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Feasibility Research

EIA, Flood Risk & Transport Assessments

Urban Planning and Design

Integrated Transport Solutions

Infrastructure Development

Structural Design

Eco and MMC Focused

Flood Risk Assessment and Drainage Strategy

Chapel Gate, Basildon

14279

For Sempra Homes Ltd

Engineering at its Best

Schedule For

Sempra Homes Ltd

Scheme No: 14279

Chapel Gate, Basildon

Flood Risk Assessment and Drainage Strategy

March 2020

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Contents

1 Introduction

1.1 Tully De'Ath have been commissioned by Sempra Homes Ltd to provide a Flood Risk Assessment and Drainage Strategy report for the development of Chapel Gate, Basildon.

1.2 The purpose of the report is to demonstrate to the Local Planning Authority and the Lead Local Flood Authority (Essex County Council) that the site can be drained both safely and sustainably for the lifetime of the development.

1.3 The report has been prepared in accordance with guidance set out within the following documents:

- National Planning Policy Framework (NPPF) (updated version February 2019)
- CIRIA C753 SuDS Manual (2015)
- Basildon Borough Council Strategic Flood Risk Assessment, 2011
- South Essex Strategic Flood Risk Assessment, 2018
- Sustainable Drainage Systems Design Guide for Essex 2020

2 Site Location

2.1 The site is located at the junction of Laindon Link (B1007) and Nether Mayne in Basildon (A176). The centre of the site has a National Grid Reference of 569850, 188340 and the nearest registered postcode is SS15 5AA.

2.2 The site is bounded by Laindon Link to the north, Nether Mayne to the east, a railway embankment to the south, and open woodland to the west.

Refer to Appendix A for Location Plan.

3 Existing Conditions

3.1 Land Use

The site covers an area of approximately 2.38 hectares.

The site is in part a former carpark, the western edge of which is bounded by a ditch. Beyond this, the site is made up of open grassland and woods.

3.2 Topography

The Topographical Survey indicates that the site falls to the east.

Ground levels at the western end of the site are typically at 30.0m AOD falling to 27.6m – 28.2m AOD along the eastern boundary. The lowest part of the site is located within the north eastern corner with a level of 27.50m AOD

Laindon Link is typically 0.5m to 1.0m below the adjacent site level.

Levels directly adjacent to the eastern boundary fall to the north dropping down to a level of 25.0m AOD at the underpass below the adjacent roundabout.

Beyond the southern boundary the adjacent railway is on an elevated embankment.

Refer to Appendix B for Topographical Survey.

3.3 Geology

The British Geological Society mapping records the site to be underlain by the solid geology of the London Clay Formation with superficial Head Deposits recorded in the northwest of the site.

Intrusive investigations established that below a layer of made ground (to a maximum depth of 1.6m bgl) the natural geology was:

- Superficial Deposits – gravelly sandy clay (0.3m to 1.5m bgl), over
- Bedrock - London Clay Formation

The site does not lie within a groundwater Source Protection Zone.

3.4 Impermeable Area

The Topographical Survey (Appendix B), shows that the site is covered by approximately 7000m² of impermeable area which relates to the former carpark. The western end of the site is currently all soft landscaping with no hard paving.

3.5 Drainage

The Anglian Water Sewer Records do not identify any adopted sewers within the site.

The nearest adopted sewers are located adjacent to the south eastern corner, where a 1350 dia surface water sewer and a 375 dia foul sewer run parallel, in a north easterly direction, under the adjacent roundabout. Based upon the sewer records the surface water sewer is in the order of 4.0m deep, and the foul is at 4.9m deep.

A second adopted 300 dia foul sewer flowing north is indicated as stopping at the southern boundary.

The records show a potential surface water connection from the site to the 1350 dia sewer.

Adopted surface water sewers ranging in size from 300 to 525 dia are located on the northern side of Laindon Links.

A Drainage Survey has established that the majority (6000m²) of the existing carpark discharges via a private onsite system into the 1350 dia adopted surface water sewer.

The survey has picked up that adjacent to the site entrance at least 2no. road gullies draining Laindon Link (an adopted highway) currently discharge into a separate drainage system passing through the sit, although it is also apparent that approximately 1000m² of the existing carpark adjacent to the northern boundary discharges into this Highway Drain serving Laindon Link.

Refer to Appendix C for Anglian Water Sewer Records, and Appendix B for the Drainage Survey.

3.6 Water Courses/Rivers

The EA's Detailed River Network (DRN) dataset indicates that an unnamed Ordinary Watercourse flows from south to north through the centre of the site. This Ordinary Watercourse is an unnamed tributary of the Basildon Brook, which is an EA Main River located approximately 835m north-east of the application boundary.

It is noted on the SFRA flood maps that there are a number of watercourses/culverts to the south of the railway which appear to start from fields to the south of Lee Chapel South and are assumed to be linked to the Basildon Borough Washland System. Some of these watercourses/culverts combine just south of the railway and then cross the site. There is a discrepancy between what is shown on the SFRA maps, (Fig 1) with two crossings, compared to a single run shown on the Water Network Map (Fig 2).

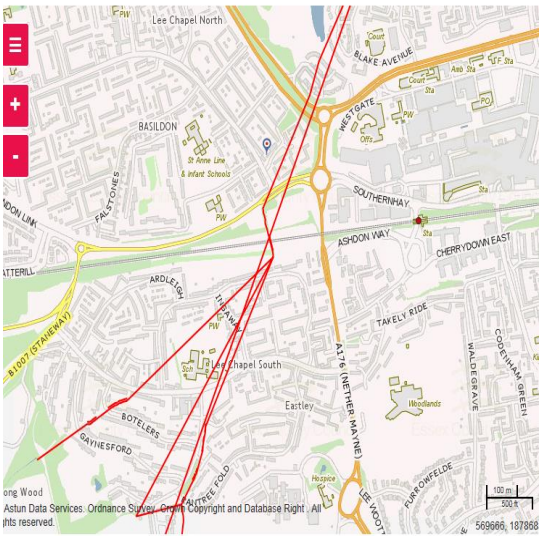


Fig 1 - SFRA map

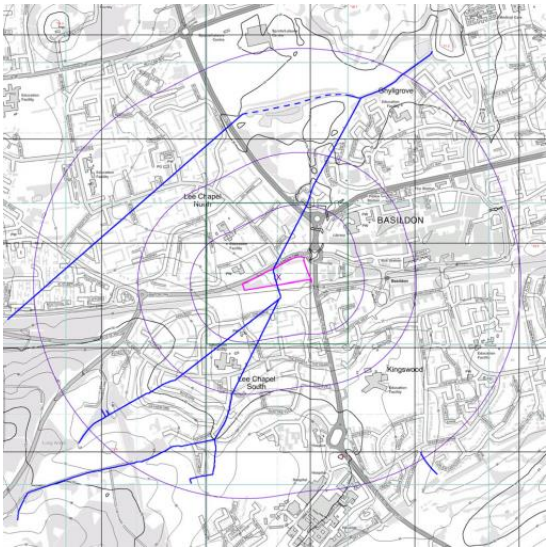


Fig 2 - Water Network Map

In reviewing the historic maps, sewer records, legal searches, a below ground utility and drainage survey there appears to be no evidence of two watercourses/culverts. All of the above searches identify a single drainage ditch running through the site, matching the Water Network Map.

It is also noted that the Water Network Map indicates a separate watercourse running in a straight line to the west of the site, which is not shown on the SRFA plans.

4 Development Proposals

4.1 The existing site is to be developed to provide 233 new residential units made up of 16 dwelling houses and 217 apartments.

4.1 A Full Planning Application is proposed for the provision of a new residential development including affordable housing across apartment blocks and dwellings houses, vehicular accesses, pedestrian links onto Laindon Links, associated parking, landscaping including open space, boundary treatments, drainage and earthworks.

Refer to Appendix D for Development Proposals

5 Flooding Assessment

5.1 With reference to the Gov. UK Flood Maps (Appendix E), the site is located within a Flood Zone1 (low risk) area which is classed as having less than a 1 in 1000 chance of river flooding within any one year (annual chance of flooding of less than 0.1%).

5.2 The proposed residential development is classified as 'more vulnerable' which is deemed appropriate within the NPPF for a Flood Zone 1 area.

5.3 With reference to the South Essex SFRA Historic Flood Map in Appendix E, the site has no record of an historic flood event.

6 Other Sources of Flooding

6.1 Surface Water/Overland Flow

The Gov.UK Surface Water Flood Maps (Appendix E), indicate that the eastern end of the site and just to the west of the ditch within the middle of the site, has a *Low* flood risk. This equates to between a 1 in 100 and 1 in 1000 chance of flooding in any one year. In reviewing the flood depths, only the low risk events flood the site, suggesting the flooding occurs at the more extreme return periods. Flood depths of up to 900mm are noted in the east and up to 300mm adjacent to the ditch.

In reviewing the flood extents against the topographical survey, the top flood level in the eastern half of the site has been conservatively established to be 28.30m AOD, which gives a maximum flood depth of up to 800mm.

Adjacent to the ditch the top flood level equates to 29.20m AOD with a maximum flood depth of approximately 200mm.

In terms of flood mitigation:

- On the eastern side of the site no residential accommodation will be below a level of 28.60m AOD which is 300mm above the 1 in 1000 flood level.
- Block E, which is located adjacent to the lowest part of the site will have no residential accommodation at ground floor level. The ground floor uses will be limited to plant and storage. However, the ground floor level will still be set 300mm above the existing ground level and flood doors will be installed to protect the plant room.
- The ground flood level of the houses fronting the ditch will have a ground floor level of 29.50m AOD which is 300mm above the 1 in 1000-year flood event level.
- The proposed site access is located within the more extreme surface water flood extents which as a result may impede emergency vehicular access during a significant flood event. A secondary emergency vehicle access, which is outside the flood extents, is to be provided at the western end of the site which will provide direct access to Laindon Links.

6.2 Sewer

With reference to the Sewer Flooding Maps within the SESFRA (Appendix E), the site is located within an area (SS15 5) where no sewer flooding events have been recorded.

A new foul and surface water system is to be provided on site which will include significant surface water flow control and attenuation. Consequently, this type of flooding is considered to be low.

6.3 Ground Water

The Areas Susceptible to Ground Water Flooding Maps within the SESFRA (Appendix E) locate the site within a >25%<50% area.

The intrusive ground investigations established that ground water seepages were recorded between 2.4m and 3.5m bgl.

No basements are proposed on the site and with the mitigation measures (elevated ground floor levels) discussed in Chapter 8, this form of flooding is considered to be low.

6.4 Reservoirs

With reference to the Gov. UK Flood Maps in Appendix E, the site is not located within an area which is subject to reservoir flooding.

6.5 Artificial Sources

There are no artificial sources of flooding within the vicinity of the site.

7 Sustainable Drainage Options

7.1 CIRIA C753 SuDS Manual explains that the primary function of SuDS measures is to protect watercourses from any impact due to the new development. However, SuDS can also improve the quality of life in a new development and urban spaces by making them more vibrant, visually attractive, sustainable and more resilient to change. This document explains the wider social context of SuDS and how SuDS can deliver high quality drainage while supporting urban areas to cope better with severe rainfall both in present and future.

7.2 There are four main categories of benefits that can be achieved by SuDS:

- Water Quantity (mitigate flood risk & protect natural water cycle)
- Water Quality (manage the quality of the runoff to prevent pollution)
- Amenity (create and sustain better places for people)
- Biodiversity (create and sustain better places for nature)

7.3 There are many site-specific factors which will influence the choice of any SuDS devices used within a development. The primary factors are:

- How the land is to be used- whether domestic, commercial or industrial.
- Soil contamination.
- Existing soil conditions i.e. ground permeability, groundwater levels.
- Site topography e.g. steeply sloping.
- Space availability – urban or non-urban.

7.4 Most advice on the use of sustainable drainage techniques recommends the utilisation of ground infiltration, which may take the form of permeable paving, swales, infiltration basins or soakaways. However, these systems are dependent on the sub-soil suitability, unsaturated soil zone to an adequate depth and the absence of leachable contaminants in the sub-soils.

7.5 It is essential to design and install a sustainable drainage system that is appropriate for the specific development and location in question.

7.6 SuDS measures, as stated in CIRIA C753 SuDS Manual, have been considered and the potential SuDS solutions for inclusion in this development are stated in Table 1 – SuDS Feasibility Matrix.

