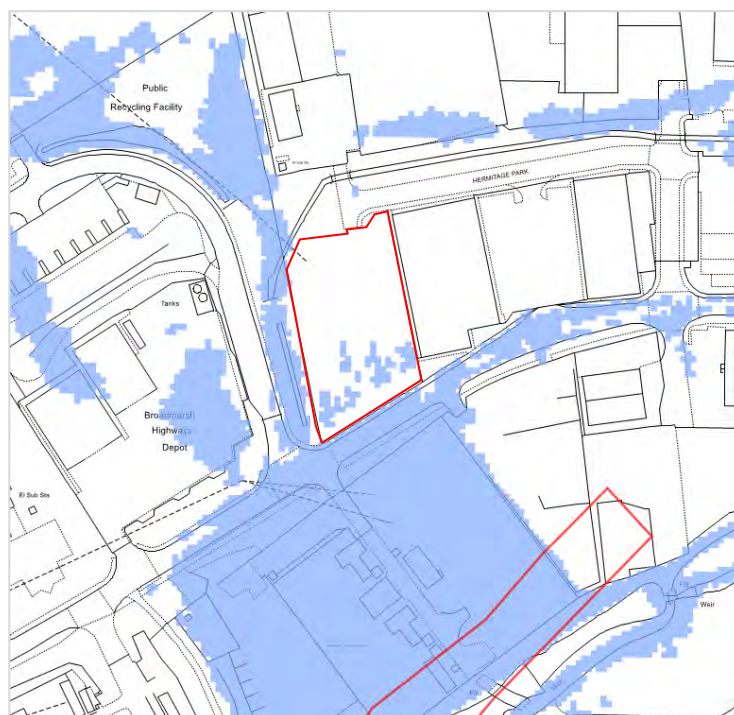


Figure 007: SFRA Tidal Flood Map 200 Years + Climate Change (2055)

¹⁵ <https://pcc.dynamicmaps.co.uk/MapThatPublic/Default.aspx#>

- 3.7.11 No flooding is indicated at the property for the present day 1000 year return period tidal flood event (2022). However, accounting for climate change, minor flooding is indicated by 2055. Maximum water depths of 0.14m are estimated within the area of built development, with inundation of the southern half of the property, where ground levels are located between 3.60m AOD and 3.74m AOD. Flood water is anticipated to enter the property via a low point (3.7m AOD) at the northern end of the embankment present on the western boundary, Figure 008.

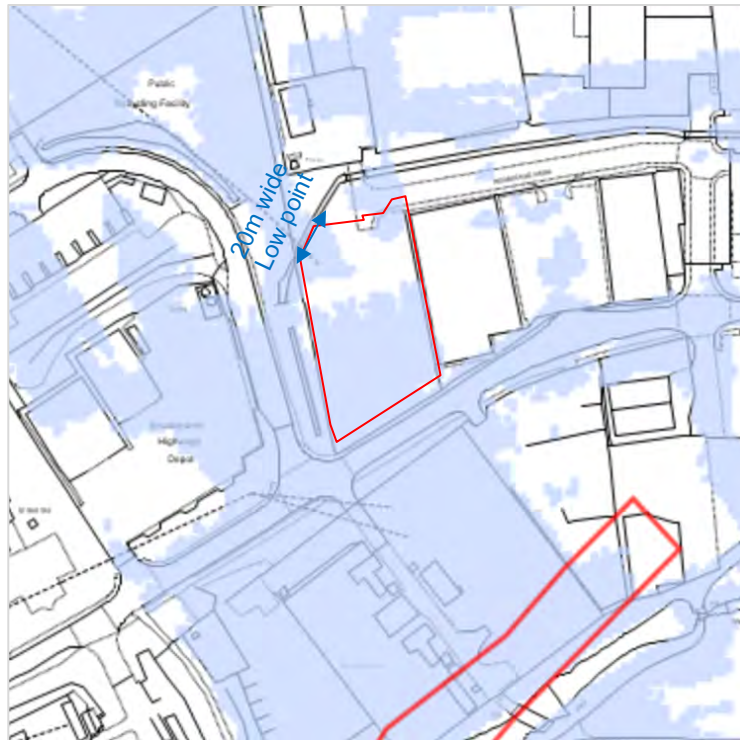


Figure 008: SFRA Tidal Flood Map 1000 Years + Climate Change (2055)

3.8 Flood Defences

- 3.8.1 The application area is indicated to benefit from the presence of flood defences which are understood to comprise a mixture of sea walls, embankments, engineered / raised ground and managed beaches, with these under both public and private ownership.
- 3.8.2 The flood defences are understood to have crest levels of between 2.30m AOD and 8.48m AOD in this locale, with these largely providing protection from coastal flooding and with a varying standard of protection provided. It is noted that the flood levels are the same for the with and without flood defences scenarios which indicates the flood defences to provide a low standard of protection.
- 3.8.3 The North Solent Shoreline Management Plan (2010) notes a policy for Hold the Line for the flood defences at Langstone Harbour with this understood to comprise the following '*maintain or upgrade the level of protection provided by the existing coastal defences.*'
- 3.8.4 The property is understood not to benefit from the presence of fluvial flood defences.

3.9 Fluvial Flooding and Hydrology

- 3.9.1 The nearest Main Rivers are the Hermitage Stream, which flows in a generally southerly direction passing c.225m west of the property at the closest point; and the Brockhampton Stream, which is situated 115m south and which flows in a south westerly direction in this locale. These two watercourses convene and discharge into Langstone Harbour c.295m south west.
- 3.9.2 A small drainage channel is present on the western and northern site boundaries. This flows in an easterly direction in this locale discharging into the Brockhampton Stream at the eastern extent of Hermitage Park, adjacent to Brockhampton Road, c.270m north east. This watercourse appears to be man-made and to form part of the surface water management network serving the wider Industrial Park although is understood to be classified as a Main River.
- 3.9.3 Review of Environment Agency Flood Mapping indicates the application area to be within Flood Zone 1 (Low Risk) and to be unaffected by fluvial or tidal flooding for return period events up to and including 1000 years.

Catchment Descriptor	Value
Area	19.89km ²
River Baseflow Index (BFIHOST-19)	0.300
Standard Percentage Runoff (SPRHOST)	44.85%
Drainage Path Length (DPLBAR)	4.88m
Drainage Path Slope (DPSBAR)	33.40m/km
Flood Attenuation by Rivers and Lakes (FARL)	0.992
Proportion of time soils are wet (PROPWET)	0.34
Standard Annual Average Rainfall (SAAR)	823mm
Urban Extent (URBEXT: 2000)	0.2408

Table 005: FEH Catchment Descriptor Information

- 3.9.4 Catchment descriptor information has been downloaded from the CEH Flood Estimation Handbook Web Service for this sub-catchment, which is summarised in Table 005. This indicates a small, heavily urbanised catchment, with low topographical relief, moderately impermeable geology and low average annual rainfall.
- 3.9.5 Flows within local watercourses are indicated to be predominated by overland flow (SPRHOST) with more minor contributions via subterranean flow (BFIHOST) with a moderately elevated catchment response to incident rainfall anticipated. Significant attenuation is indicated to be afforded by upstream reservoirs with this reflected in the FARL index and with this likely to depress the catchment response to incident rainfall. At a local scale the catchment response to rainfall may be further elevated by impermeable overlying soils or urban runoff.

Historic Flooding

- 3.9.6 Desk based investigation has been undertaken which includes review of the Strategic Flood Risk Assessment, Environment Agency and Defra Historic Flood Maps¹⁶, and which reveals no evidence of historic flooding in this area, although this may arise from a lack of recorded incidents based on the current and historic land uses, i.e. *industrial*.
- 3.9.7 The Partnership for Urban South Hampshire (PUSH) SFRA notes historic flooding from groundwater sources in the PfSH area, particularly during the winter of 2013 / 2014.
- 3.9.8 Caution should be exercised when reviewing historic flood records. This information is largely anecdotal and does not always

¹⁶ <https://www.arcgis.com/apps/mapviewer/index.html?layers=e73409bf14724c53b350898ff3a752bd>

include record of either the antecedent conditions giving rise to flooding (e.g. flood source), or reference to a flood return period. Furthermore, a lack of recorded incidents is no guarantee that an area has never flooded.

Fluvial Flood data

- 3.9.9 Environment Agency fluvial flood data and flood outlines are available for this area which are summarised in Table 006 and Figures 009a and 009b.

Return Period	Flood Level (m AOD)
100 (existing)	2.80
100 (Future)	3.90
1000 (2018)	2.80

Table 006: Fluvial Flood Levels

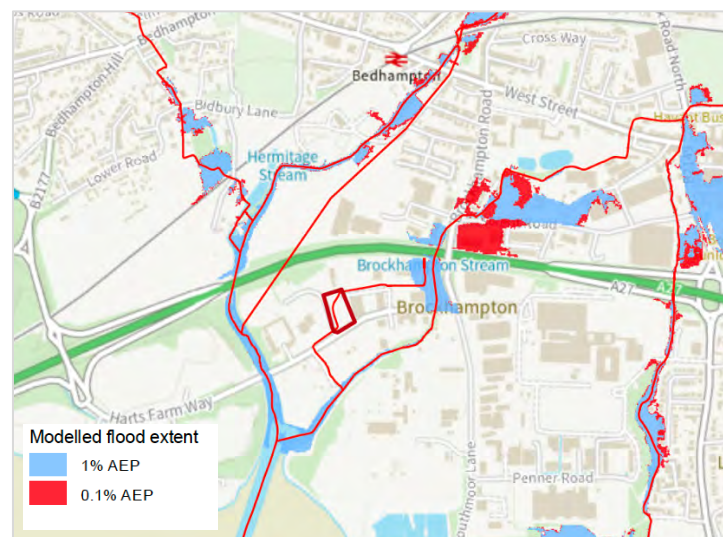


Figure 009a: EA Detailed Fluvial Flood Map

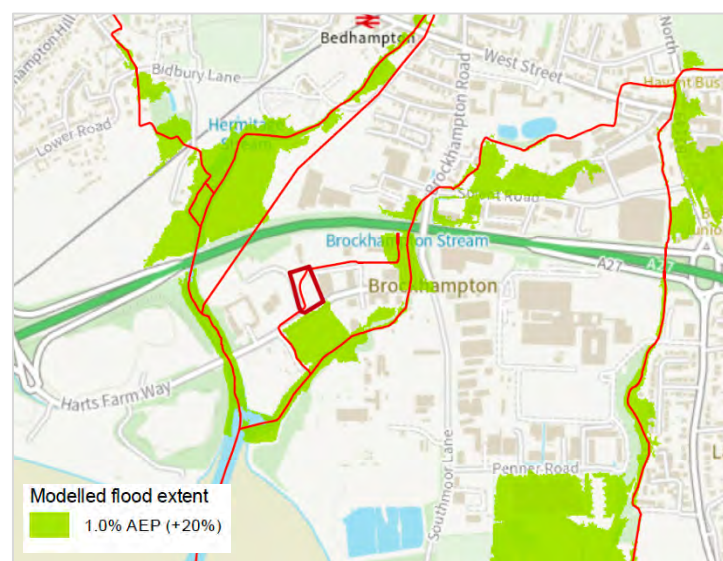


Figure 009b: EA Detailed Fluvial Flood Map 100 Years Including Climate Change

- 3.9.10 This data has been reviewed with maximum flood levels of 2.80m AOD estimated during an existing fluvial flood for return period events up to and including 1000 years and with no inundation of the property indicated for either event. The flood levels show low sensitivity to the return period assessed, suggesting the predominant flood mechanism to be tidal influence at the downstream end of the Hermitage and Brockhampton Streams.
- 3.9.11 Future flood levels and floodplain outlines have been provided, Figure 009b, which account for climate change and which indicates no inundation of the property by future flooding during a 100 year return period fluvial flood event.
- 3.9.12 Further review of detailed flood mapping has been undertaken using the PfSH Maps¹⁷. This confirms the property to be unaffected by fluvial flooding for return period flood events up to and including 100 years to 2115, Figure 010.

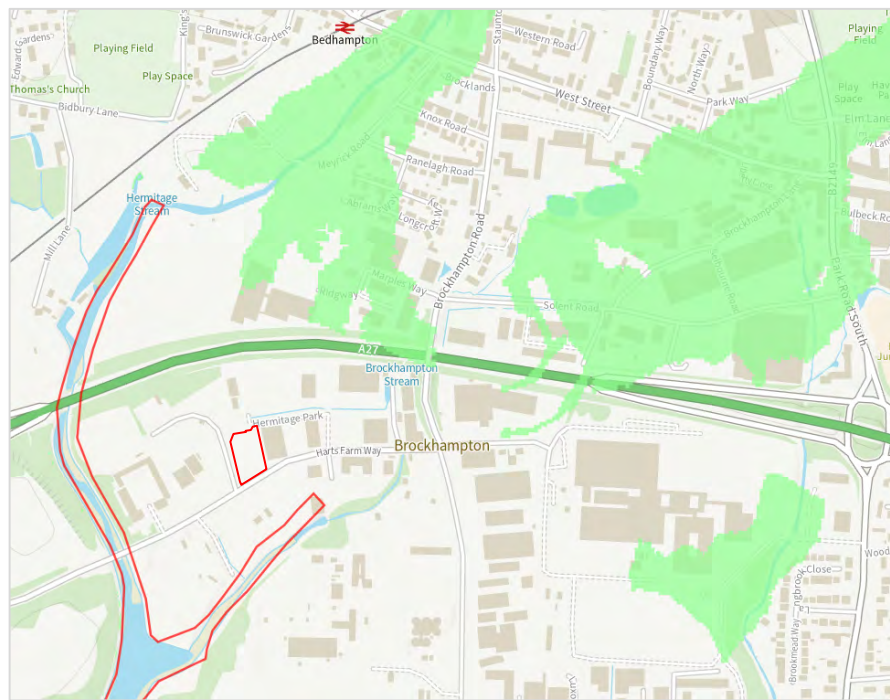


Figure 010: SFRA Detailed Fluvial Flood Map 100 Years Including Climate Change to 2115

- 3.9.13 It is therefore considered that the development would be unaffected by fluvial flooding now or in the future. Nevertheless, and given the proximity to the floodplain, it is recommended that flood mitigation be incorporated within the development design to minimise residual risks associated with fluvial flooding.

3.10 Flood Zone Classification

- 3.10.1 Whilst the property is indicated by Environment Agency Flood Maps to be unaffected by both fluvial and tidal flooding for return period events up to and including 1000 years, flooding is indicated for design return period tidal flood events (200 years) beyond 2055, accounting for climate change. The property is therefore considered to be located within Flood Zone 3a (High Risk) for tidal flooding.

¹⁷ <https://pcc.dynamicmaps.co.uk/MapThatPublic/Default.aspx#>

3.11 Flood Risk Vulnerability

	Flood Risk Vulnerability Class'n	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (Functional Floodplain)	Exception Test Required	x	x	x	✓

Key:

✓ Development is appropriate x Development should not be permitted

Table 007: Flood Risk Vulnerability and Flood Zone Compatibility

3.11.1 Development proposals include the installation of a Gas Energy Generating Plant, access and associated infrastructure to provide back-up generation for the National Grid within a c.0.32ha plot of land at Hermitage Park, Harts Farm Way, Havant, PO9 1FA.

