Job Number: 161206

CROFT STRUCTURAL ENGINEERS

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Basement Impact Assessment

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Surface Water BIA and Design and Construction Proposals

Property:

80 Greencroft Gardens
Camden
NW6 3JQ

Client:

Quorum Project Management

Structural design reviewed by	Surface-water BIA reviewed by
Chris Tomlin MEng CEng MIStructE	Phil Henry BEng MEng MICE

Hydrogeology Report	Land Stability Report
(Separate Report) Hannah Fraser CGeol	(Separate Report) Jon Smithson CGeol

Revision	Date	Comment
-	25.06.2017	First Issue
1	31.08.2017	Minor alterations following audit

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Contents

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Executive (non-technical) Summary

	The London Borough of Camden requires a BIA (Basement Impact Assessment) to be prepared for developments that include basements and lightwells. This document forms the main part of the BIA and gives details on the impact of surface water flow. The scheme design for the proposed subterranean structure is also included. This document should be used in conjunction with the Land Stability BIA (Ref 30207-1) and the Groundwater BIA (Ref. 30132R3). These are separate reports and are referred to, where relevant, within this document. This BIA follows the requirements contained within Camden Council's planning guidance CGP4 – Basements and Lightwells (2015). In summary, the council will only allow basement construction to proceed if it does not: • cause harm to the built or natural environment and local amenity • result in flooding • lead to ground instability. In order to comply with the above clauses, a BIA must undertake five stages detailed in CPG 4. This report has been produced in line with Camden planning guidance and associated supporting documents such as CPG1, CPG3, DP23, DP26, DP25 and DP27. Technical information from 'Camden geological, hydrogeological and hydrological study - Guidance for subterranean development', Issue 01, November 2010 (GSD, hereafter) was also used and is referred to in this assessment.
Existing Property	The site comprises a three storey detached residential property. There is a garden at the rear and a front yard. The land within the site boundary is relatively flat. Head deposits and London Clay are the highest natural strata below the property.
Proposed Development	The proposed development involves the formation of a new basement. This will be below the footprint of the existing structure. The basement will extend partly into the rear garden to include a full length rear lightwell with uninterrupted stepped access up to the rear garden. There will also be alterations to the structure above ground level.
Stage 1 – Screening	The BIA identified the following issues that should be carried forward to the Scoping stage:

	Subterranean flow (ground water) Refer to Groundwater BIA (Ref. 30132R3) Slope Stability Refer to Land Stability BIA (Ref 30207-1) Surface Flow and Flooding • The site is on a street that has experienced flooding.
Stage 2 – Scoping	The Scoping stage identifies in more detail the potential impacts of the basement and sets the parameters required for further study. Part of this was incorporated into the Screening stage. Areas of further study were identified, and subsequently examined by means of a desk study (refer to Section 1 of this document and also Section 3 of the BIA by Chelmer). This studied the physical setting of the site and the surrounding area. The most notable items are listed below. Subterranean flow (ground water) Refer to Groundwater BIA (Ref. 30132R3) Slope Stability Refer to Land Stability BIA (Ref 30207-1) Surface Flow and Flooding • The scoping stage identified various mechanisms related to surface water flow.
Stage 3 – Site Investigation and Study	The desk study was corroborated by a site investigation. This included a site visit by Croft and ground investigation works by Ground & Water Ltd. The ground investigation is available as a separate report [Ref GWPR1731] and is appended to the Groundwater BIA. The most relevant site features identified during the site study are: Drainage & Surface Water Flow Clay is the present at basement level. This could have implications on the ease at which rainwater can recharge to the ground. This could in turn affect the flow of surface water within and around the site.

	Subterranean flow (ground water) & Slope Stability Refer to Groundwater BIA (Ref. 30132R3)and Land Stability BIA (Ref 30207-1); summaries relevant to these facets are contained in each report.
Stage 4 – Impact Assessment	Subterranean flow (ground water) & Slope Stability Refer to Groundwater BIA (Ref. 30132R3)and Land Stability BIA (Ref 30207-1); summaries relevant to these facets are contained in each report. Drainage & Surface Water Flow A site specific flood risk assessment was carried out. This concluded that the basement can be constructed with the risk associated with flooding suitably mitigated.

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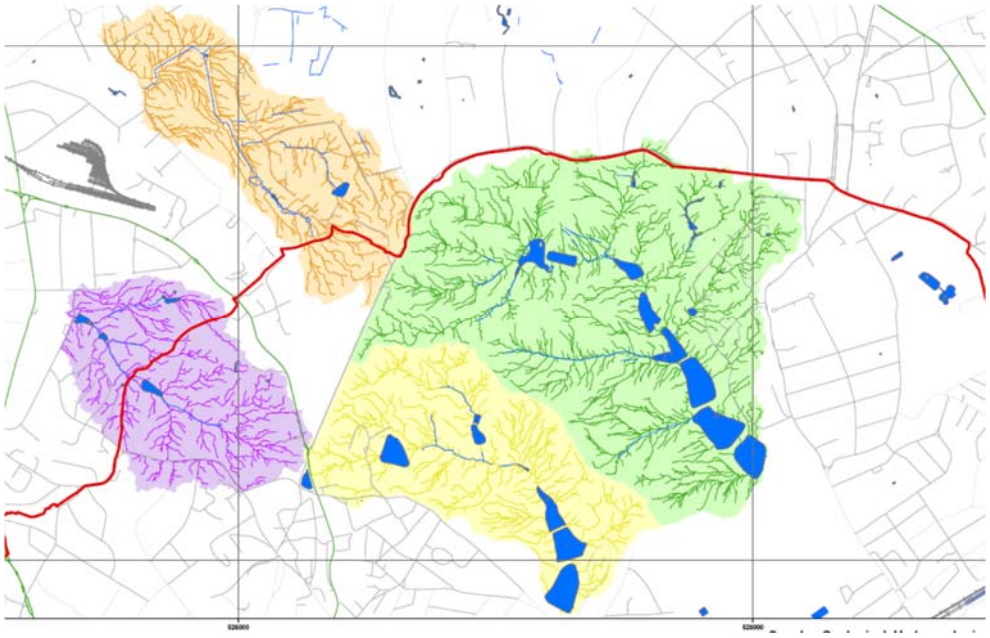
1. Screening Stage

	This stage identifies any areas for concern that should be investigated further.
Land Stability	Refer to Land Stability BIA (Ref 30207-1).
Subterranean Flow	Refer to the Groundwater BIA (Ref. 30132R3).
Surface Flow and Flooding	The questions below (taken from the Camden CPG 4 – Basements and Lightwells) and the responses by Croft form a standardised and structured approach to the Screening process.
	Question 1: Is the site within the catchment of the pond chains on Hampstead Heath? **No**. The Highgate chain catchment is indicated by coloured shaded areas on Figure 14 of the GSD. An extract of this is reproduced below. The site lies outside of these areas.  *Figure 1: Extract from Figure 14 of the GSD*
	Question 2. As part of the proposed site drainage, will surface water flows

	(e.g. volume of rainfall and peak run-off) be materially changed from the existing route? **No** – The surface water that flows from the proposed development will be routed the same way as before: water collected hard surfaced areas will enter the existing drainage system; water on soft-landscaped areas will discharge to the ground.
	Question 3. Will the proposed basement development result in a change to the hard surfaced /paved external areas? **Unknown** – Due to the removal of paving slabs at the rear and subsequent construction of lightwells, the impermeable areas may change. Carry forward to scoping
	Question 4. Will the proposed basement result in changes to the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses? **No**. At present there are no surface flows from the site to adjacent properties and downstream water courses. This will remain the case when the new basement is complete. The inflows of water received by adjacent properties and downstream water courses will not be affected.
	Question 5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses? **No**. At present surface water does no flow from the site to adjacent properties and downstream water courses. This will remain the case when the new basement is complete. The quality of water received by adjacent properties and downstream water courses will not be affected.
	Question 6 : Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature? **Unknown**. Flooding records show that the site is on a street that experienced flooding in the last 50 years. These records don't show further details that indicate exactly which properties on the street were flooded or whether the flooding included the whole of the street. Further study is

	required. Carry forward to scoping
	Summary In this section, positive and 'unknown' answers are given to Questions 3 and 6 respectively. The assessment, with regards to Surface Water Flow, should therefore be carried forward to Scoping Stage for further studying of the potential impacts.

2. Scoping Stage

	This stage identifies the potential impacts of the areas of concern highlighted in the Screening phase.
Land Stability	Refer to Land Stability BIA (Ref 30207-1).
Subterranean Flow	Refer to the Groundwater BIA (Ref. 30132R3)
Surface Flow & Flooding	**Conceptual Model** A conceptual model relating to surface water flow includes the following: • Conventional drainage is likely to be present, which collects water from hard surfaces and directs it to the sewer system. • Rainwater on soft-landscaped areas surrounding the building discharges to the ground • Groundwater levels are likely to be influenced by water discharging directly into the ground, within the site. The rate at which surface water can discharge into the ground is heavily influenced by the type of ground present. Clay is known to be the highest natural strata present throughout much of Camden. This has a low level of permeability. If much of the soil below and surrounding the basement has a low level of permeability then the structure is unlikely to significantly change the rate at which water can discharge into the soil. This in turn is unlikely to change the volume of surface water that would be present in or around the site in the event of a storm. The site investigation and walkover survey will confirm the above, and where necessary inform of the mechanisms that may influence surface water flow.

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Ground Investigation

Ground Investigation Brief	A ground investigation is required. Croft considers that this should cover: • Two trial pits to confirm the extent of the existing foundations. • 1 borehole to a depth of 10m below ground level (i.e. more than twice the depth of the proposed basement). • Stand pipe to be inserted to monitor ground water. • Indication of soil type • Site testing to determine in-situ soil parameters. • Laboratory testing to confirm soil make up and properties. • Report on soil conditions.

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3. Site Investigation and Desk Study

This section identifies the relevant features of the site and its immediate surroundings, providing further scoping where required.

The site comprises a detached residential property in a densely built up urban area. The building is constructed from brickwork loadbearing walls. Trial pits were dug next to the foundations of these walls (refer to the ground investigation report appended to the Groundwater BIA). These show that the foundations are approximately 600mm deep below ground level.

Figure 2: Front view of property

Figure 3: Birdseye View from south

Figure 4: Birdseye View from -east

Walkover Survey

A structural engineer from Croft visited the property on 19 May 2017

The site comprises a three storey residential property with a front and a rear garden. Paving is present to the front and rear of the property. A significant portion of the rear garden is soft-landscaped. The building is approximately 120 years old and is built from traditional building materials (brickwork and timber.

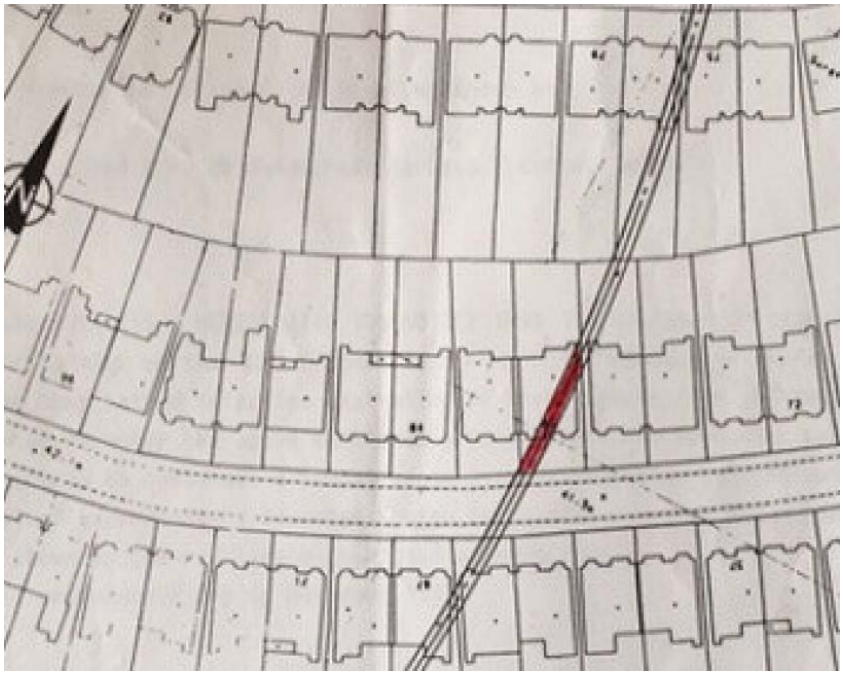
The land within the site boundary is relatively flat.

Figure 5: Partial view of rear garden looking towards rear of building

No significant structural faults were noted; the main building appeared to be in good condition.

	The land surrounding the site slopes gently downward from north to south. No significant watercourses or bodies of water were noted in the immediate vicinity.
Proposed Development	The proposed development involves the formation of a new basement. This will be below the footprint of the existing structure. The basement will extend partly into the rear garden to include a full length rear lightwell with uninterrupted stepped access up to the rear garden. There will also be alterations to the structure above ground level. Plans showing the extent of the structural alterations are appended. Architectural drawings that show the extent of the proposed alterations have been produced by Archian. These are available separately. An street plan of the area is shown below. This site is indicated. In addition to the basement area, this also includes areas that are likely to be temporarily occupied for construction purposes.  *Figure 6: Street plan with approx. site area indicated* A proposed outline construction sequence is appended to this report.
Local topography & external features not noted from walk-over survey	Inspection of OS maps show that there are no water courses, ponds, water courses or similar open water features within 50m of the site. No water features were noted within the site.

	 *Figure 7: Extract from OS map, with location of site indicated.*
Listed Buildings and Conservation Areas	The existing building is not listed. Data from Historic England shows that there are no listed buildings close by. The site is in the South Hampstead Conservation Area.
Geology & Ground Conditions	Drift sheets from the British Geological Survey (BGS) show that the site is underlain with clay. This has been confirmed by a ground investigation. More details are presented in a ground investigation report by Ground & Water (ref GWPR1731). This is appended to the Groundwater BIA.
Highways & public footpaths	The site is not within 5m of a public highway.
London Underground and Network Rail	The site is more than 100m away from the nearest national rail line and the nearest subterranean train line. These are unlikely to be affected by the new basement.
UK Power Networks	There are no significant items of electrical infrastructure (eg pylons and substations) in the immediate vicinity.
Underground water services	In 2016 Thames Water produced an asset search showing drainage infrastructure close to the site. This is appended. A trunk sewer is shown below the main road. A storm water relief pipe is shown crossing the site. The diameter of this is

	given as approximately 2.5m. A record of correspondence from Thames Water dated 1992 has details of this is and is appended to the Groundwater BIA. This confirms the tunnel has an internal diameter of 2.59m and runs at approximately 13m below the ground surface. An extract from a plan used as part of this correspondence is reproduced below.  *Figure 8: Record drawing of storm water relief sewer* There will be approximately 10m of vertical clearance between the top ot this sewer and the bottom of the proposed basement. It is unlikely that the sewer will be affected by the works. Nevertheless, after planning permission is granted, and before construction, the design team and the contractor should notify Thames Water of the intention to excavate above this asset.
Proximity of Trees	Mature trees are present within the site boundary. These are outside of the edge of the proposed basement. The closest tree is a semi-mature cypress, close to the garden wall with No 82 (pictured below).

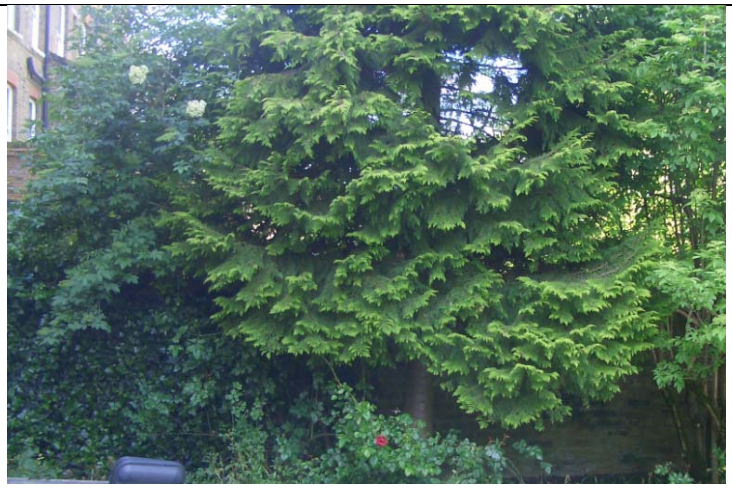


Figure 9: Cypress tree close to proposed basement

By inspection, the tree was planted after the construction of the building and the neighbouring property No 82.. If the planting and subsequent growth of the tree had any effect on the foundations of these buildings then this would have manifested in the form of settlement cracks. None were visible during the site visit. Removal or relocation of this tree is therefore unlikely to affect the neighbouring property.

Adjacent Properties

Visual inspections of the external elevations (and where possible, internal areas) were taken of the adjacent properties.

78 Greencroft Gardens – property to the right

78 Greencroft Gardens is a residential property of a similar age and construction to No 80. This is currently divided into flats.

In April 2014, a structural engineer visited the ground floor flat of this property with the intention of producing a BIA to support the planning application of a basement below part for the main building. The existing building did not exhibit any signs of subsidence nor movement.

No trial pits were dug at the time of the structural engineer's visit in 2014. However, given that the property is of a similar age and construction to No 80, it is reasonable to assume that the foundations would be at a similar depth.

The building is separated from No 80 by side access routes and a dividing wall, as shown in the photo below.