Table 1: SuDS Feasibility Matrix

Technique	Description	Implementation at the Site
Rainwater Harvesting	Collection of rainwater for re-use externally for irrigation or internally within the building for toilets, washing machine etc.	YES - Water butts to be provided for irrigation to all houses and blocks of flats. Internal re-use not implementable due to cost.
Biodiverse Roofs	Areas of living vegetation installed on the top of buildings to reduce run-off.	Yes – Approximately 1000m² of Biodiverse roofs will be provided across Blocks A, C and the lower roofs to Block B.
Infiltration Systems	Specifically, designed systems designed to promote infiltration of surface water runoff into the ground.	NO – Infiltration established that soakage was not feasible on the site.
Proprietary Treatment Systems	Manufactured products that remove specified pollutants from surface water run-off.	NO – Pollution hazard indices class the site as VERY LOW or LOW. No specific products required over current provision of catchpits, trapped gullies and permeable paving to all parking bays.
Filter Strips	Uniformly graded and gently sloping strips of grass or vegetation designed to treat surface water runoff from adjacent impermeable areas.	YES – Areas of hardstanding located will be allowed to drain directly onto the adjacent soft landscaping.
Filter Drains	Shallow trenches filled with stone/gravel creating temporary storage, conveyance and filtration of surface water run-off.	POSSIBLE – As part of the detailed design these could be used adjacent to parking courts.
Swales	Shallow, flat bottomed, vegetated open channels for conveyance and often attenuation.	POSSIBLE – As part of the detailed design these could be used adjacent to parking courts.
Bioretention Systems	Shallow landscaped depressions that can reduce run off.	POSSIBLE – as part of the detailed design it may be appropriate to add these in the soft landscaped areas between the road and footway.
Trees	Protect and enhance the urban environment. Transpiration, Interception, Increased infiltration, Phytoremediation.	YES – The layout has been designed to retain a number of existing trees and new trees will be incorporated in to the landscaping proposals.
Pervious Pavements	Vehicular/pedestrian pavements allowing water to infiltrate through the surface into underlying structural layers.	YES – Permeable paving (type C) to be incorporated to all parking bays.
Attenuation Storage Tanks	Below ground void space for the temporary storage of surface water.	YES – Sub-surface tanks in access road
Detention Basins	Landscaped depressions for the temporary storage of surface water.	NO – The constraints of the site mean there is insufficient space available.
Ponds and Wetlands	Features with permanent water providing attenuation and treatment of surface water.	NO – The constraints of the site mean there is insufficient space available.

8 Surface Water Drainage Proposals

8.1 Existing Situation

In developing the drainage strategy, the site has been split into two catchments to match the existing onsite conditions. The eastern half (Lower Catchment) currently discharges to sewers and the western area (Upper Catchment), which is currently greenfield, drains naturally to the adjacent ditch.

The existing impermeable area for the Lower Catchment is approximately 7000m^2 compared to a new impermeable area of 6500m^2.

The Upper Catchment currently has no impermeable surfaces. The new development will generate 3250m^2 of hard surfacing.

8.2 Equivalent Greenfield

The equivalent greenfield run-off rates for the site have been calculated using the IH124 Method for sites <50 hectares (in accordance with the Interim Code of Practice for SuDS):

Lower Catchment:

Catchment Area (m²)	Greenfield Flow Rate (l/s) for Storm Return Period		
	1 in 1	1 in 30	1 in 100 + 40%CC
14,000	4.2	11.3	22.2

Upper Catchment:

Catchment Area (m²)	Greenfield Flow Rate (l/s) for Storm Return Period		
	1 in 1	1 in 30	1 in 100 + 40%CC
9800	3.0	7.8	15.5

Refer to Appendix G for Surface Water Calculations

8.3 Proposed Drainage Strategy

The Essex Sustainable Drainage Systems Design Guide requests that new developments should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. Store rainwater for later use
2. Discharge to an adequate soakaway or infiltration system
3. Discharge via a Hybrid solution of infiltration and discharging to a surface water body
4. Discharge to a surface water body
5. Discharge to a surface water sewer, highway drain or other drainage system
6. Discharge rainwater to the combined sewer

In terms of rainwater re-use for the new development, the blocks of flats and all the houses will incorporate water butts for irrigation.

Infiltration testing on site has established that the natural sub-soils are not suitable for infiltration.

The unnamed watercourse/ditch that runs through the middle of the site is too high for the Lower Catchment to connect to. Once surface water attenuation has been considered, the depth of the ditch is also too low for direct discharge of surface water from the Upper Catchment. However, the northern end of the ditch connects to a manhole which is of sufficient depth to connect to.

For the Upper Catchment flows will be restricted to 2.5 l/s for all events up to and including the 1 in 100 year return event with an additional 40% allowance for climate change. This restricted flow rate is slightly less than the equivalent greenfield runoff rate of 3.0 l/s for a 1 in 1-year event generated by the upper catchment.

Although there will be no direct drainage connections to the ditch, as part of the redevelopment of the site, the ditch will be cleaned out and opened up which will as a result improve the hydraulic performance of the ditch.

As there are no surface water bodies adjacent to the Lower Catchment, this area will discharge to an adopted surface water sewerage system. Flows will be restricted to 4.4 l/s for all events up to and including the 1 in 100 year return event with an additional 40% allowance for climate change. The restricted flow rate is slightly higher than the equivalent greenfield runoff rate of 4.2 l/s for a 1 in 1-year event generated by the lower catchment.

Within the Lower Catchment a separate drainage run will be provided to maintain the outfall from at least 2No. road gullies serving Laindon Link. To avoid issues with ownership and maintenance, this network will bypass the onsite flow control and attenuation system.

Due to site levels there is a proportion of Block B and an area at the site entrance which is too low to connect to the onsite attenuation system. As a result, these areas (totalling 600m²) will connect to the diverted drainage serving part of Laindon Link. To offset this, the existing 1000m² of carpark that currently discharges into this system will be removed, resulting in a net reduction (400m² impermeable area) of surface water flows discharging from the site into the diverted sewer.

In summary, with the exception of the 600m² area described above which is to discharge unrestricted to the diverted sewer serving part of Laindon Link, total surface water discharge from the site (upper and lower catchment) will be restricted to 6.9 l/s for all events up to an including a 1 in 100 year return event with an additional 40% allowance for climate change. This restricted flow rate is less than the total equivalent 1 in 1-year greenfield rate of 7.2 l/s.

Refer to Appendix F for an indicative drainage strategy drawing.

8.4 Discharge Rates

Within the Lower Catchment approximately 7000m² (50%) of impermeable surface currently discharges to the existing surface water sewer in Nether Mayne

The existing surface water run-off rates have been calculated using the Modified Rational Method with rainfall intensity from Microdrainage Windes for a storm of 30 minutes' duration:

$Q = 2.78 \times C_R \times Cv \times A \times i$

Where:

Q = Flow (l/s)

Cv = Volumetric coefficient of run-off = 1.0

C_R = Routing coefficient = 1.3

A = Area drained (hectares)

i = Rainfall intensity (mm/hr) (determined from Microdrainage Windes)

Impermeable Area (m²)	Lower Catchment Flow Rate (l/s) for Storm Return Period		
	1 in 1	1 in 30	1 in 100 + 40% CC
7000	50	144	268

For the both the Upper and Lower Catchments, flows will be restricted to match the equivalent of the 1 in 1 year greenfield runoff rate.

A comparison of pre and post development peak flow discharge rates for the **Lower Catchment**:

Return Period (years)	Proposed Run off Rate (l/s)	Existing Impermeable Run-off Rate (l/s)
1	4.4	50
30	4.4	144
100	4.4	191
100+40%CC	4.4	268

For the **Upper Catchment**, in the absence of any existing impermeable areas, the proposed discharge rates are compared to the equivalent greenfield rates:

Return Period (years)	Proposed Run off Rate (l/s)	Existing Greenfield Run-off Rate (l/s)
1	2.5	3.0
30	2.5	7.8
100	2.5	11.0
100+40%CC	2.5	15.5

Refer to Appendix G for Surface Water Drainage Calculations

8.5 Attenuation

Based upon the controlled discharge rates surface water attenuation will be provided to accommodate all storms up to the 1 in 100-year event with an additional allowance of 40% for climate change.

In terms of design parameters, a Cv value of 1 has been used and a 10% urban creep factor has been added to the roof areas of the houses; the latter applies only to the Upper Catchment since the Lower Catchment comprises only flats blocks and as such it is considered that there is no opportunity for future extension.

Attenuation on both catchments will be provided in the form of below ground attenuation tanks to accommodate 377m^3 of storage on the Upper Catchment and 755m^3 on the Lower Catchment. Limited additional attenuation will also be provided within the sub-base of the permeable paving.

Refer to Appendix F for Drainage Strategy.

8.6 Exceedance

External ground levels will be designed to fall away from the proposed buildings as far as reasonably practicable. During an exceedance event, overland surface water flows will be directed away from the buildings and into the adjacent roads, which will ultimately discharge via low points along the northern and eastern boundaries.

The ground floor levels of the adjacent buildings have been set artificially high where Block D is in the order of 1.0m higher than the lowest point on the site, and Block E is 500mm higher but has no accommodation at ground floor level.

Consequently, the risk of exceedance flows is considered to be low. Refer to Appendix F for a plan showing the exceedance flood routes.

8.7 Drainage Assessment Form

The LLFA Technical Assessment Proforma has been completed using the information provided within this report.

Refer to Appendix H for Drainage Assessment Form.

9 Foul Water Drainage Proposals

9.1 The proposed onsite foul network will discharge to an adopted foul manhole (Ref 0301) to the east of the site, located within Nether Mayne.

9.2 On site levels and sewer record information indicate that the connection will be via a gravity condition.

9.3 Based on the peak daily flow of 4000 litres per dwelling specified in Sewers for Adoption 7th Edition, the proposed development of 233 units will generate a peak foul design flow of 10.8 l/s.

9.4 The proposed sewer connection will be subject to Anglian Water approval via a Section 106 Agreement under the terms of the Water Industry Act 1991.

Refer to Appendix F for Drainage Strategy.

10 Maintenance

10.1 Maintenance of any drainage scheme is essential to ensure that it continues to perform as designed. Within the site's, Health & Safety File a Maintenance Strategy will be developed which will give details of routine maintenance inspections for each element of the drainage system, together with details of how they should be undertaken and at what intervals or events. It should also include, where relevant, the installed manufacturer's details and maintenance recommendations

10.2 The surface water drainage systems require regular inspection/clearing to prevent blockages due to the accumulation of silt. The table below sets out the maintenance requirement for each SuDS element proposed for the development, based on CIRIA C753 SuDS Manual.

10.3 Adopted elements of the drainage system will be the responsibility of Anglian Water, who will be liable for the on-going inspection and maintenance.

10.4 The site will be managed by Sempra Homes Ltd for the lifetime of the development and therefore the private drainage system will form part of their maintenance obligations.

10.5 All maintenance must be carried out by suitably trained persons.

SuDS Maintenance Schedule

Item	Task	Frequency	Location	Access	Comments
Main Drainage Network					
Rainwater downpipes	Clean out at roof level and ground level	Twice yearly for the first 2 years of operation then annually	Roof level, around building perimeter and internal system suspended beneath first floor slab and ground floor slab	High level access required to roof outlets. Communal carpark and hard/soft landscaping	Works undertaken by appropriately qualified person(s). For RWP outlets at roof level follow health & safety regulations dealing with working at height
Chambers, silt-traps & catchpits	Clean out chamber/sump		Outside buildings and within Communal carpark and hard/soft landscaping	Communal carpark and hard/soft landscaping	
Pipe network & drainage channels	Pipes to be inspected and condition assessed. Pipes/channels to be cleaned (jetted) as necessary				
Flow Control Devices					
Hydrobrake chambers	Clean out chamber/sump	Monthly for first 3 months then twice yearly	Communal hard landscaped areas.	Communal hard landscaped areas.	Works undertaken by appropriately qualified person(s)
	Inspect flow control unit and remove debris				

SuDS Maintenance Schedule (continued)

Rain Garden					
Surface	Inspect. Remove litter/debris/ leaves.	Quarterly	Around perimeter of buildings	Private/ communal paths/patios	Works undertaken by appropriately qualified person(s)
	Add vegetation to maintain planting density. Remove silt. Scarify.	As required			
	Replace all vegetation (together with replacement of filter medium)	As required but likely to be >20 years			
Filter medium	Infill holes or scour damage. Improve erosion protection if required.	As required			
	Replace all filter medium (together with replacement of vegetation)	As required but likely to be >20 years			
Inlets and outlets	Check for blockages	Quarterly			

SuDS Maintenance Schedule (continued)

Item	Task	Frequency	Location	Access	Comments
Permeable Pavement					
Pavement structure	Remove organic matter. Brush and vacuum (standard cosmetic sweep over entire surface).	Monthly for first 3 months then twice yearly (in spring and autumn)	All parking bays	Site access roads	Provide adequate working space and safety zone at work location. Provide clear warning of obstructions, minimise potential conflict between road users and road works. Works undertaken by appropriately qualified person(s)
	Replace broken slabs/blocks	As required			
	Replace jointing material	As required			
	Remedial sweeping to rehabilitate surface and upper substructure	Every 10 to 15 years (or as required if significant siltation is apparent)			
Sub-surface conveyance/ attenuation tanks	Inspect catchpits/ silt traps for excessive siltation. Clean as necessary	Twice yearly for first 2 years and then annually			
	CCTV inspection and clean (jetted) as necessary	5 Years			

Item	Task	Frequency	Location	Access	Comments
Geocellular Attenuation Tanks					
Upstream & downstream catchpit chambers	Clean out chamber/sump	Twice yearly for the first 2 years of operation then annually	Access roads and communal parking bays	Communal hard landscaped areas	Works undertaken by appropriately qualified person(s)
Inlets, outlets, vents and overflows	Inspect/check to ensure in good condition and correct operation	Annually and after large storms			
Geocellular units	CCTV inspection. Clean (jet) if required	5 Years or if excessive silt/debris observed in upstream & downstream catchpit chambers			

Item	Task	Frequency	Location	Access	Comments
Biodiverse Roofs					
Generally	Inspect all components including soil substrate, inlet/outlets, fire breaks, underside of roof for structural integrity & signs of leakage. Remove litter/debris.	Monthly for first 12 months then annually or after severe storms	Roofs to flats Blocks A, C and lower part of B	High level access to roof and podium	Works undertaken by appropriately qualified person(s) following health & safety regulations dealing with working at height
Biodiverse areas/planting/shrubs/trees	Pruning, remove cuttings/debris/fallen leaves, weeding, remove invasive species, replace dead plants	Monthly for first 12 months every 6 months or as required			
Grassed areas	Mowing, remove debris/cuttings	Fortnightly or monthly as appropriate during growing season.			
Hard landscaped areas (Resin bound gravel e.g. Addaset, Addabound or Terrabound by Addagrip)	Remove organic matter from surface (with brush and suction cleaner)	Monthly for first 3 months then twice yearly (in spring and autumn)			
Roof outlets	Clean out, inspect, remove plant growth	Monthly for first 12 months every 6 months or as required and always after severe storms			

11 Conclusions

11.1 Flood mapping shows that the site is located in a Flood Zone 1 area which is classified as having a less than 1 in 1000 chance of flooding within any one year. This is the lowest flood risk category.