3.11.2 The PPG defines the facility as 'infrastructure for electricity supply including generation, storage and distribution systems' and classifies this use as 'Essential Infrastructure.' Table 3 of the PPG considers this an appropriate use within Flood Zones 1, 2 and 3a.

3.12 NPPF Sequential and Exception Tests

3.12.1 The Sequential Test steers development preferentially towards Flood Zone 1 (Low Risk), considering Flood Zone 2 (Medium Risk) and then Flood Zone 3 (High Risk) only if land cannot be identified as available for development in zones at lower risk from flooding.

3.12.2 The Sequential Test is generally carried out at a strategic level by the Local Planning Authority with input from the Environment Agency, as part of the Local Plan process and should be informed by a Strategic Flood Risk Assessment.

3.12.3 Planning was originally granted for the facility in 2017 (APP/17/00511) which was amended in 2018 (APP/18/01281). A resubmission was then granted permission in 2021 to extend the timeframe of the extant permission (APP/21/00809). At this time the property was allocated for development under Policy HB2: Havant and Bedhampton Employment Allocations (Harts Farm Way North - sub section BD9), Figure 001. This land allocation is understood to have been informed by a Strategic Flood Risk Assessment.

3.12.4 A site specific Drainage Assessment was prepared in support of the aforementioned applications which was deemed to be acceptable by the Lead Local Flood Authority. The current application represents a variation to the original permitted layout with this supporting technical document now upgraded to a Flood Risk Assessment to take account of future flood zones.

3.12.5 Analysis has been undertaken which demonstrates the property to be unaffected by fluvial flooding for design return period events up to and including 100 years, now and in the future, and to be unaffected by extreme fluvial flooding (1000 years).

3.12.6 The facility is also indicated to be unaffected by tidal flooding for design return period events up to and including 200 years, now and in the future, and to be currently unaffected from extreme tidal flooding (1000 years). Minor flooding is seen during extreme tidal flood events accounting for climate change (2055), with this limited to the upper end of the lifetime range.

3.12.7 It is therefore confirmed that the proposed facility would be unaffected by design return period fluvial or tidal flooding or by extreme fluvial flooding throughout its anticipated lifetime and would remain largely unaffected from extreme tidal flooding for the majority of its anticipated lifetime.

3.12.8 Furthermore, the proposals comprise 'Essential Infrastructure' situated within Flood Zone 3a and therefore fulfil the

requirements of the Flood Risk Sequential Test by default, subject to application of the exception test which is addressed within this FRA.

Applying the Exception Test

3.12.9 For the Exception test to be passed it should be demonstrated that:

- a) The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- b) The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

3.12.10 Both parts of the exception test should be satisfied for development to be allocated or permitted.

Wider Sustainability Benefits

3.12.11 NPPF Table 3 indicates that the flood risk vulnerability classification of the development is appropriate at this location subject to application of the Exception Test. In accordance with the principles outlined within the NPPF PPG, it is considered that the development would provide wider sustainability benefits within the town, for the following reasons:

- Preferential use of Brownfield infill plots in preference to increased uptake of Greenfield land (especially for industrial uses);
- Providing a more secure, efficient and flexible power network, both locally and nationally, through the provision of boosts to energy supply at times when spikes in local demand would otherwise be met by a shortfall in supply;
- Proximity to the National Grid connection point, increases efficiency and reduces power losses for energy uploaded into the Grid from the Energy Plant; and
- Opportunity to remove un-neighbourly uses (e.g. *industrial*, adjacent to residential areas) and to make better use of brownfield land.

Safety from Flooding

3.12.12 This Flood Risk Assessment considers the flood mitigation and management measures required to ensure the continued safety of the development from flooding throughout its lifetime, taking account of the vulnerability of its users and without increasing flood risk elsewhere, and fulfils the requirements of element 2 of the Exception Test, as follows:

'b) The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'

3.13 Climate Change

Tidal Allowance

3.13.1 The tidal flood data is derived from the 2015 Southampton Water Coastal Model. Updated climate change allowances have been applied to the supplied flood levels in accordance with current UK guidance¹⁸ to 2055 (South Eastern Basins) based on a development lifetime of <30 years. The results are summarised in Table 004.

Fluvial Allowances

3.13.2 Environment Agency & SFRA flood data for the area has been prepared using detailed hydrodynamic modelling which includes climate change allowances for both fluvial and tidal inputs for the next 100 years, and with these based on detailed joint probability modelling. These data sets have been used as input to this study.

¹⁸ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-1>

Rainfall Allowance

- 3.13.3 Government Guidance on Climate Change Allowances to Peak Rainfall Intensity requires application of climate change factors of 20% (Central Allowance) for the 2050s epoch based on an anticipated development lifetime of c.30 years. In line with best practice, climate change impacts of up to 25% (Central Allowance) for the 2070s epoch, have been used within the drainage calculations in order to future proof the on-site surface water management measures.

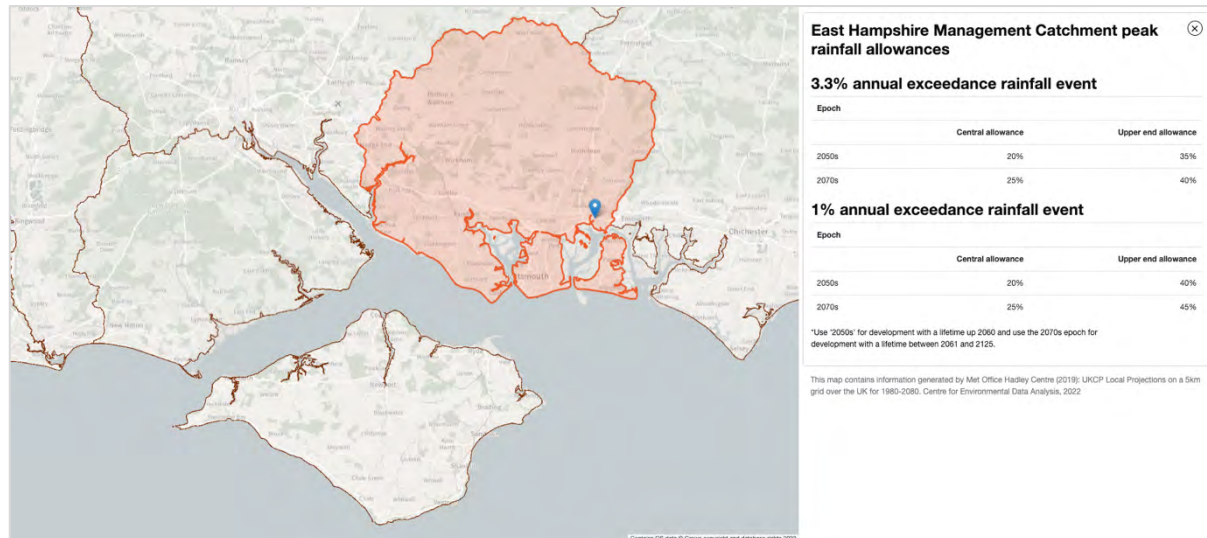


Figure 011: Climate Change Allowances – Rainfall Intensity

3.14 Infrastructure Failure

- 3.14.1 Flooding from artificial sources occurs when man made infrastructure, e.g. flood defences, raised channels or surface water storage features (i.e. reservoirs), becomes overwhelmed leading to breach or failure of the dam, banks or control structures. The probability of failure is low owing to regular inspection and maintenance regimes. However, in the event of a breach occurring the consequences can be significant.
- 3.14.2 Review of the National Reservoir Flood Maps indicates the area to be unaffected by reservoir flooding with no further assessment required. The property is also remote from raised waterways the breach or failure of which could lead to flooding with no further assessment required.
- 3.14.3 The property is noted not to benefit from fluvial flood defences but is understood to be afforded protection from tidal flooding by the presence of coastal flood defences within Langstone Harbour and the immediate surrounds.
- 3.14.4 Review of the SFRA mapping indicates these coastal flood defences to afford a standard of protection <20 years. Therefore a breach or failure of these defences is not considered to result in a greater flood hazard to the property than that already assessed for the 200 year tidal flood event, with no further assessment required. This assertion is confirmed by review of the SFRA online Breach Mapping and Undefended Flood Hazard Mapping.

3.15 Surface Water Flooding

- 3.15.1 Detailed EA pluvial mapping downloaded from the EA website, assesses three main scenarios, Low Risk (0.1%-1% probability of flooding annually), Medium Risk (3.3% - 1%) and High Risk (>3.3%). The findings of this assessment are summarised in Figure 012.
- 3.15.2 This data indicates the property to be generally at **Very Low** risk from pluvial flooding. Whilst discrete areas of the property are at **Low** Risk of pluvial flooding, this is likely associated with the ponding of runoff within discrete topographical points. The input of a level development platform and formal surface water management, which includes on-site attenuation and controlled discharge, would reduce this risk with no impact to the facility or its drainage networks anticipated and with no further assessment proposed.

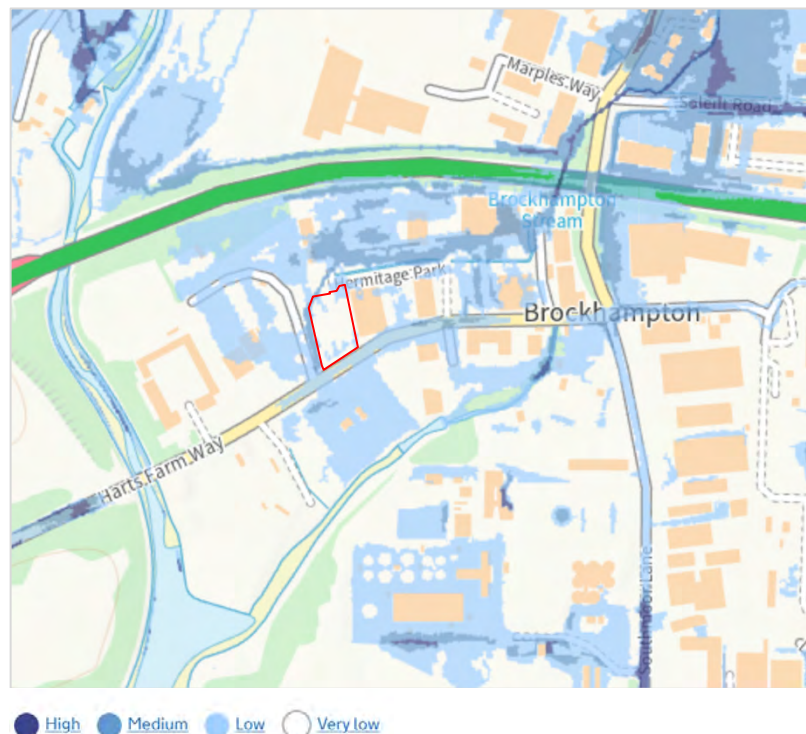


Figure 012: Environment Agency Surface Water Flood Map

3.16 Sewers

- 3.16.1 The Harts Farm Way area is served by a network of public sewers which is understood to be maintained by Southern Water. The nearest surface water sewers are likely to be present beneath Hermitage Park / Harts Farm Way.
- 3.16.2 The potential flood extents are likely to be similar to that outlined for pluvial flooding, with a **Very Low** associated flood risk and with no impact to the facility or its surface water management networks anticipated.
- 3.16.3 A previous drainage study prepared for the property by Waterco Ltd. indicates the plot to be served by an existing surface water drainage system with this comprising surface water gullies and manholes, although these are noted as being silted up.
- 3.16.4 These gullies are indicated to drain to a 600mm dia. sewer immediately south of the property on the northern side of Harts Farm Way. This is not identified on Southern Water Sewer plans and is therefore assumed to be in private ownership. This drain is oriented south-west and likely discharges into the watercourse present on the western boundary. According to the Waterco. Report, invert levels on this sewer are located at c.2.23m AOD compared with surrounding ground levels which are located >3.71m AOD, with gravitational discharge indicated to be feasible.

4.0 FLOOD RISK ASSESSMENT

4.1 Flood Risk Screening Opinion

- 4.1.1 In accordance with the NPPF Section 14 it is necessary to consider all forms of flood risk. A flood risk scoping exercise has therefore been completed, the results of which are outlined in Table 008.

Nature of Flood Risk	Flood Risk to Site?
Groundwater	No. Groundwater is indicated to be located at depth.
	Indicative: Flood Zone 1 (Low Risk) rising to Flood Zone 3 (High Risk) accounting for climate change. Assessed Tidal Flood Risk: 1:200 Year Tidal Event: No flooding now or in future (2055). 1:1000 Year Tidal Event (2022): No Flooding. 1:1000 Year Tidal Event (2055): Minor flooding (0.14m). Flood mitigation and management measures outlined to reduce residual flood hazards to an acceptable level throughout the development lifetime. Safe access achievable throughout all return period flood events now and in the future.
Tidal	
Fluvial	Assessed Fluvial Flood Risk: 1:100 Year Fluvial Event: No flooding now or in future (2122). 1:1000 Year Fluvial Event: No flooding.
	Raised Waterways: Not at risk.
Infrastructure Failure (Reservoirs, Canals and Other Artificial Sources)	Reservoir Failure: Not at risk. Flood Defence Breach / Failure: Not at risk owing to the low standard of protection offered by existing flood defences.
Overland Flow (surface water from off-site sources)	Yes. EA Flood Maps indicate the property to be at Low to Very Low risk from surface water flooding with no further assessment required.
Sewers	No. The property is considered to be at Very Low risk of sewer flooding with no further assessment required.
Surface Water Drainage (on-site)	Yes. An uplift in impermeable surface will arise from development proposals. Consideration of surface water management is therefore required.

Table 008: Flood Risk Screening Opinion

- 4.1.2 Flood screening indicates the facility to be unaffected by fluvial or tidal flooding for design return period events, throughout the anticipated development lifetime.
- 4.1.3 Residual risks associated with extreme tidal flooding (1000 years) have been identified which have been duly assessed. The results are summarised below.

4.2 Residual Flood Risk

Flood Zone 2 - 1000 Year Flood Outline: Tidal

- 4.2.1 Tidal flood data is available for the Havant area which indicates maximum flood levels of 3.74m AOD for a future 1000 year tidal flood (2055) accounting for climate change. Maximum water depths of 0.14m are estimated within the area of built development, where minimum ground levels are located at 3.60m AOD. Flood water is anticipated to enter the property via a low point (3.7m AOD) at the northern end of the embankment present on the western boundary, Figure 008.
- 4.2.2 The tidal flood level has been superimposed onto a Spring Tide (MHWS) curve. The results are summarised in figure 013 with inundation of the property indicated for a period of c.<0.5hrs – 1.0hrs around high water accounting for the ground level at the overtopping point and minimum site surface elevations, respectively.