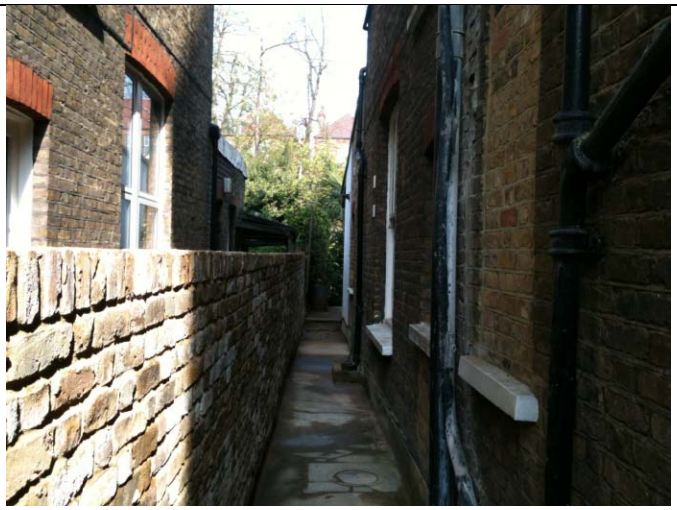
	 *Figure 10: Side of property adjacent to Number 80, looking towards the rear* A cellar was present. This extended to no more than 25% (in plan) of the footprint of the existing property. The cellar was to the rear of the property and closest to the flank wall nearest to No 80.  *Figure 11: Existing cellar, opening of redundant coal chute* It is understood that a basement was subsequently constructed. The planning stage drawings for this, which give an indication of the proposed extent of the basement, are appended.
82 Greencroft Gardens – property to the left	82 Greencroft Gardens, is of a similar age and construction to No 80.

Figure 12: Front view of property

The building does not adjoin No 80. The buildings are separated by a small gap of approximately 0.5m, as shown in the photo below.

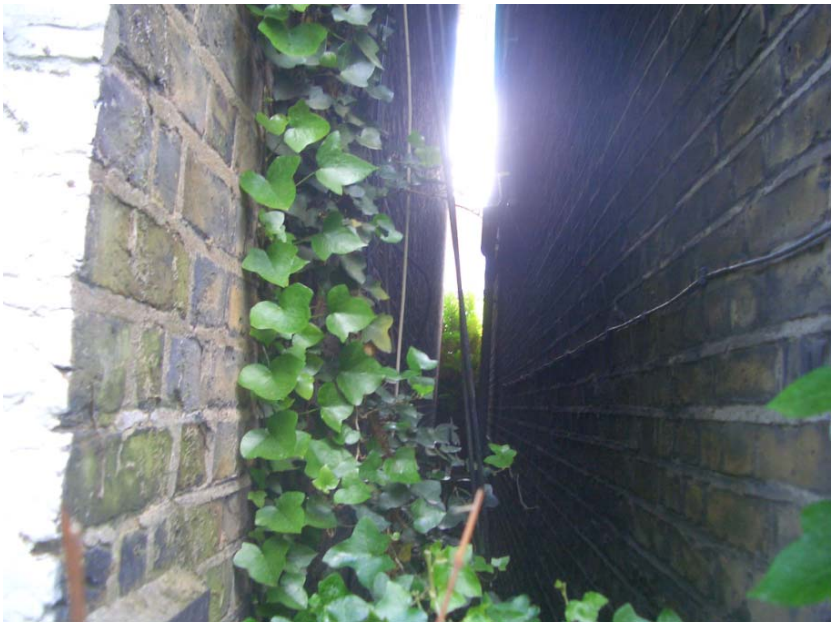


Figure 13: Gap between buildings 80 and 82

No signs of movement were noted to the main building from the outside. A search on Camden Council's website has shown that no basements have been proposed since the original construction. The plan layout is similar to the arrangement of No 78. Accounting for this, there is likely to be a cellar which will be closest to the flank wall nearest to No 84.

Monitoring, Reporting and Investigation

The ground investigation report, is available as a separate report by Ground & Water (ref GWPR1731).

4. Basement Impact Assessment

Impacts relating to Land Stability and Groundwater are described in separate BIAs (referenced previously). Proposed measures to mitigate these, which should be developed further at detailed design stage, are presented in this section.

Ground Movement Assessment & Predicted Damage Category

The design and construction methodology aims to limit damage to the existing building on the site, and to the neighbouring buildings, to Category 2 or lower as set out in Table 6.4 of CIRIA report C760. For this development, suitable temporary propping during the construction phase will limit the amount of movement due to the basement works. This is described in the Basement Method Statement (appended).

The ground movement assessment (GMA) is contained within the Land Stability BIA [Ref 30207-1].

Mitigation Measures: Limiting Ground Movement

The BIA by Ground and Project Consultants Ltd (Ref 30207-1) emphasised the requirement for best practice construction methods to limit any ground movements and associated damage to the neighbouring properties.

The design and construction methodology described in this report aims to limit damage to acceptable levels. For this development, suitable temporary propping during the construction phase will limit the amount of movement due to the basement works. This is described in the Basement Method Statement (appended). The procedures described in this will mitigate the impacts that the construction of the basement will have on nearby properties.

The works must be carried out in accordance with the Party Wall Act and condition surveys will be necessary at the beginning and the end of the works. The Party Wall Approval procedure will reinforce the use of the proposed method statement and, if necessary, require it to be developed in more detail with more stringent requirements than those required at planning stage.

It is not expected that any cracking will occur in nearby structures during the works. However, Croft's experience advises that there is a risk of movement to the neighbouring property.

To reduce the risk to the development:

- Employ a reputable firm that has extensive knowledge of basement works.
- Employ suitably qualified consultants.
- Provide method statements for the contractors to follow
- Investigate the ground this has now been done.
- Record and monitor the properties close by. This is completed by a condition survey under the Party Wall Act, before and after the works are completed. Refer to the end of the appended Basement Construction Method Statement.
- Provide additional temporary support at the head of the retaining walls. This will give a 'high stiffness' propping model, as identified under CIRIA C580.

Monitoring of Structures

In order to safeguard the existing structures during underpinning and new basement construction, movement monitoring is to be undertaken.

Risk Assessment

Monitoring Level proposed	Type of Works.
Monitoring 4 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment Lateral movement between walls by laser measurements	New basements greater than 2.5m and shallower than 4m deep in gravels Basements up to 4.5m deep in clays Underpinning works to grade I listed building

Before the works begin, a detailed monitoring report is required to confirm the implementation of the monitoring. The items that this should cover are:

- Risk Assessment to determine level of monitoring
- Scope of Works
- Applicable standards
- Specification for Instrumentation
- Monitoring of Existing cracks
- Monitoring of movement
- Reporting
- Trigger Levels using a RED / AMBER / GREEN System

Recommend levels are shown within the proposed monitoring statement (appended).

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Basement Design & Construction Impacts and Initial Design Considerations

Design Concept

The basement will consist of RC (reinforced concrete) cantilevered retaining walls. These will be designed to resist the lateral loads around the perimeter of the basement. The basement floor structure will comprise reinforced concrete slabs. There will also be internal foundation strips to support internal walls.

The RC walls will also transfer vertical loads to the ground.

The investigations highlight that water is present. The walls will be designed to resist the hydrostatic pressure. Design of retaining walls should account for the anticipated worst case scenario for ground water levels. It is possible that a water main may break causing a local high water table. To account for this, the wall is designed for water 1m from the top of the wall.

The design should also consider floatation as a risk. The design has accounted for the weight of the building and the uplift forces from the water. The weight of the building is greater than the uplift, resulting in a stable structure.

The basement slabs should be designed to resist local uplift.

The stability of the walls should be designed using K_a & K_p values. The Land Stability BIA predicts heave below the basement. This will be less than 20mm and can be accommodated by installing compressible material or a void former (Clayboard or similar) between the basement slab and the ground. Alternatively the slab can be designed to resist upward pressures due to heave. The option of using void former is shown as a possible solution in Appendix C; the final method of resisting heave should be decided at detailed design stage and designed accordingly.

Trees roots are known to cause volumetric changes in cohesive soils. This has the potential to affect building foundations. The basement will be founded at a level which will be outside the zone of influence of any trees.

Drawings showing the structural scheme design are appended.

Additional loading requirements	The lateral earth pressure exerts a horizontal force on the retaining walls. The retaining walls will be checked for resistance to the overturning force this produces. Lateral forces will be applied from: • Soil loads • Hydrostatic pressures • Surcharge loading from behind the retaining walls <u>Surcharge Loading</u> The following will be applied as surcharge loads to the retaining walls: • Garden surcharge 2.5kN/m^2 As noted previously, the basement is more than 5m of a highway or a pedestrian right of way. Surcharge loading from heavy vehicles are therefore not applicable. <u>Adjacent Properties</u> A line at 45º from the foundation of the garden wall with No 78 and on the other side, from the foundation of the flank wall of no 82 would intersect the basement retaining wall. Dispersed loading from these walls would need to be accounted for at detailed design stage. The appended calculations show the design of the most heavily loaded retaining walls. The most critical parameters have been used for this.
Mitigation Measures - Drainage and Damp-proofing	The design of drainage and damp-proofing is not within the scope of this assessment and would not normally be expected to be part of the structural engineer's remit at detailed design stage. A common and anticipated detailed design stage approach is to use internal membranes (Delta or similar). These will be integral to the waterproofing of the basement. Any water from this will enter a drainage channel below the slab. This will be pumped and discharged into the exiting sewer system. It is recommended that a waterproofing specialist is employed to ensure all the water proofing requirements are met. The waterproofing specialist must name their structural waterproofer. The structural waterproofer must inspect the structural details and confirm that he is happy with the robustness. Due to the segmental construction nature of the basement, it is not possible to water proof the joints. All waterproofing must be made by the

	waterproofing specialist. He should review the structural engineer's design stage details and advise if water bars and stops are necessary. The waterproofing designer must not assume that the structure is watertight. To help reduce water flow through the joints in the segmental pins, the following measures should be applied: • All faces should be cleaned of all debris and detritus • Faces between pins should be needle hammered to improve key for bonding • All pipe work and other penetrations should have puddle flanges or hydrophilic strips Mitigation measures with regards to internal flooding are described within a site specific flood risk assessment. This is a separate document.
SUDS Considerations	As described previously, the basement will not have any noteworthy impacts on surface flow. Section 11 of CPG3 draws attention to the SUDS hierarchy of drainage solutions, which promotes the use of infiltration techniques above others. SUDS considerations are described in more detail in a site specific flood risk assessment. This is a separate document.

Temporary Works	Temporary propping details will be required. This must be provided by the contractor. Their details should be forwarded to the design stage engineer. Water levels should be monitored for at least one month prior to starting on site and throughout the construction process. Localised dewatering to pin excavations may be necessary. To demonstrate the feasibility of the works, a proposed basement construction method statement is appended. <u>Protection of trees</u> As mentioned previously, there semi-mature cypress tree close to the basement. If the client intends to retain this tree, the construction of the basement should aim to minimise the damage to any of the tree's roots. This should be incorporated into the contractor's construction method statement at detailed design stage. <u>Construction Management</u> The site is in a conservation area. Camden Council will require a management plan for construction, construction traffic and demolition. This should be produced at detailed design stage after planning permission is granted. An outline construction programme is appended. At detailed design stage, after planning permission is granted, the design team should notify Thames Water of the intention to proceed with these works and provide further design details if necessary.

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Appendix A: Structural Calculations

CPG4 Section 5 highlights that other permits and requirements will be necessary after planning. Item 5.1 highlights that Building Regulations will be required. As part of the building control pack full calculations must be undertaken and provided at detailed design stage once planning permission is granted. The calculations must be completed to a recognised Standard (BS or Euro Codes). The calculations must take into account the findings of this report and the recommendations of the auditors.

The design must resist:

- Vertical loads from the proposed works
- Lateral loads from wind, soil and water
- Loadings in the temporary condition
- All other applied loads on the building
- Uplift forces from hydrostatic effects and soil heave (if not using a suspended slab)

The final proposed scheme must:

- Provide stability in the temporary condition to all forces
- Provide stability to all forces in the permanent condition

As part of the planning Croft structural engineers has considered some of the pertinent parts of the basement structure to ensure that it can be constructed. The following calculations are not a full set of calculations for the final design which must be provided for building regulations. The structural calculations Croft considers the most relevant (and included in this appendix) for this development are:

1. Retaining wall for rear basement

The most critically loaded retaning wall is presented here. This is the retaining wall closest to No 82.

RETAINING WALL ANALYSIS & DESIGN

Hydrostatic Forces

Currently taken at 1m below ground level to account for seasonal fluctuations in ground water level. Further monitoring of ground water at detailed design stage may justify a lower water table for the calculations.

Vertical load run down

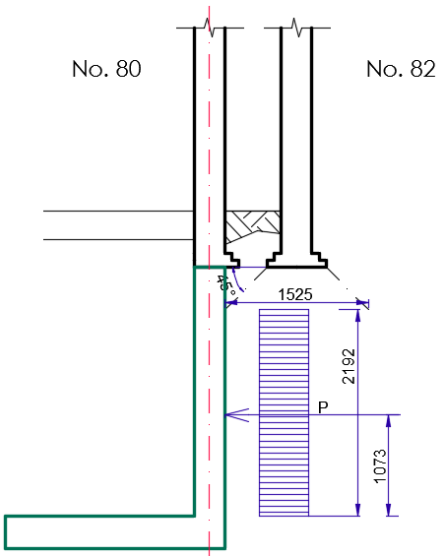
For worst case, take minimal loads on wall (ie dead load of superstructure walls only, ignore floor loads)

225 thick wall	DL_225 = 4.65kN/m^2 × 3.3m =**15.345**kN/m
325 thick wall	DL_325 = 6.85 kN/m^2 × 6.6m =**45.210**kN/m
Total DL	DL = DL_225 + DL_325 = **60.555**kN/m

Surcharge behind wall

Garden surcharge (variable load)	q = 2.5kN/m^2

Surcharge from foundation, applied as horizontal load



Per metre of flank wall (similar to above):

Dead load from neighbouring building	DL_82 = 61kN
Load spread length	L = 1500 mm
Resultant point load from brickwork wall	P = DL_82 / L = **40.667**kN/m

Angle of friction	ϕ = 20	
Active coeff	K_a = (1 - sin(ϕ)) / (1 + sin(ϕ))	= **0.490**
Passive coeff	K_p = 1 / K_a	= **2.040**

Dispersed load contacts wall at 2.2m above top of base of retaining wall

horizontal pressure $p_g = P * K_a$ = **19.938** kN/m

horizontal force (due to wall) $P_g = p_g * 2.2m$ = **43.865** kN

acting at 1.1m above base

RETAINING WALL ANALYSIS

In accordance with EN1997-1:2004 incorporating Corrigendum dated February 2009 and the UK National Annex incorporating Corrigendum No.1

Tedds calculation version 2.6.08

Retaining wall details

Stem type	Cantilever		
Stem height	h_{stem} = **2900** mm		
Stem thickness	t_{stem} = **325** mm		
Angle to rear face of stem	α = **90** deg		
Stem density	γ_{stem} = **25** kN/m^3		
Toe length	l_{toe} = **2000** mm		
Base thickness	t_{base} = **300** mm		
Base density	γ_{base} = **25** kN/m^3		
Height of retained soil	h_{ret} = **2900** mm	Angle of soil surface	β = **0** deg
Depth of cover	d_{cover} = **0** mm		
Height of water	h_{water} = **2000** mm		
Water density	γ_w = **9.8** kN/m^3		

Retained soil properties

Soil type	Stiff clay		
Moist density	γ_{mr} = **19** kN/m^3		
Saturated density	γ_{sr} = **19** kN/m^3		
Characteristic effective shear resistance angle		$\phi'_{r.k}$ = **18** deg	
Characteristic wall friction angle	$\delta_{r.k}$ = **9** deg		

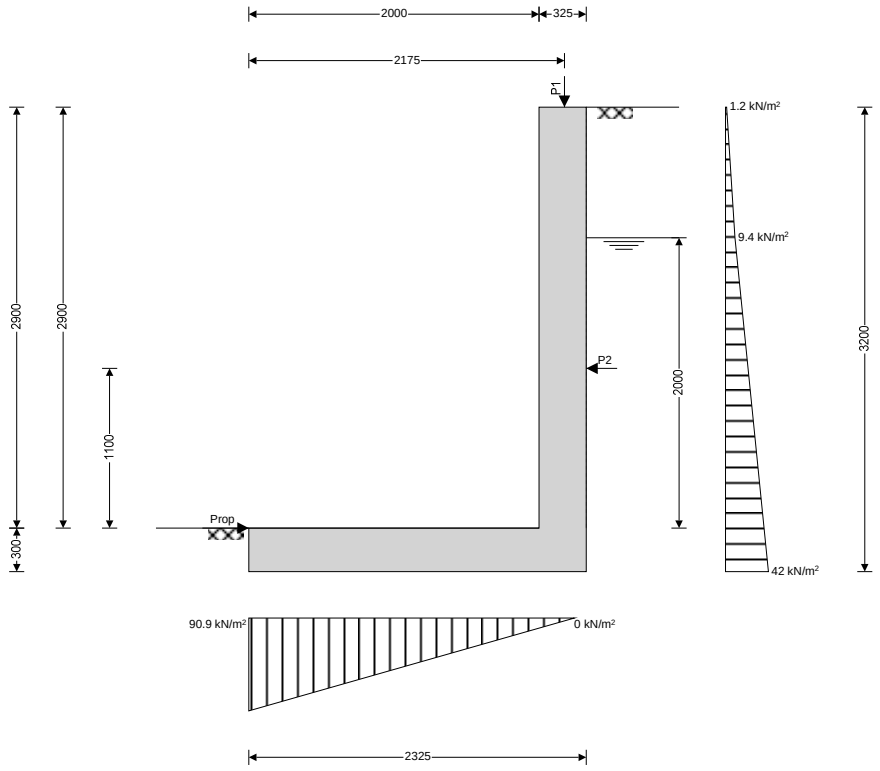
Base soil properties

Soil type	Stiff clay		
Soil density	γ_b = **19** kN/m^3		
Characteristic effective shear resistance angle		$\phi'_{b.k}$ = **18** deg	
Characteristic wall friction angle	$\delta_{b.k}$ = **9** deg		
Characteristic base friction angle		$\delta_{bb.k}$ = **12** deg	
Presumed bearing capacity	$P_{bearing}$ = **125** kN/m^2		

Loading details

Variable surcharge load	$Surcharge_Q$ = **2.5** kN/m^2		
Vertical line load at 2175 mm	P_{G1} = **61** kN/m		
Horizontal line load at 1100 mm	P_{G2} = **44** kN/m		

Croft Structural Engineers Ltd Rear of 60 Saxon Rd SE25 5EH Selhurst, London	Project 80 Greencroft Gardens				Job Ref. 170503	
	Section Basement Calculations				Sheet no./rev. 3	
	Calc. by GW	Date 25/06/2017	Chk'd by	Date	App'd by	Date