11.2 Surface water flood maps indicate that parts of the site have a low risk of surface water flooding. To mitigate against this risk, accommodation at ground floor level has been set to be 300mm above the 1 in 1000 flood level. Block E, which is located in the lowest part of the site, does not have any residential accommodation at ground floor level.

11.3 Other sources of flooding have been reviewed and considered to be very low.

11.4 Onsite infiltration testing established that infiltration is not appropriate for this site. However, a variety of SuDS features, including biodiverse roofs, permeable paving, water butts and significant new soft landscaping will be incorporated within the surface water design.

11.5 Due to site levels, two separate surface water systems are required, where the upper catchment (houses) drain to a culverted watercourse, and the Lower Catchment (Flats) discharge to an adopted surface water sewerage system.

11.5 Surface water flows from both catchments will be controlled using vortex flow control devices to restrict peak flows to match the 1 in 1-year greenfield runoff rate for all events up to the 1 in 100 event with an additional 40% allowance for climate change.

11.6 Surface water attenuation will be predominately provided within below ground attenuation crates designed to accommodate a 1 in 100-year event with a 40% allowance for climate change.

11.7 Ground levels will be designed to fall away from the proposed buildings as far as reasonably practicable and ground floor levels to the buildings have been raised above existing ground levels. During an exceedance event, overland surface water flows will be directed away from the buildings.

11.8 A new gravity foul system will be provided which will discharge into an adopted manhole in Nether Mayne.

11.9 The proposed onsite private drainage system will be maintained by Sempra Homes Ltd for the lifetime of the development. Maintenance will be in accordance with a site-specific maintenance strategy.

11.10 With the implementation of the mitigation measures discussed above the proposed development is subject to an acceptable level of flood risk and should not increase the likelihood of flooding elsewhere. The site can also be drained both safely and sustainably for the lifetime of the development.

Appendix A - Location Plan

N

1:1250m

0 25 50 125

Notes:
Do not scale. All dimensions are in millimetres unless otherwise stated. This drawing should be read in conjunction with all relevant project information and contract documentation. All dimensions to be checked prior to fabrication and or commencement of works. All works to comply with all relevant legal standards, building regulations and warranty provider requirements. Report any discrepancies, if in doubt ask.

Revisions:

Rev	Status	Date	Description	Drn	Chkd
C01	A3	25.03.21	Planning Issue	TC	AA

Client Name: Sempra Homes

Project Name: Chapel Gate

Drawing Name: Site Location Plan

Drawing Number:	Rev:	Status:
CPK-BPTW-01-ZZ-DR-A-0101	C01	A3

Project No:	RIBA Stage:	Drawn By:	Scale:
20-173	3	DAJ	1:1250 @ A2

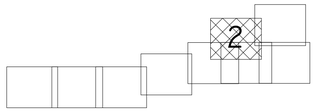
PLANNING ISSUE

40 Norman Road,
Greenwich, London
SE10 9QX

t. 020 8293 5175
bptw.co.uk

Appendix B - Topographical Survey and Drainage Survey

NOTE: DENSE VEGETATION HAS RESTRICTED MEASUREMENTS
TREE HEIGHTS & SPREAD ARE AN APPROXIMATION
BASED ON OBSERVATION FROM GROUND LEVEL
ONLY TREES WITH A BOLE GREATER THAN
0.15M HAVE BEEN RECORDED



188440MN

188420MN

188400MN

188380MN

188360MN

569780ME

569800ME

569820ME

569840ME

569860ME

569880ME

569900ME

N

INDICATIVE ONLY

0 2 4 6 8 10

SCALE (M)

THIS SURVEY HAS BEEN CARRIED OUT COMMENSURATE TO A PLOTTED SCALE OF 1:200 @ A1

DRG NO: TX0463/LAINDON/UGS/02/R2

LEGEND

A	AREA
B	BOLLARD
CATV	CABLE TV SERVICE COVER
CF	CELLAR FLAP
CP	COAL PLATE
E	ELECTRICITY SUPPLY
FH	FIRE HYDRANT
WSV	WATER STOP VALVE
IC	INSPECTION CHAMBER
CATV	COMMUNICATIONS IC
KL	LOWERED KERB FOR ACCESS
LP	LAMP POST
MH	MANHOLE
NP	ROAD NAME PLATE
PE	PIPE
PT	POST
PL	PAVEMENT LIGHT
PWP	PLANNATER PIPE
RS	ROAD SIGN
STN	SURVEY STATION
TCB	TELEPHONE CALL BOX
TL	TRAFFIC LIGHTS
TP	TELEGRAPH POLE
IRF	IRON RAIL FENCE
WMF	WIRE MESH FENCE
CBF	CONTINUOUS BOARD FENCE
PBF	POST & RAIL FENCE
EJB	ELECTRIC JUNCTION BOX
GY	GULLY
	STEP ARROW
Dn	RAMP ARROW
	PIPE OUTLINE
	GATE
	SLOPE ARROW
	TREE (INDIVIDUALLY SHOWN)
	TREES (SECONDARY) - PART OF A GROUP OF TREES
	CONIFER TREE

UTILITIES

ABBREVIATIONS:

(AC)	Assumed Connection
(AR)	Assumed Route
BL	Blocked
CL	Cover Level
d	Depth of service (approx)
Dd	Depth to top of duct
(e)	Empty Duct
EOT	End of trace
ExG	Exits Ground
GPR	Ground Penetrating Radar
GPRa	GPR Anomaly
Id	Invert Depth
IL	Invert Level
NFI	No Further Information
NSV	No Service Visable
Oe	Open Ended
OF	Overflow Pipe
Pd	Depth to top of pipe
(R)	From Records
RFL	Radio Frequency Locator
Sd	Sump depth
UTR	Unable to Raise
UTT	Unable to Trace
WD	Way Duct

LEGEND

- FOUL DRAINAGE
- SURFACE WATER DRAINAGE
- ELECTRICITY
- WATER
- GAS
- TELEPHONE
- TRAFFIC LIGHT
- CATV
- UNKNOWN
- UNDERGROUND CHAMBER
- UGS SURVEY BOUNDARY

CAUTIONARY NOTES
RADIO FREQUENCY AND GPR TECHNIQUES HAVE BEEN USED WHERE APPROPRIATE. INTERPRETATION OF THESE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS MUST BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITION AND PARTICULARLY DEPTHS. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE THE ACCURACY OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED.

Note: Pipe sizes in mm – Electricity is assumed LV unless annotated otherwise

STATION CO-ORDINATES

STATION	TYPE	EASTING	NORTHING	LEVEL
STN01	NAIL	569945.401	188336.171	28.146
STN02	NAIL	569856.665	188312.701	29.096
STN03	NAIL	569945.030	188371.263	27.756
STN04	NAIL	569909.698	188342.576	28.231
STN05	NAIL	569839.089	188355.850	28.479
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STN11	NAIL	569850.010	188390.833	27.706

COORDINATES AND LEVELS VIA GPS AND ADJUSTED INTO THE ORDNANCE SURVEY ACTIVE NETWORK

REV	DRG. AMENDMENTS	BY	DATE
R2	UAV LIDAR DATA ADDED	JM	05/01/21
R1	PRELIM TOPO	JM	09/10

CALFORD SEADEN
LOCKS HILL
ROCHFORD
ESSEX
SS4 1BB

CARPARK 14 & LAND AT LAINDON LINK

BASILDON

UTILITY SURVEY

TEXO DSI
SURVEY AND INSPECTION
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ESSEX
CM8 3TH
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E: INFO@TEXODSI.CO.UK
W: WWW.TEXODSI.CO.UK

SCALE: 1:200@A1

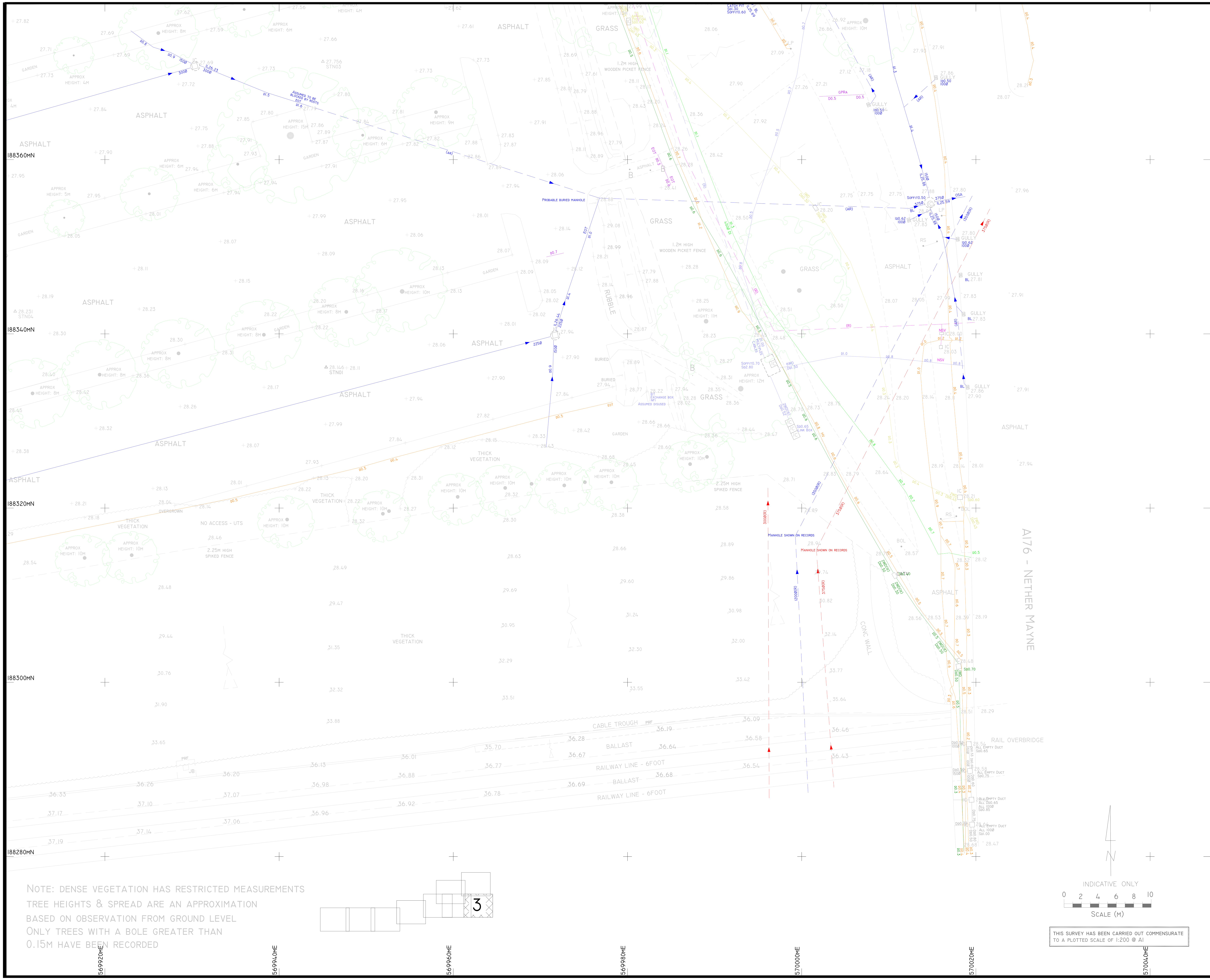
DATE: OCTOBER 2020

DRAWN BY: MH

CHECKED BY: JM

DRG NO: TX0463/LAINDON/UGS/02/R2

DRG NO: TX0463/LAINDON/UGS/03/R2



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CATV	COMMUNICATIONS IC
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SURFACE WATER DRAINAGE
ELECTRICITY
WATER
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UNKNOWN
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UGS SURVEY BOUNDARY