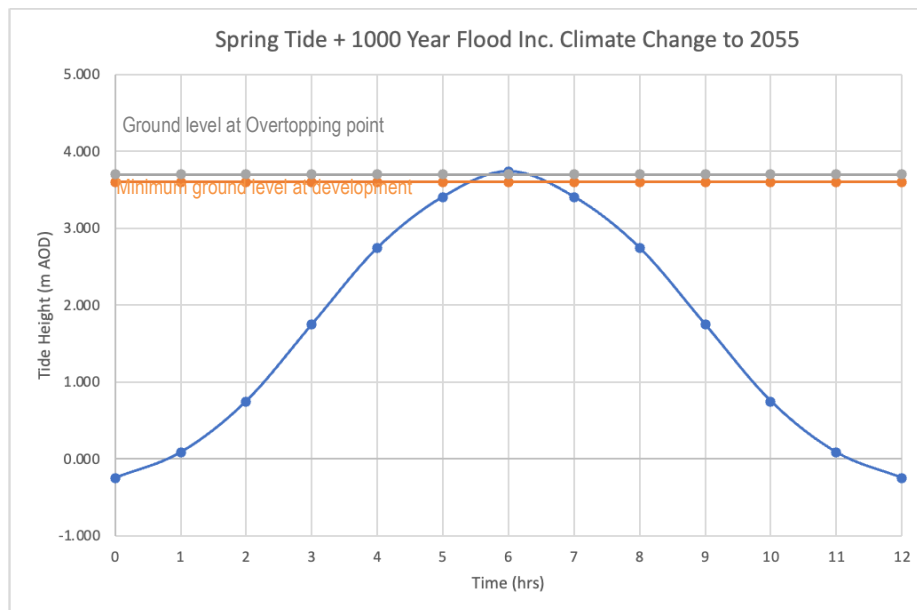


Figure 013: 1000 Year Tidal Flood Curve – Spring Tide (2055)

- 4.2.3 Table 4 of Defra's Supplementary Note on Flood Hazard¹⁹ (Figure 014) considers the combination of flow velocity and flood depth in defining flood hazard. This has been used in assessing the flood hazard to the Gas facility, taking account of the nature of proposed use (*non-residential*).
- 4.2.4 This indicates a **Very Low** flood hazard for flows up to 0.5m/s^{-1} for future extreme return period tidal flood events based on a maximum on-site water depth of 0.14m. No flooding is indicated to occur within the northern section of the property or at the site access onto Hermitage Way where ground levels are $>3.74\text{m AOD}$ and $>3.99\text{m AOD}$, respectively.
- 4.2.5 The probability of extreme flooding occurring is considered to be low, which reduces the flood hazard.

¹⁹ Defra & the Environment Agency (2008). Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose: Clarification of the Table 13.1 of FD2320/TR1 and Figure 3.2 of FD2321/TR1.

Table 4 – Hazard to People Classification using Hazard Rating ($HR = d \times (v + 0.5) + DF$) for (Source Table 13.1 of FD2320/TR2 - Extended version)

HR	Depth of flooding - d (m)												
	DF = 0.5												
	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
Velocity v (m/s)													
0.0	0.03 + 0.5 = 0.53	0.03 + 0.5 = -0.55	0.10 + 0.5 = -0.60	0.13 + 0.5 = -0.63	0.15 + 0.5 = -1.15	0.20 + 0.5 = -1.20	0.25 + 0.5 = -1.25	0.30 + 0.5 = -1.30	0.40 + 0.5 = -1.40	0.50 + 0.5 = -1.50	0.75 + 0.5 = -1.75	1.00 + 0.5 = -2.00	1.25 + 0.5 = -2.25
0.1	0.03 + 0.5 = 0.53	0.06 + 0.5 = -0.56	0.12 + 0.5 = -0.62	0.15 + 0.5 = -0.65	0.18 + 0.5 = -1.18	0.24 + 0.5 = -1.24	0.30 + 0.5 = -1.30	0.36 + 0.5 = -1.36	0.48 + 0.5 = -1.48	0.60 + 0.5 = -1.60	0.90 + 0.5 = -1.90	1.20 + 0.5 = -2.20	1.50 + 0.5 = -2.50
0.3	0.04 + 0.5 = 0.54	0.08 + 0.5 = -0.58	0.15 + 0.5 = -0.65	0.19 + 0.5 = -0.69	0.23 + 0.5 = -1.23	0.30 + 0.5 = -1.30	0.36 + 0.5 = -1.36	0.45 + 0.5 = -1.45	0.60 + 0.5 = -1.60	0.75 + 0.5 = -1.75	1.12 + 0.5 = -2.12	1.50 + 0.5 = -2.50	1.88 + 0.5 = -2.88
0.5	0.05 + 0.5 = 0.55	0.10 + 0.5 = -0.60	0.20 + 0.5 = -0.70	0.25 + 0.5 = -0.75	0.30 + 0.5 = -1.30	0.40 + 0.5 = -1.40	0.50 + 0.5 = -1.50	0.60 + 0.5 = -1.60	0.80 + 0.5 = -1.80	1.00 + 0.5 = -2.00	1.50 + 0.5 = -2.50	2.00 + 0.5 = -3.00	2.50 + 0.5 = -3.50
1.0	0.08 + 0.5 = 0.58	0.15 + 0.5 = -0.65	0.30 + 0.5 = -0.80	0.38 + 0.5 = -0.88	0.45 + 0.5 = -1.45	0.60 + 0.5 = -1.60	0.75 + 0.5 = -1.75	0.90 + 0.5 = -1.90	1.20 + 0.5 = -2.20	1.50 + 0.5 = -2.50	2.25 + 0.5 = -3.25	3.00 + 0.5 = -4.00	3.75 + 0.5 = -4.75
1.5	0.10 + 0.5 = 0.60	0.20 + 0.5 = -0.70	0.40 + 0.5 = -0.90	0.50 + 0.5 = -1.00	0.60 + 0.5 = -1.60	0.80 + 0.5 = -1.80	1.00 + 0.5 = -2.00	1.20 + 0.5 = -2.20	1.60 + 0.5 = -2.60	2.00 + 0.5 = -3.00	3.00 + 0.5 = -4.00	4.00 + 0.5 = -5.00	5.00 + 0.5 = -6.00
2.0	0.13 + 0.5 = 0.63	0.25 + 0.5 = -0.75	0.50 + 0.5 = -1.00	0.63 + 0.5 = -1.13	0.75 + 0.5 = -1.75	1.00 + 0.5 = -2.00	1.25 + 0.5 = -2.25	1.50 + 0.5 = -2.50	2.00 + 0.5 = -3.00	2.50 + 0.5 = -3.50	4.00 + 0.5 = -5.00	5.50 + 0.5 = -6.50	7.00 + 0.5 = -8.00
2.5	0.15 + 0.5 = 0.65	0.30 + 0.5 = -0.80	0.60 + 0.5 = -1.10	0.75 + 0.5 = -1.25	0.90 + 0.5 = -1.90	1.20 + 0.5 = -2.20	1.50 + 0.5 = -2.50	1.80 + 0.5 = -2.80	2.40 + 0.5 = -3.40	3.00 + 0.5 = -4.00	4.50 + 0.5 = -5.50	6.00 + 0.5 = -7.00	7.50 + 0.5 = -8.50
3.0	0.18 + 0.5 = 0.68	0.35 + 0.5 = -0.85	0.70 + 0.5 = -1.20	0.88 + 0.5 = -1.38	1.05 + 0.5 = -2.05	1.40 + 0.5 = -2.40	1.75 + 0.5 = -2.75	2.10 + 0.5 = -3.10	2.80 + 0.5 = -3.80	3.50 + 0.5 = -4.50	5.25 + 0.5 = -6.25	7.00 + 0.5 = -8.00	8.75 + 0.5 = -9.75
3.5	0.20 + 0.5 = 0.70	0.40 + 0.5 = -0.90	0.80 + 0.5 = -1.30	1.00 + 0.5 = -1.80	1.20 + 0.5 = -2.20	1.60 + 0.5 = -2.60	2.00 + 0.5 = -3.00	2.40 + 0.5 = -3.40	3.20 + 0.5 = -4.20	4.00 + 0.5 = -5.00	6.00 + 0.5 = -7.00	8.00 + 0.5 = -9.00	10.00 + 0.5 = -11.00
4.0	0.23 + 0.5 = 0.73	0.45 + 0.5 = -0.95	0.90 + 0.5 = -1.40	1.13 + 0.5 = -1.63	1.35 + 0.5 = -2.35	1.70 + 0.5 = -2.70	2.10 + 0.5 = -3.10	2.50 + 0.5 = -3.50	3.40 + 0.5 = -4.40	4.30 + 0.5 = -5.30	6.50 + 0.5 = -7.50	8.75 + 0.5 = -9.75	11.00 + 0.5 = -12.50
4.5	0.25 + 0.5 = 0.75	0.50 + 0.5 = -1.00	1.00 + 0.5 = -1.50	1.25 + 0.5 = -1.75	1.50 + 0.5 = -2.50	1.80 + 0.5 = -3.00	2.20 + 0.5 = -3.50	2.60 + 0.5 = -4.00	3.60 + 0.5 = -5.10	4.60 + 0.5 = -6.10	7.00 + 0.5 = -8.50	9.50 + 0.5 = -11.00	12.00 + 0.5 = -13.50
5.0	0.28 + 0.5 = 0.78	0.60 + 0.5 = -1.10	1.20 + 0.5 = -1.60	1.50 + 0.5 = -1.88	1.75 + 0.5 = -2.65	2.10 + 0.5 = -3.20	2.50 + 0.5 = -3.75	2.90 + 0.5 = -4.30	4.00 + 0.5 = -5.50	5.10 + 0.5 = -6.60	7.75 + 0.5 = -9.25	10.50 + 0.5 = -12.00	13.25 + 0.5 = -14.75
Flood Hazard Rating (HR)	Colour Code												
Less than 0.75	Very low hazard - Caution												
0.75 to 1.25	Danger for some – includes children, the elderly and the infirm												
1.25 to 2.0	Danger for most – includes the general public												
More than 2.0	Danger for all – includes the emergency services												

Figure 014: Excerpt from Table 4 of the Supplementary Note on Flood Hazard Ratings

4.2.6 The following factors serve to increase the lead time for flood warning and to further reduce the flood hazard:

- The tidal nature of flooding with elevated water levels likely subject to a degree of predictability and with maximum water levels anticipated to be restricted to the peak around the high tide, with flood water receding quickly in the period between high waters;
- Mechanism of flooding, with water entering the property via a low point (3.70m AOD) present on the north western boundary, where tidal water levels (3.74m AOD) would overtop only during the peak of high water, with minimal water levels (head) at the overtopping point (0.04m);
- Flood mitigation incorporated within the development design;
- Flood management measures proposed to alert personnel to the risks posed by flooding and the actions to be taken should flooding occur;
- The plant would be subject to remote operation, shut down and isolation procedures, and with no personnel present within the site who could be placed at risk;
- Presence of safe refuge within the northern section of the property which is indicated to be unaffected by flooding;
- Availability of safe access / egress which is achievable via Hermitage Park to the north; and
- The property benefits from flood warning which would alert site users to the potential for elevated water levels in the Solent / Hayling area, which may lead to flooding.

4.2.7 It is considered that with the outlined mitigation and management measures in place, the residual risks posed to the installation by tidal flooding can be reduced to an acceptable level.

4.3 Flood Mitigation and Management

- 4.3.1 The property is indicated to be unaffected by fluvial flooding for return period events up to and including 1000 years, and from tidal flooding for return period events up to and including 200 years, with that standard of protection indicated to be maintained throughout the anticipated development lifetime (2055).
- 4.3.2 The plot is indicated to be currently unaffected by extreme tidal flooding (1000 years), although minor flooding is seen during extreme tidal flood events when accounting for climate change (2055), with this limited to the upper end of the lifetime range.
- 4.3.3 Nevertheless, given the proximity to the tidal and fluvial floodplains and accounting for the residual flood hazard associated with extreme flooding, particularly when accounting for climate change predictions, it is recommended that the following flood resilience measures be incorporated within the development design. This is to future proof the development from flooding and to minimise any disruption caused in this event:
- Raising of all on-site controls, critical infrastructure and entry points for services (gas / electricity / water) by 300mm above the maximum 200 year + climate change tidal flood level (e.g. to 3.87m AOD) to minimise any disruption caused by residual flooding;
 - Raising of the crest level of the embankment surrounding the property to 4.34m AOD, placing it 600mm above the current tidal flood level and infill of the current low point within this embankment (NW boundary); and
 - Flood resistant and resilient construction techniques to be incorporated within the development design (particularly any elements which have not been raised). This to extend up to 600mm above surrounding ground level, to minimise water ingress in the event of flooding. This design should be suited to salt water environments.
- 4.3.4 The proposed flood embankment would not impact fluvial flows or floodplain storage since this embankment is outside of areas affected by fluvial flooding. Furthermore, the proposals represent an uplift to an existing flood bank which already prevents water flowing onto the property. Tidal flooding is governed by level and is not subject to impacts on floodplain storage arising from reduced floodplain storage volume. It is therefore considered that proposed flood mitigation measures would not detrimentally impact the flood risk to third party property.
- 4.3.5 The following flood management measures are proposed to further ameliorate those residual risks which cannot be borne out via design:
- Preparation of a Flood Management Plan outlining the procedures to be followed in the event of flooding;
 - Signing up to the EA flood warning system to alert personnel to the potential for flooding and allow safe evacuation and execution of the Flood Management Plan;
 - The plant will be subject to remote operation with no staff present who would be placed at risk; and
 - In the event of flooding the plant will be subject to remote shut down / isolation.

Safe Refuge and Access

- 4.3.6 The property is indicated to be currently defended from fluvial and tidal flooding for design return period events now and in the future. Inundation is indicated under a future (2055) extreme tidal flood event with maximum flood depths of 0.14m and a **Very Low** associated flood hazard.
- 4.3.7 Safe access is indicated to be achievable from the property. Where flooding is anticipated but has not yet occurred, personnel should evacuate north onto Hermitage Park then head south east towards the main roundabout with Brockhampton road which is elevated and unaffected by flooding and which forms part of the main arterial road network serving the area. A short section of Hermitage Park (60m) is indicated to be affected by tidal flooding however this is indicated to be minor with safe passage anticipated to be available for both pedestrians and vehicles. The pavements are likely to be less affected since these will be raised by c.150mm above the road level.
- 4.3.8 Safe refuge exists within the northern section of the property where elevated land (>3.74m AOD) exists. Where flooding has already occurred personnel should execute the Flood Management Plan, evacuate to the northern section of the property and await further instruction from the Environment Agency and emergency services.
- 4.3.9 The risks posed to site users will be minimised through remote operation, with staff highly unlikely to be present during day to day operations.

4.4 Summary of Flood Risk

- 4.4.1 In accordance with the requirements of the NPPF, all potential flood risks posed to / by the development have been assessed. The facility is concluded to be defended from fluvial and tidal flooding for design return period events, with this standard of protection likely to be maintained over time.
- 4.4.2 The property is also indicated to be unaffected by extreme flooding from existing fluvial and tidal flood events, with inundation predicted only for future tidal flooding, accounting for climate change to 2055.
- 4.4.3 Given the proximity to the tidal floodplain, flood mitigation measures are specified to reduce identified risks to an acceptable level accounting for both the development lifetime and flood risk vulnerability. It is also demonstrated that the proposals will not detrimentally impact flood risk elsewhere.
- 4.4.4 Flood management is proposed to alert site users to the risks posed by flooding and the actions to be taken should this occur. This includes consideration of flood warning and designation of points of safe refuge. Safe access / egress is achievable throughout all periods of flooding (design and extreme events), now and in the future.
- 4.4.5 The proposed operational measures, which include remote operation and shut down / isolation, further reduce the flood hazard to site users.
- 4.4.6 It is concluded that with the outlined flood mitigation and management measures in place, the identified residual flood risks to the site and its users can be reduced to an acceptable level through the development lifetime. It is also demonstrated that the proposals will not detrimentally impact flood risk elsewhere.
- 4.4.7 The proposals are therefore considered appropriate within the context of the Local Planning Policy documents and paragraph 173 of the NPPF:
- *Is the site at risk of flooding?*
- If yes and following the Sequential Test:*
- *Has the most vulnerable development been located in areas of lowest flood risk?*
 - *Is development appropriately flood resistant and resilient such that, in the event of a flood it could be quickly brought back into use without significant refurbishment?*
 - *Does the development incorporate sustainable drainage systems (where appropriate)?*
 - *Can any residual risk be safely managed?*
 - *Are safe access and escape routes available (where applicable)?*
- 4.4.8 Potential impacts to flood risk arising from surface water generated by the development are addressed in Section 5.0.