General arrangement

Calculate retaining wall geometry

Base length	l_{base} = **2325** mm		
Saturated soil height	h_{sat} = **2000** mm		
Moist soil height	h_{moist} = **900** mm		
Length of surcharge load	l_{sur} = **0** mm		
Vertical distance	x_{sur_v} = **2325** mm		
Effective height of wall	h_{eff} = **3200** mm		
Horizontal distance	x_{sur_h} = **1600** mm		
Area of wall stem	A_{stem} = **0.943** m^2	Vertical distance	x_{stem} = **2163** mm
Area of wall base	A_{base} = **0.698** m^2	Vertical distance	x_{base} = **1163** mm

Using Coulomb theory

Active pressure coefficient	K_A = **0.483**	Passive pressure coefficient	K_P = **2.359**

Bearing pressure check

Vertical forces on wall

Total $F_{total\_v} = F_{stem} + F_{base} + F_{water\_v} + F_{P\_v}$ = **102** kN/m

Horizontal forces on wall

Total $F_{total\_h} = F_{sat\_h} + F_{moist\_h} + F_{pass\_h} + F_{water\_h} + F_{sur\_h} + F_{P\_h}$ = **105.8** kN/m

Moments on wall

Total $M_{total} = M_{stem} + M_{base} + M_{sat} + M_{moist} + M_{water} + M_{sur} + M_P$ = **76.3** kNm/m

Check bearing pressure

Propping force F_{prop_base} = **105.8** kN/m

Bearing pressure at toe	q_{toe} = **90.9** kN/m^2	Bearing pressure at heel	q_{heel} = **0** kN/m^2
Factor of safety	FoS_{bp} = **1.375**		

PASS - Allowable bearing pressure exceeds maximum applied bearing pressure

RETAINING WALL DESIGN

In accordance with EN1992-1-1:2004 incorporating Corrigendum dated January 2008 and the UK National Annex incorporating National Amendment No.1

Tedds calculation version 2.6.08

Concrete details - Table 3.1 - Strength and deformation characteristics for concrete

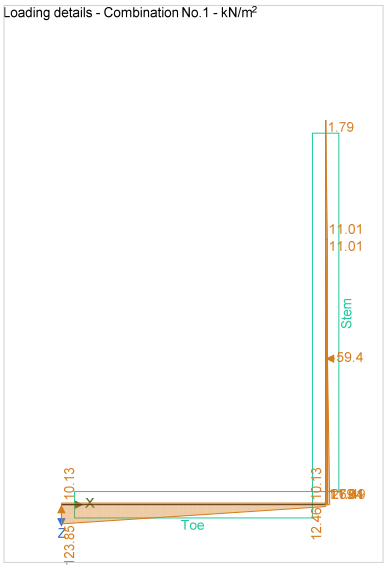
Concrete strength class	C32/40		
Char.comp.cylinder strength	f_{ck} = **32** N/mm^2	Mean axial tensile strength	f_{ctm} = **3.0** N/mm^2
Secant modulus of elasticity	E_{cm} = **33346** N/mm^2	Maximum aggregate size	h_{agg} = **20** mm
Design comp.concrete strength	f_{cd} = **18.1** N/mm^2	Partial factor	γ_C = **1.50**

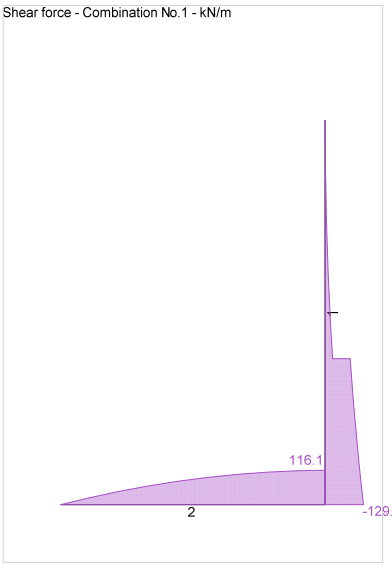
Reinforcement details

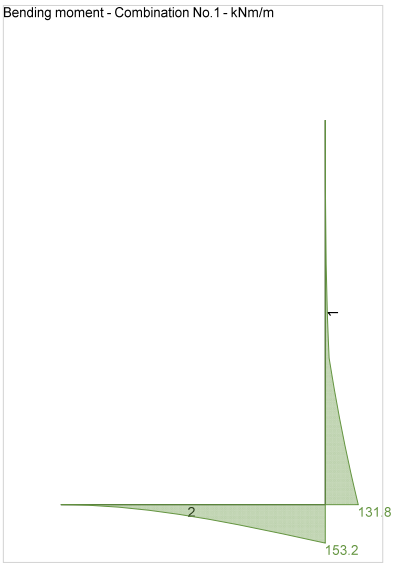
Characteristic yield strength	f_{yk} = **500** N/mm^2	Modulus of elasticity	E_s = **200000** N/mm^2
Design yield strength	f_{yd} = **435** N/mm^2	Partial factor	γ_S = **1.15**

Cover to reinforcement

Front face of stem	c_{sf} = **40** mm	Rear face of stem	c_{sr} = **50** mm
Top face of base	c_{bt} = **50** mm	Bottom face of base	c_{bb} = **75** mm







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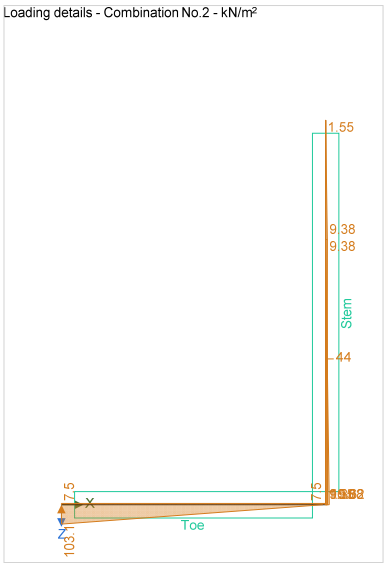
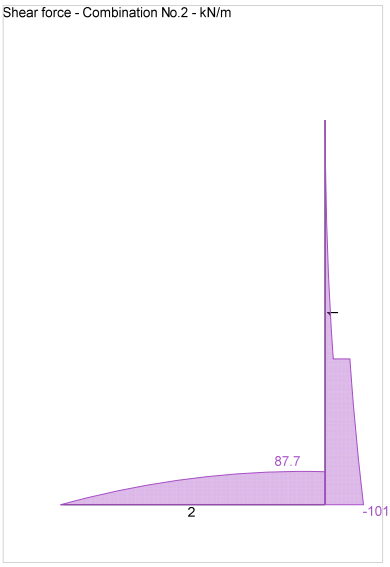
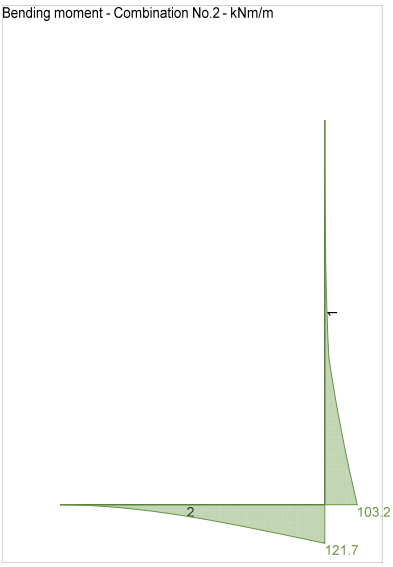
	Section Basement Calculations			Sheet no./rev. 5	
	Calc. by GW	Date 25/06/2017	Chk'd by	Date	App'd by	Date







Check stem design at base of stem

Depth of section h = **325** mm

Rectangular section in flexure - Section 6.1

Design bending moment M = **131.8** kNm/m K = **0.059** K' = **0.207**

K' > K - No compression reinforcement is required

Tens.reinforcement required $A_{sr.req}$ = **1211** mm²/m

Tens.reinforcement provided 20 dia.bars @ 100 c/c Tens.reinforcement provided $A_{sr.prov}$ = **3142** mm²/m

Min.area of reinforcement $A_{sr.min}$ = **417** mm²/m Max.area of reinforcement $A_{sr.max}$ = **13000** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Deflection control - Section 7.4

Limiting span to depth ratio 14.2 Actual span to depth ratio 10.9

PASS - Span to depth ratio is less than deflection control limit

Rectangular section in shear - Section 6.2

Design shear force V = **129.9** kN/m Design shear resistance $V_{Rd.c}$ = **199.7** kN/m

PASS - Design shear resistance exceeds design shear force

Horizontal reinforcement parallel to face of stem - Section 9.6

Min.area of reinforcement $A_{sx.req}$ = **785** mm²/m Max.spacing of reinforcement s_{sx_max} = **400** mm

Trans.reinforcement provided 16 dia.bars @ 200 c/c Trans.reinforcement provided $A_{sx.prov}$ = **1005** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Check base design at toe

Depth of section h = **300** mm

Rectangular section in flexure - Section 6.1

Design bending moment M = **153.2** kNm/m K = **0.104** K' = **0.207**

K' > K - No compression reinforcement is required

Tens.reinforcement required $A_{bb.req}$ = **1824** mm²/m

Tens.reinforcement provided 20 dia.bars @ 100 c/c Tens.reinforcement provided $A_{bb.prov}$ = **3142** mm²/m

Min.area of reinforcement $A_{bb.min}$ = **338** mm²/m Max.area of reinforcement $A_{bb.max}$ = **12000** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Rectangular section in shear - Section 6.2

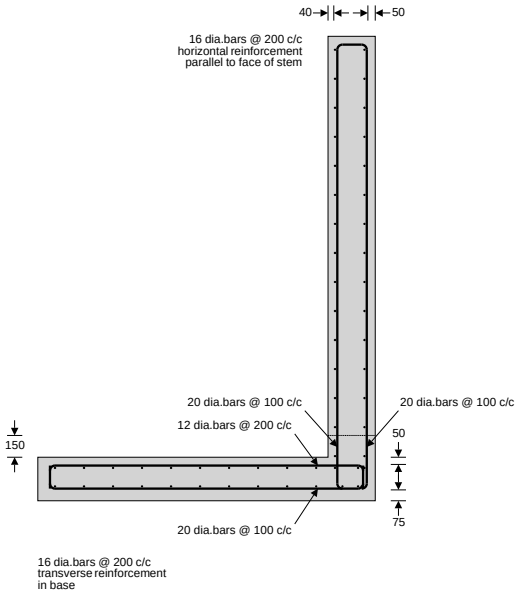
Design shear force V = **116.1** kN/m Design shear resistance $V_{Rd.c}$ = **182.6** kN/m

PASS - Design shear resistance exceeds design shear force

Secondary transverse reinforcement to base - Section 9.3

Min.area of reinforcement	$A_{bx.req}$ = **628** mm^2/m	Max.spacing of reinforcement	s_{bx_max} = **450** mm
Trans.reinforcement provided	16 dia.bars @ 200 c/c	Trans.reinforcement provided	$A_{bx.prov}$ = **1005** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required



Reinforcement details

Above digram is indicavtive only and is not a final design stage representation of the reinforcement to be used.

BASEMENT SLAB DESIGN

A suspended slab is proposed for the basement.

This needs to be designed for:

- local uplift due to net hydrostatic forces (with ground water at 1m below ground level, ie a head of 2.5m) for top reinforcement
- dead and live loads for bottom reinforcement

By inspection, the pressure for the net uplift forces will be the most critical and a conservative design to match the bottom reinforcement with the top reinforcement will suffice.

Conservatively take max span as span from perimeter to internal foundation strip (ignoring the holding down effect of the retaining wall base) ie 5m

Net pressure, water less weight of concrete (conservatively assume concrete is only 100mm thick)

$p = 2.5m*10kN/m^3-100mm*24kN/m^3 =$ **22.600** kN/m^2

Moment (for 1m width of slab) $M = p*1m*5m*5m/8 =$ **70.625** kNm

Slab, main reinforcement

ULS moment (approx) M = 71 kNm

Overall depth (average depth) h = 200mm

Cover c = 75mm

Bar diameter D = 16mm

Effective depth $d = h - c - D/2 =$ **117.000** mm

Width b = 1m

Concrete strength $f_{cu} = 35N/mm^2$

Ratio $k = M/(f_{cu}*b*d\text{^}2) =$ **0.148**

Assuming redistribution does not exceed 10 % (this implies a limitation of the neutral axis depth to d/2),

k' = 0.156

Compression re-bar required? check = if(k<k',"No","Yes") = **"No"**

Lever arm (assuming no comp steel req'd) $z = \min(d*(0.5 + \sqrt{(0.25-k/0.9)}),0.95*d) =$ **92.680** mm

Steel strength $f_y = 500N/mm^2$

Area of steel required $A_s = M/(0.95*f_y*z) =$ **1612.791** mm^2

H16s @ 100cc (2011mm/m) will suffice

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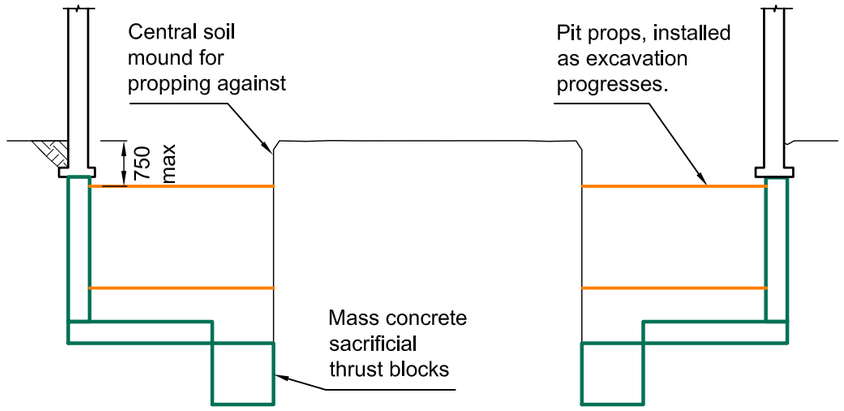
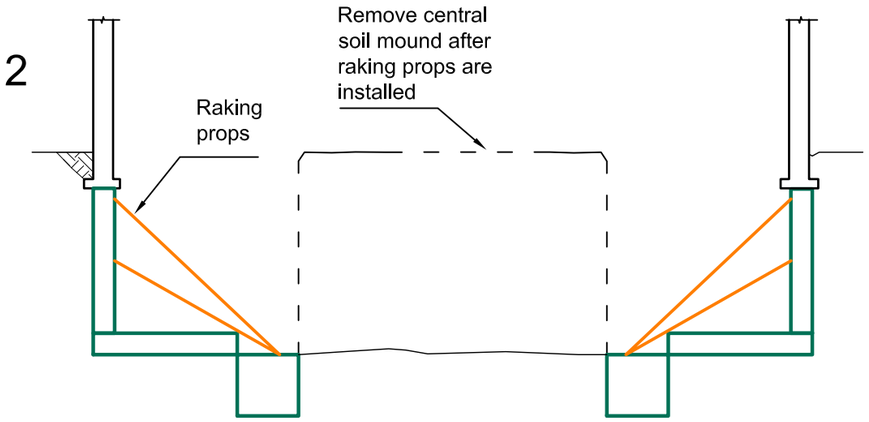
Appendix B: Construction Sequence

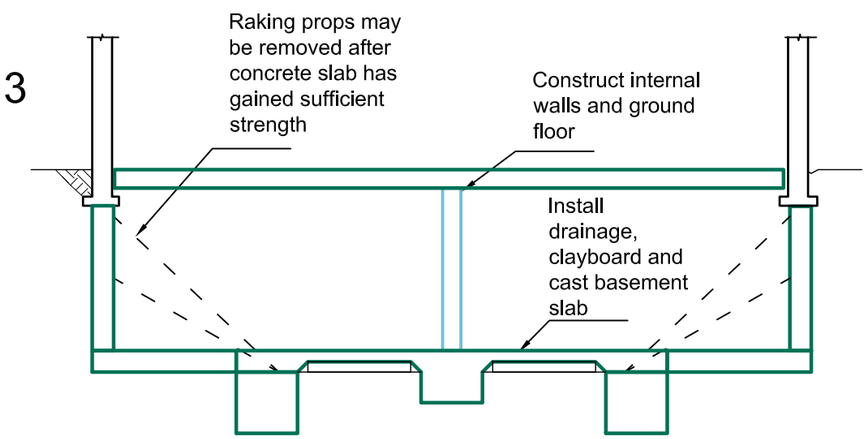
Phase 1



Phase 2



Phase 3



Typical section through building showing construction sequence

(1:100)

PHASE 1

1.1. Demolish and upper floors and walls and provide temporary lateral support to flank walls and internal walls where required
1.2. Needle and prop upper front and rear walls, constructing temporary mass concrete pads where necessary.
1.3. Demolish ground floor and excavate to level of existing footings
1.4. Excavate underpins in a hit and miss procedure following the sequence shown in plan on structural engineer's drawing (SL-10)
  1.4.1. Prop pits against central soil mound as excavation progresses
  1.4.2. Do not commence excavation for pin until at least 48 hours after drypacking for adjacent pin is complete (24hours minimum is possible if Conbextra 100 cement accelerator is added to dry pack mix)
  1.4.3. For every second pin, extend excavation to allow for subesquent construction of mass concrete thrust block below formation level

PHASE 2

2.1. Install raking props to wall and prop against thrust blocks.
2.2. Excavate central soil mass

PHASE 3

3.1. Excavate soil between pins
3.2. Install below slab drainage and clayboard
3.3. Construct internal foundations
3.4. Cast concrete floor slab.
  3.4.1. Cast around bases of raking props to allow for removal
3.5. After basement slab has gained sufficient strength, remove raking props.
3.6. Proceed with construction of internal walls and ground floor structure.