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CALFORD SEADEN
LOCKS HILL
ROCHFORD
ESSEX
SS4 1BB

CARPARK 14 & LAND AT LAINDON LINK

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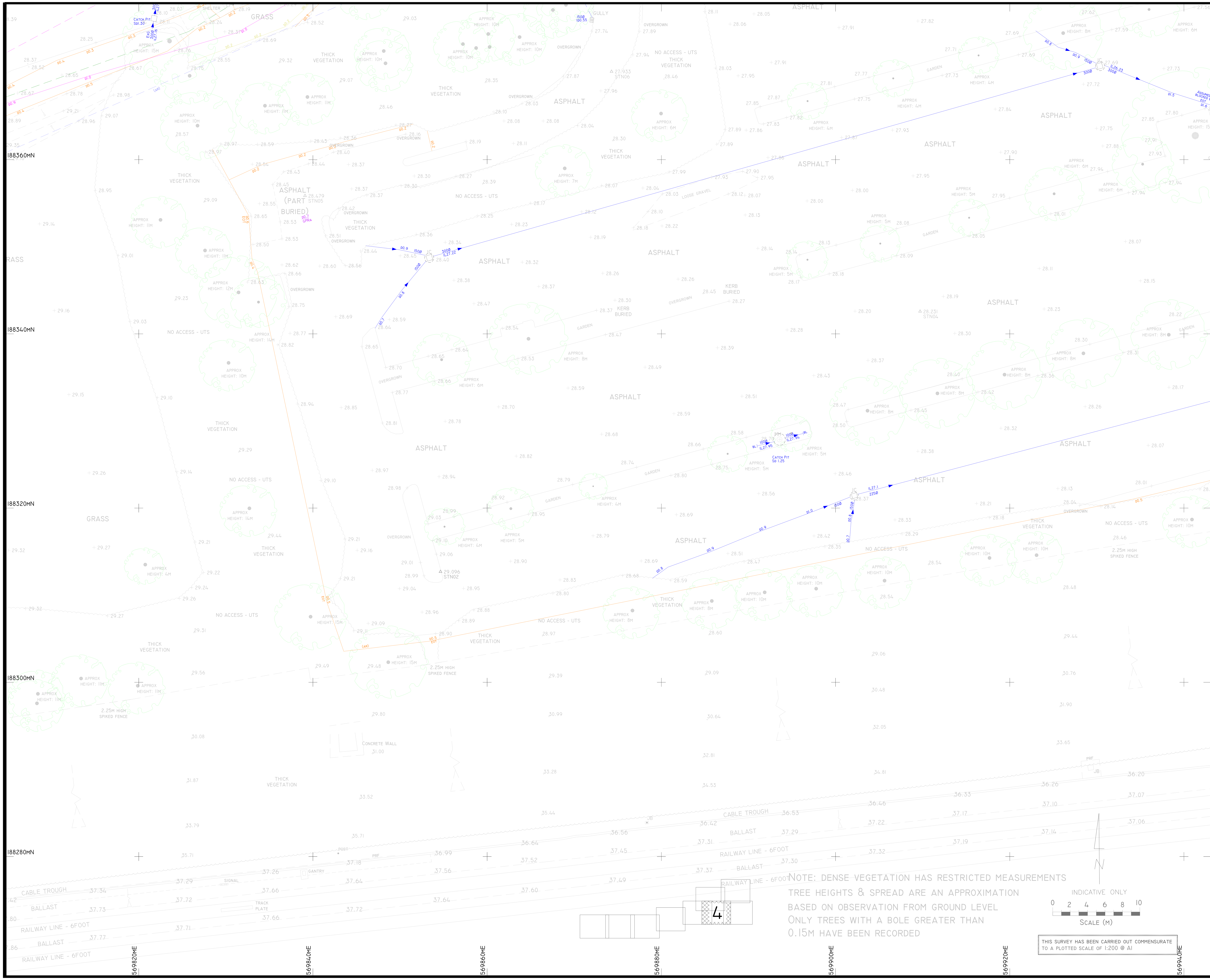

DRG NO: TX0463/LAINDON/UGS/04/R2

LEGEND

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CATV	CABLE TV SERVICE COVER
CF	CELLAR FLAP
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SURFACE WATER DRAINAGE
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CALFORD SEADEN

LOCKS HILL
ROCHFORD
ESSEX
SS4 1BB

CARPARK 14 & LAND AT LAINDON LINK

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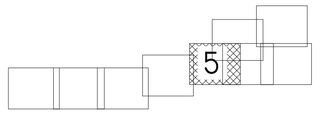

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188360MN
188340MN
188320MN
188300MN
188280MN

569720ME
569740ME
569760ME
569780ME
569800ME
569820ME
569840ME

LAINDON LINK

DRG NO: TX0463/LAINDON/UGS/05/R2

LEGEND

A	AREA
B	BOLLARD
CATV	CABLE TV SERVICE COVER
CF	CELLAR FLAP
CP	COAL PLATE
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TREE (INDIVIDUALLY SHOWN)

TREES (OCCLUDED) - PART OF A GROUP OF TREES

CONIFER TREE

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- GAS
- TELEPHONE
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INDICATIVE ONLY
0 2 4 6 8 10
SCALE (M)

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CALFORD SEADEN
LOCKS HILL
ROCHFORD
ESSEX
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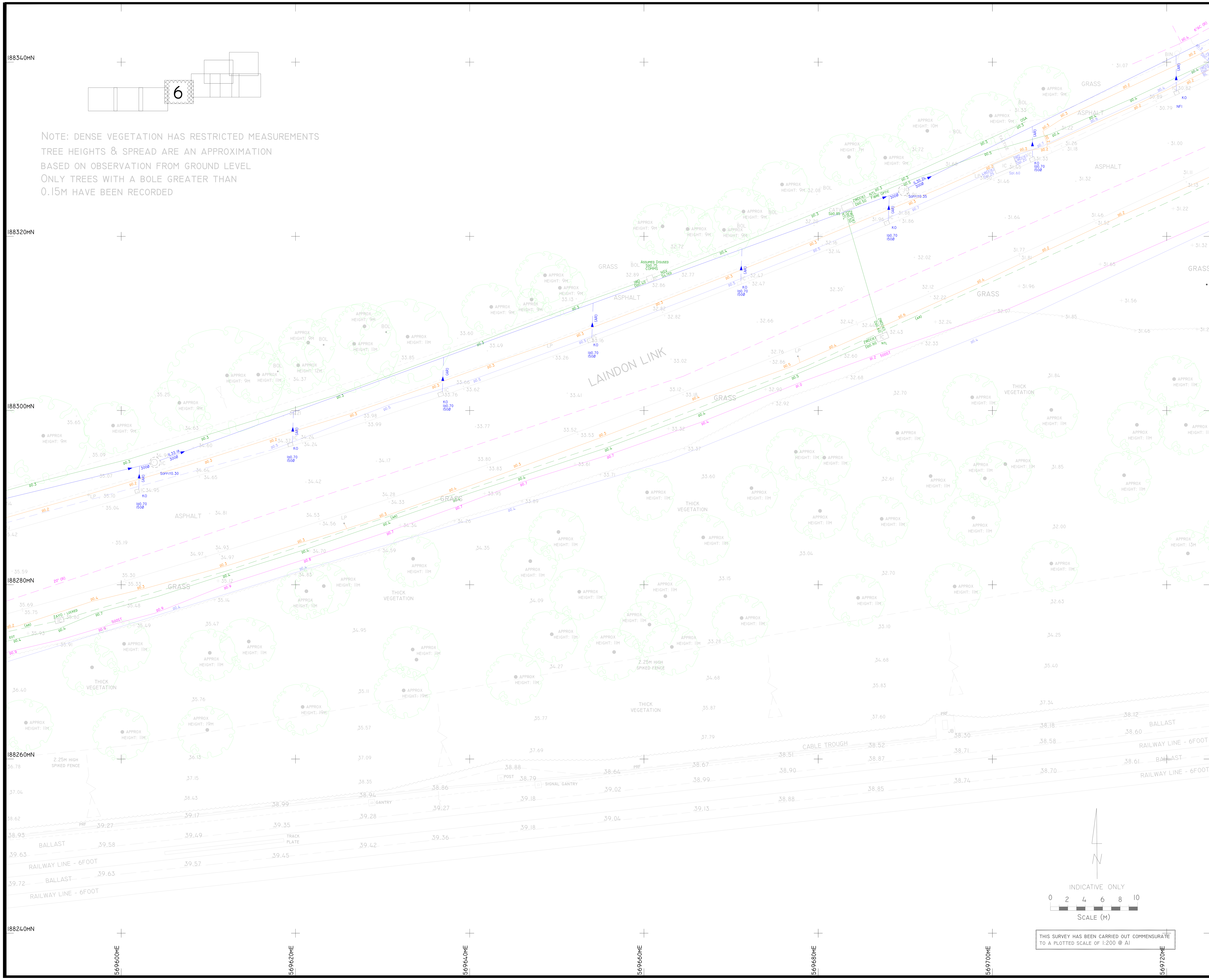

LEGEND

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Conifer tree

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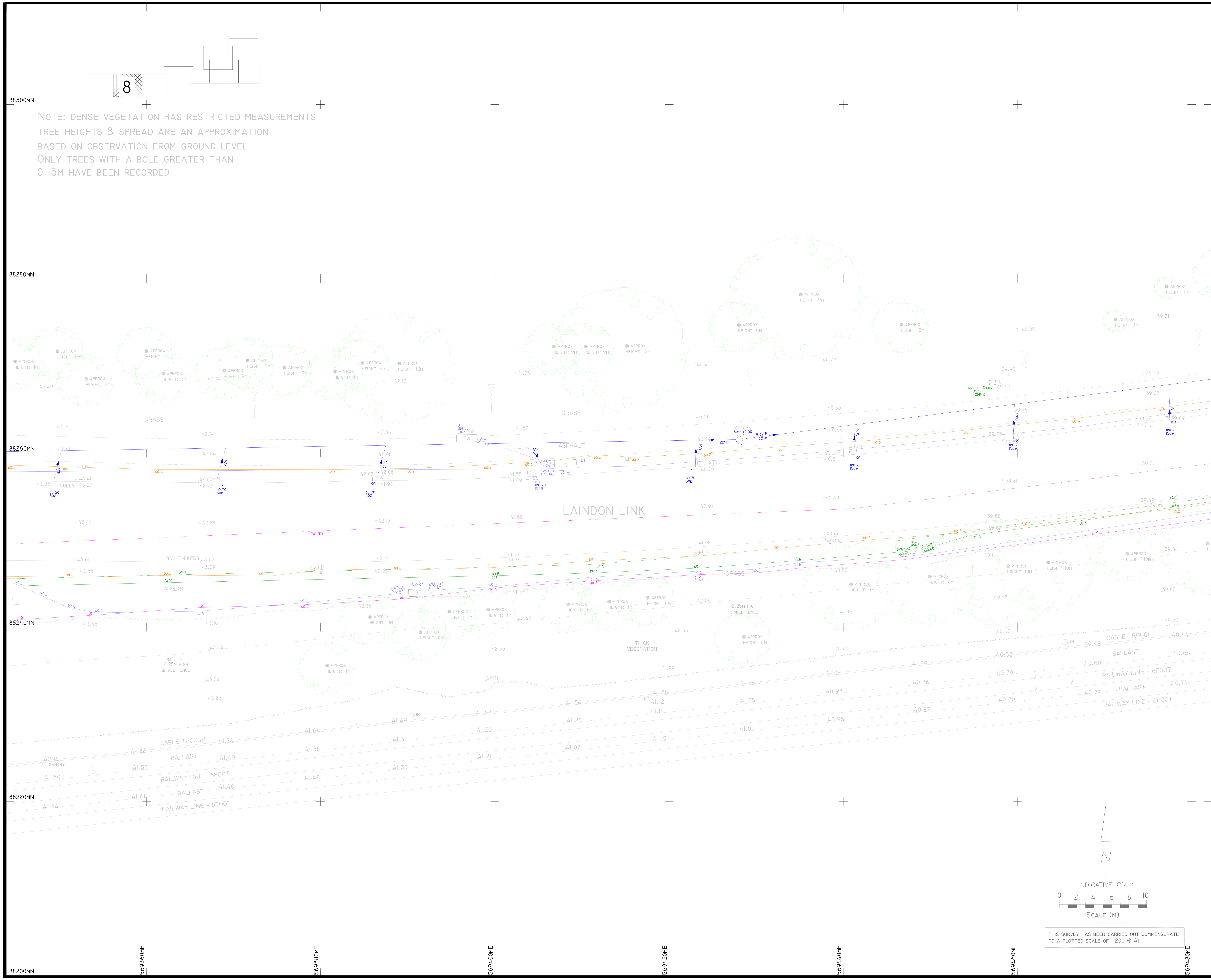

LEGEND

Tree (Individually shown)