5.0 SURFACE WATER

5.1 Introduction

- 5.1.1 Proposals include the construction of a Gas Energy Generating Plant, access and associated infrastructure within a 0.32ha plot of land at Hermitage Park, Harts Farm Way, Havant, PO9 1FA.
- 5.1.2 The property comprises Brownfield land, the surface finishes of which are currently largely impervious. The plot is served by a formal surface water management network, including piped drainage and an existing discharge point to local watercourses. Site generated runoff currently drains to the land drain present on the western and northern boundaries which is understood to serve the wider Hermitage Park Industrial Estate. No on-site attenuation or discharge control measures are indicated to be present.
- 5.1.3 The NPPF and its PPG require that existing runoff rates be maintained, taking account of climate change and that, wherever possible, a degree of betterment is provided.
- 5.1.4 Whilst no overall change in impervious surface will arise from development proposals, climate change effects may lead to detrimental impacts on the rate and volume of runoff generated over time.
- 5.1.5 In accordance with the NPPF, new development must incorporate flood attenuation measures sized to accommodate flows from developed surfaces for return period pluvial flood events up to and including 100 years, taking account of climate change and with discharges restricted to existing rates. Water quality treatment is also required to mitigate potential detrimental impacts to downstream receptors, including groundwater and local watercourses.
- 5.1.6 Sustainable Drainage Systems (SuDS) must be incorporated within the design, wherever practicable.

5.2 Land Use

Land Use	Existing		Proposed	
	Area (m ²)	Runoff Coefficient	Area (m ²)	Runoff Coefficient
Soft Landscaping	0	0.40	575	0.35
Gravel Chippings	0	0.70	1,555	0.70
Impermeable (roads / hardstanding / built)	3,200	0.90	1,070	0.90
Total	3,200	0.90	3,200	0.70

Table 009: Summary of Land Use

5.3 SuDS Options for Surface Water Disposal

- 5.3.1 Desk based investigation indicates the presence of underlying undifferentiated Chalk Formations overlain by permeable soils, with infiltration potential. Elevated groundwater may locally impede infiltration, particularly during the winter months.
- 5.3.2 A land drainage channel is present on the western and northern boundaries into which a connection could be established for the disposal of site generated runoff. This appears to serve the wider industrial estate and to be laterally extensive, discharging into the Brockhampton Stream downstream.
- 5.3.3 The property is served by a formal surface water management network which includes piped drainage and a discharge point, although no flood attenuation or discharge control are indicated to be present. Site generated runoff currently discharges to the land drain present on the western and northern boundaries via a 600mm surface water drainage pipe present on the southern boundary.

- 5.3.4 It is therefore proposed to continue to discharge runoff via gravity to the land drain present on the western boundary via an existing connection, following upstream water quality treatment, attenuation and discharge control. Invert levels on this pipe are located at c.2.23m AOD compared with surrounding ground levels >3.71m AOD, with gravitational discharge indicated to be feasible.
- 5.3.5 The surface water attenuation measures have therefore been sized based on discharge to local land drainage networks at *modified greenfield* (reduced) rates. SuDS measures are proposed to maximise infiltration at source.
- 5.3.6 This conforms with the discharge hierarchy outlined within Section 3.2.3 of the SuDS Manual, as follows:

SuDS Discharge Hierarchy:

- Infiltration
- Discharge to surface waters
- Discharge to surface water sewer
- Discharge to combined sewer (Last Resort).

5.4 Greenfield Runoff Rates

- 5.4.1 Greenfield runoff rates have been estimated using the WinDes Micro drainage ICPSUDS function, with input data from the Flood Estimation Handbook web service and based on linear interpolation from a 50ha catchment, in accordance with SUDS manual guidance.
- 5.4.2 The application area comprises previously developed (Brownfield) land with existing hard landscaped and highly compacted surface finishes present. The soil factor within the ICPSUDS calculations has therefore been increased to 0.5 to provide a '*modified Greenfield*' runoff rate. This is in accordance with SuDS Manual guidance (Section 24.5, approach 2).
- 5.4.3 Table 010 summarises the results of this analysis. Full copies of these calculations are located at Appendix II: *Workings*.

Return Period (yrs.)	Runoff Rate (l/s/ha)	Runoff Rate (l/s)*
Q_{BAR}	9.392	3.005
30	19.292	6.173
100	24.892	7.965

Table 010: Greenfield Runoff Rates

Based on a 3,200m² u/s impervious area

5.5 Attenuation and Controlled Discharge

- 5.5.1 The WinDes Micro Drainage software package has been used to estimate the surface water attenuation requirements. Storm scenarios were run for both winter and summer profiles, for a range of durations (15-10,080 minutes), taking account of land use data, greenfield runoff rates and climate change, respectively. Copies of these calculations are contained within Appendix II and are summarised below.
- 5.5.2 The WinDes Micro Drainage package assumes all land surface to be impermeable. Therefore, where the runoff coefficient differs (e.g. gravel / stone chipping) the total contributing area has been multiplied by the runoff coefficient to establish an '*Effective Impermeable Area*' for assessment. Impermeable surfaces are accounted for at 100%.

Results

Return Period Rainfall Event (Yrs.)	Required Storage (m³) 25%CC
Q_{BAR} Urban	28
30	60
100	84

Table 011: Surface Water Attenuation Requirements *Based on a 2,159m² u/s effective impervious area

5.6 Drainage Layout

- 5.6.1 A maximum rainwater storage requirement of 84m³ has been estimated. This will be provided by a detention basin situated on the southern boundary and sized to accommodate runoff for return period rainfall events up to and including the 100 year storm, without surcharge and accounting for climate change at 25%.
- 5.6.2 The following design considerations have been assumed:
- Depth: 0.70m
 - Area (top of bank): 305m² (16.7m x 18.2m)
 - Area (base): 175m² (12.5m x 14.0m)
 - Freeboard: >300mm
 - Max. Water Level: <0.4m
 - Volume: 84m³
 - Invert level: 0.7m bgl / 2.839m AOD
- 5.6.3 A dual outfall arrangement is proposed, with a low level outlet to release at reduced rates under standard flow conditions and a high level offtake to allow discharge at higher rates under flood flows. This to maintain natural hydrological and ecological regimes downstream. Discharge from both outfalls will be controlled by a Hydrobrake / restricted orifice fitted with a flow control slot and / or flap valve to ensure existing (*modified greenfield*) runoff rates are maintained and to reduce the likelihood of blockage leading to surcharge.
- 5.6.4 This configuration will promote infiltration to ground, where practicable, with excess water discharged via gravity to local drainage channels at controlled (*modified greenfield*) rates.

5.7 Network Capacity

- 5.7.1 The detention facility is designed to be dry under normal conditions becoming operational only following intense rainfall or storm activity. Capacity is present to accommodate rainfall events up to and including the 100 year storm, accounting for climate change and without surcharge.
- 5.7.2 Safety factors are incorporated within the surface water storage calculations to allow for successive rainfall, fluctuations in flow and flood levels, climate change sensitivity and losses in efficiency associated with siltation.
- 5.7.3 Roof water (where present) will drain to the detention area via a piped network sized to convey runoff for rainfall events of up to 100 years, including climate change and without surcharge.
- 5.7.4 Runoff from hardstanding areas will be directed to the storage facility via perimeter filter drains with underlying permeable pipework. It is recommended that all filter drains / permeable pipes be lined / sleeved with a geotextile membrane to reduce sediment ingress / clogging, with a silt trap fitted at the downstream end to prevent sedimentation of the attenuation facility(ies).

- 5.7.5 The piped networks are sized to convey runoff for return period storms up to and including 100 years, accounting climate change, without surcharge, and with capacity present for short duration (high intensity) rainfall events, e.g. the 15 minute storm. Where practicable, the fall on the piped networks has been designed to promote self-cleansing. Minor ground reprofiling may be necessary to facilitate pipe protection and enable gravitational discharge into the storage area.
- 5.7.6 Surface contouring will be used to direct runoff into the piped networks serving the developed areas, with flood exceedance routes incorporated within the design to convey runoff to the attenuation facility via overland flow should pipe blockage / surcharge occur.
- 5.7.7 Intercept drainage will be placed at the property perimeter to direct runoff back into the on-site surface water management systems and to prevent the uncontrolled discharge of runoff to off-site areas.
- 5.7.8 It is recommended that the main surface water outfall be fitted with a non-return valve to prevent backflow where elevated water levels occur downstream.
- 5.7.9 Given the shallow depth to groundwater in this locale, it may be necessary to incorporate clay liners within the design of the detention basin. This should be undertaken where elevated groundwater is encountered during construction.

5.8 Water Quality

- 5.8.1 The surface water management system incorporates a number of SuDS elements which have been designed in accordance with the SuDS Manual (CIRIA report no. C753) to provide on-site water quality treatment. These measures account for the Pollution Hazard and Mitigation Indices outlined within Tables 26.2 and 26.3 of the SuDS Manual, respectively; with these summarised in Tables 012 and 013 of this report.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
General industrial (Energy Facility)	High	0.8	0.8	0.9

Table 012: Excerpt from CIRIA 753 Table 26.2 Pollution Hazard Indices for Different Land Use Classifications

- 5.8.2 Review of the SuDS Manual Table 26.2 indicates there to be no hazard classification which applies specifically to the nature of development proposed. However, as the proposals are industrial in nature a **High Hazard** has been assumed.

SuDS Mitigation Indices			
SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Filter Strip	0.40	0.40	0.50
Filter Drain	0.40	0.40	0.40
Permeable Paviours / Crushed Stone Surface	0.70	0.60	0.70
Detention Basin	0.50	0.50	0.60
Adjusted SuDS Mitigation Index ¹	1.20	1.15	1.35

¹ Applies where the Mitigation Index of individual SuDS component is insufficient to treat runoff in isolation and where 2 SuDS components (or more) are required in series.

Table 013: Excerpt from CIRIA 753 Table 26.3 SuDS Mitigation Indices for Discharges to Surface Waters

- 5.8.3 Review of the above data indicates the Mitigation Index for each of the SuDS Components (considered in isolation) to be below the identified Pollution Hazard Index for each of the potential contaminants present within runoff generated by **High Hazard** sites.

- 5.8.4 The guidance notes within CIRIA 753, P.568 state that where the Mitigation Index of an individual SuDS component is insufficient to perform water treatment in isolation, two SuDS components (or more) in series are required, where:

$$\text{Total SuDS Mitigation Index} = \text{Mitigation Index}_1 + 0.5 (\text{Mitigation Index}_2)$$

- 5.8.5 A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations. For example, the adjustment for TSS would be calculated as follows:

$$\text{Total SuDS Mitigation Index (TSS)} = 0.4 + (0.5 \times 0.4) + (0.5 \times 0.70) + (0.5 \times 0.5) = 1.20$$

- 5.8.6 The adjusted SuDS Mitigation Indices are presented in the bottom row of Table 013. Based on this adjusted data it is concluded that the proposed SuDS Mitigation measures outlined above and expanded on below, are sufficient to mitigate potential contaminants present within the runoff from the proposed facility in isolation, with no requirement for further water quality treatment.

- 5.8.7 Nevertheless, an oil separator could be installed where required. This would be sized in accordance with the manufacturer's specification for oil separators within an industrial setting and accounting for the upstream drainage area.

Water Quality Treatment

- 5.8.8 Based on the above analysis, the following water quality treatment measures will be interspersed throughout the development and will service the different built elements as follows:

- **Roof drainage (where present):** to pass to the attenuation facility via filter drains with no further treatment aside from silt traps located at the upstream end of all pipe runs to remove silts and sediments upstream of the SW storage area;
- **Potentially contaminated runoff from the plant, roads and hardstanding:** will discharge to the attenuation area via the following water quality treatment, designed in accordance with the requirements of the SuDS Manual section 4 (Table 4.3) and Section 26 (Tables 26.2 and 26.3):
 - **Filter Strips:** 0.5m - 1m wide grass / crushed stone strips present between the power facility / car parks / roads / filter drains to slow runoff and encourage sediment deposition;
 - **Filter Drains:** : Located throughout the facility and at the property perimeter and designed to convey runoff into the storage area(s) via an underlying permeable pipe. Storm cells and permeable pipework to be wrapped in membrane to prevent sediment ingress;
 - **Crushed Stone Surfaces:** Crushed stone surfaces interspersed throughout the facility will slow runoff and encourage sediment deposition upstream of the main storage area. Hydrocarbons present will be removed through adsorption, adhesion and microbial processes within the stone surfaces; and
 - **Detention Basin:** Reeds planting to reduce flows, encourage silt / sediment deposition and to further aid water quality polishing upstream of the outfall.

- 5.8.9 The inclusion of the above SuDS measures will encourage the settlement and retention of sediments, preventing blockage of the inlet(s) / outfall(s), the discharge of sediment laden water to local receiving waters and associated scour, and will ensure that only clean water is discharged, mitigating potential detrimental impacts on the quality of downstream receiving waters.

First Flush Areas

- 5.8.10 In line with best practise, first flush storage is required to accept the first 5mm of rainfall from impervious surfaces and infiltrate it into the surrounding topsoil. This to reduce off-site surface water discharges during minor rainfall events.
- 5.8.11 A total first flush storage requirement of 10.79m³ is calculated based on an effective impermeable area of 2,159m². It is anticipated that this would be easily accommodated within the on-site SuDS measures, which include permeable surfaces, filter drains and a detention basin, and which will promote the interception and infiltration of runoff at source, limiting off-site discharges under general / low flow conditions.

5.9 Management and Maintenance Responsibility

- 5.9.1 **Forsa Energy Gas Holdings Ltd.** will be responsible for ensuring ongoing management and maintenance of the surface water management systems serving the facility, either directly or via an appointed contractor. The responsibility for management and maintenance will pass to the lessee, where the facility is operated by a third party, and to the purchaser where the site is subject to sale.

Inspection and Maintenance Schedule

- 5.9.2 It is proposed that a programme of inspection and maintenance be executed for the surface water management systems by the facilities manager, or appointed drainage contractor. This should be undertaken in accordance with the schedule outlined below and following significant rainfall events and / or storm activity.
- 5.9.3 A photographic record of inspections should be undertaken to pick up long term changes that may not be apparent within a single inspection. Inspections should comply with all relevant Health and Safety legislation.
- 5.9.4 This maintenance schedule applies for the lifetime of the development.