Final Temporary Works Method Statement TBA at Detailed Design Stage

- PLANNING ISSUE -
NOT FOR CONSTRUCTION

Rev	Date	Amendments
1	30.08.2017	Higher level propping in Phase 1 clarified
-	25.06.2017	First issue for comment

Job No. 170503	Drawn GW / Chk'd -	Scale As shown @ A3
Dwg No. TW-10	Rev. 1	Date June 2017

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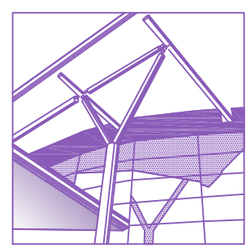


Client: Quorum Project Management

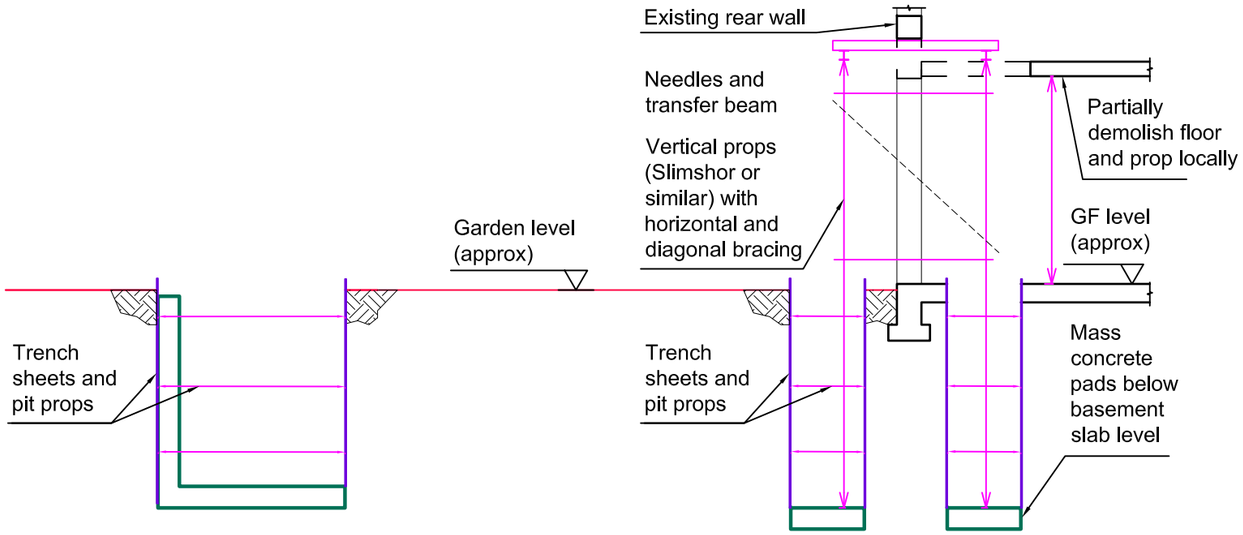
Project: 80 Greencroft Gardens

Title : Temporary Works Scheme Design

PHASE 1

1.1. Needle and prop upper front and rear walls, constructing temporary mass concrete pads where necessary.

1.2. Excavate for rear retaining walls in a hit and miss procedure following the sequence shown in plan on drawing SL-10 (may commence at same time as above step)
- 1.2.1. Install trench sheets and props from high level as the excavation progresses)
- 1.2.2. Place reinforcement and cast wall segments.
- 1.2.3. Do not commence excavation for pin until at least 48 hours after adjacent pin is complete

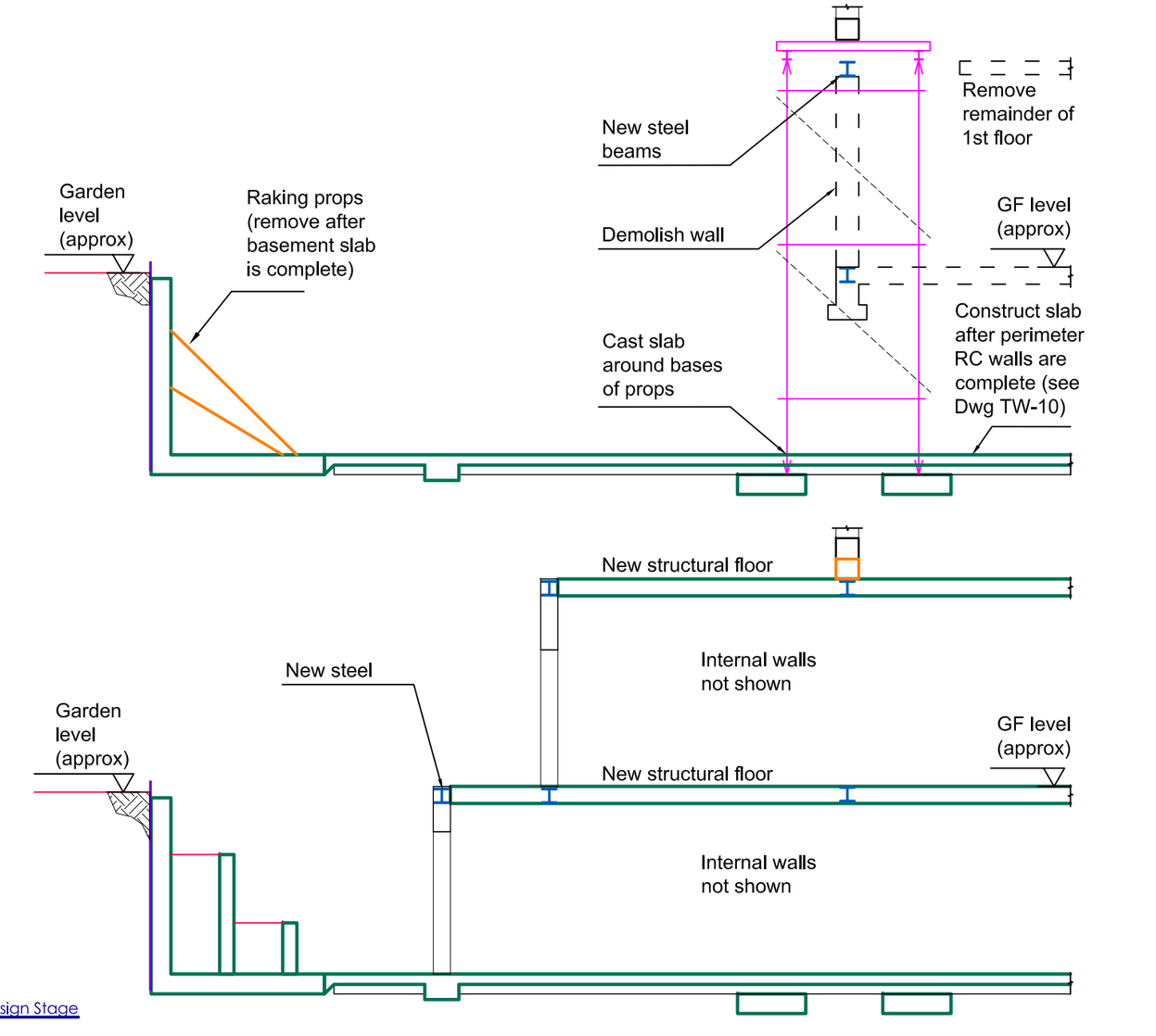


PHASE 2

2.1. Partially demolish rear wall of main building and install new steelwork

2.2. For rear retaining wall install raking props to base (may be done at same time as above step).

2.3. Excavate and cast basement slab (follow procedures on TW-10).



PHASE 3

3.1. After basement slab has gained sufficient strength, remove raking props.

3.2. After steelwork structure and basement RC structure is complete, remove props to rear wall

3.3. Complete ground floor and upper floor structure

Final Temporary Works Method Statement TBA at Detailed Design Stage

- PLANNING ISSUE -
NOT FOR CONSTRUCTION

Rev	Date	Amendments
-	30.08.2017	First issue

Job No. 170503	Drawn GW / Chk'd -	Scale As shown @ A3
Dwg No. TW-20	Rev. -	Date June 2017

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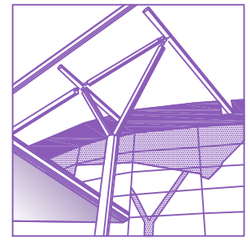

Client: Quorum Project Management

Project: 80 Greencroft Gardens

Title : Temporary Works Scheme Design for Rear of Basement

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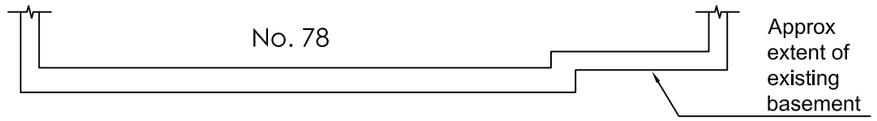
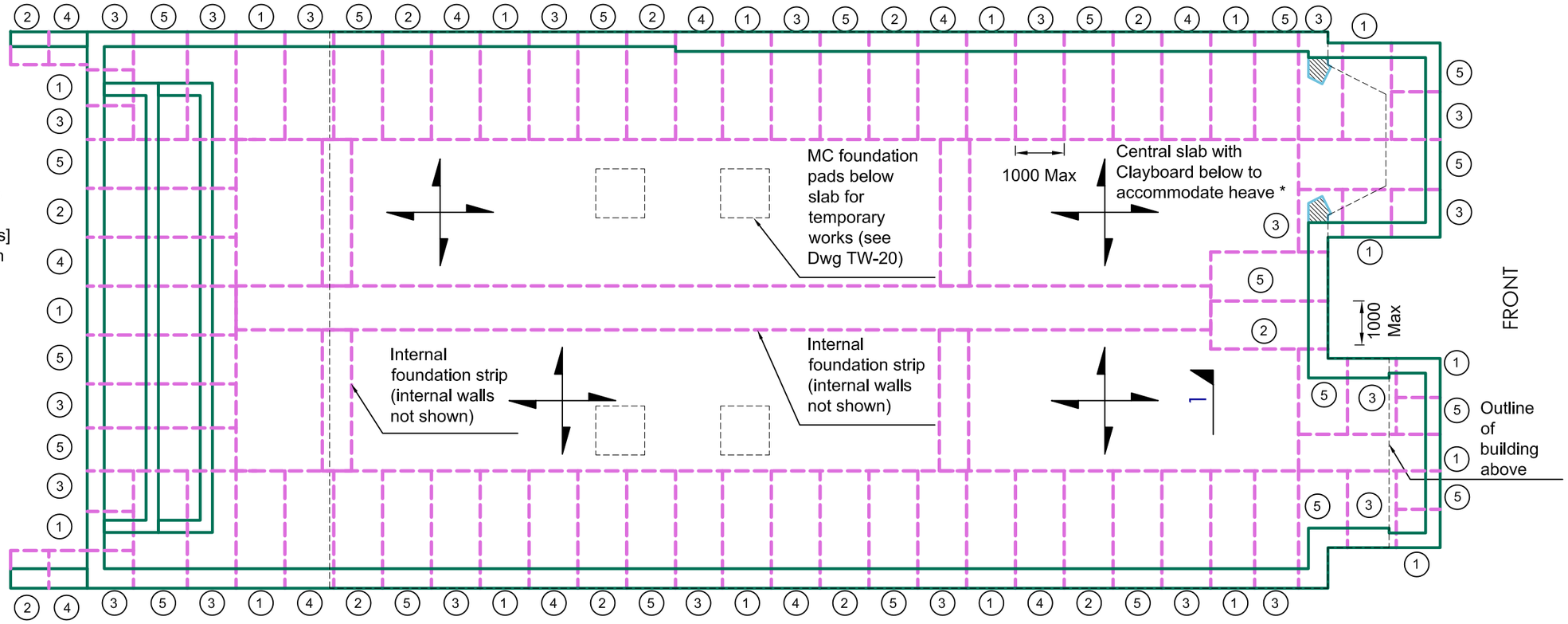
Appendix C: Structural Drawings

- PLANNING ISSUE -
NOT FOR CONSTRUCTION

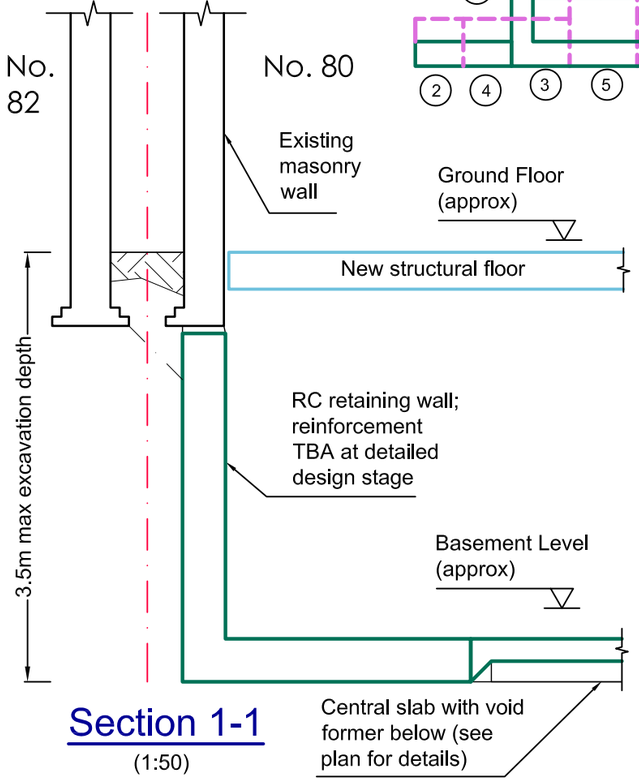


Numbers denote underpin/wall construction sequence. Refer to Temporary Works drawings [TW series] for more information



Basement Floor Plan (Scale 1:100)

* Design of slab, including provision to accommodate heave, to TBA at Detailed Design Stage



Section 1-1 (1:50)

Rev	Date	Amendments
-	30.08.2017	First issue

Job No. 170503	Drawn GW / Chk'd -	Scale As shown @ A3
Dwg No. SL-10	Rev. '-	Date Aug 2017

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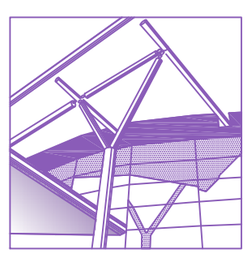

Client: Quorum Project Management

Project: 80 Greencroft Gardens

Title : Structural Scheme Design

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Appendix D: Monitoring Proposals

Job Number: 170503

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Structural Monitoring Statement

Property:

80 Greencroft Gardens
Camden
NW6 3JQ

Client:

Quorum Project Management

Revision	Date	Comment
-	25.06.2017	First Issue

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CROFT STRUCTURAL ENGINEERS

Contents

CROFT STRUCTURAL ENGINEERS

1. Introduction

Basement works are intended to 80 Greencroft Gardens. The structural works for this require Party Wall Awards. This statement describes the procedures for the Principal Contractor to follow to observe any movement that may occur to the existing properties, and also describes mitigation measures to apply if necessary.

2. Risk Assessment

The purpose of this risk assessment is to consider the impact of the proposed works and how they impact the party wall. There are varying levels of inspection that can be undertaken and not all works, soil conditions and properties require the same level of protection.

Monitoring Level Proposed	Type of Works.
Monitoring 1 Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works.	Loft conversions, cross wall removals, insertion of padstones Survey of LUL and Network Rail tunnels. Mass concrete, reinforced and piled foundations to new build properties

Monitoring 2 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate.	Removal of lateral stability and insertion of new stability fames Removal of main masonry load bearing walls. Underpinning works less than 1.2m deep
Monitoring 3 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment	Lowering of existing basement and cellars more than 2.5m Underpinning works less than 3.0m deep in clays Basements up to 2.5m deep in clays
Monitoring 4 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment Lateral movement between walls by laser measurements	New basements greater than 2.5m and shallower than 4m Deep in gravels Basements up to 4.5m deep in clays Underpinning works to Grade I listed building
Monitoring 5 Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by theodolite at specific times during the projects.	Underpinning works to Grade I listed buildings Basements to Listed building Basements deeper than 4m in gravels Basements deeper than 4.5m in clays Underpinning, basements to buildings that are expressing defects.
Monitoring 6	

Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by electronic means with live data gathering. Weekly interpretation	Double storey basements supported by piled retaining walls in gravels and soft sands. (N<12)
Monitoring 7 Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by electronic means with live data gathering with data transfer.	Larger multi-storey basements on particular projects.

3. Scheme Details

This document has been prepared by Croft Structural Engineers Ltd. It covers the proposed construction of a new basement underneath the existing structure at 80 Greencroft Gardens.

Scope of Works

The works comprise:

- Visual Monitoring of the party wall
- Attachment of Tell tales or Demec Studs to accurately record movement of significant cracks.
- Attachment of levelling targets to monitor settlement.
- The monitoring of the above instrumentation is in accordance with Appendix A. The number and precise locations of instrumentation may change during the works; this shall be subject to agreement with the Principal Contractor (PC).
- All instruments are to be adequately protected against any damage from construction plant or private vehicles using clearly visible markings and suitable head protection e.g. manhole rings or similar. Any damaged instruments are to be immediately replaced or repaired at the contractors own cost.
- Reporting of all data in a manner easily understood by all interested parties.
- Co-ordination of these monitoring works with other site operations to ensure that all instruments can be read and can be reviewed against specified trigger values both during and post construction.
- Regular site meetings by the Principal Contractor (PC) and the Monitoring Surveyor (MS) to review the data and their implications.
- Review of data by Croft Structural Engineers

In addition, the PC will have responsibility for the following:

- Review of methods of working/operations to limit movements, and
- Implementation of any emergency remedial measures if deemed necessary by the results of the monitoring.

The Monitoring Surveyor shall allow for settlement and crack monitoring measures to be installed and monitored on various parts of the structure described in Table 1 as directed by the PC and Party Wall Surveyor (PWS) for the Client.

Item	Instrumentation Type
Party Wall Brickwork	
Settlement monitoring	Levelling equipment & targets
Crack monitoring	Visual inspection of cracking, Demec studs where necessary

Table 1: Instrumentation

General

The site excavations and substructure works up to finished ground slab stage have the potential to cause vibration and ground movements in the vicinity of the site due to the following:

a) Removal of any existing redundant foundations / obstructions;
b) Installation of reinforced concrete retaining walls under the existing footings;
c) Excavations within the site

The purpose of the monitoring is a check to confirm building movements are not excessive.

This specification is aimed at providing a strategy for monitoring of potential ground and building movements at the site.