Trees (Deciduous) - Part of a group of trees

Conifer tree

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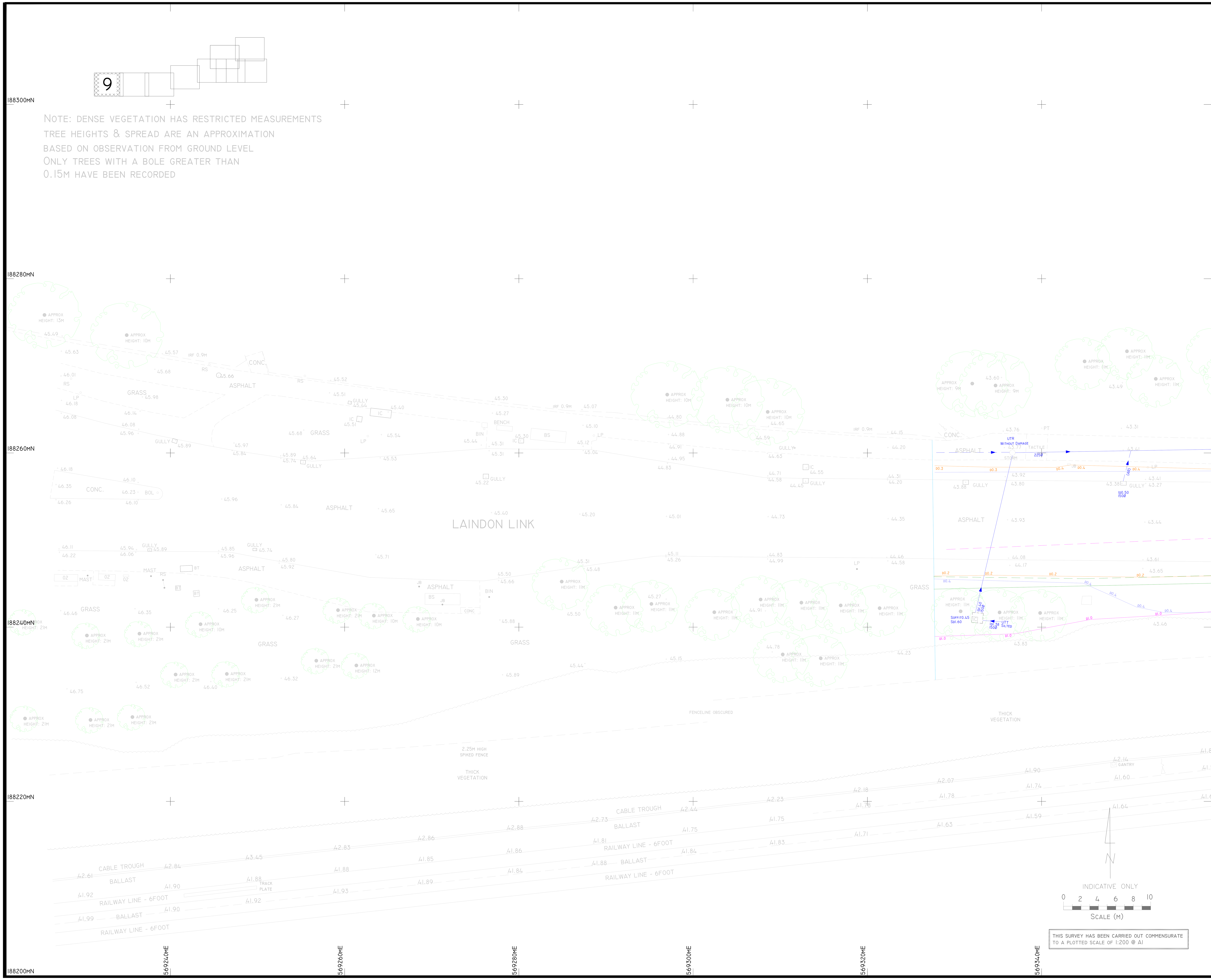
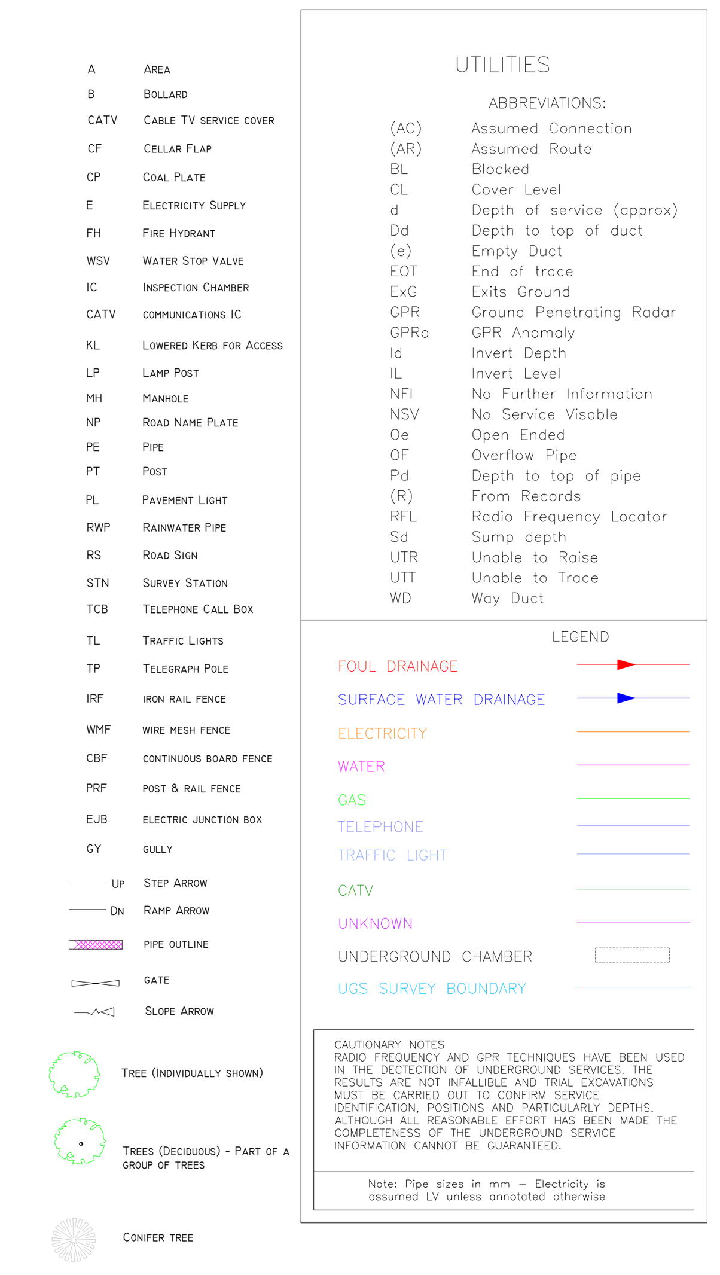


LEGEND



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STATION	TYPE	EASTING	NORTHING	LEVEL
STN01	NAIL	569945.401	188336.171	28.146
STN02	NAIL	569854.645	188312.701	29.096
STN03	NAIL	569945.030	188371.263	27.756
STN04	NAIL	569909.698	188342.576	28.231
STN05	NAIL	569839.089	188355.850	28.479
STN06	NAIL	569874.278	188370.117	27.933
STN07	NAIL	569877.848	188385.710	27.770
STN08	NAIL	569965.395	188410.179	27.756
STN11	NAIL	569850.010	188390.833	27.706

COORDINATES AND LEVELS VIA GPS AND ADJUSTED INTO THE ORDNANCE SURVEY ACTIVE NETWORK

REV	DRG. AMENDMENTS	BY	DATE
R2	UAV LIDAR DATA ADDED	JM	05/01/21
R1	PRELIM TOPO	JM	09/10

CALFORD SEADEN

LOCKS HILL
ROCHFORD
ESSEX
SS4 1BB

CARPARK 14 & LAND AT LAINDON LINK

BASILDON

UTILITY SURVEY

TEXO DSI
SURVEY AND INSPECTION

8 STEPFIELD INDUSTRIAL ESTATE
WITHAM
ESSEX
CM8 3TH
T: +44 (0)1376 533 979
F: +44 (0)1376 515 946
E: INFO@TEXODSI.CO.UK
W: WWW.TEXODSI.CO.UK

SCALE: 1:200@A1

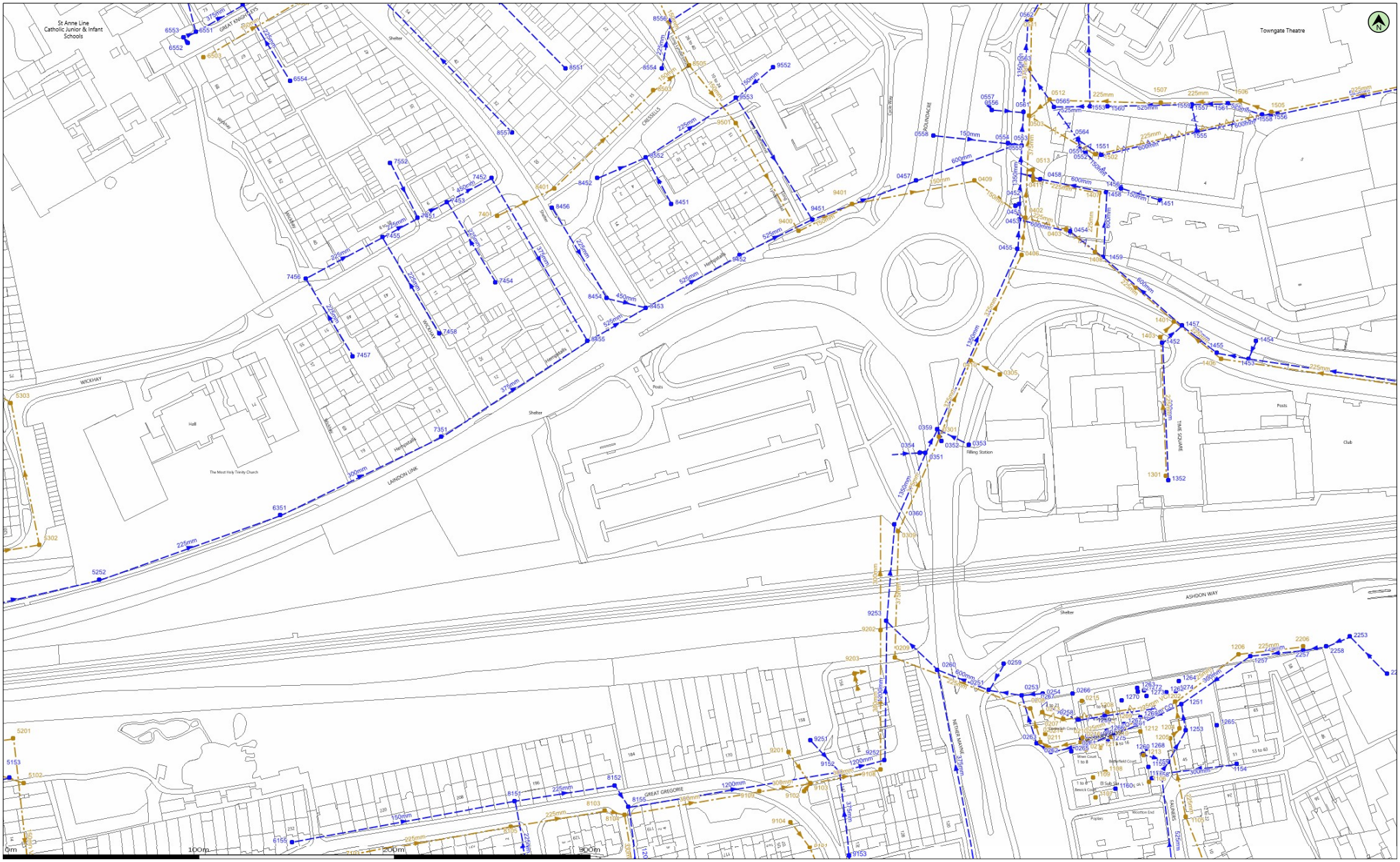
DATE: OCTOBER 2020

DRAWN BY: MH

CHECKED BY: JM

DRG NO: TX0463/LAINDON/UGS/09/R2

Appendix C - Thames Water Sewer Records



Date: 07/05/20

Scale: 1:1250

Map Centre: 569902,188368

Data updated: 01/04/20

Our Ref: 386890 - 1

Wastewater Plan A2

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station
*(Colour denotes effluent type)