Notes

- 5.9.5 Where silt removal is proposed, this should be undertaken in an environmentally sensitive manner. All waste arisings should be collected by an approved contractor and should be subject to appropriate treatment and disposal. The facilities manager should be contacted where pollution or blockage are identified.

Element	Frequency	Notes
Gulleys / Gulley Pots / Drainage grates	Quarterly / following storm activity	- Remove grill and check for debris / blockage. - Remove accumulated debris to prevent blockage of pipework. - Rod / jet where required. Silt traps to be cleansed before and after rodding to prevent silt bypassing the traps.
Manholes / Inspection Covers / pipework	Quarterly / following storm activity	- Visual inspection – remove cover, shine torch into manhole. - Check every orifice for blockage / siltation. - Pour water into each to verify through flow. - Remove debris /silt and rod / jet where required.
Silt Traps	Quarterly / following storm activity	- Visual inspection, removal of accumulated silt. - Where rodding of manholes is proposed silt traps should be cleansed before and after to prevent silt bypassing the traps.
Filter Strips	Quarterly / following storm activity	- Regular mowing and maintenance will be key to ensuring the continued efficiency of the filter strips. - Reseeding or turfing should be undertaken where bald patches or die back occur.
Filter Drains / Crushed Stone Surface	Quarterly / following storm activity	- Visual inspection for accumulated silt / vegetation (at surface). - Check for surface clogging / ponding. Remove vegetation / silt. - Remove siltation / blockage from the stone sub-base and / or underlying pipework serving the drainage blanket.
Attenuation Areas / Swales	Twice annually (Mar. / Sept.) / following storm activity	- Visual inspection for accumulated silt. Where significant siltation is seen, remedial works should be undertaken. - Visual inspection / removal of accumulated, debris, blockage.
Inlets / Outfalls	Monthly / following storm activity	- Visual inspection for accumulated debris or blockage, at both upstream and downstream faces. - Check every orifice / inlet / outlet / structure for blockage or siltation, pour water into each to verify through flow. - Remove any debris and rod where required.
Vegetation	Quarterly (ensure cutting / strimming is undertaken at least twice during peak growing seasons e.g. Mar. / Sept.)	- Regular grass cutting and maintenance of shrubs / trees will be key in reducing the presence of debris which could block the drainage network or cause eutrophication of water bodies. - Grass should be cut quarterly, with focus on the growing season (Mar. – Oct.) and leaves / debris cleared from landscaped areas. - During the winter shrubs and trees should be pruned to reduce accumulated vegetation within the site / surface water features. - All mowings / cuttings to be removed from vicinity of lagoons / swales to prevent eutrophication.
Oil Separator (where present)	In accordance with manufacturers' specification.	NA

Table 014: Drainage Inspection and Maintenance Schedule

5.10 Foul Arisings

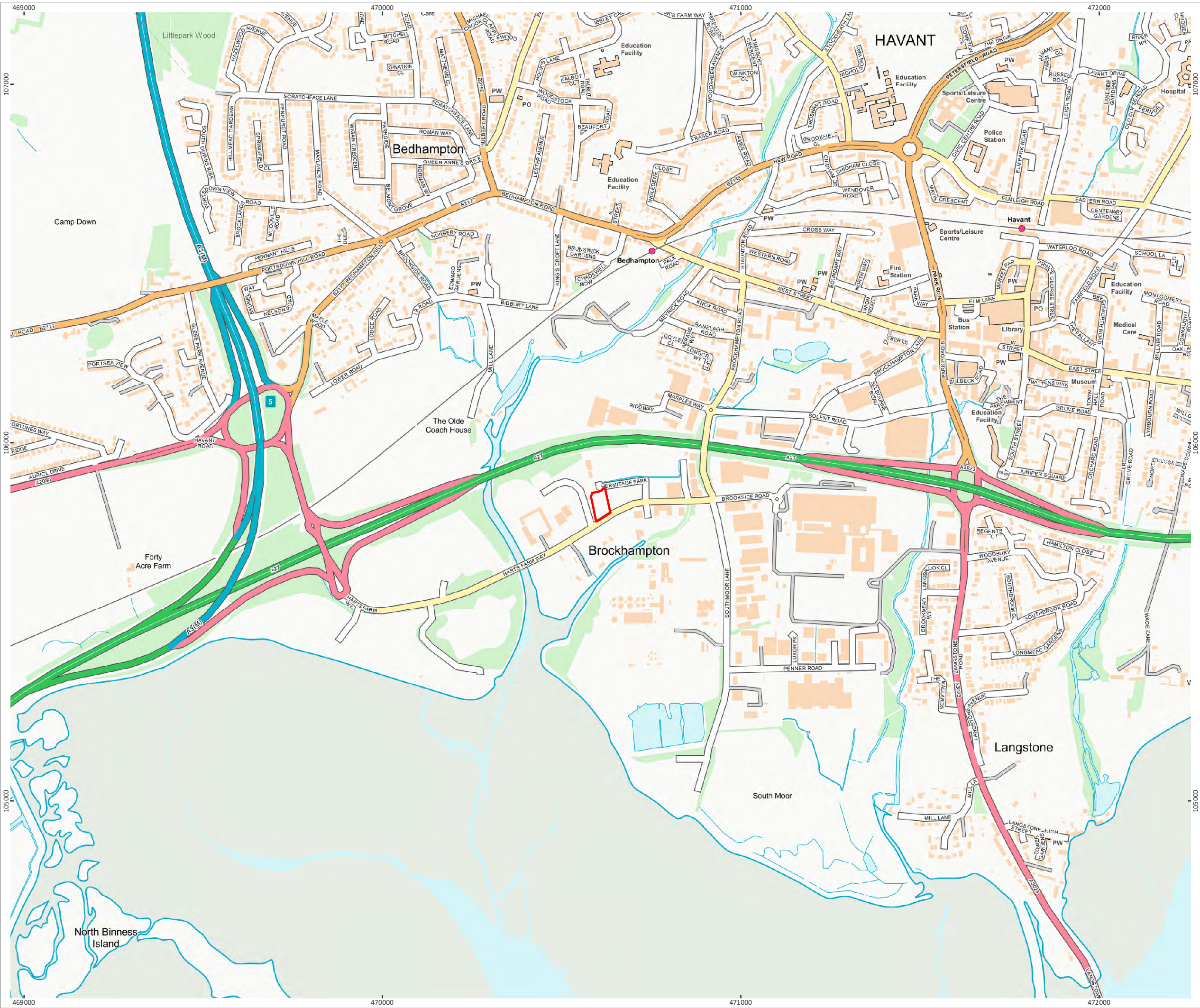
- 5.10.1 Where welfare / sanitary facilities are proposed, foul arisings would be discharged into the Southern Water sewerage network, the nearest manhole for which is understood to be located adjacent to the northern boundary on Hermitage Park. It is anticipated that minimal foul discharges would be generated by the facility owing to the remote nature of its operation.

6.0 CONCLUSIONS

- 6.0.1 Amber Planning Ltd. has been appointed by Forsa Energy Gas Holdings Ltd. to prepare a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment in support of an application for a Gas Energy Generating Plant with access and associated infrastructure within a 0.32ha plot of land at Hermitage Park, Harts Farm Way, Havant, PO9 1FA. The Havant area falls within the administrative remit of Havant Borough Council.
- 6.0.2 This Flood Risk Assessment has been completed in accordance with the guidance set out in the NPPF, Section 14, and its accompanying PPG for 'Essential Infrastructure' development within Flood Zone 3. The requirements of Local Planning Policy, including the SFRA, have also been accounted for within this study.
- 6.0.1 A scoping exercise has been completed which considers all potential flood risks, each of which have been fully assessed as part of this study, with the facility concluded to be unaffected by fluvial or tidal flooding for design return period events and with this standard of protection likely to be maintained throughout the anticipated development time.
- 6.0.2 The property is also indicated to be unaffected by extreme flooding from existing fluvial and tidal flood events, with inundation predicted only for future tidal flooding, accounting for climate change to 2055.
- 6.0.3 Given the proximity to the tidal floodplain, flood mitigation and management measures are specified to reduce identified risks to an acceptable level accounting for both the development lifetime and flood risk vulnerability. The latter includes consideration of flood warning, points of safe refuge and means of safe access / egress.
- 6.0.4 The proposed operational measures, which include remote operation and shut down / isolation, further reduce the flood hazard to site users.
- 6.0.5 It is concluded that with the outlined flood mitigation and management measures in place, the identified residual flood risks to the site and its users can be reduced to an acceptable level through the development lifetime, accounting for climate change predictions. It is also demonstrated that the proposals will not detrimentally impact flood risk elsewhere.
- 6.0.6 The surface water attenuation requirements for the facility have been assessed using the WinDes Micro Drainage software package for return period rainfall events up to and including 100 years, taking account of existing runoff rates, land use data and climate change consideration, with a total storage of 84m³ proposed. This will be provided by a detention basin situated on the southern boundary, with controlled gravitational discharge to local watercourses proposed at *modified greenfield* rates, via an existing connection.
- 6.0.7 Climate change allowance at 25% has been accounted for within these calculations based on a development lifetime of <30 years.
- 6.0.8 All drainage networks have been designed to account for industry best practice with regards system capacity, with safety factors accounted for within the surface water storage calculations to allow for successive rainfall events, fluctuations in flow and flood levels, climate change sensitivity and losses in efficiency associated with siltation.
- 6.0.9 It is duly presented that the provision of a formal surface water management system, which incorporates on-site attenuation and water quality treatment, will ensure that potential detrimental impacts to flood risk and water quality are suitably mitigated throughout the anticipated development lifetime, in accordance with the National Planning Policy Framework and its accompanying Planning Practice Guidance.
- 6.0.10 It is concluded that the provision of formal surface water management, which incorporates on site attenuation and controlled discharge, will result in an overall reduction in the rate and volume of surface water runoff generated by the property.
- 6.0.11 **Forsa Energy Gas Holdings Ltd.** or its successor, will be responsible for the ongoing management and maintenance of the surface water management system(s), throughout the development lifetime, either directly or via an appointed contractor. The responsibility for management and maintenance will pass to the lessee, where the site is operated by a third party, and to the purchaser where the site is subject to sale.
- 6.0.12 The mitigation solutions noted within this report are subject to agreement with the Environment Agency, Havant Borough Council and Hampshire County Council in their respective capacities within the Lead Local Flood Authority, and as part of the application process. It is duly presented that the proposed facility is appropriate within the context of the NPPF (Section 14) and Local Planning Policy.

7.0 CLOSURE

- 7.0.1 This report has been prepared by Amber Planning Ltd. with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with The Client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.
- 7.0.2 Reliance has been placed on factual and anecdotal data obtained from the sources identified. Amber Planning Ltd. cannot be held responsible for the scope of work, or any omissions, misrepresentation, errors or inaccuracies within the supplied information. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part in the event of delay between the writing of the report and its consideration by The Client, with particular regard to submission of a planning application.
- 7.0.3 This report is for the exclusive use of The Client; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Amber Planning.
- 7.0.4 Amber Planning disclaims any responsibility to The Client and others in respect of any matters outside the agreed scope of the work.



 Site Boundary



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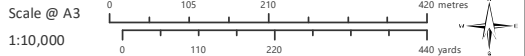
FORSA ENERGY

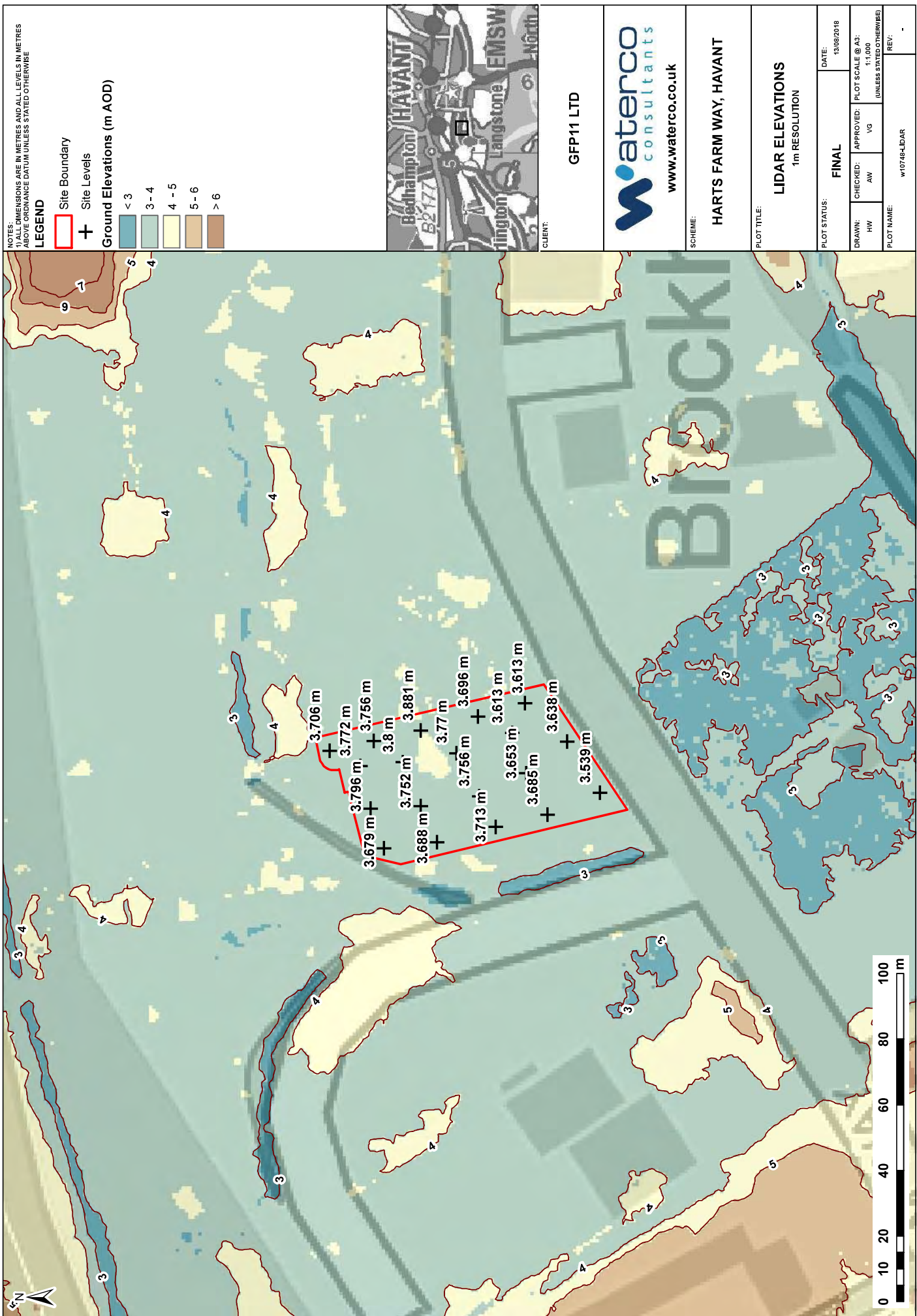
Site Location

**Gas Energy Generating Site
Harts Farm Way, Havant**

NOTE:

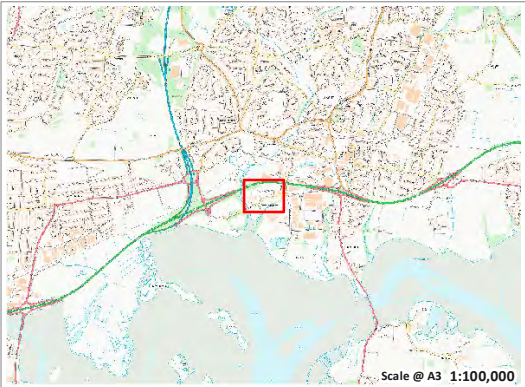
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Site Boundary



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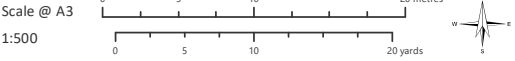
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Site Layout

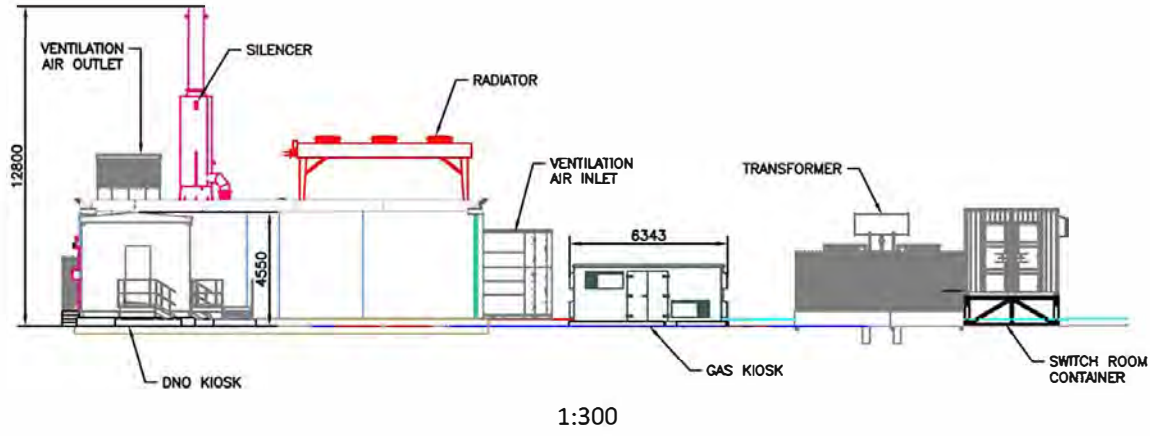
Gas Energy Generating Site
Harts Farm Way, Havant, Portsmouth

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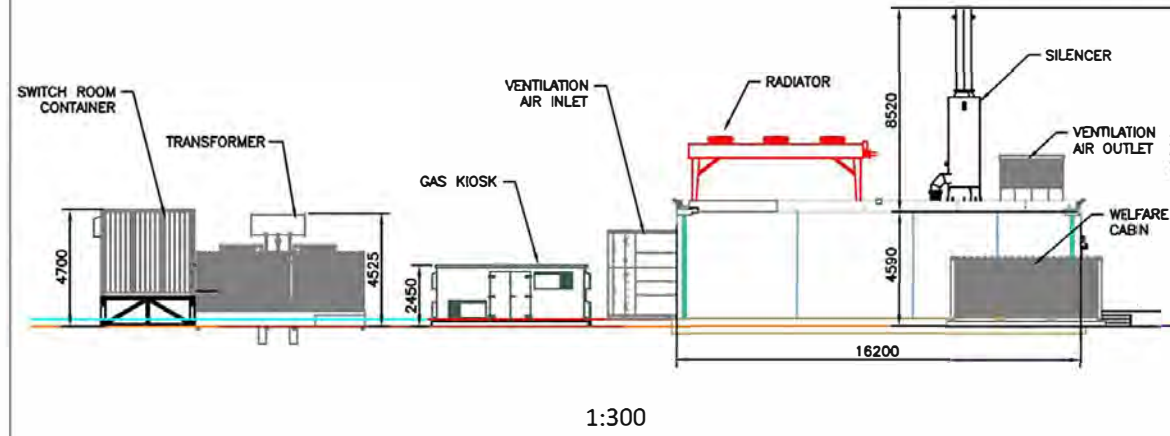
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Approved: RW



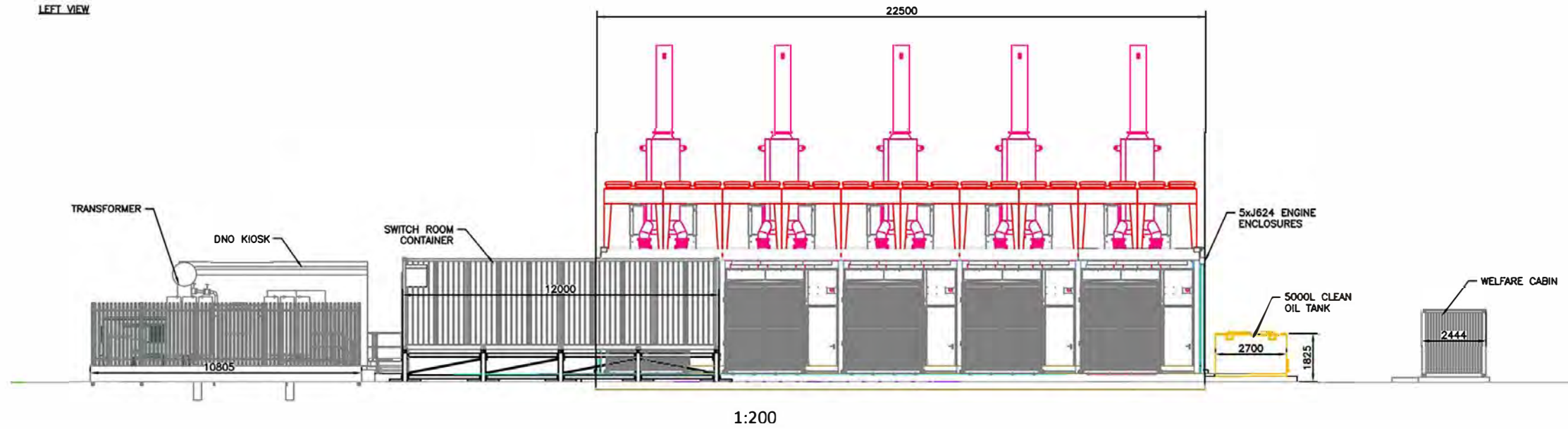
FRONT VIEW



BACK VIEW



LEFT VIEW



RIGHT VIEW



SCALE:

Scale @ A3
1:300 and 1:200

FIGURE REF: FE/017/594

DATE OF ISSUE: 18/01/24

PAPER SIZE A3
DRAWN: VM
ISSUED: RW

FIGURE

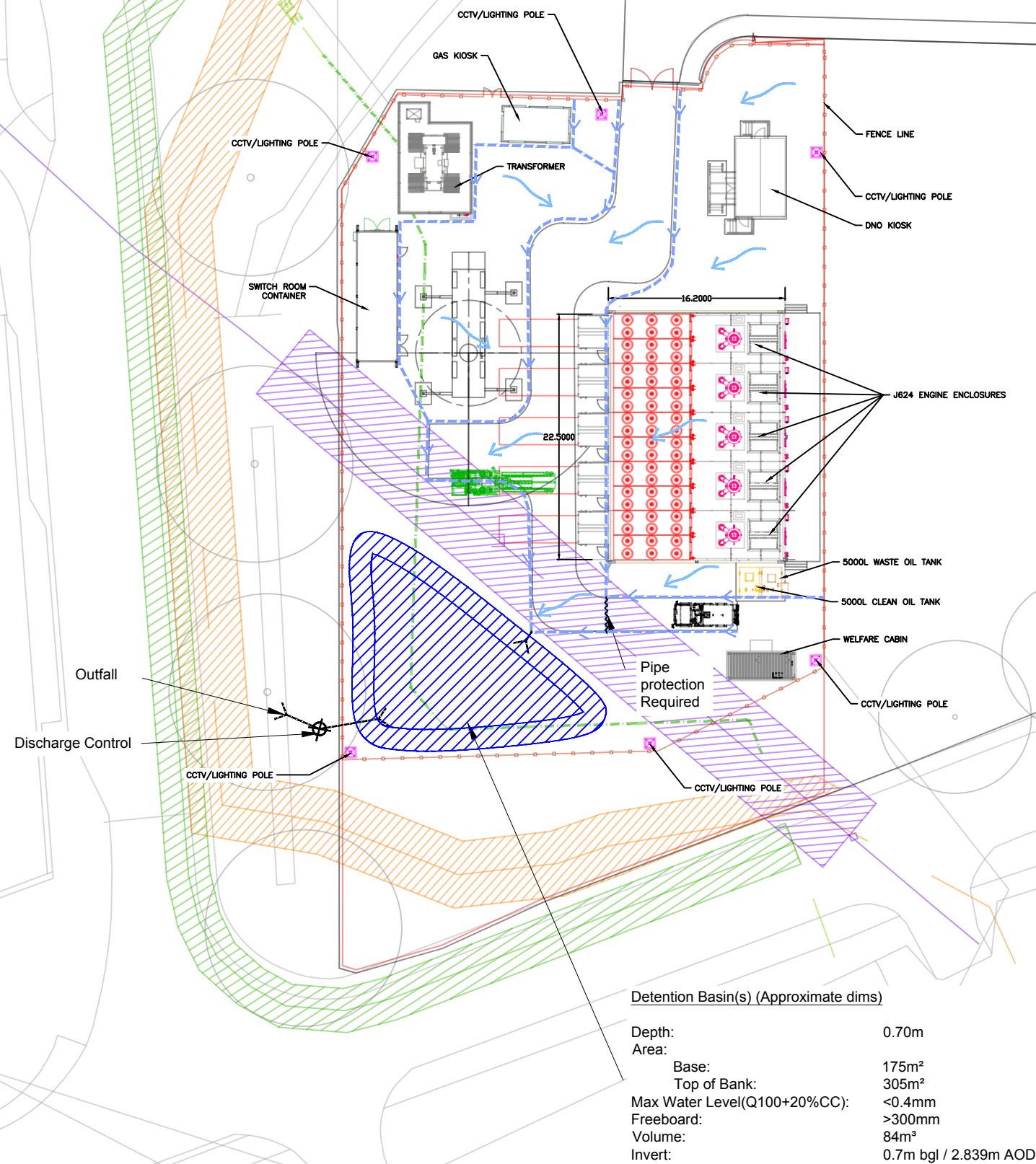
SITE ELEVATIONS



PROJECT

Gas Energy Generating Site
Hants Farm Way, Havant, Portsmouth





Detention Basin(s) (Approximate dims)	
Depth:	0.70m
Area:	
Base:	175m ²
Top of Bank:	305m ²
Max Water Level(Q100+20%CC):	<0.4m
Freeboard:	>300mm
Volume:	84m ³
Invert:	0.7m bgl / 2.839m AOD

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Do not scale off drawings
All dimensions to be checked on site.

KEY	
	Potential Location(s) for Detention Basin(s) / underground attenuation system
	Flow Exceedance Route
	Filter Drain & Permeable Pipework. Arrow Marks Flow Direction
	Outfall/Inlet
	Pipe Protection Required
	Manhole/Inspection Cover
	Discharge Control

NOTES:	
Storm Cells (or alternative underground system to accommodate equal volumes).	

SCALE	PROJECT NO.
1:500 @ A3	H8492
DATE	DRAWING NO.
Feb 2024	H8492-001
DRAWN	CHECKED
KR	KdS

PROJECT	Gas Energy Production Site - Harts Farm Way, Havant
DRAWING TITLE	Conceptual Drainage Layout
CLIENT	

SU 70NW/Bx101 A

PROJECT: PROPOSED INCINERATOR

LOCATION: Havant

GROUND LEVEL: 8.03 2.43m

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

DIA. OF CASING: 154 mm. to metres

mm. to metres

DATE DRILLED: 19/20/21/22/23.3.71.

TYPE OF BORING: Shell and Auger

Reduced Level Ft.	Depth	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits			
			Type	Depth			Percent			
							10	20	30	40
7.5	0.5		D	1.0	▼ GWL 0.0 TOPSOIL					
6.5	1.5		D	3.0	GRAVEL - graded to 2½" sandy in grey clay matrix					
3.5	4.5		D	5.0	CLAY - medium brown, sandy, stony..					
0.5	7.5		D	6.5						
0.0	0.0		D	8.0	CHALK - rubbly,, partly weathered with pieces of flint.					
			D	10.0						
			S(17)	12.0						
			D	14.0						
			D	15.0						
			S(12)	16.5						
			D	19.0						
			D	20.0						
			S(8)	22.0						
			D	24.0						
			D	25.0						
			S(6)	27.0						
			D	29.0						
			D	30.0						
			S(7)	32.0						
			D							

Ground water encountered at 8.0'
Quantity

SHEET 1 OF 3

Borehole No. 1

PROJECT: PROPOSED INCINERATOR.

LOCATION: Havant,

GROUND LEVEL: 8.26

INCLINATION: Vertical.

SCALE OF LOG: 1"=4'

5070NW/Box 101 B

7048 0583

DIA. OF CASING: 154 mm. to metres:

mm. to metres:

DATE DRILLED: 20/21/22.3.1971.

TYPE OF BORING: Shell and Auger,

Reduced Level	Depth ft.	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits			
			Type	Depth ft.			Percent			
7.8	0.5				G.W.L. 0.5'. TOPSOIL. GRAVEL - very dense, clayey.					
			D	2.0						
			S(84)							
4.3	4.0		D	4.0						
			S(53)	5.0	very dense.					
			D	6.0						
			D	8.0						
0.0	0.D.		D	10.0						
			D	12.0						
5.7	14.0		D	14.0		4.3m				
			S(19)	15.0	with weathered chalk, medium dense					
			D	16.0						
			D	18.0						
			S(10)	20.0		urick				
			D	22.0						
15.7	24.0		D	24.0						
			U4	25.0	CHALK - white, weathered.	Tx				
			D	26.0		Cv				
			D	28.0						
21.7	30.0		D	30.0						
			S(15)		rubbly, partly weathered.					
			D	32.0						

Ground water encountered at 0.5'
Quantity

SHEET 1, OF 2

Borehole No. 2

SU 70NW/Box 101 C

7-50 0580

PROJECT: PROPOSED INCINERATOR.

LOCATION: Havant.

GROUND LEVEL: 7.73

DIA. OF CASING: 154 mm. to metres

INCLINATION: Vertical.

mm. to metres

SCALE OF LOG: 1" = 4'

DATE DRILLED: 22/23.3.1971.

TYPE OF BORING: Shell and Auger.

Reduced Level	Depth ft.	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits			
			Type	Depth ft.			Percent			
7.2	0.5				▼ G.W.L. 0.5' TOPSOIL.					
			D	2.0	GRAVEL - very dense, graded to 3", sandy, clayey					
			S(50)							
			D	4.0						
2.7	5.0		S(60)	5.0						
1.7	6.0		D	6.0	with pieces of chalk.					
					clayey.					
0.0	0.0		D	8.0						
			D	10.0						
			S(31)							
4.3	12.0		D	12.0	with chalk.					
			D	14.0						
7.3	15.0		S(6)	15.0						
8.3	16.0		D	16.0	medium dense.					
					large.					
			D	18.0						
			D	20.0						
			S(26)							
			D	22.0						
16.3	24.0		D	24.0						
			S(8)	25.0	with pieces of chalk.					
18.3	26.0		D	26.0		7.9m				
					CHALK - white, stoney, weathered.					
			D	28.0						
			D	30.0		DNCK				
			U4							
			D	32.0						

Ground water encountered at 0.5'
Quantity

SHEET 1 OF 2.