This specification is intended to define a background level of monitoring. The PC may choose to carry out additional monitoring during critical operations. Monitoring that should be carried out is as follows:

a) Visual inspection of the party wall and any pre-existing cracking
b) Settlement of the party wall

All instruments are to be protected from interference and damage as part of these works.

Access to all instrumentation or monitoring points for reading shall be the responsibility of the Monitoring Surveyor (MS). The MS shall be in sole charge for ensuring that all instruments or monitoring points can be read at each visit and for reporting of the data in a form to be agreed with the PWS. He shall inform the PC if access is not available to certain instruments and the PC will, wherever possible, arrange for access. He shall immediately report to the PC any damage. The Monitoring Surveyor and the Principal Contractor will be responsible for ensuring that all the instruments that fall under their respective remits as specified are fully operational at all times and any defective or damaged instruments are immediately identified and replaced.

The PC shall be fully responsible for reviewing the monitoring data with the MS - before passing it on to Croft Structural Engineers - determining its accuracy and assessing whether immediate action is to be taken by him and/or other contractors on site to prevent damage to instrumentation or to ensure safety of the site and personnel. All work shall comply with the relevant legislation, regulations and manufacturer's instructions for installation and monitoring of instrumentation.

Applicable Standards and References

The following British Standards and civil engineering industry references are applicable to the monitoring of ground movements related to activities on construction works sites:

1. BS 5228: Part 1: 1997 - Noise and Vibration Control on Construction and Open Sites -Part 1.Code of practice for basic information and procedures for noise and vibration control, Second Edition, BSI 1999.
2. BS 5228: Part 2: 1997 - Noise and Vibration Control on Construction and Open Sites -Part 2.Guide to noise and vibration control legislation for construction and demolition including road construction and maintenance, Second Edition, BSI 1997.
3. BS 7385-1: 1990 (ISO 4866:1990) - Evaluation and measurement for vibration in buildings - Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings, First Edition, BSI 1990.
4. BS 7385-2: 1993 - Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from ground-borne vibration, First Edition, BSI 1999.
5. CIRIA SP 201 - Response of buildings to excavation-induced ground movements, CIRIA 2001.

SPECIFICATION FOR INSTRUMENTATION

General

The Monitoring Contractor is required to monitor, protect and reinstall instruments as described. The readings are to be recorded and reported. The following instruments are defined:

a) Automatic level and targets: A device which allows the measurement of settlement in the vertical axis. To be installed by the MS.

b) Tell-tales and 3 stud sets: A device which allows measurement of movement to be made in two axes perpendicular to each other. To be installed by the MS.

Monitoring of existing cracks

The locations of tell-tales or Demec studs to monitor existing cracks shall be agreed with Croft Structural Engineers.

Instrument Installation Records and Reports

Where instrumentation is to be installed or reinstalled, the Monitoring Surveyor, or the Principal Contractor, as applicable, shall make a complete record of the work. This should include the position and level of each instrument. The records shall include base readings and measurements taken during each monitoring visit. Both tables and graphical outputs of these measurements shall be presented in a format to be agreed with the CM. The report shall include photographs of each type of instrumentation installed and clear scaled sections and plans of each instrument installed. This report shall also include the supplier's technical fact sheet on the type of instrument used and instructions on monitoring.

Two signed copies of the report shall be supplied to the PWS within one week of completion of site measurements for approval.

Installation

All instruments shall be installed to the satisfaction of the PC. No loosening or disturbance of the instrument with use or time shall be acceptable. All instruments are to be clearly marked to avoid damage.

All setting out shall be undertaken by the Monitoring Surveyor or the Principal Contractor as may be applicable. The precise locations will be agreed by the PC prior to installation of the instrument.

The installations are to be managed and supervised by the Instrumentation Engineer or the Measurement Surveyor as may be applicable.

Monitoring

The frequencies of monitoring for each Section of the Works are given in Appendix A.

The following accuracies/ tolerances shall be achieved:

Party Wall settlement	±1.5mm
Crack monitoring	±0.75mm

CROFT STRUCTURAL ENGINEERS

REPORT OF RESULTS AND TRIGGER LEVELS

General

Within 24 hours of taking the readings, the Monitoring Surveyor will submit a single page summary of the recorded movements. All readings shall be immediately reviewed by Croft Structural Engineers prior to reporting to the PWS.

Within one working day of taking the readings the Monitoring Contractor shall produce a full report (see below).

The following system of control shall be employed by the PC and appropriate contractors for each section of the works. The Trigger value, at which the appropriate action shall be taken, for each section, is given in Table 2, below.

The method of construction by use of sequential underpins limits the deflections in the party wall.

Trigger limits are shown in the following table

During works measurements are taken, these are compared with the limits set out below:

MOVEMENT		CATEGORY	ACTION
Vertical	Horizontal		
0mm-3mm	0-5mm	Green	No action required
3mm-6mm	5-7mm	AMBER	Detailed review of Monitoring: Check studs are OK and have not moved. Ensure site staff have not moved studs. If studs have moved reposition. Relevel to ensure results are correct and tolerance is not a concern. Inform Party Wall surveyors of amber readings. Double the monitoring for 2 further readings. If stable revert back. Carry out a local structural review and inspection. Preparation for the implementation of remedial measures should be required. Double number of lateral props
6mm-10mm	7-9mm		Implement remedial measures review method of working and ground conditions
>10mm	>9mm	RED	Implement structural support as required; Cease works with the exception of necessary works for the safety and stability of the structure and personnel; Review monitoring data and implement revised method of works

Table 2 – Movement limits between adjacent sets of Tell-tales or stud sets

Any movements which exceed the individual amber trigger levels for a monitoring measure given in Table 2 shall be immediately reported to the PWS, and a review of all of the current monitoring data for all monitoring measures must be implemented to determine the possible causes of the trigger level being exceeded. Monitoring of the affected location must be increased and the actions described above implemented. Assessment of exceeded trigger levels must not be carried out in isolation from an assessment of the entire monitoring regime as the monitoring measures are

inter-related. Where required, measures may be implemented or prepared as determined by the specific situation and combination of observed monitoring measurement data.

Standard Reporting

1 No. electronic copy of the report in PDF format shall be submitted to the PWS.

The Monitoring Surveyor shall report whether the movements are within (or otherwise) the Trigger Levels indicated in Table 2. A summary of the extent of completion of any of the elements of works and any other significant events shall be given. These works shall be shown in the form of annotated plans (and sections) for each survey visit both local to the instrumentation and over a wider area. The associated changes to readings at each survey or monitoring point shall be then regulated to the construction activity so that the cause of any change, if it occurs, can be determined.

The Monitoring Surveyor shall also give details of any events on site which in his opinion could affect the validity of the results of any of the surveys.

The report shall contain as a minimum, for each survey visit the following information:

a) The date and time of each reading:
b) The weather on the day:
c) The name of the person recording the data on site and the person analysing the readings together with their company affiliations;
d) Any damage to the instrumentation or difficulties in reading;
e) Tables comparing the latest reading with the last reading and the base reading and the changes between these recorded data;
f) Graphs showing variations in crack width with time for the crack measuring gauges; and
g) Construction activity as described. It is very important that each set of readings is associated with the extent of excavation and construction at that time. Readings shall be accompanied by information describing the extent of works at the time of readings. This shall be agreed with the PC.

Spread-sheet columns of numbers should be clearly labelled together with units. Numbers should not be reported to a greater accuracy than is appropriate. Graph axis should be linear and clearly labelled together with units. The axis scales are to be agreed with the PC before the start of monitoring and are to remain constant for the duration of the job unless agreed otherwise. The specified trigger values are also to be plotted on all graphs.

The reports are to include progress photographs of the works both general to the area of each instrument and globally to the main Works. In particular, these are to supplement annotated plans/sections described above. Wherever possible the global photographs are to be taken from approximately the same spot on each occasion. The locations of these points should be agreed at design stage with the engineer and the monitoring surveyor.

Erroneous Data

All data shall be checked for errors by the Monitoring Surveyor prior to submission. If a reading that appears to be erroneous (i.e. it shows a trend which is not supported by the surrounding instrumentation), he shall notify the PC immediately, resurvey the point in question and the neighbouring points and if the error is repeated, he shall attempt to identify the cause of the error. Both sets of readings shall be processed and submitted, together with the reasons for the errors and details of remedial works. If the error persists at subsequent survey visits, the Monitoring Surveyor shall agree with the PC how the data should be corrected. Correction could be achieved by correcting the readings subsequent to the error first being identified to a new base reading.

The Monitoring Surveyor shall rectify any faults found in or damage caused to the instrumentation system for the duration of the specified monitoring period, irrespective of cause, at his own cost.

Trigger Values

Trigger values for maximum movements as listed in Table 2. If the movement exceeds these values then action may be required to limit further movement. The PC should be immediately advised of the movements in order to implement the necessary works.

It is important that all neighbouring points (not necessarily a single survey point) should be used in assessing the impact of any movements which exceed the trigger values, and that rechecks are carried out to ensure the data is not erroneous. A detailed record of all activities in the area of the survey point will also be required as specified elsewhere.

Responsibility for Instrumentation

The Monitoring Surveyor shall be responsible for: managing the installation of the instruments or measuring points, reporting of the results in a format which is user friendly to all parties; and immediately reporting to all parties any damage. The Monitoring Surveyor shall be responsible for informing the PC of any movements which exceed the specified trigger values listed in Table 2 so that the PC can implement appropriate procedures. He shall immediately inform the PWS of any decisions taken.

CROFT STRUCTURAL ENGINEERS

APPENDIX A
MONITORING FREQUENCY

INSTRUMENT	FREQUENCY OF READING
Settlement monitoring and Monitoring existing cracks	**Pre-construction** Monitored once. **During construction** Monitored after every pin is cast for first 4 no. pins to gauge effect of underpinning. If all is well, monitor after every other pin. **Post construction works** Monitored once.

CROFT STRUCTURAL ENGINEERS

APPENDIX B

An Analysis on allowable settlements of structures (Skempton and MacDonald (1956))

The most comprehensive studies linking self-weight settlements of buildings to structural damage were carried out in the 1950's by Skempton and MacDonald (1956) and Polshin and Tokar. These studies show that damage is most often caused by differential settlements rather than absolute settlements. More recently, similar empirical studies by Boscardin and Cording (1989) and Boone (1996) have linked structural damage to ground movements induced by excavations and tunnelling activities.

In 1955 Skempton and MacDonald identified the parameter $\delta\rho/L$ as the fundamental element on which to judge maximum admissible settlements for structures. This criterion was later confirmed in the works of GRANT *et al.* [1975] and WALSH [1981]. Another important approach to the problem was that of BURLAND and WROTH [1974], based on the criterion of maximum tensile strains.

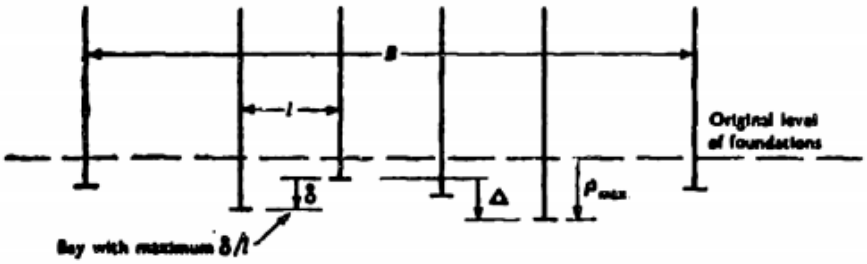


Figure 2.1 – Diagram illustrating the definitions of maximum angular distortion, δ/l, maximum settlement, ρ_{max}, and greatest differential settlement, Δ, for a building with no tilt (Skempton and MacDonald, 1956).

Figure 1: Diagram illustrating the definitions of maximum angular distortion, δ/l, maximum settlement, p_{max}, and greatest differential settlement ,Δ , for a building with no tilt (Skempton and MacDonald, 1956)

The differential settlement is defined as the greatest vertical distance between two points on the foundation of a structure that has settled, while the angular distortion, is the difference in elevation between two points, divided by the distance between those points.

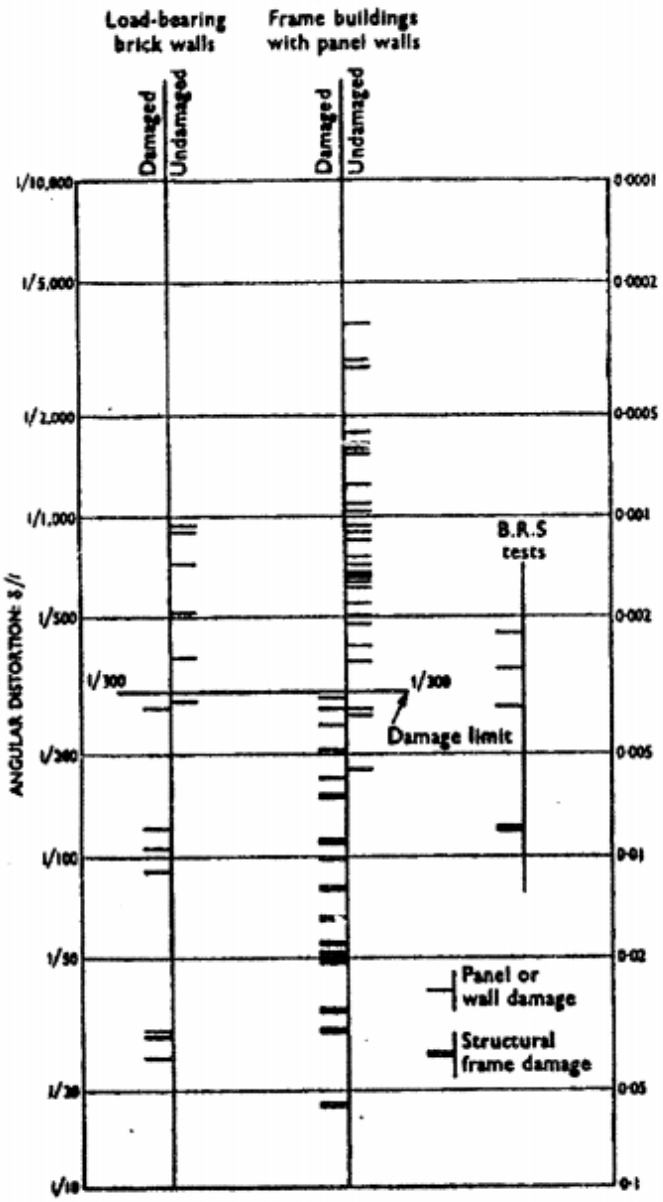
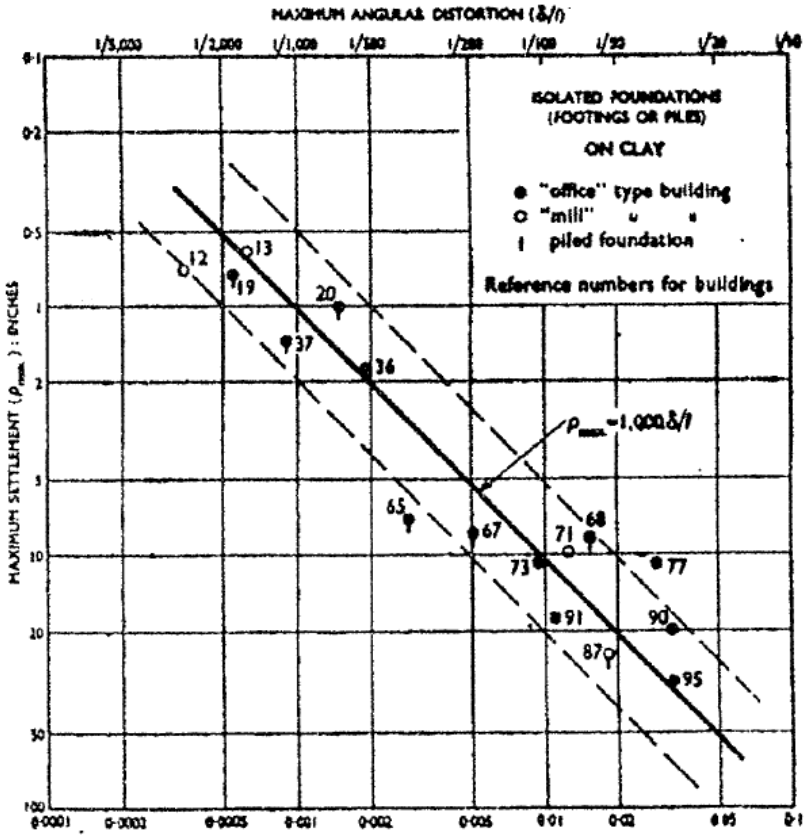


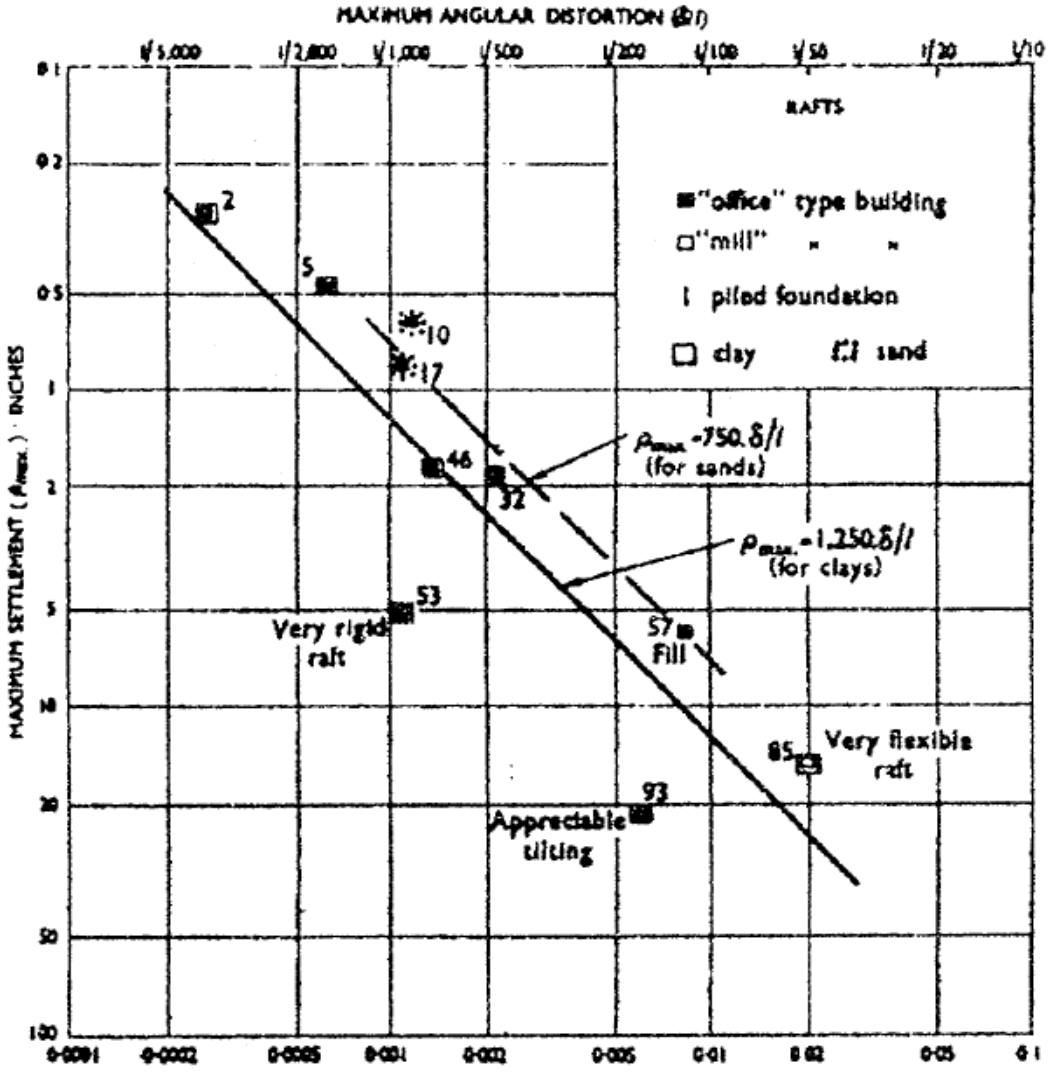
Figure 2: Skempton and MacDonald's analysis of field evidence of damage on traditional frame buildings and loadbearing brick walls

Data from Skempton and MacDonald's work suggest that the limiting value of angular distortion is 1/300. Angular distortion, greater than 1/300 produced visible cracking in the majority of buildings studied, regardless of whether it was a load bearing or a frame structure. As shown in the figure 2.