consultancy@ambiental.co.uk
5426

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0207	F	29.97	26.94	3.03
0208	F	29.7	26.688	3.012
0209	F	-	-	-
0210	F	30.632	26.99	3.642
0211	F	30.71	26.867	3.843
0212	F	30.71	26.829	3.881
0213	F	-	-	-
0214	F	-	-	-
0215	F	-	-	-
0216	F	-	-	-
0217	F	-	-	-
0301	F	28	24.64	3.36
0305	F	27.87	25.97	1.9
0309	F	29.73	24.83	4.9
0402	F	27.22	22.96	4.26
0403	F	28.07	24	4.07
0406	F	28.53	23.16	5.37
0409	F	28.28	23.56	4.72
0410	F	27.87	23.97	3.9
0411	F	-	-	-
0503	F	26.58	22.67	3.91
0511	F	27.54	22.56	4.98
0512	F	23.2	20.8	2.4
0513	F	-	-	3.1
1105	F	31.01	28.09	2.92
1106	F	-	-	-
1107	F	-	-	-
1108	F	-	-	-
1109	F	-	-	-
1202	F	30.31	27.368	2.942
1204	F	30.58	27.51	3.07
1205	F	-	27.49	-
1206	F	-	28.06	-
1208	F	30.71	27.14	3.57
1209	F	30.3	27.154	3.146
1210	F	-	-	-
1211	F	-	-	-
1212	F	-	-	-
1213	F	-	-	-
1301	F	28.93	27.01	1.92
1401	F	-	-	-
1403	F	28.58	25.5	3.08
1406	F	28.79	25.8	2.99
1407	F	-	-	4.5
1408	F	-	-	5.2
1502	F	28.96	23.88	5.08
1505	F	28.12	25.13	2.99
1506	F	24.83	22.28	2.55
1507	F	24.07	19.67	4.4
2206	F	30.86	-	-
5102	F	-	-	-
5201	F	-	36.83	-
5302	F	-	-	-
5303	F	-	-	-
6503	F	28.27	-	-
7401	F	-	26.02	-
8103	F	-	28.07	-
8104	F	-	30.44	-
8105	F	-	29.36	-
8401	F	-	27.71	-
8503	F	27.22	25.1	2.12
8505	F	27.09	24.9	2.19
9101	F	-	28.88	-
9102	F	-	27.63	-
9103	F	-	-	-
9104	F	-	28.58	-
9108	F	-	-	-
9109	F	-	27.08	-
9201	F	-	27.12	-
9202	F	-	-	-
9203	F	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
9400	F	-	-	-
9401	F	-	-	-
9501	F	27.04	24.6	2.44
0251	S	29.58	27.33	2.25
0253	S	29.515	27.374	2.141
0254	S	29.66	28.82	0.84
0258	S	30.33	27.65	2.68
0259	S	29.11	27.63	1.48
0260	S	-	-	-
0261	S	30.7	27.645	3.055
0262	S	30.875	27.548	3.327
0263	S	30.6	27.502	3.098
0264	S	-	-	-
0265	S	-	-	-
0266	S	-	-	-
0267	S	-	-	-
0351	S	-	-	-
0352	S	27.94	-	-
0353	S	27.7	26.22	1.48
0354	S	28.06	25.61	2.45
0359	S	-	-	-
0360	S	-	-	-
0451	S	25.72	23.85	1.87
0452	S	-	-	-
0453	S	-	-	-
0454	S	28.31	24.66	3.65
0455	S	28.66	23.72	4.94
0457	S	27.25	24.6	2.65
0458	S	-	-	2.7
0551	S	28.37	23.86	4.51
0552	S	28.59	23.98	4.61
0553	S	-	-	-
0554	S	26.13	23.63	2.5
0555	S	25.94	23.47	2.47
0556	S	27.9	25.43	2.47
0557	S	27.72	26.77	0.95
0558	S	24.68	24.01	0.67
0561	S	-	-	-
0562	S	27.49	23.14	4.35
0563	S	-	-	-
0564	S	-	-	-
0565	S	24.03	-	-
1152	S	-	-	2.2
1154	S	31.02	29.35	1.67
1157	S	30.71	28.14	2.57
1158	S	-	-	-
1159	S	-	-	-
1160	S	-	-	-
1251	S	30.26	27.915	2.345
1253	S	30.63	28.13	2.5
1257	S	-	28.7	-
1259	S	30.74	27.8	2.94
1260	S	30.51	29.6	0.91
1261	S	30.4	27.785	2.615
1262	S	-	-	-
1263	S	-	-	-
1264	S	-	-	-
1265	S	-	-	-
1266	S	-	-	-
1267	S	-	-	-
1268	S	-	-	-
1269	S	-	-	-
1270	S	-	-	-
1271	S	-	-	-
1272	S	-	-	-
1273	S	-	-	-
1274	S	-	-	-
1275	S	-	-	-
1352	S	28.94	27.24	1.7
1451	S	25.97	24.36	1.61
1452	S	28.66	25.95	2.71

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
1453	S	-	-	-
1454	S	29.29	27	2.29
1455	S	28.75	-	-
1456	S	-	-	-
1457	S	-	-	-
1458	S	-	-	3.5
1459	S	-	-	3.9
1551	S	28.95	24.37	4.58
1553	S	27.94	26.94	1
1555	S	-	-	-
1556	S	28.16	-	-
1557	S	28.05	25.52	2.53
1558	S	25.6	-	-
1559	S	25.17	-	-
1560	S	24.49	-	-
1561	S	25.41	22.41	3
2253	S	30.94	28.71	2.23
2254	S	31.02	29.29	1.73
2257	S	30.92	-	-
2258	S	31.26	-	-
5153	S	-	37.83	-
5252	S	-	33.21	-
6155	S	-	32.26	-
6351	S	-	30.31	-
6551	S	28.16	25.68	2.48
6552	S	28.18	27.71	0.47
6553	S	-	-	-
6554	S	27.82	25.85	1.97
6555	S	27.93	25.35	2.58
7351	S	-	27.73	-
7451	S	-	25.89	-
7452	S	-	22.54	-
7453	S	-	26.78	-
7454	S	-	26.14	-
7455	S	-	25.89	-
7456	S	-	26.14	-
7457	S	-	26.77	-
7458	S	-	26.47	-
7552	S	27.34	26.33	1.01
8151	S	-	29.77	-
8152	S	-	29.8	-
8155	S	-	28.23	-
8451	S	-	26.17	-
8452	S	-	25.71	-
8453	S	-	24.87	-
8454	S	-	24.99	-
8455	S	-	26.43	-
8456	S	-	25.3	-
8551	S	27.11	26.03	1.08
8552	S	26.87	25.59	1.28
8554	S	27.21	25.77	1.44
8556	S	27.01	25.49	1.52
8557	S	-	-	-
9152	S	-	29.86	-
9153	S	-	-	-
9251	S	-	27.88	-
9252	S	-	23.38	-
9253	S	-	-	-
9451	S	-	24.59	-
9452	S	-	24.67	-
9552	S	26.36	25.61	0.75
9553	S	26.93	25.12	1.81

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix D – Development Proposals

Key

- 3B5P House
- 3B5P Flat
- 2B4P House
- 2B3P Flat
- 1B2P Flat
- Refuse Store
- Cycle Store
- Caretaker's room
- Energy centre
- Water tank room
- Substation
- Existing trees - retained
- Existing TPO trees/area - retained
- Existing TPO Trees/area - removed

WICKHAY

Wickhay

WICKHAY

Wickhay

LANDON LINK

Boro Const Bdy

CR

Co Const, ED & Ward Bdy

01

02

03

04

05

06

Issues

Block and Terrace Key

N

1:500m

0 5 25 50

Indicative landscape shown for context
Please refer to Landscape Architect's drawings for detail landscape proposal

Notes:
Do not scale. All dimensions are in millimetres unless otherwise stated. This drawing should be read in conjunction with all relevant project information and contract documentation. All dimensions to be checked prior to fabrication and or commencement of works. All works to comply with all relevant legal standards, building regulations and warranty provider requirements. Report any discrepancies, if in doubt ask.

Revisions:

Rev	Status	Date	Description	Drn	Chkd
C01	A3	23.03.21	Planning Issue	TC	AA

Client Name: Sempra Homes

Project Name: Chapel Gate

Drawing Name: Site Ground Floor Plan

Drawing Number:	Rev:	Status:
CPK-BPTW-08-00-DR-A-0102	C01	A3

Project No:	RIBA Stage:	Drawn By:	Scale:
20-173	3	AA	1:500 @ A1

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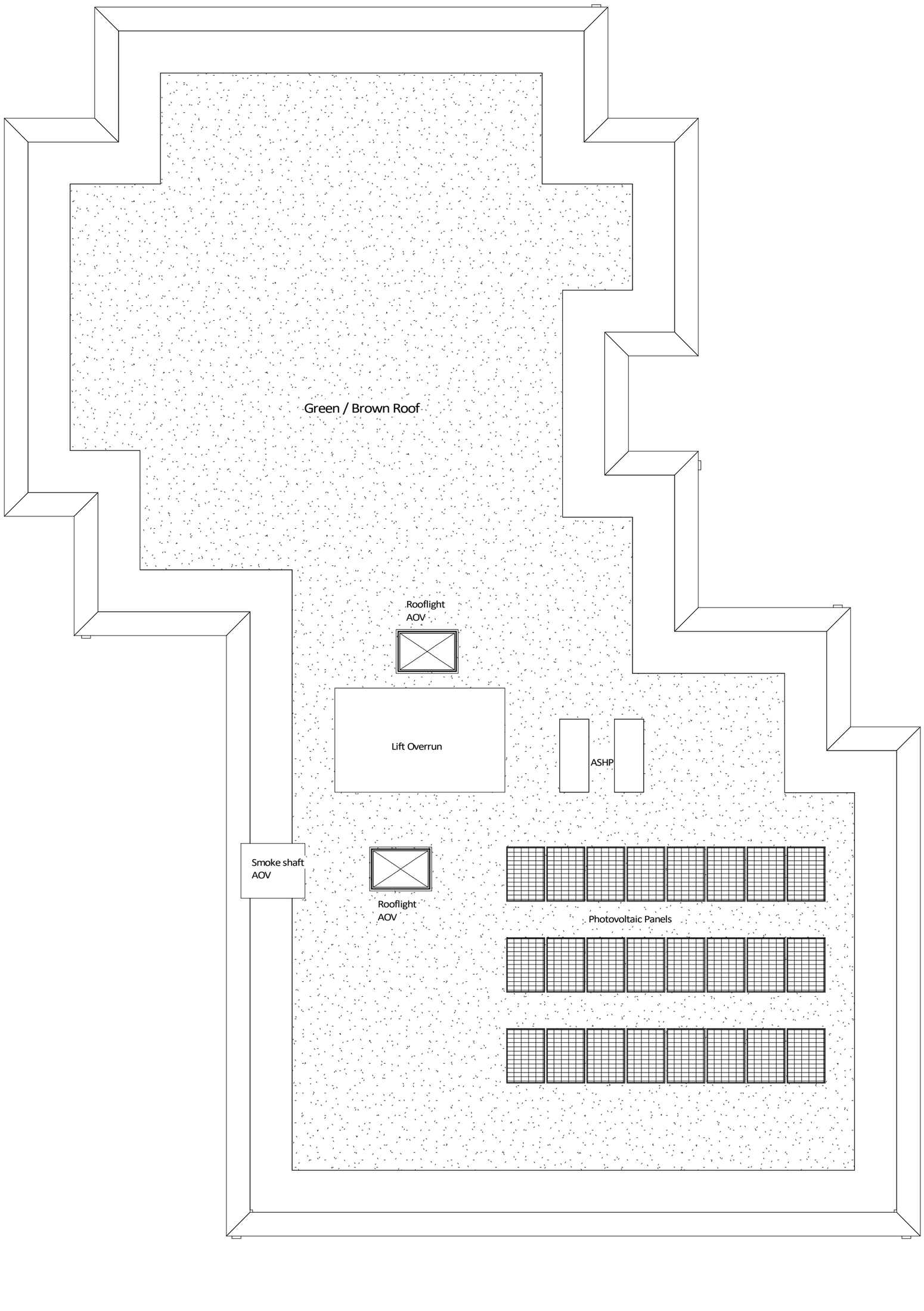
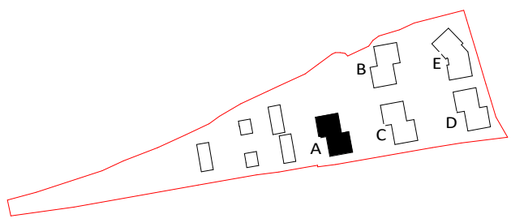


Photovoltaic panels and Air Source Heat Pumps shown and location are indicative



Key Plan

N

1:100m

0 1 5 10

Notes:
Do not scale. All dimensions are in millimetres unless otherwise stated. This drawing should be read in conjunction with all relevant project information and contract documentation. All dimensions to be checked prior to fabrication and or commencement of works. All works to comply with all relevant legal standards, building regulations and warranty provider requirements. Report any discrepancies, if in doubt ask.

Revisions:

Rev	Status	Date	Description	Drn	Chkd
C01	A3	23.03.21	Planning Issue	TC	AA

Client Name: Sempra Homes

Project Name: Chapel Gate

Drawing Name: Block A - Roof Plan

Drawing Number:	Rev:	Status:
CPK-BPTW-10-05-DR-A-1005	C01	A3

Project No:	RIBA Stage:	Drawn By:	Scale:
20-173	3	TC	1:100 @ A2

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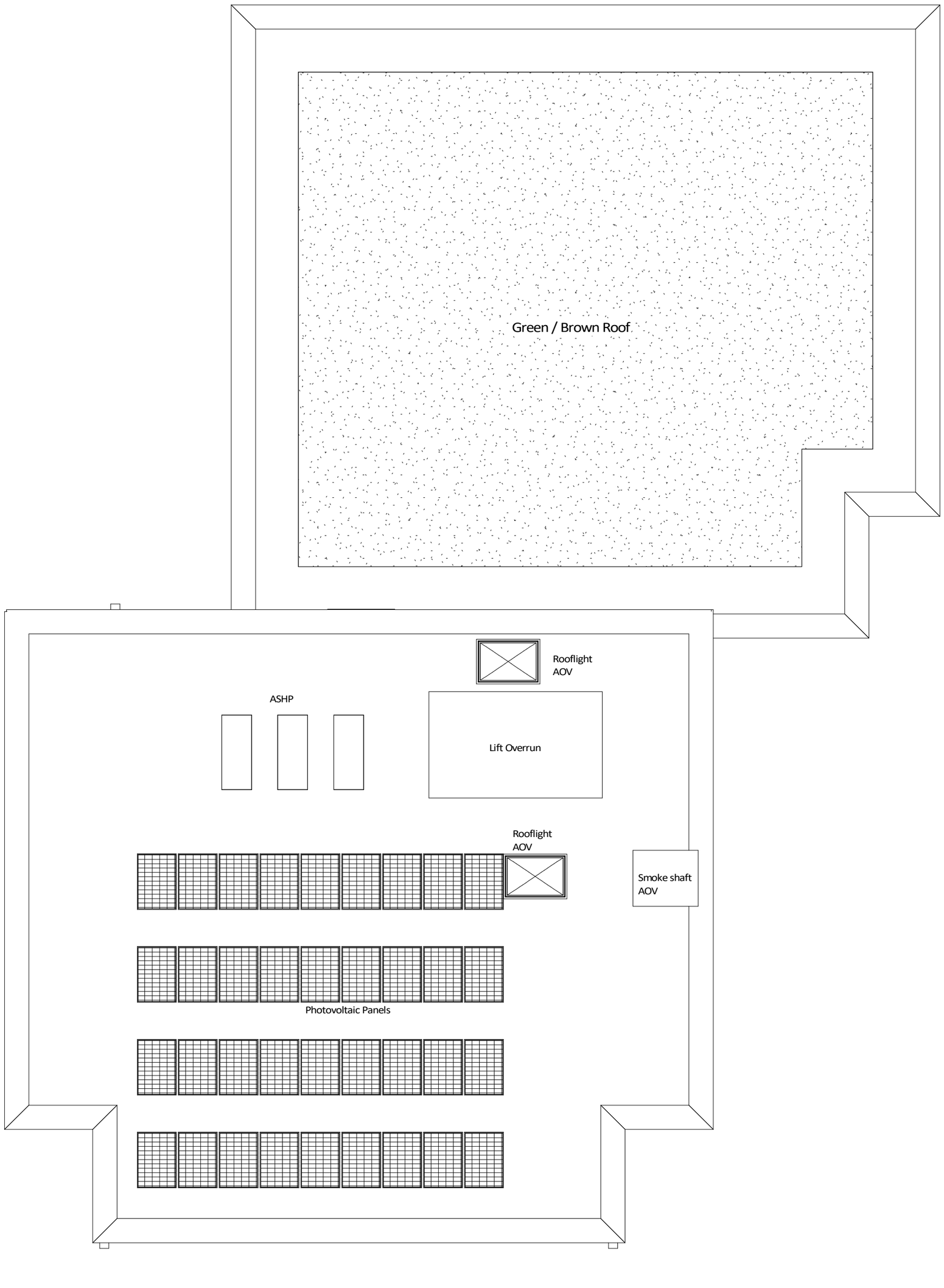
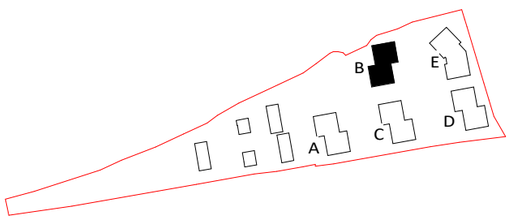


Photovoltaic panels and Air Source Heat Pumps shown and location are indicative



Key Plan

N

1:100m

0 1 5 10

Notes:
Do not scale. All dimensions are in millimetres unless otherwise stated. This drawing should be read in conjunction with all relevant project information and contract documentation. All dimensions to be checked prior to fabrication and or commencement of works. All works to comply with all relevant legal standards, building regulations and warranty provider requirements. Report any discrepancies, if in doubt ask.

Revisions:

Rev	Status	Date	Description	Drn	Chkd
C01	A3	23.03.21	Planning Issue	TC	AA

Client Name: Sempra Homes

Project Name: Chapel Gate

Drawing Name: Block B - Roof Plan

Drawing Number:	Rev:	Status:
CPK-BPTW-11-08-DR-A-1018	C01	A3

Project No:	RIBA Stage:	Drawn By:	Scale:
20-173	3	TC	1:100 @ A2

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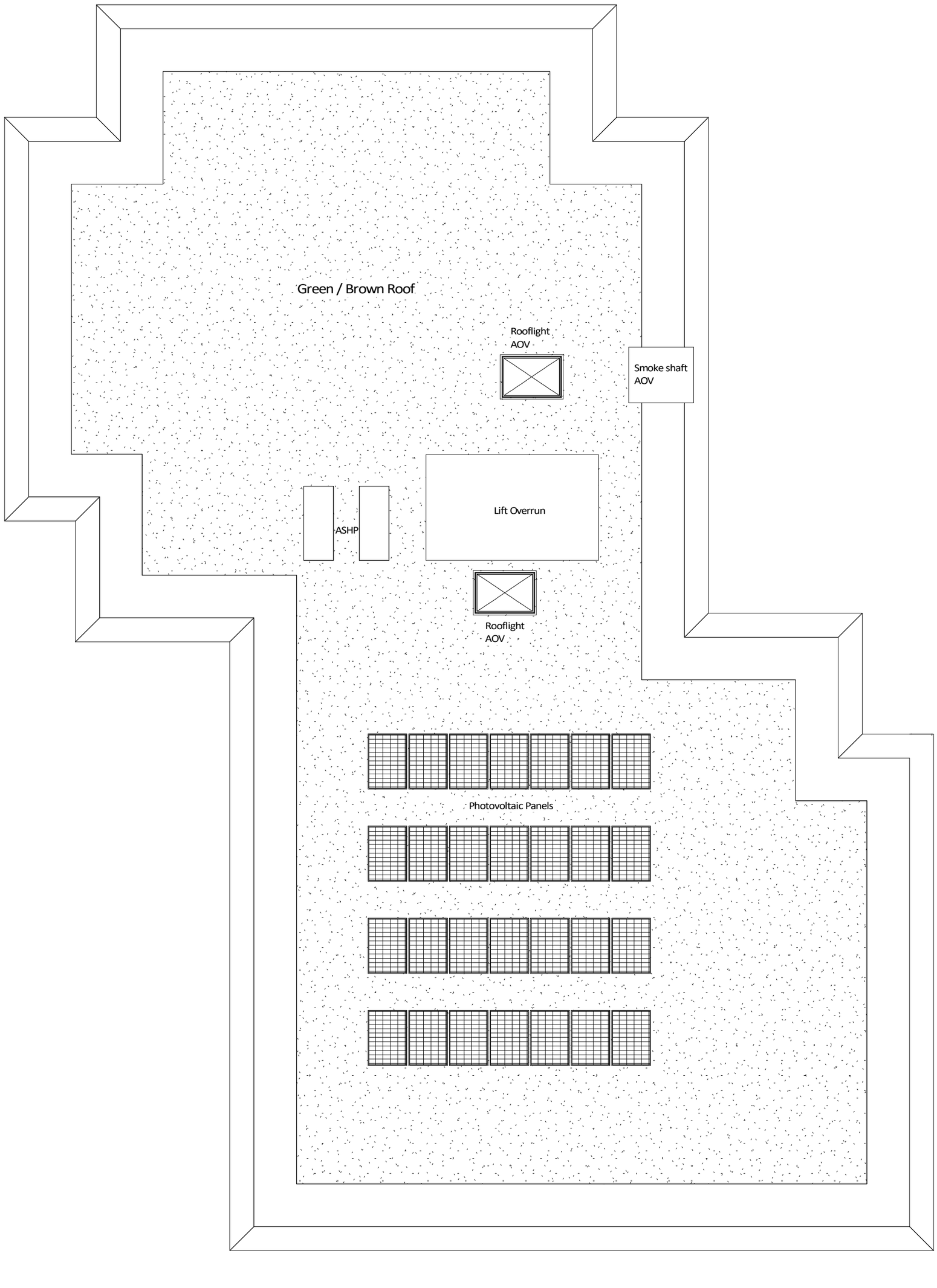
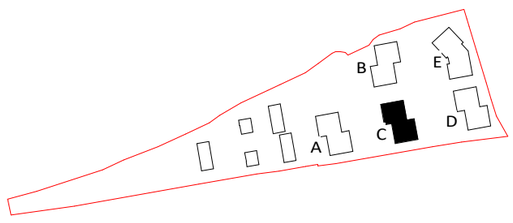


Photovoltaic panels and Air Source Heat Pumps shown and location are indicative



Key Plan

N

1:100m

0 1 5 10

Notes:
Do not scale. All dimensions are in millimetres unless otherwise stated. This drawing should be read in conjunction with all relevant project information and contract documentation. All dimensions to be checked prior to fabrication and or commencement of works. All works to comply with all relevant legal standards, building regulations and warranty provider requirements. Report any discrepancies, if in doubt ask.

Revisions:

Rev	Status	Date	Description	Drn	Chkd
C01	A3	23.03.21	Planning Issue	TC	AA

Client Name: Sempra Homes

Project Name: Chapel Gate

Drawing Name: Block C - Roof Plan

Drawing Number:	Rev:	Status:
CPK-BPTW-12-06-DR-A-1026	**C01**	A3

Project No:	RIBA Stage:	Drawn By:	Scale:
20-173	3	TC	1:100 @ A2

PLANNING ISSUE

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Appendix E - Flood Risk Maps

Flood risk

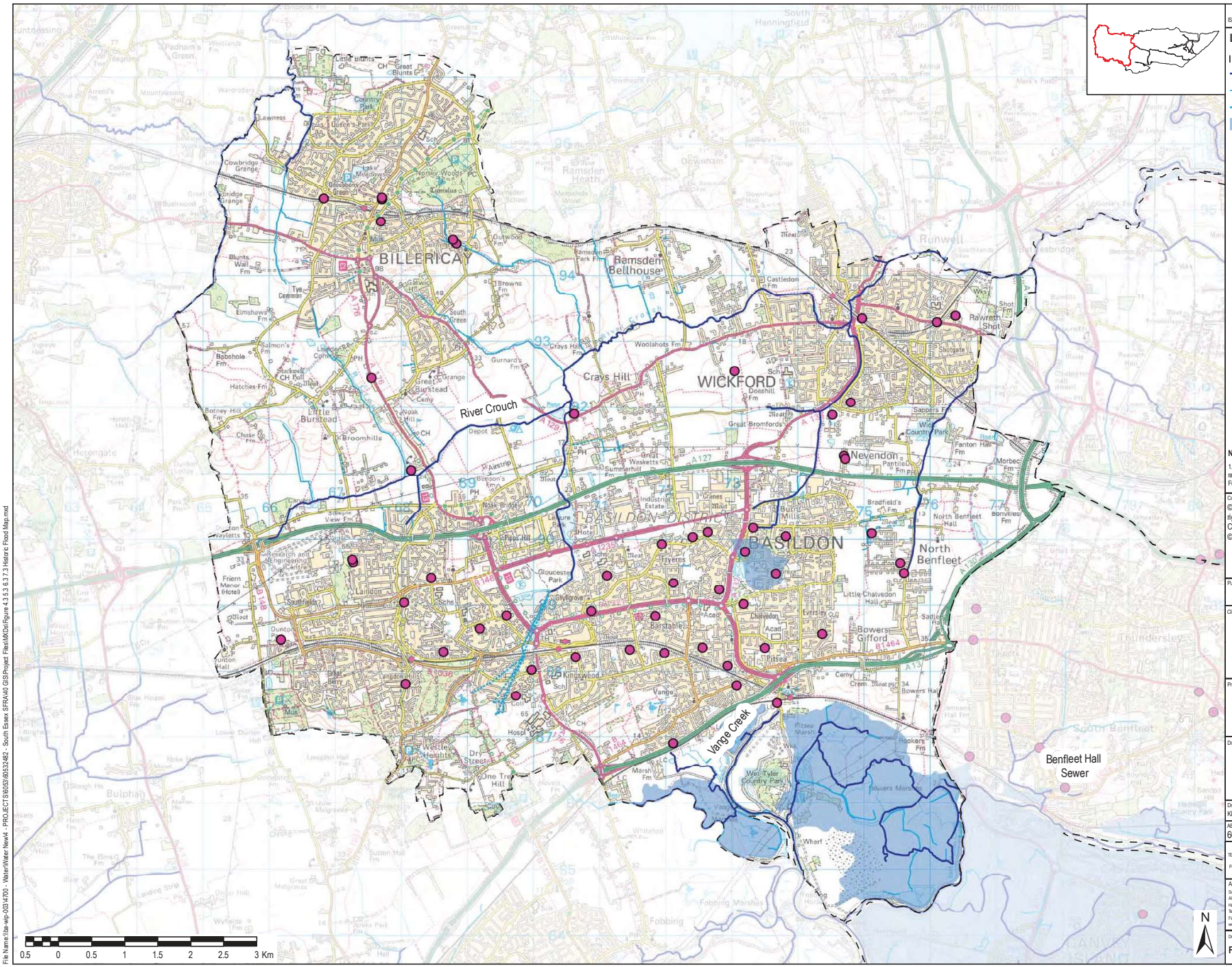
Extent of flooding

Location

SS15 5AA

Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Council Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Historic Flood Map
- Record of Flooding (Unknown Source)

NOTES

1. Flood records do not refer to internal property flooding, rather area that have been susceptible to flooding in the past. Further detail is included in Appendix A of this report.