Borehole No 3

PROJECT: PROPOSED INCINERATOR

LOCATION: Havant

GROUND LEVEL: 6.89

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

SU 70 NW/B0x101 D

7053 0577

DIA. OF CASING: 154 mm. to metres

mm. to metres

DATE DRILLED: 24/25.3.71.

TYPE OF BORING: Shell and Auger

Reduced Level Ft.	Depth	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits			
			Type	Depth			Percent			
							10	20	30	40
5.9	1.0				▼ GWL 0.5 TOPSOIL					
		x	D	2.0	GRAVEL - silty graded to 1½ ins. medium dense.					
		x	S(16)							
		x	D	4.0						
		x	S(30)	5.0						
		x	D	6.0						
0.0	0.0									
1.1	8.0	x	D	8.0	CHALK - weathered, white with large pieces flint, dense.	24m				
		x	D	10.0						
		x	S(38)							
		x	D	12.0						
		x	D	14.0						
7.1	15.0	x	S(5)	15.0		U7CK				
		x	D	16.0						
		x	D	18.0						
		x	D	20.0						
		x	U4							
		x	D	22.0						
		x	D	24.0						
		x	D	25.0						
		x	D	26.0						
		x	D	28.0						
		x	D	30.0						
		x	U4							
		x	D	32.0						

Ground water encountered at 0.5'
Quantity

SHEET 1 OF 2

Borehole No. 4

PROJECT: PROPOSED INCINERATOR

LOCATION: Havant

GROUND LEVEL: 8.47

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

SU70NW/Box 101 E

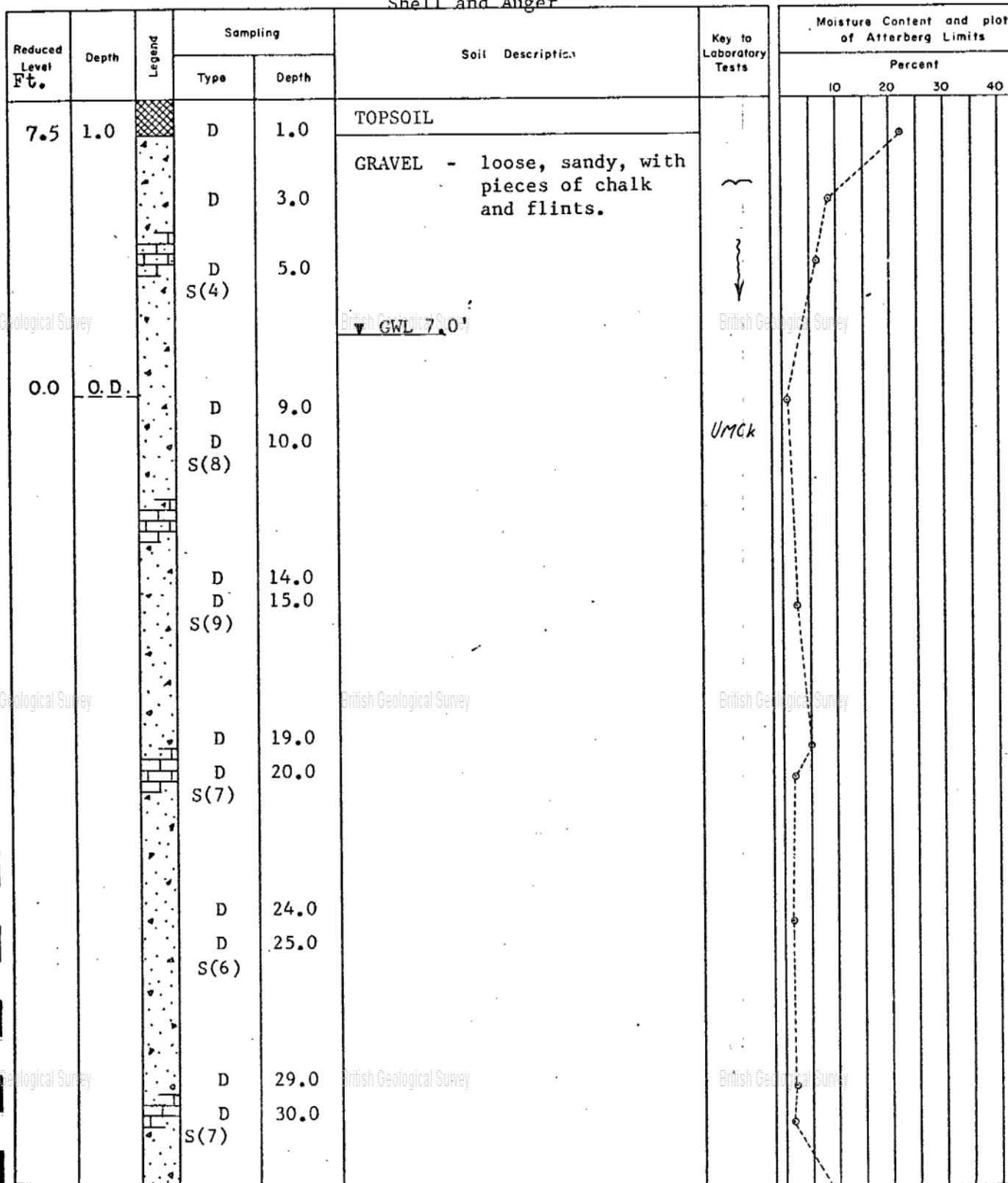
7049 0586

DIA. OF CASING: 154 mm. to metre

mm. to metre

DATE DRILLED: 24.3.71.

TYPE OF BORING: Shell and Auger



Ground water encountered at 7.0
Quantity

SHEET 1 OF 2

Borehole No. 5

PROJECT: PROPOSED INCINERATOR

LOCATION: Havant

GROUND LEVEL: 7.88

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

SU70NW/Box 101 F

7050 0584

DIA. OF CASING: 154 mm. to metres

mm. to metre

DATE DRILLED: 19/20.3.71.

TYPE OF BORING: Shell and Auger

Reduced Level Ft.	Depth	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits			
			Type	Depth			Percent			
7.4	0.5				▼ GWL 0.0'		10	20	30	40
					TOPSOIL					
			D	2.0	CLAY - soft brown with pieces of flint.					
			D	4.0						
1.88	6.0		D	6.0						
0.0	O.D.		D	8.0	silty, stoney					
2.1	10.0		D	10.0						
			C(19)		with traces of chalk.					
4.1	12.0		D	12.0						
			D	14.0	CHALK - white, weathered with pieces of flint.					
7.1	15.0		C(66)	15.0						
			D	16.0	FLINT - weathered very dense.					
10.1	18.0		D	18.0	in clay matrix					
12.1	20.0		D	20.0						
			S(18)		CHALK - crumbly, partly weathered.					
14.1	22.0		D	22.0						
			D	24.0	CLAY - brown, chalky, stoney.					
17.1	25.0		U4	25.0						
			D	26.0	CHALK - wet weathered with pieces of flint.					
			D	28.0						
21.1	29.0		S(9)	30.0	structureless, remoulded, containing lumps of intact chalk					
			D	32.0						

Ground water encountered at 0.0'
Quantity

SHEET 1 OF 2

Borehole No. 6A

PROJECT: PROPOSED INCINERATOR
LOCATION: Havant

GROUND LEVEL: 7.39

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

SU70NW/Box 101 G

7053 0581

DIA. OF CASING: 154 mm. to metres

mm. to metres

DATE DRILLED: 23/24.3.71.

TYPE OF BORING: Shell and Auger

Reduced Level Ft.	Depth	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits				
			Type	Depth			Percent				
							10	20	30	40	
6.9	0.5				▼ GWL 0.5' TOPSOIL						
			D	2.0	FLINT - Weathered gravel graded to 5ins in grey clay matrix, very stiff.						
			D	4.0							
			S(16)	5.0							
			D	6.0							
0.0	0.0										
			D	8.0							
1.6	9.0		D	10.0	CLAY - Soft, grey, chalky, with flint pebbles.						
			D	12.0							
6.6	14.0		D	14.0	FLINT - weathered gravel to 3ins.						
			D	16.0							
10.6	18.0		D	18.0	Chalky.						
			D	20.0							
			S(21)	22.0							
			D	24.0							
17.6	25.0		D	25.0	Chalky, clayey.						
18.6	26.0		D	26.0							
			D	28.0	CHALK - White weathered with pieces of flint.	U4					
			D	30.0							
			U4								
			D	32.0							

Ground water encountered at 0.5'
Quantity

SHEET 1 OF 2

Borehole No. 8

PROJECT: PROPOSED INCINERATOR
LOCATION: Havant

GROUND LEVEL: 7.85

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

SU 70NW/BOX 101 H

7049 0585

DIA. OF CASING: 154 mm. to metre
mm. to metre

DATE DRILLED: 17/18.3.71.

TYPE OF BORING: Shell and Auger

Reduced Level Ft.	Depth	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits
			Type	Depth			
7.4	0.5				TOPSOIL		
			D		CLAY		
			U4	2.0	▼CWL 2.0' Soft, brown grey, stony.		
4.4	3.5		D	4.0			
3.9	4.0				GRAVEL - in clay matrix with chalk	1.5m	
2.9	5.0		U4	5.0			
			D	6.0	CHALK - hard and brittle with pieces of flint.		
0.0	O.D.		D	8.0			
			S(21)	10.0			
			D	12.0			
			D	14.0			
			S(21)	15.0		Umck	
10.2	18.0		D	18.0			
			D		CLAY - very stiff brown with pieces of chalk.		
			S(23)	20.0			
			D	22.0			
16.2	24.0		D	24.0			
			S(25)	25.0	CHALK - white, blocky; medium-hard, stony.		
			D	26.0			
			D	28.0			
			D	30.0			
			U4			Tx Cv	
			D	32.0			

Ground water encountered at 3.0
Quantity

SHEET 1 OF 2

Borehole No. 9A

PROJECT: PROPOSED INCINERATOR

LOCATION: Havant

GROUND LEVEL: 7.58

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

5070NW/Box 101 I

7059 0580

DIA. OF CASING: 154 mm. to metr

mm. to metr

DATE DRILLED: 25.3.71

TYPE OF BORING: Shell and Auger

Reduced Level Ft.	Depth	Legend	Sampling		Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits			
			Type	Depth			Percent			
							10	20	30	40
6.6	1.0		D	1.5	TOPSOIL					
			D	3.0	in soft GRAVEL - brown clay matrix.	0.8				
			D	5.0	CHALK - rubbly, white partly weathered with pieces of flint					
0.0	O.D.		D	9.0						
2.4	10.0		D	10.0						
			S(8)		with pieces of flint, weathered, structureless, remoulded.					
			D	14.0						
7.4	15.0		S(6)	15.0		UMCK				
			D	16.0						
					with pieces of flint, extremely soft structureless.					
11.4	19.0		D	19.0						
			D	20.0						
			S(9)		with pieces of flint					
			D	21.5						
			D	24.0						
			U4	25.0						
			D	26.5	Structureless, remoulded containing lumps of intact chalk.	Tx				
			D	28.0						
			D	30.0						
			S(9)							

Ground water encountered at 2.0'
Quantity

SHEET 1 OF 2

Borehole No. 10

BOREHOLE RECORD

CONTRACT HavantDATE STARTED 13/9 FINISHED 13/9/87BOREHOLE No. 04OPERATOR D SmithELEVANCE DATUM LEVEL 11.6TYPE OF PENETRATION TEST —TYPE OF BORING Shallow AugerWEIGHT — DROP —DIAMETER OF BORING 6"STANDING WATER LEVEL 6.50"

REMARKS

Depth Feet	O.D. Level	Type & No. of Sample	Boring Details			Legend	Description of Material and Observations
			Penetration	Lining	Water		
		D					Topsoil & flint material
		D					Firm brown clay
5		D					Firm brown sandy clay & chalk inserts
10		D					Chalk & flint. debris
15		D					
20							
			Borehole terminated				

BE

UMCK

K.T.V.
19/10/83

STRUCTURAL SOILS LTD.

SU 70NW/98

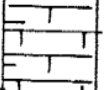
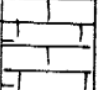
7061 0589

SHEET No. 15 OF 17

CONTRACT No. 4195

BOREHOLE RECORD

CONTRACT Havant DATE STARTED 4/9/67 FINISHED 4/9/67
BOREHOLE No. 85 OPERATOR D. Smith
ORDNANCE DATUM LEVEL 10.2 TYPE OF PENETRATION TEST SPT
TYPE OF BORING Shell & Auger WEIGHT 140 lbs DROP 25"
DIAMETER OF BORING 6" STANDING WATER LEVEL 2.6"
REMARKS

Depth Feet	O.D. Level	Type & No. of Sample	Boring Details			Legend	Description of Material and Observations
			Penetration	Lining	Water		
		D					Topsoil & flint
5		D					Chalk & flint debris
10		D					
15		D					
			Borehole terminated				RTV. 19.10.83

50 70 NW/99

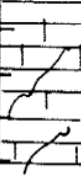
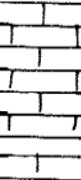
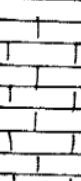
7068 0582

SHEET NO. 10 OF 11

CONTRACT No. 4195

BOREHOLE RECORD

CONTRACT Havant DATE STARTED 14/9 FINISHED 14/9/67
BOREHOLE No. 86 OPERATOR D. Smith
ORDNANCE DATUM LEVEL 11.8 TYPE OF PENETRATION TEST SPT
TYPE OF BORING Shell & Auger WEIGHT 140 lbs DROP 256
DIAMETER OF BORING 6" STANDING WATER LEVEL NIL
REMARKS

Depth Feet	O.D. Level	Type & No. of Sample	Boring Details			Legend	Description of Material and Observations
			Penetration	Lining	Water		
5		D					Medium shingle & flint
10		D					Chalk & flint
15		D					
			Borehole terminated				

m

1.5m

UMCK

6.0m

R.J.W.