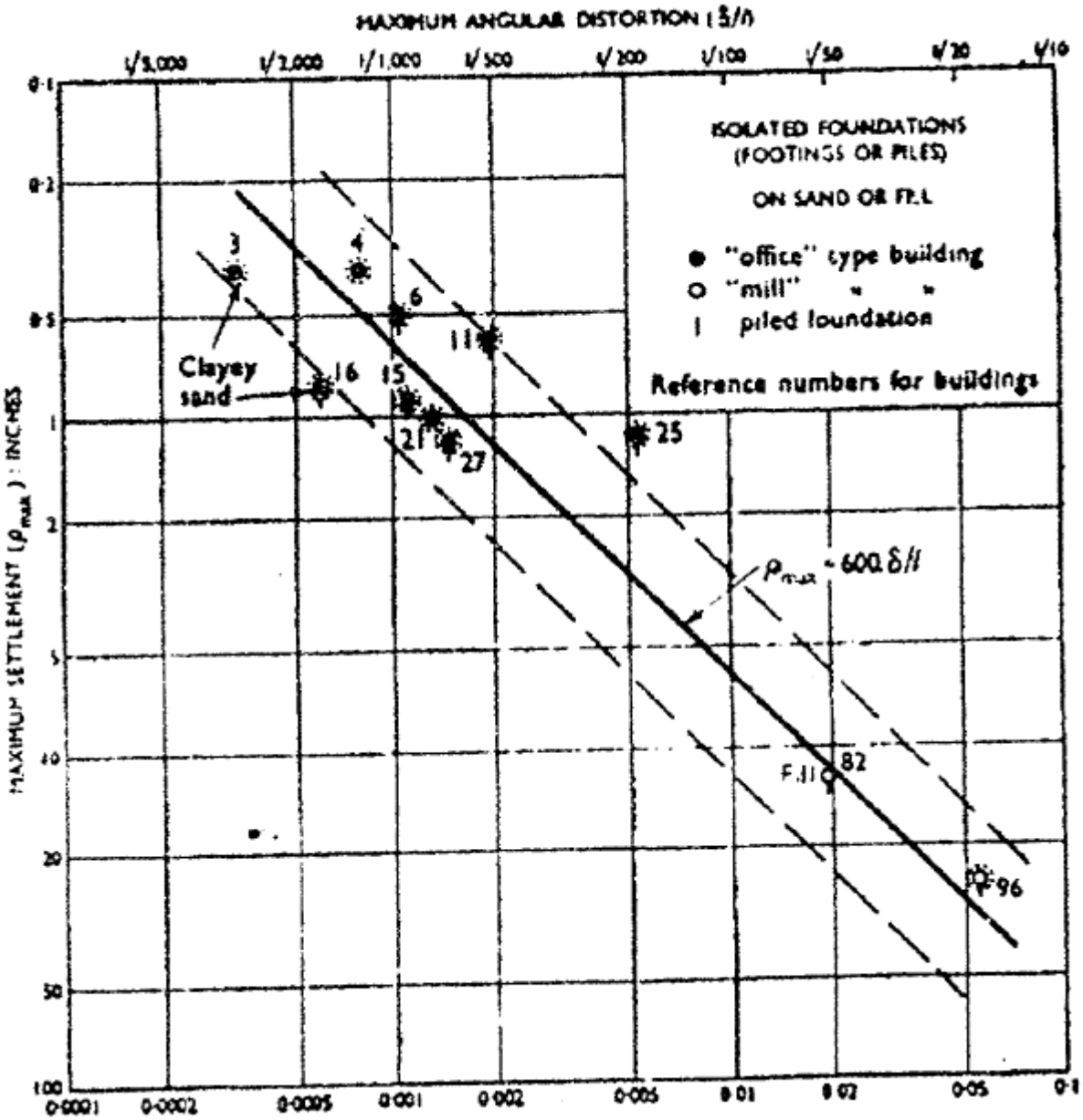
CROFT STRUCTURAL ENGINEERS

Other key findings by Skempton and MacDonald include limiting values of δ/l for structure, and a relationship between maximum settlement, ρ_{max} and δ/l for structures founded on sands and clays. The charts below show these relations for raft foundations and isolated footings.





CROFT STRUCTURAL ENGINEERS



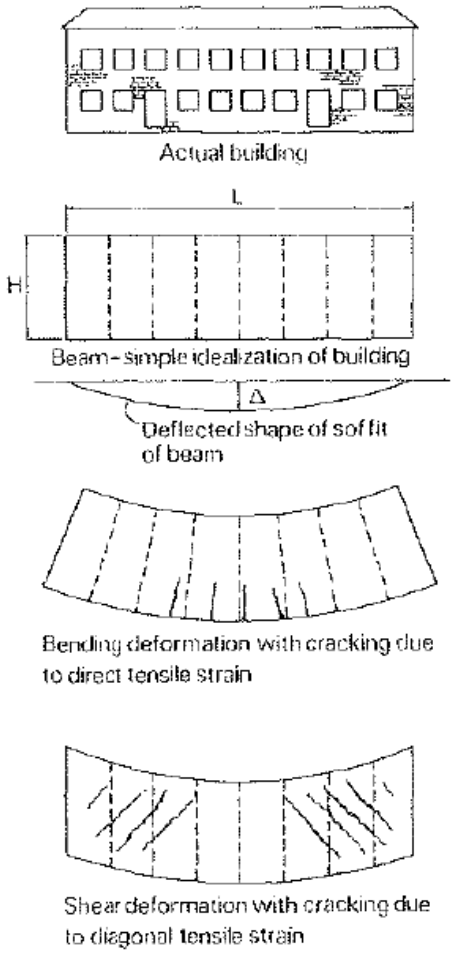


TABLE I

Angular distorsion	Characteristic situation
1/300	Cracking of the panels in frame buildings of the traditional type, or of the walls in load-bearing wall buildings;
1/150	Structural damage to the stanchions and beams;
1/500	Design limit to avoid cracking;
1/1000	Design limit to avoid any settlement damage.

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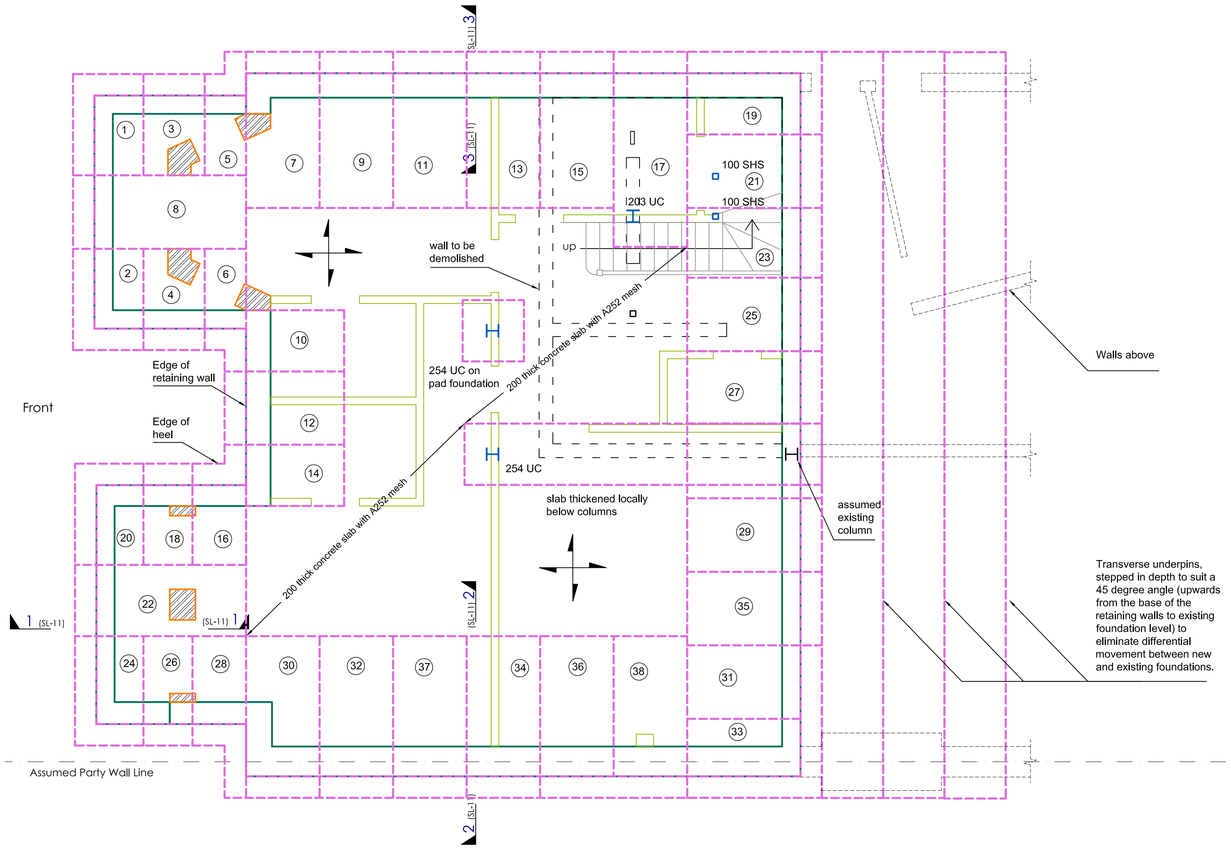
Appendix E: Outline Construction Programme

The Contractor is responsible for the final construction programme

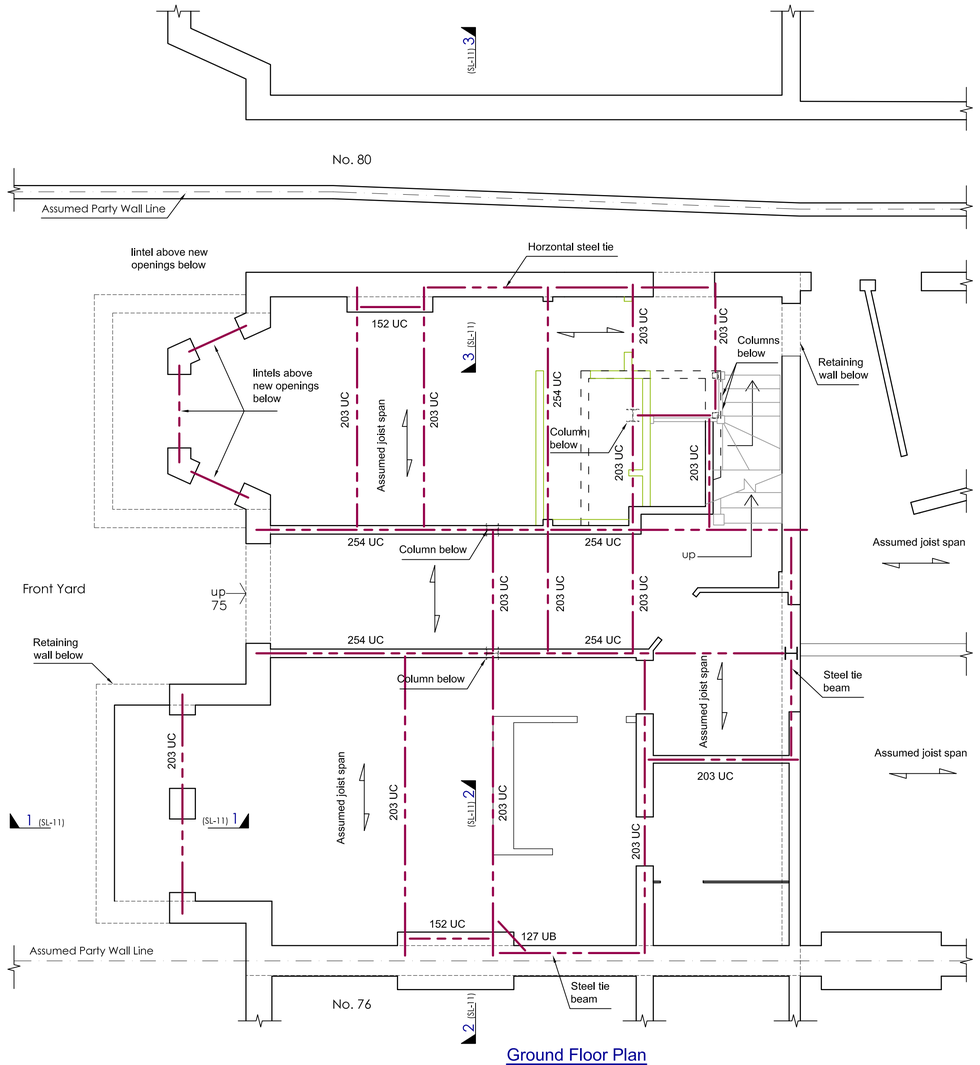
Task	Month										
	1	2	3	4	5	6	7	8	9	10	11
Monitoring of adjacent structures											
Enabling works											
Demolition											
Underpinning works											
Bulk excavation											
Drainage installation and basement floor construction											
Ground floor construction											
Waterproofing and internal works											

Appendix F: No 78 Basement

NOT FOR CONSTRUCTION



Basement Plan
Scale 1:50



Ground Floor Plan
Scale 1:50

LEGEND:

- New Brickwork
- New Blockwork
- New Steel
- New Timber
- Hidden detail
- Demolition line
- Concrete foundation
- Concrete
- (14) Proposed retaining wall sequence No

STEEL SIZES AND GENERAL ARRANGEMENT TBA AT DETAILED DESIGN STAGE

Rev	Date	Amendments
-	April '14	First issue for comment

Croft Structural Engineers
Clockshop Mews,
r/o 60 Sawon Rd,
London, SE25 5EH.
020 8684 4744
www.croftse.co.uk