Purpose of Issue: FINAL

Client: Basildon Council, castlepoint, Rochford District Council, southend on sea

Project Title: SOUTH ESSEX LEVEL 1 SFRA

Drawing Title: HISTORIC FLOOD MAP

Drawn	Checked	Approved	Date
KLD	JW	CP	12/04/2018

AECOM Internal Project No.: 60532482

Scale @ A3: 1:52,000

AECOM
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number: FIGURE 4.3

Rev: 1

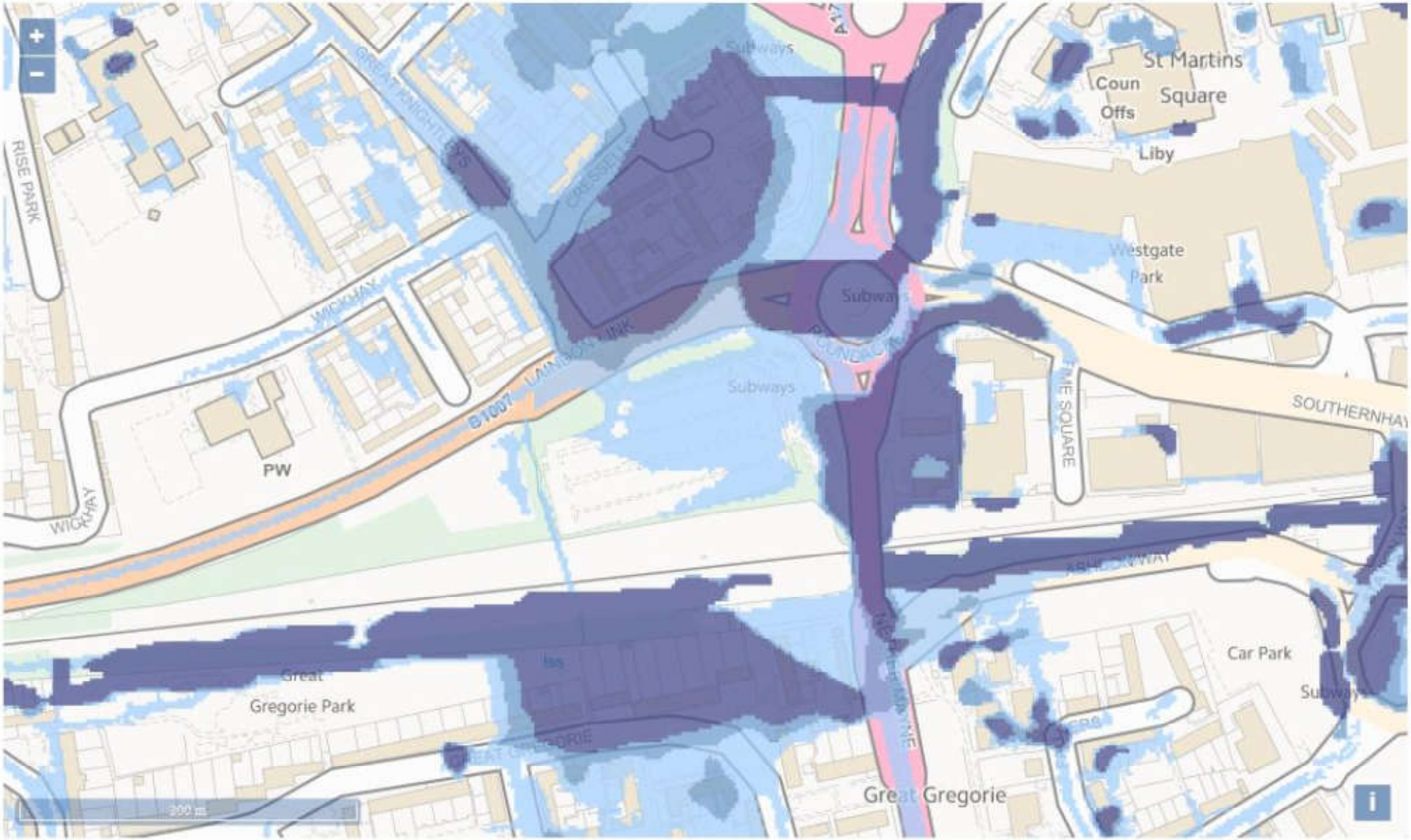
File Name:\\ba-wip-003-t4700 - Water\Water New\4 - PROJECTS\60053\60532482 - South Essex SFRA\40 GIS\Project Files\MXDs\Figure 4.3 5.3 6.3 7.3 Historic Flood Map.mxd

Flood risk

Extent of flooding

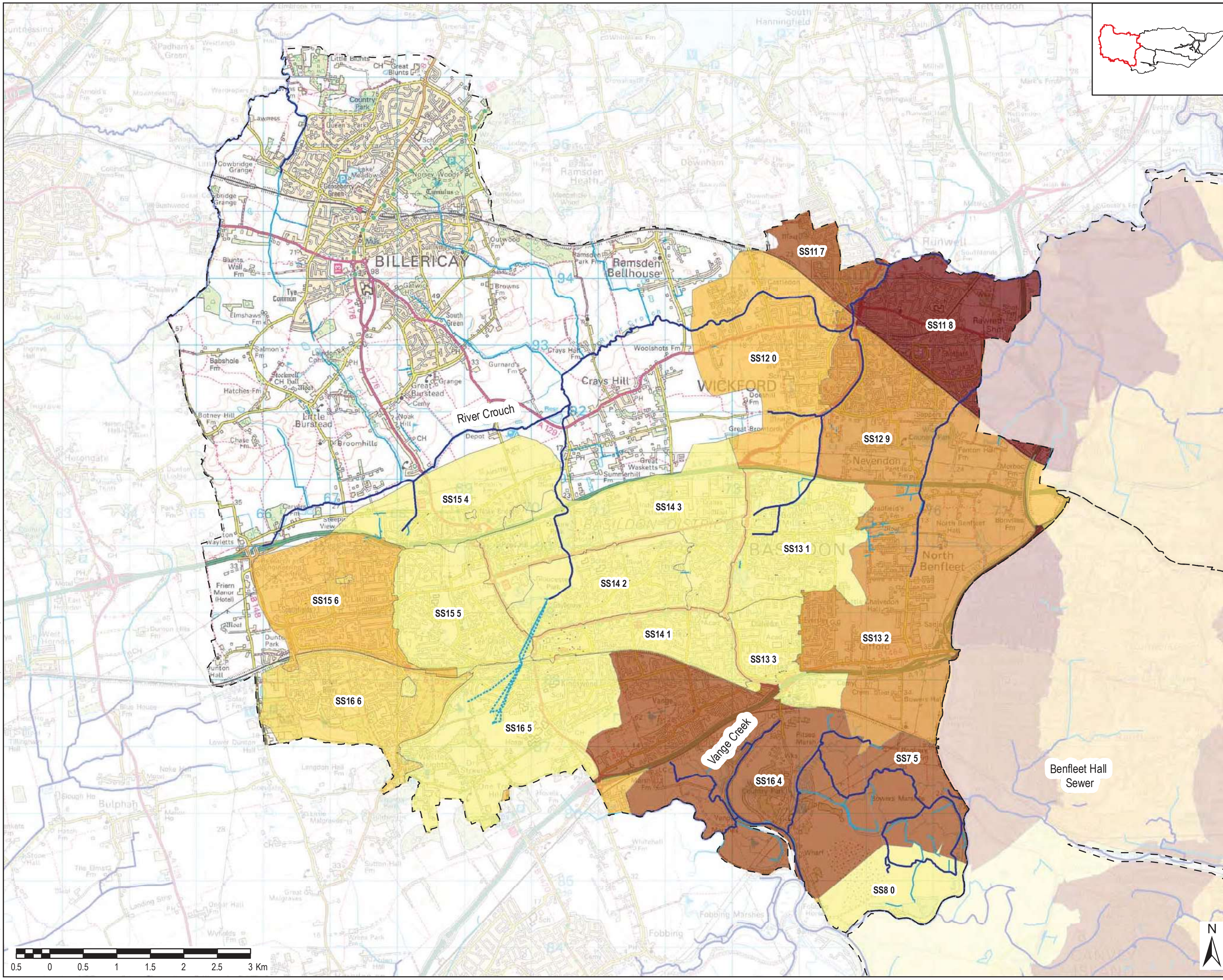
Location

SS15 5AA



Extent of flooding from surface water

High Medium Low Very low Location you selected



File Name:\\ba-wip-00314700 - Water\Water New\4 - PROJECTS\60532482 - South Essex SFRA\40 GIS\Project Files\MXDs\Figure 4.5 5.5 6.5 7.5 Sewer Flooding.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Council Boundary
- Main River
- Ordinary Watercourse
- Culvert

DG5: Flooding Incidents by Postcode

- 0
- 1
- 2 - 3
- 4 - 5
- 6 - 10
- 11 - 30

NOTES

1. This map is intended to provide a strategic overview of historic sewer flooding and should not be used to assess flood risk for individual properties.

Purpose of Issue

FINAL

Client

Basildon Council
castlepoint
Rochford District Council
southend on sea

Project Title

SOUTH ESSEX
LEVEL 1 SFRA

Drawing Title

SEWER FLOODING

Drawn	Checked	Approved	Date
KLD	JW	CP	11/04/2018

AECOM Internal Project No.	Scale @ A3
60532482	1:52,000

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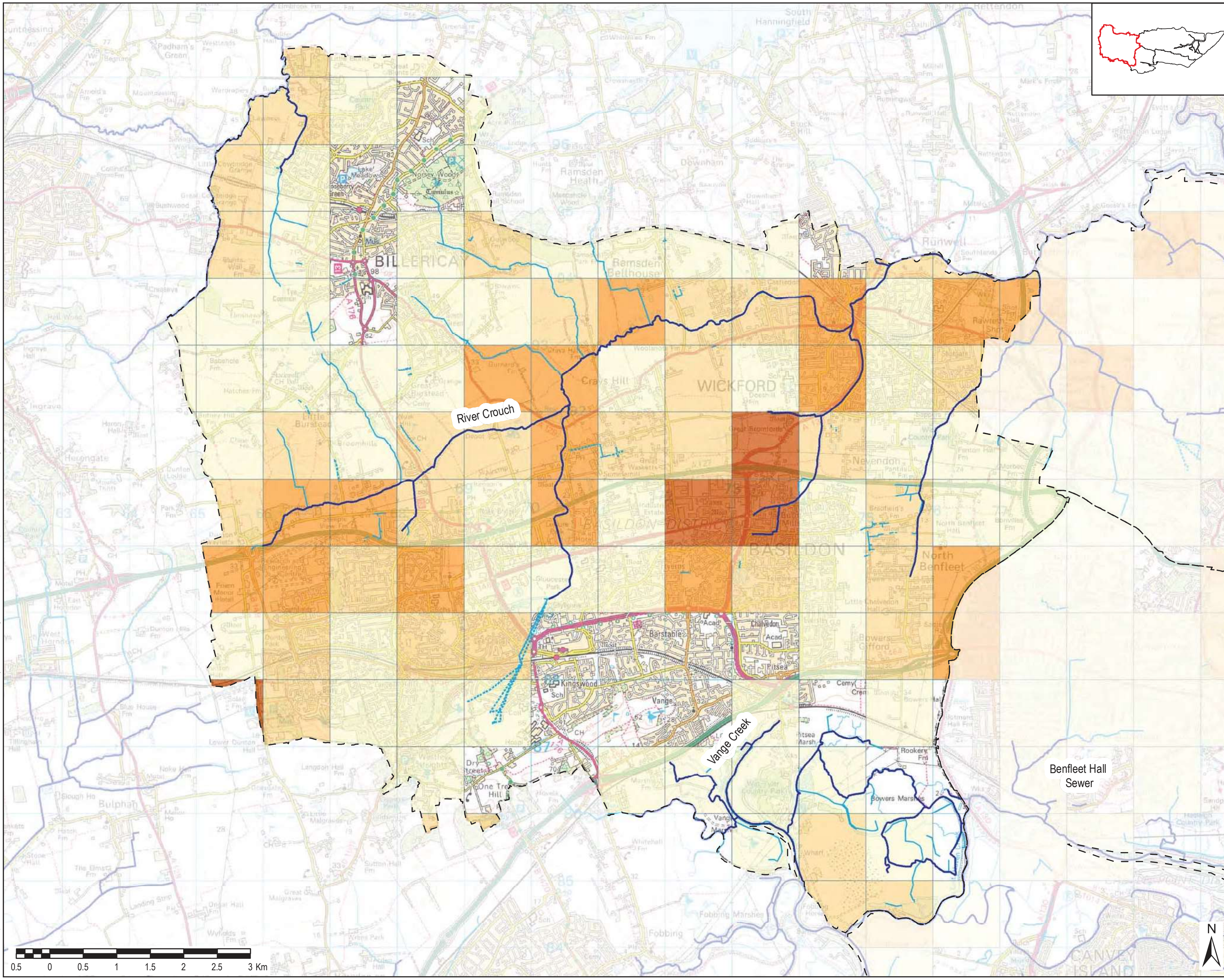
Drawing Number	Rev
FIGURE 4.5	1



LEGEND

- Council Boundary
- Main River
- Ordinary Watercourse
- Culvert

Areas Susceptible to Groundwater Flooding - Level of Risk

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

NOTES

1. This map is intended to provide a strategic over-view of susceptibility to groundwater flooding and should not be used to assess flood risk for individual properties.

2. Absence of values for any grid square means that no part of that square is identified as being susceptible to groundwater emergence.

Purpose of Issue

FINAL

Client

Basildon Council, castlepoint, Rochford District Council, southend on sea

Project Title

SOUTH ESSEX
LEVEL 1 SFRA

Drawing Title

AREAS SUSCEPTIBLE TO GROUNDWATER FLOODING

Drawn	Checked	Approved	Date
KLD	JW	CP	11/04/2018

AECOM Internal Project No.	Scale @ A3
60532482	1:52,000

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Drawing Number: FIGURE 4.4

Rev: 1

File Name:\\ba-wip-00314700 - Water\Water New\4 - PROJECTS\60532482 - South Essex SFRA\40 GIS\Project Files\MXDs\Figure 4.4 5.4 6.4 7.4 Areas Susceptible to Ground Water Flooding.mxd

Flood risk

Extent of flooding

Location

SS15 5AA

Extent of flooding from reservoirs

Maximum extent of flooding Location you selected