19.10.83

Amber Planning Flood Risk & Hydrology		Page 1																								
46 Ash Lane Wells Somerset BA5 2LS																										
Date 07/03/2023 13:34 File 230307-H8492-win...	Designed by kirsten.d... Checked by																									
Micro Drainage Source Control W.12.6																										
<u>ICP SUDS Mean Annual Flood</u> Input <table> <tr> <td>Return Period (years)</td> <td>100</td> <td>Soil</td> <td>0.500</td> </tr> <tr> <td>Area (ha)</td> <td>50.000</td> <td>Urban</td> <td>0.241</td> </tr> <tr> <td>SAAR (mm)</td> <td>823</td> <td>Region Number</td> <td>Region 7</td> </tr> </table> Results l/s <table> <tr> <td>QBAR Rural</td> <td>333.6</td> </tr> <tr> <td>QBAR Urban</td> <td>469.6</td> </tr> <tr> <td>Q100 years</td> <td>1244.6</td> </tr> <tr> <td>Q1 year</td> <td>399.1</td> </tr> <tr> <td>Q30 years</td> <td>964.6</td> </tr> <tr> <td>Q100 years</td> <td>1244.6</td> </tr> </table>			Return Period (years)	100	Soil	0.500	Area (ha)	50.000	Urban	0.241	SAAR (mm)	823	Region Number	Region 7	QBAR Rural	333.6	QBAR Urban	469.6	Q100 years	1244.6	Q1 year	399.1	Q30 years	964.6	Q100 years	1244.6
Return Period (years)	100	Soil	0.500																							
Area (ha)	50.000	Urban	0.241																							
SAAR (mm)	823	Region Number	Region 7																							
QBAR Rural	333.6																									
QBAR Urban	469.6																									
Q100 years	1244.6																									
Q1 year	399.1																									
Q30 years	964.6																									
Q100 years	1244.6																									
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46 Ash Lane Wells Somerset BA5 2LS		FORSA Energy Harts Farm Way Havant					
Date Jan.24 File 240126-H8492-win...		Designed by K de Savary Checked by					
Micro Drainage		Source Control W.12.6					
Summary of Results for 2 year Return Period (+25%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.063	0.063	1.5	0.0	1.5	11.4	O K
30 min Summer	0.081	0.081	2.0	0.0	2.0	14.8	O K
60 min Summer	0.100	0.100	2.4	0.0	2.4	18.5	O K
120 min Summer	0.119	0.119	2.7	0.0	2.7	22.1	O K
180 min Summer	0.129	0.129	2.8	0.0	2.8	24.2	O K
240 min Summer	0.136	0.136	2.9	0.0	2.9	25.4	O K
360 min Summer	0.142	0.142	2.9	0.0	2.9	26.7	O K
480 min Summer	0.143	0.143	2.9	0.0	2.9	27.0	O K
600 min Summer	0.143	0.143	2.9	0.0	2.9	26.8	O K
720 min Summer	0.141	0.141	2.9	0.0	2.9	26.4	O K
960 min Summer	0.128	0.128	2.8	0.0	2.8	24.0	O K
1440 min Summer	0.109	0.109	2.6	0.0	2.6	20.2	O K
2160 min Summer	0.091	0.091	2.2	0.0	2.2	16.7	O K
2880 min Summer	0.079	0.079	1.9	0.0	1.9	14.5	O K
4320 min Summer	0.067	0.067	1.6	0.0	1.6	12.1	O K
5760 min Summer	0.059	0.059	1.4	0.0	1.4	10.7	O K
7200 min Summer	0.054	0.054	1.2	0.0	1.2	9.7	O K
8640 min Summer	0.050	0.050	1.1	0.0	1.1	9.0	O K
10080 min Summer	0.047	0.047	1.0	0.0	1.0	8.4	O K
15 min Winter	0.070	0.070	1.7	0.0	1.7	12.7	O K
30 min Winter	0.090	0.090	2.2	0.0	2.2	16.5	O K
60 min Winter	0.112	0.112	2.6	0.0	2.6	20.8	O K
120 min Winter	0.132	0.132	2.8	0.0	2.8	24.7	O K
Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)				
15 min Summer	31.214	0.0	30				
30 min Summer	21.156	0.0	41				
60 min Summer	14.340	0.0	62				
120 min Summer	9.719	0.0	98				
180 min Summer	7.741	0.0	132				
240 min Summer	6.587	0.0	166				
360 min Summer	5.247	0.0	236				
480 min Summer	4.465	0.0	302				
600 min Summer	3.939	0.0	368				
720 min Summer	3.556	0.0	434				
960 min Summer	2.891	0.0	558				
1440 min Summer	2.159	0.0	798				
2160 min Summer	1.612	0.0	1160				
2880 min Summer	1.311	0.0	1516				
4320 min Summer	1.009	0.0	2248				
5760 min Summer	0.838	0.0	2952				
7200 min Summer	0.726	0.0	3680				
8640 min Summer	0.645	0.0	4416				
10080 min Summer	0.584	0.0	5144				
15 min Winter	31.214	0.0	31				
30 min Winter	21.156	0.0	41				
60 min Winter	14.340	0.0	64				
120 min Winter	9.719	0.0	104				
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Amber Planning Flood Risk & Hydrology		Page 3																																																								
46 Ash Lane Wells Somerset BA5 2LS	FORSA Energy Harts Farm Way Havant																																																									
Date Jan.24 File 240126-H8492-win...	Designed by K de Savary Checked by																																																									
Micro Drainage Source Control W.12.6																																																										
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Date Jan.24 File 240126-H8492-win...	Designed by K de Savary Checked by	
Micro Drainage	Source Control W.12.6	

Model Details

Storage is Online Cover Level (m) 0.700

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	0.700	305.0

Hydro-Brake® Outflow Control

Design Head (m) 0.150 Hydro-Brake® Type Md5 SW Only Invert Level (m) 0.000
Design Flow (l/s) 3.0 Diameter (mm) 90

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	5.3	3.000	8.4	7.000	12.9
0.200	3.0	1.400	5.8	3.500	9.1	7.500	13.4
0.300	3.0	1.600	6.2	4.000	9.7	8.000	13.8
0.400	3.2	1.800	6.5	4.500	10.3	8.500	14.2
0.500	3.5	2.000	6.9	5.000	10.9	9.000	14.6
0.600	3.8	2.200	7.2	5.500	11.4	9.500	15.0
0.800	4.4	2.400	7.6	6.000	11.9		
1.000	4.9	2.600	7.9	6.500	12.4		

Orifice Overflow Control

Diameter (m) 0.073 Discharge Coefficient 0.600 Invert Level (m) 0.174

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46 Ash Lane Wells Somerset BA5 2LS		FORSA Energy Harts Farm Way Havant					
Date Jan.24 File 240126-H8492-win...		Designed by K de Savary Checked by					
Micro Drainage		Source Control W.12.6					
Summary of Results for 30 year Return Period (+25%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.155	0.155	3.0	0.0	3.0	29.3	O K
30 min Summer	0.191	0.191	3.1	0.1	3.2	36.8	O K
60 min Summer	0.227	0.227	3.1	1.0	4.1	44.6	O K
120 min Summer	0.254	0.254	3.1	2.0	5.0	50.4	O K
180 min Summer	0.266	0.266	3.1	2.4	5.4	53.1	O K
240 min Summer	0.272	0.272	3.1	2.7	5.7	54.6	O K
360 min Summer	0.277	0.277	3.1	2.8	5.8	55.5	O K
480 min Summer	0.276	0.276	3.1	2.8	5.8	55.3	O K
600 min Summer	0.272	0.272	3.1	2.7	5.7	54.6	O K
720 min Summer	0.268	0.268	3.1	2.5	5.5	53.6	O K
960 min Summer	0.250	0.250	3.1	1.8	4.8	49.6	O K
1440 min Summer	0.220	0.220	3.1	0.8	3.9	42.9	O K
2160 min Summer	0.178	0.178	3.0	0.0	3.1	34.2	O K
2880 min Summer	0.142	0.142	2.9	0.0	2.9	26.7	O K
4320 min Summer	0.107	0.107	2.6	0.0	2.6	19.8	O K
5760 min Summer	0.089	0.089	2.2	0.0	2.2	16.4	O K
7200 min Summer	0.079	0.079	1.9	0.0	1.9	14.3	O K
8640 min Summer	0.071	0.071	1.7	0.0	1.7	12.9	O K
10080 min Summer	0.065	0.065	1.6	0.0	1.6	11.8	O K
15 min Winter	0.173	0.173	3.0	0.0	3.0	33.0	O K
30 min Winter	0.213	0.213	3.1	0.6	3.7	41.4	O K
60 min Winter	0.251	0.251	3.1	1.9	4.9	49.9	O K
120 min Winter	0.279	0.279	3.1	2.9	5.9	56.0	O K
Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)				
15 min Summer	80.103	0.0	31				
30 min Summer	51.434	0.1	43				
60 min Summer	33.025	2.4	66				
120 min Summer	21.205	7.8	102				
180 min Summer	16.364	11.9	134				
240 min Summer	13.616	14.7	168				
360 min Summer	10.507	17.8	236				
480 min Summer	8.743	19.0	302				
600 min Summer	7.581	19.2	368				
720 min Summer	6.747	19.1	434				
960 min Summer	5.363	14.4	566				
1440 min Summer	3.880	6.3	828				
2160 min Summer	2.807	0.0	1216				
2880 min Summer	2.231	0.0	1564				
4320 min Summer	1.664	0.0	2260				
5760 min Summer	1.352	0.0	2960				
7200 min Summer	1.150	0.0	3680				
8640 min Summer	1.008	0.0	4416				
10080 min Summer	0.902	0.0	5144				
15 min Winter	80.103	0.0	31				
30 min Winter	51.434	0.8	43				
60 min Winter	33.025	5.1	66				
120 min Winter	21.205	12.5	104				

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Micro Drainage		Source Control W.12.6

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.375	Cv (Winter)	0.840
Return Period (years)	30	E (1km)	0.310	Shortest Storm (mins)	15
Site Location		F (1km)	2.225	Longest Storm (mins)	10080
C (1km)	-0.029	Summer Storms	Yes	Climate Change %	+25
D1 (1km)	0.459	Winter Storms	Yes		
D2 (1km)	0.300	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 0.216

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.043	4-8	0.043	8-12	0.043	12-16	0.043	16-20	0.044

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46 Ash Lane Wells Somerset BA5 2LS	FORSA Energy Harts Farm Way Havant	
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Micro Drainage	Source Control W.12.6	

Model Details

Storage is Online Cover Level (m) 0.700

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	0.700	305.0

Hydro-Brake® Outflow Control

Design Head (m) 0.150 Hydro-Brake® Type Md5 SW Only Invert Level (m) 0.000
Design Flow (l/s) 3.0 Diameter (mm) 90

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	5.3	3.000	8.4	7.000	12.9
0.200	3.0	1.400	5.8	3.500	9.1	7.500	13.4
0.300	3.0	1.600	6.2	4.000	9.7	8.000	13.8
0.400	3.2	1.800	6.5	4.500	10.3	8.500	14.2
0.500	3.5	2.000	6.9	5.000	10.9	9.000	14.6
0.600	3.8	2.200	7.2	5.500	11.4	9.500	15.0
0.800	4.4	2.400	7.6	6.000	11.9		
1.000	4.9	2.600	7.9	6.500	12.4		

Orifice Overflow Control

Diameter (m) 0.073 Discharge Coefficient 0.600 Invert Level (m) 0.174

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46 Ash Lane Wells Somerset BA5 2LS		FORSA Energy Harts Farm Way Havant					
Date Jan.24 File 240126-H8492-win...		Designed by K de Savary Checked by					
Micro Drainage		Source Control W.12.6					
<u>Summary of Results for 100 year Return Period (+25%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.231	0.231	3.1	1.1	4.2	45.4	O K
30 min Summer	0.274	0.274	3.1	2.7	5.7	54.9	O K
60 min Summer	0.315	0.315	3.1	3.6	6.6	64.3	O K
120 min Summer	0.344	0.344	3.1	4.1	7.1	71.2	O K
180 min Summer	0.357	0.357	3.1	4.3	7.4	74.3	O K
240 min Summer	0.363	0.363	3.1	4.3	7.5	75.8	O K
360 min Summer	0.365	0.365	3.1	4.4	7.5	76.4	O K
480 min Summer	0.361	0.361	3.1	4.3	7.4	75.3	O K
600 min Summer	0.354	0.354	3.1	4.2	7.3	73.5	O K
720 min Summer	0.345	0.345	3.1	4.1	7.2	71.5	O K
960 min Summer	0.315	0.315	3.1	3.6	6.6	64.3	O K
1440 min Summer	0.273	0.273	3.1	2.7	5.7	54.6	O K
2160 min Summer	0.234	0.234	3.1	1.2	4.3	46.1	O K
2880 min Summer	0.203	0.203	3.1	0.3	3.4	39.3	O K
4320 min Summer	0.145	0.145	2.9	0.0	2.9	27.3	O K
5760 min Summer	0.113	0.113	2.6	0.0	2.6	21.0	O K
7200 min Summer	0.096	0.096	2.3	0.0	2.3	17.6	O K
8640 min Summer	0.085	0.085	2.1	0.0	2.1	15.5	O K
10080 min Summer	0.077	0.077	1.9	0.0	1.9	14.0	O K
15 min Winter	0.256	0.256	3.1	2.0	5.0	50.8	O K
30 min Winter	0.303	0.303	3.1	3.4	6.4	61.5	O K
60 min Winter	0.349	0.349	3.1	4.1	7.2	72.3	O K
120 min Winter	0.380	0.380	3.2	4.6	7.7	80.0	O K
Storm Event			Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)		
15 min Summer			122.623	1.9	31		
30 min Summer			76.834	7.2	42		
60 min Summer			48.144	15.4	64		
120 min Summer			30.166	25.5	102		
180 min Summer			22.949	32.1	136		
240 min Summer			18.902	36.8	170		
360 min Summer			14.380	43.1	238		
480 min Summer			11.844	46.2	304		
600 min Summer			10.189	47.2	370		
720 min Summer			9.010	47.2	436		
960 min Summer			7.089	40.9	562		
1440 min Summer			5.057	29.2	810		
2160 min Summer			3.607	13.9	1196		
2880 min Summer			2.838	3.0	1592		
4320 min Summer			2.087	0.0	2300		
5760 min Summer			1.678	0.0	3000		
7200 min Summer			1.416	0.0	3688		
8640 min Summer			1.233	0.0	4416		
10080 min Summer			1.097	0.0	5144		
15 min Winter			122.623	4.2	31		
30 min Winter			76.834	11.3	42		
60 min Winter			48.144	20.9	66		
120 min Winter			30.166	32.6	108		
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Micro Drainage		Source Control W.12.6

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.375	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.310	Shortest Storm (mins)	15
Site Location		F (1km)	2.225	Longest Storm (mins)	10080
C (1km)	-0.029	Summer Storms	Yes	Climate Change %	+25
D1 (1km)	0.459	Winter Storms	Yes		
D2 (1km)	0.300	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 0.216

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.043	4-8	0.043	8-12	0.043	12-16	0.043	16-20	0.044

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Micro Drainage	Source Control W.12.6	

Model Details

Storage is Online Cover Level (m) 0.700

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	0.700	305.0

Hydro-Brake® Outflow Control

Design Head (m) 0.150 Hydro-Brake® Type Md5 SW Only Invert Level (m) 0.000
Design Flow (l/s) 3.0 Diameter (mm) 90

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	5.3	3.000	8.4	7.000	12.9
0.200	3.0	1.400	5.8	3.500	9.1	7.500	13.4
0.300	3.0	1.600	6.2	4.000	9.7	8.000	13.8
0.400	3.2	1.800	6.5	4.500	10.3	8.500	14.2
0.500	3.5	2.000	6.9	5.000	10.9	9.000	14.6
0.600	3.8	2.200	7.2	5.500	11.4	9.500	15.0
0.800	4.4	2.400	7.6	6.000	11.9		
1.000	4.9	2.600	7.9	6.500	12.4		

Orifice Overflow Control

Diameter (m) 0.073 Discharge Coefficient 0.600 Invert Level (m) 0.174