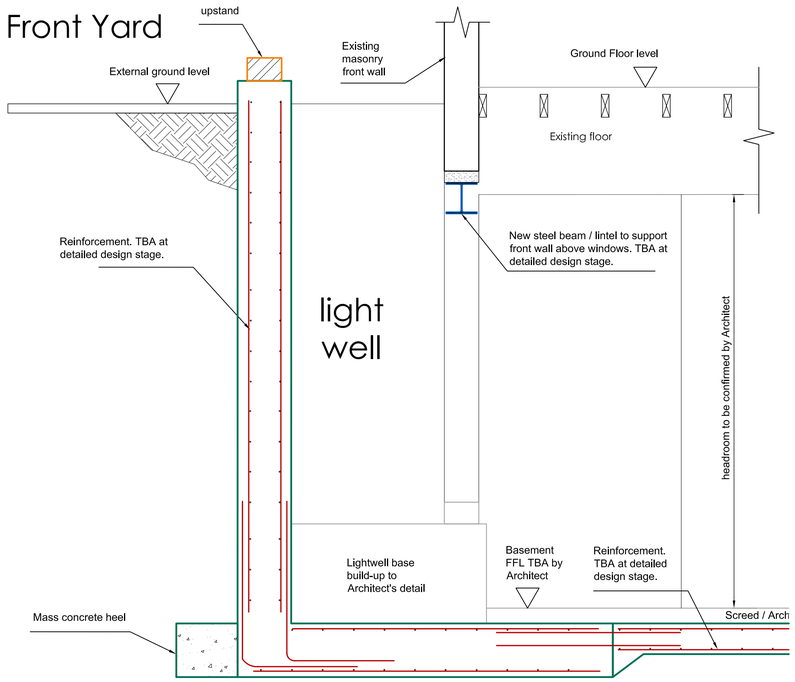
Client: Basement Design Studio

Project: Fl't 1, 78 Greencroft G'dns

Title : Basement & Ground Floor Plans

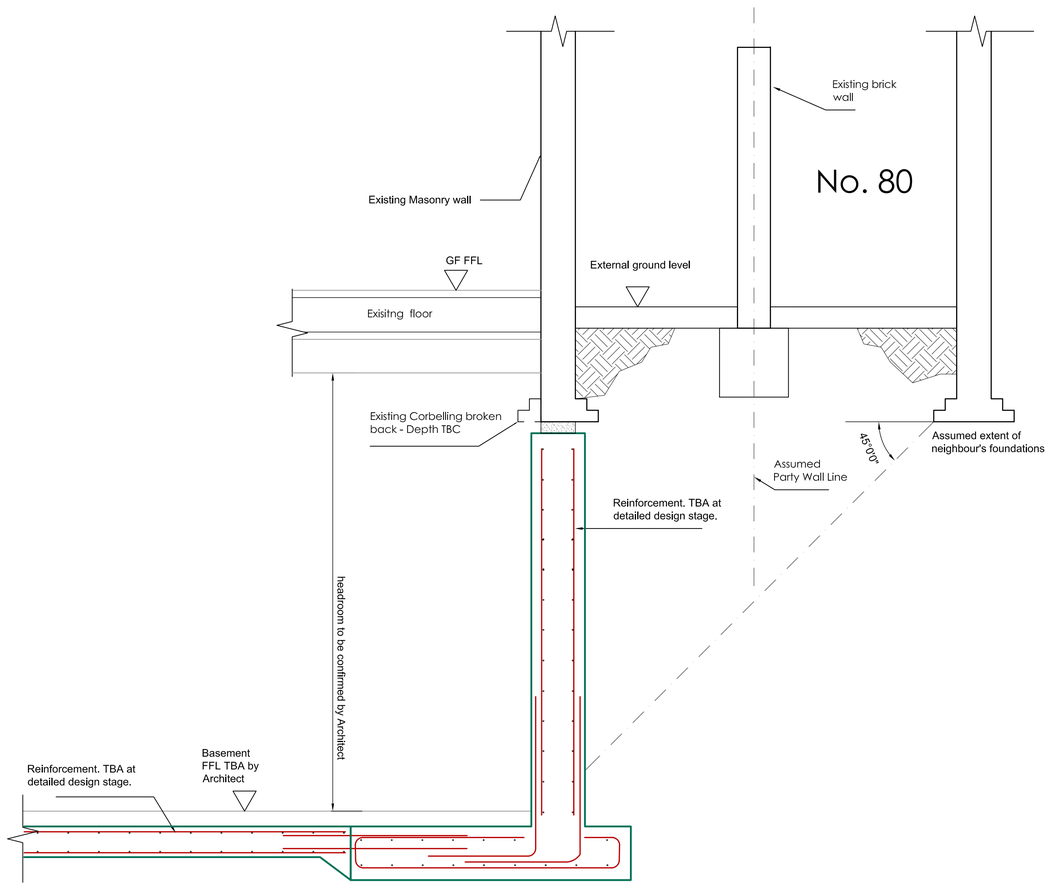
Job No	Drawn	Scale
140326	GW	as shown @ A1
	Chkd CT	
Dwg No SL-10	Rev -	Date April 2014

NOT FOR CONSTRUCTION



Section 1-1
(Scale 1:20)

Section 2-2
(Scale 1:20)



Section 3-3
(Scale 1:20)

Rev	Date	Amendments
-	April '14	First issue for comment

Croft Structural Engineers
Clockshop Mews,
r/o 60 Sawn Rd,
London, SE25 5EH.
020 8684 4744
www.croftse.co.uk

Client: Basement Design Studio

Project: Fl't 1, 78 Greencroft G'dns

Title : Sections

Job No	Drawn	Scale
140326	GW	as shown @ A1
	Chkd CT	
Dwg No SL-11	Rev -	Date April 2014

CROFT STRUCTURAL ENGINEERS

Appendix G: Thames Water Search Report

Residential

The Law Society's CON29DW
Drainage & Water Enquiry

TM Property Service Ltd.
743360 Swindon 31

Search address supplied	Ground Floor, 80, GREENCROFT GARDENS, LONDON, NW6 3JQ
Your reference	15580731
Our reference	DWS/DWS Standard/2016_3384432
Received date	2 August 2016
Search date	3 August 2016

Notification of Price Changes…

From 1 September 2016 Thames Water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches.

This will be the first price rise in three years and is in line with the RPI at 1.84%. The increase follows significant capital investment in improving our systems and infrastructure, including the recent updates to the content of the Law Society's CON29DW and the CommercialDW Enquiries.

Enquiries received with a higher payment prior to 1 September 2016 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

CON29DW
DRAINAGE AND WATER ENQUIRY

SearchCode™

Residential

CON29DW Drainage & Water Enquiry

Question		Summary Answer
Maps		
1.1	Where relevant, please include a copy of an extract from the public sewer map.	Map Provided
1.2	Where relevant, please include a copy of an extract from the map of waterworks.	Map Provided
Drainage		
2.1	Does foul water from the property drain to a public sewer?	Connected
2.2	Does surface water from the property drain to a public sewer?	Connected
2.3	Is a surface water drainage charge payable?	Charge Payable
2.4	Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?	Yes
2.4.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?	No
2.5	Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?	Yes
2.5.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the 50metres of any buildings within the property?	No
2.6	Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
2.7	Has a sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?	No
2.8	Is the building which is or forms part of the property, at risk of internal flooding due to overloaded public sewers?	Not At Risk
2.9	Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.	11.36 Kilometres
Water		
3.1	Is the property connected to mains water supply?	Connected
3.2	Are there any water mains, resource mains or discharge pipes within the boundaries of the property?	No
3.3	Is any water main or service pipe serving or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
3.4	Is the property at risk of receiving low water pressure or flow?	No
3.5	What is the classification of the water supply for the property?	Hard
3.6	Please include details of the location of any water meter serving the property.	No Meter
Charging		
4.1.1	Who are the sewerage undertakers for the area?	Thames Water
4.1.2	Who are the water undertakers for the area?	Thames Water
4.2	Who bills the property for sewerage services?	Thames Water
4.3	Who bills the property for water services?	Thames Water
4.4	What is the current basis for charging for sewerage and/or water services at the property?	See Details
4.5	Will the basis for charging for sewerage and water services at the property change as a consequence of a change of occupation?	No

Residential

CON29DW Drainage & Water Enquiry

Search address supplied: Ground Floor, 80, GREENCROFT GARDENS, LONDON, NW6 3JQ

Any new owner or occupier will need to contact Thames Water on 0800 316 9800 or log onto our website www.thameswater.co.uk and complete our online form to change the water and drainage services bills to their name.

The following records were searched in compiling this report: - the Map of Public Sewers, the Map of Waterworks, Water and Sewer billing records, Adoption of Public Sewer records, Building Over Public Sewer records, the Register of Properties subject to Internal Foul Flooding, the Register of Properties subject to Poor Water Pressure and the Drinking Water Register. Thames Water Utilities Ltd (TWUL), Clearwater Court, Vastern Road, Reading RG1 8DB, holds all of these.

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Please refer to the attached Terms & Conditions.

Thames Water Property Searches is an Executive member of CoPSO (Council of Property Search Organisations).

Residential

CON29DW Drainage & Water Enquiry

Interpretation of CON29DW Drainage and Water Search

Appendix 1 contains definitions of terms and expressions used in this report.

For your guidance:

- Thames Water Property Searches Complaints Procedure:
  - Thames Water Property Searches offers a robust complaints procedure. Complaints can be made by telephone, in writing, by email (searches@thameswater.co.uk) or through our website (www.thameswater-propertysearches.co.uk)

As a minimum standard Thames Water Property Searches will:

- endeavour to resolve any contact or complaint at the time of receipt. If this isn't possible, we will advise of timescales;
- investigate and research the matter in detail to identify the issue raised (in some cases third party consultation will be required);
- provide a response to the customer within 10 working days of receipt of the complaint;
- provide compensation, if no response or acknowledgment that we are investigating the case is given within 10 working days of receipt of the complaint;
- keep you informed of the progress and, depending on the scale of investigation required, update with new timescales as necessary;
- provide an amended search, free of charge, if required;
- provide a refund if we find your complaint to be justified; take the necessary action within our power to put things right.

If you want us to liaise with a third party on your behalf, just let us know.

If you are still not satisfied with the outcome provided we will refer the matter to a Senior Manager for resolution who will respond again within 5 working days.

If you remain dissatisfied with our final response you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). Please refer to the final page of the search for further details.

Residential

CON29DW Drainage & Water Enquiry

Maps

1.1 – Where relevant, please include a copy of an extract from the public sewer map.

A copy of an extract of the public sewer map is included, showing the public sewers, disposal mains and lateral drains in the vicinity of the property.

For your guidance:

- The Water Industry Act 1991 defines Public Sewers as those which Thames Water have responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purposes only.
- The company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.
- Assets other than public sewers may be shown on the copy extract, for information.

1.2 – Where relevant, please include a copy of an extract from the map of waterworks.

A copy of an extract of the map of waterworks is included, showing water mains, resource mains or discharge pipes in the vicinity of the property.

For your guidance:

- The "water mains" in this context are those, which are vested in and maintainable by the water company under statute.
- Assets other than public water mains may be shown on the plan, for information only.
- Water companies are not responsible for private supply pipes connecting the property to the public water main and do not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Residential

CON29DW Drainage & Water Enquiry

Drainage

2.1 – Does foul water from the property drain to a public sewer?

Records indicate that foul water from the property drains to a public sewer.

For your guidance:

- Water companies are not responsible for any private drains that connect the property to the public sewerage system and do not hold details of these. The property owner will normally have sole responsibility for private drains serving the property. These may pass through land outside the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- If foul water does not drain to the public sewerage system, the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.
- An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

2.2 – Does surface water from the property drain to a public sewer?

Records indicate that surface water from the property drains to a public sewer.

For your guidance:

- Sewerage Undertakers are not responsible for any private drains that connect the property to the public sewerage system, and do not hold details of these.
- The property owner will normally have sole responsibility for private drains serving the property. These private drains may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- In some cases, 'Sewerage Undertakers' records do not distinguish between foul and surface water connections to the public sewerage system.
- At the time of privatisation in 1989, Sewerage Undertakers were sold with poorly-kept records of sewerage infrastructure. The records did not always show which properties were connected for surface water drainage purposes. Accordingly, billing records have been used to provide an answer for this element of the drainage and water search.
- Due to the potential inadequacy of 'Sewerage Undertakers' infrastructure records with respect to surface water drainage, it is the customer's responsibility to inform the Sewerage Undertaker that they do not receive the surface water drainage service. If on inspection, the buyer finds that surface water from the property does not drain to a public sewer, then the property may be eligible for a rebate of the surface water drainage charge. For further information, please contact Thames Water on Tel: 0800 316 9800, or refer to the website at www.thameswater.co.uk.
- If surface water from the property does not drain to the public sewerage system, the property may have private facilities in the form of a soakaway or private connection to a watercourse.
- An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

2.3 – Is a surface water drainage charge payable?

Records confirm that a surface water drainage charge is payable for the property and the charge is £26.19 for the current financial year.

For your guidance:

- If surface water from the property drains to a public sewer, then a surface water drainage charge is payable.
- Where a surface water drainage charge is currently included in the property's water and sewerage bill but, on inspection, the buyer finds that surface water from the property does not drain to a public sewer, then the property may be eligible for a rebate of the surface water drainage charge. For further information, please contact Thames Water on Tel: 0800 316 9800 or refer to the website www.thameswater.co.uk.

2.4 – Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?

The public sewer map included indicates that there is a public sewer, disposal main or lateral drain within the boundaries of the property. However, from the 1st October 2011 there may be additional public sewers, disposal mains or lateral drains which are not recorded on the public sewer map but which may further prevent or restrict development of the property.

For your guidance:

- Thames Water has a statutory right of access to carry out work on its assets. Employees of Thames Water or its contractors may, therefore, need to enter the property to carry out work.
- Please note if the property was constructed after 1st July 2011 any sewers and/or lateral drain within the boundary of the property are the responsibility of the householder.
- The approximate boundary of the property has been determined by reference to the Ordnance Survey Record or the map supplied.
- The presence of a public sewer running within the boundary of the property may restrict further development. The company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the company, or its contractors, needing to enter the property to carry out work.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

2.4.1 – Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?

The public sewer map included indicates that there is no public pumping station within the boundaries of the property.

For your guidance:

- Private pumping stations installed before 1 July 2011 will be transferred into the ownership of the sewerage undertaker.
- The approximate boundary of the property has been determined by reference to the Ordnance Survey Record or the map supplied.
- The presence of a public Pumping station running within the boundary of the property may restrict further development. The company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the company, or its contractors, needing to enter the property to carry out work.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

2.5 – Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?

The public sewer map included indicates that there is a public sewer within 30.48 metres (100 feet) of a building within the property.

For your guidance:

- From the 1st October 2011 there may be additional lateral drains and/or public sewers which are not recorded on the public sewer map but are also within 30.48 metres (100 feet) of a building within the property.
- The presence of a public sewer within 30.48 metres (100 feet) of the building(s) within the property can result in the local authority requiring a property to be connected to the public sewer.
- The measurement is estimated from the Ordnance Survey record, between the building(s) within the boundary of the property and the nearest public sewer.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

2.5.1 – Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?

The public sewer map included indicates that there is no public pumping station within 50 metres of any buildings within the property.

For your guidance:

- Private pumping stations installed before 1 July 2011 will be transferred into the ownership of the sewerage undertaker.
- The presence of a public pumping station within 50 metres of the building(s) within the property can result in the local authority requiring a property to be connected to the public sewer.
- The measurement is estimated from the Ordnance Survey record, between the building(s) within the boundary of the property and the nearest public sewer.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

2.6 – Are any sewers or lateral drains serving or which are proposed to serve the property the subject of an existing adoption agreement or an application for such an agreement?

Records confirm that Foul sewers serving the development, of which the property forms part are not the subject of an existing adoption agreement or an application for such an agreement.

The Surface Water sewer(s) and/or Surface Water lateral drain(s) are not the subject of an adoption agreement.

For your guidance:

- Any sewers and/or lateral drains within the boundary of the property are not the subject of an adoption agreement and remain the responsibility of the householder. Adoptable sewers are normally those situated in the public highway.
- This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to a public sewer.
- Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.
- Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991 and meeting the requirements of 'Sewers for Adoption' 6th Edition.

2.7 – Has a sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

There are no records in relation to any approval or consultation about plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. However, the sewerage undertaker might not be aware of a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain.

For your guidance:

- From the 1st October 2011 most private sewers, disposal mains and lateral drains were transferred into public ownership and the sewerage undertaker may not have been approved or consulted about any plans to erect a building or extension on the property over or in the vicinity of these.
- Buildings or extensions erected over a sewer in contravention of building controls may have to be removed or altered.

2.8 – Is the building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?

The property is not recorded as being at risk of internal flooding due to overloaded public sewers.

From the 1st October 2011 most private sewers, disposal mains and lateral drains were transferred into public ownership It is therefore possible that a property may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

For your guidance:

- For reporting purposes buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

2.9 – Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

The nearest sewage treatment works is OLYMPIC PARK BLACKWATER PLANT which is 11.36 kilometres to the east of the property.

For your guidance:

- The nearest sewage treatment works will not always be the sewage treatment works serving the catchment within which the property is situated.
- The sewerage undertaker's records were inspected to determine the nearest sewage treatment works.
- It should be noted that there may be a private sewage treatment works closer than the one detailed above that has not been identified.
- As a responsible utility operator, Thames Water Utilities seeks to manage the impact of odour from operational sewage works on the surrounding area. This is done in accordance with the Code of Practice on Odour Nuisance from Sewage Treatment Works issued via the Department of Environment, Food and Rural Affairs (DEFRA). This Code recognises that odour from sewage treatment works can have a detrimental impact on the quality of the local environment for those living close to works. However DEFRA also recognises that sewage treatment works provide important services to communities and are essential for maintaining standards in water quality and protecting aquatic based environments. For more information visit www.thameswater.co.uk

Water

3.1 – Is the property connected to mains water supply?

Records indicate that the property is connected to mains water supply.

For your guidance:

- The Company does not keep details of private supplies. The situation should be checked with the current owner of the property.

3.2 – Are there any water mains, resource mains or discharge pipes within the boundaries of the property?

The map of waterworks does not indicate any water mains, resource mains or discharge pipes within the boundaries of the property.

For your guidance:

- The boundary of the property has been determined by reference to the plan supplied. Where a plan was not supplied the Ordnance Survey Record was used. If the Water company mentioned in 4.1.2 is not Thames Water Utilities Ltd the boundary of the property has been determined by the Ordnance Survey.
- The presence of a public water main within the boundary of the property may restrict further development within it. Water companies have a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of the company, or its contractors, needing to enter the property to carry out work.

3.3 – Is any water main or service pipe serving or which is proposed to serve the property the subject of an existing adoption agreement or an application for such an agreement?

Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

For your guidance:

- This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to the mains water supply.

3.4 – Is the property at risk of receiving low water pressure or flow?

Records confirm that the property is not recorded on a register kept by the water undertaker as being at risk of receiving low water pressure or flow.

For your guidance:

- The boundary of the property has been determined by reference to the plan supplied. Where a plan was not supplied the Ordnance Survey Record was used.
- "Low water pressure" means water pressure below the regulatory reference level, which is the minimum pressure when demand on the system is not abnormal.
- Water Companies are required to include in the Regulatory Register that is presented annually to the Director General of Water Services, properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level)
- The reference level of service is a flow of 9 litres/minute at a pressure of 10metres / head on the customer's side of the outside stop valve (osv). The reference level of service must be applied on the customer's side of a meter or any other company fittings that are on the customer's side of the main stop tap. The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served. For two properties, a flow of 18 litres/minute at a pressure of 10metres/head on the customers' side of the osv is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS6700 or the Institute of Plumbing handbook.
- **Allowable exclusions** The Company is required to include in the Regulatory Register properties receiving pressure below the reference level, provided that allowable exclusions listed below do not apply.
- **Abnormal demand:** This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand, which are normally expected. Companies should exclude from the reported figures properties which are affected by low pressure only on those days with the highest peak demands. During the report year companies may exclude, for each property, up to five days of low pressure caused by peak demand.
- **Planned maintenance:** Companies should not report low pressures caused by planned maintenance. It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low-pressure incidents that are excluded because of planned maintenance are actually caused by maintenance.
- **One-off incidents:** This exclusion covers a number of causes of low pressure; mains bursts; failures of company equipment (such as pressure reducing valves or booster pumps); firefighting; and action by a third party. However, if problems of this type affect a property frequently, they cannot be classed as one-off events and further investigation will be required before they can be excluded
- **Low-pressure incidents of short duration:** Properties affected by low pressures, which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur during the course of the year, may be excluded from the reported figures.
- Please contact your water company mentioned in Question 4.1.2 if you require further information on water pressure.

3.5 – What is the classification of the water supply for the property?

The water supplied to the property has an average water hardness of 104.2mg/l calcium which is defined as Hard by Thames Water.

For your guidance:

- Water hardness can be expressed in various indices for example the hardness settings for dishwashers are commonly expressed in Clark's degrees, but check with the manufacturer as there are also other units. The following table shows the normal ranges of hardness.
- Sample table for information only:

Hardness category	Calcium (mg/l)	Calcium carbonate (mg/l)	English Clarke degrees	French degrees	General/German degrees
Soft	0 to 20	0 to 50	0 to 3.5	0 to 5	0 to 2.8
Moderately soft	21 to 40	51 to 100	3.6 to 7	6 to 10	2.9 to 5.6
Slightly hard	41 to 60	101 to 150	8 to 10.5	11 to 15	5.7 to 8.4
Moderately hard	61 to 80	151 to 200	10.6 to 14	16 to 20	8.5 to 11.2
Hard	81 to 120	201 to 300	15 to 21	21 to 30	11.3 to 16.8
Very hard	Over 120	Over 300	Over 21	Over 30	Over 16.8

3.6 – Please include details of the location of any water meter serving the property.

Records indicate that the property is not served by a water meter.

For your guidance:

- Where a meter does not serve the property and the customer wishes to consider this method of charging, they should contact the water undertakers mentioned in Question 4.1.2.

Charging

4.1.1 – Who is responsible for providing the sewerage services for the property?

Thames Water Utilities Limited, Clearwater Court, Reading, RG1 8DB is the sewerage undertaker for the area.

4.1.2 – Who is responsible for providing the water services for the property?

Thames Water Utilities Limited, Clearwater Court, Reading, RG1 8DB is the water undertaker for the area.

4.2 – Who bills the property for sewerage services?

The property is billed for sewerage services by:

Thames Water Utilities Limited
Clearwater Court
Vastern Road
Reading
Berkshire
RG1 8DB

Tel: 0845 9200 888
Website: www.thameswater.co.uk.

4.3 – Who bills the property for water services?

The property is billed for water services by:

Thames Water Utilities Limited
Clearwater Court
Vastern Road
Reading
Berkshire
RG1 8DB

Tel: 0845 9200 888
Website: www.thameswater.co.uk.

4.4 – What is the current basis for charging for sewerage and/or water services at the property?

The charges are based on the rateable value of the property which has a rateable value of £438.00, and the charge for the current financial year of £622.72.

For your guidance:

- Water and sewerage companies' full charges are set out in their charges schemes which are available from the company free of charge upon request.
- The Water Industry Act 1991 Section 150, The Water Resale Order 2001 provides protection for people who buy their water or sewerage services from a person or company instead of directly from a water or sewerage company. Details are available from the Office of Water Services (OFWAT) website is www.ofwat.gov.uk.
- Where charges are given these are based on the data available at the time of the report.
- The Company may install a meter at the premises where a buyer makes a change of use of the property or where the buyer uses water for:
    - Watering the garden other than by hand (this includes the use of sprinklers).
    - Automatically replenishing a pond or swimming pool with a capacity greater than 10,000 litres.
    - A bath with a capacity in excess of 230 litres.
    - A reverse osmosis unit.

4.5 – Will the basis for charging for sewerage and water services at the property change as a consequence of a change of occupation?

There will be no change in the current charging arrangements as a consequence of a change of occupation.

For your guidance:

- Water and sewerage companies' full charges are set out in their charges schemes which are available from the company free of charge upon request.
- The Water Industry Act 1991 Section 150, The Water Resale Order 2001 provides protection for people who buy their water or sewerage services from a person or company instead of directly from a water or sewerage company. Details are available from the Office of Water Services (OFWAT) website is www.ofwat.gov.uk.
- It is policy to meter all new water connections. This would result in charges being levied according to the measured tariff.
- The Company may install a meter at the premises where a buyer makes a change of use of the property or where the buyer uses water for:
    - Watering the garden other than by hand (this includes the use of sprinklers).
    - Automatically replenishing a pond or swimming pool with a capacity greater than 10,000 litres.
    - A bath with a capacity in excess of 230 litres.
    - A reverse osmosis unit.

Residential

CON29DW Drainage & Water Enquiry

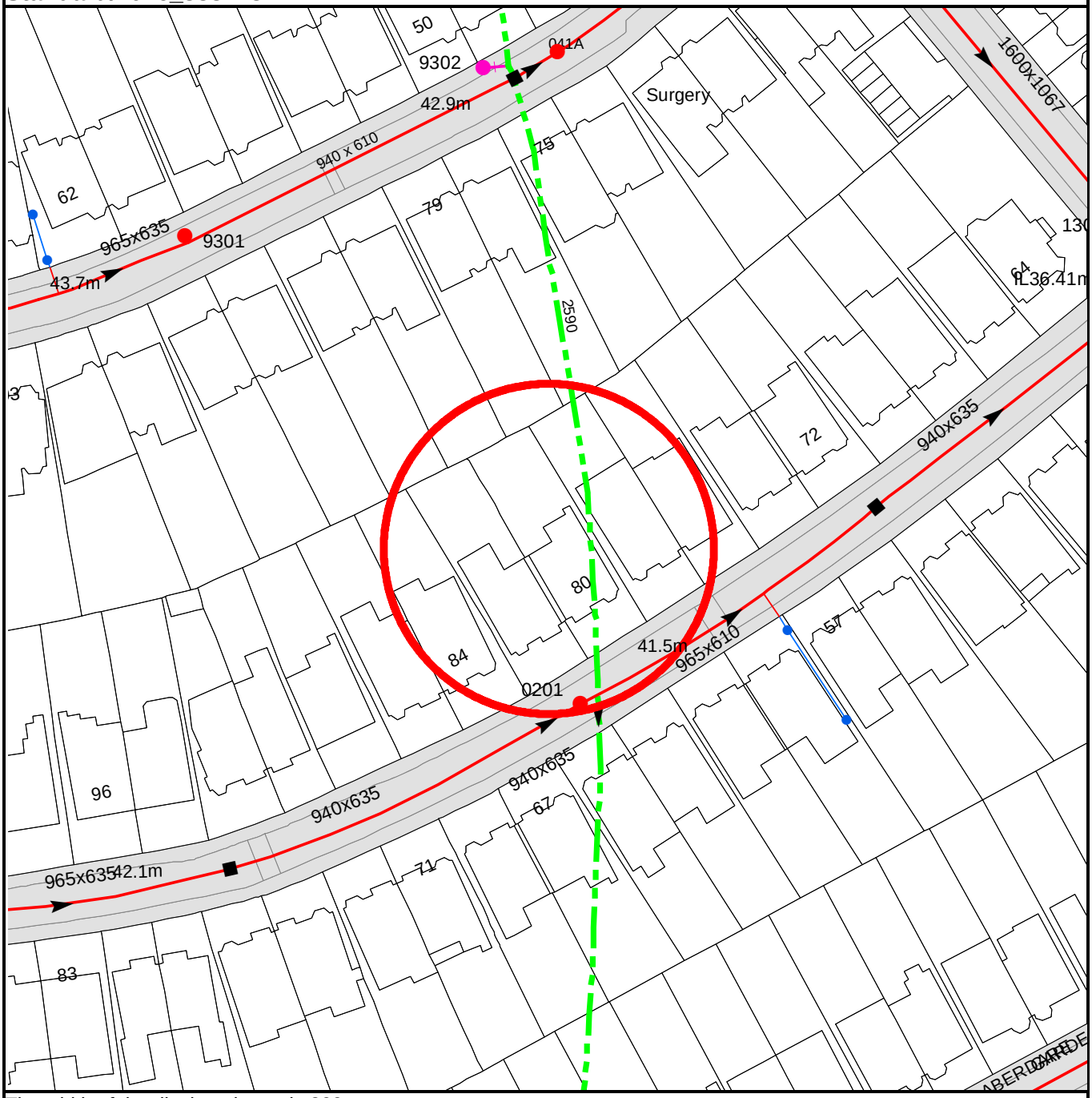
Payment for this Search

A charge will be added to your suppliers account.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information.

All prices are in accordance with the standard terms of Property Searches; discounts are available, please contact us on 0845 070 9148 to obtain further details.

Residential CON29DW Drainage & Water Search Sewer Map-DWS/DWS Standard/2016_3384432



The width of the displayed area is 200m

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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Residential Drainage & Water Search Sewer Key

Public Sewer Pipes (Operated & Maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers, watercourses or a treatment works.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Sewer: A strategic sewer which collects either foul or surface water flow from a number of subsidiary catchments and transfers this flow to a pumping station, river outfall or treatment works.

Storm Overflow Sewer: A sewer designed to convey excess rainfall to rivers or watercourses so that the flow does not exceed the capacity of normal sewers (which could cause flooding).

Biosolids: A sewer designed to convey sludge from one treatment works to another.

Vent Pipe: A section of sewer pipe connected between the top of a sewer and vent column, used to prevent the accumulation of gas in a sewer and thus allowing the system to operate properly.

Rising Main: A pipe carrying pumped flow under pressure from a low point to a high point on the sewerage network. Line style / colour and direction of fleck indicate sewer purpose and direction of flow within the pipe.

Vacuum: A foul sewer designed to remove foul sewerage under pressure (vacuum sewers cannot accept direct new connections).

Proposed Foul Sewer

Proposed Surface Water Sewer

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer: Any foul sewer that is not owned by Thames Water.

Surface Water Sewer: Any surface water sewer that is not owned by Thames Water.

Combined Sewer: Any combined sewer that is not owned by Thames Water.

Gulley: A sewer designed to convey surface water from large roads, motorways, etc. to watercourses or to public surface water sewers. These sewers are generally maintained by the relevant highway authority.

Culverted Watercourse: A watercourse running through a culvert or pipe which is the responsibility of the property owner or the Environment Agency.

Abandoned Sewer: A disused sewer. Usually filled with cement mixture or removed from the ground.

Other Symbols

Undefined Ends: These symbols represent the point at which a pipe continues but no records of its position are currently held by Thames Water. These symbols are rare but may be found on any of the public sewer types.

Public/Private Pumping Station: Foul or Surface water pumping station.

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

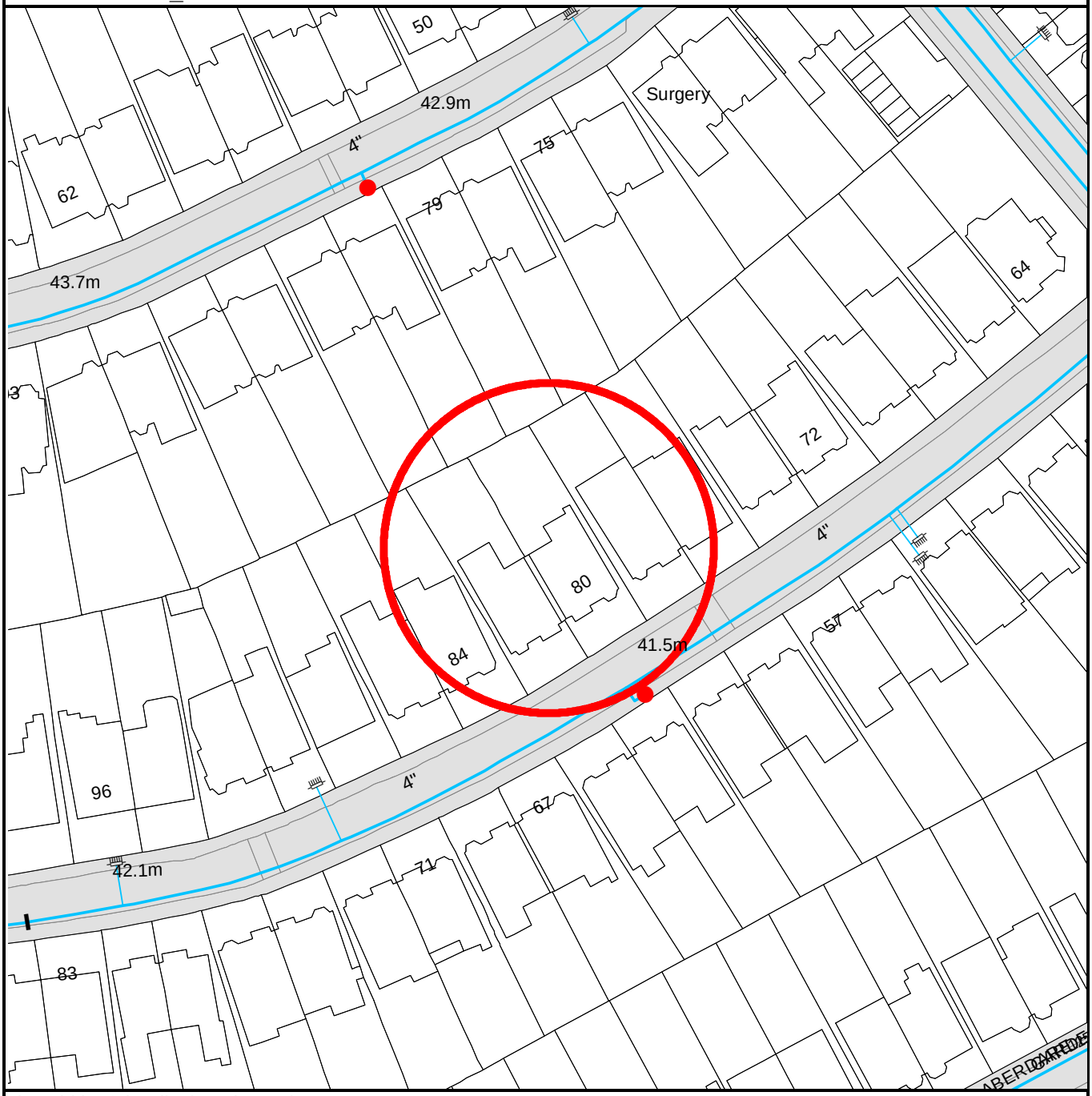
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0845 070 9148.

Residential CON29DW Drainage & Water Search Water Map-DWS/DWS Standard/2016_3384432



The width of the displayed area is 200m

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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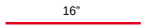
Residential Drainage & Water Search Water Key

Public Water Pipes (Operated & Maintained by Thames Water)

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.



Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

Metered Pipe: A metered pipe indicates that the pipe in question supplies water for a single property or group of properties and that the quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Depth of Water Pipes (Normal Cover)

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12”)	900mm (3’)
300mm - 600mm (12” - 24”)	1100mm (3’ 8”)
600mm and bigger (24” plus)	1200mm (4’)

Pipe fittings and controls (Operated & Maintained by Thames Water)

Hydrant: A point on a water main which is used by the fire services or for operational purposes by Thames Water.

Meter: Used to measure water flowing through a water main for domestic metering or operational purposes by Thames Water.

General Purpose Valve: Valves allowing control of water flow or pressure within the system.

Air Valve: A valve which allows the release of trapped air within a water pipe.

Other Water Pipes (Not Operated or Maintained by Thames Water)

Private Main: Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and ownership of the pipe.

Other Water Company or Unknown Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Note:
Most private pipe work and assets i.e. stopcocks, are not shown on our plans (in the past this information had not been recorded).

Appendix 1 - terms and expressions in this report

"the 1991 Act" means the Water Industry Act 1991**(1)**;

"the 2000 Regulations" means the Water Supply (Water Quality) Regulations 2000**(2)**;

"the 2001 Regulations" means the Water Supply (Water Quality) Regulations 2001**(3)**;

"adoption agreement" means an agreement made or to be made under section 51A(1) or 104(1) of the 1991 Act**(4)**;

"bond" means a surety granted by a developer who is a party to an adoption agreement;

"bond waiver" means an agreement with a developer for the provision of a form of financial security as a substitute for a bond;

"calendar year" means the twelve months ending with 31st December;

"discharge pipe" means a pipe from which discharges are made or are to be made under section 165(1) of the 1991 Act;

"disposal main" means (subject to section 219(2) of the 1991 Act) any outfall pipe or other pipe which—

(a) is a pipe for the conveyance of effluent to or from any sewage disposal works, whether of a sewerage undertaker or of any other person; and

(b) is not a public sewer;

"drain" means (subject to section 219(2) of the 1991 Act) a drain used for the drainage of one building or of any buildings or yards appurtenant to buildings within the same curtilage;

"effluent" means any liquid, including particles of matter and other substances in suspension in the liquid;

"financial year" means the twelve months ending with 31st March;

"lateral drain" means—

(a) that part of a drain which runs from the curtilage of a building (or buildings or yards within the same curtilage) to the sewer with which the drain communicates or is to communicate; or

(b) (if different and the context so requires) the part of a drain identified in a declaration of vesting made under section 102 of the 1991 Act or in an agreement made under section 104 of that Act**(5)**;

"licensed water supplier" means a company which is the holder for the time being of a water supply licence under section 17A(1) of the 1991 Act**(6)**;

"maintenance period" means the period so specified in an adoption agreement as a period of time—

(a) from the date of issue of a certificate by a sewerage undertaker to the effect that a developer has built (or substantially built) a private sewer or lateral drain to that undertaker's satisfaction; and

(b) until the date that private sewer or lateral drain is vested in the sewerage undertaker;

"map of waterworks" means the map made available under section 198(3) of the 1991 Act**(7)** in relation to the information specified in subsection (1A);

"private sewer" means a pipe or pipes which drain foul or surface water, or both, from premises, and are not vested in a sewerage undertaker;

"public sewer" means, subject to section 106(1A) of the 1991 Act**(8)**, a sewer for the time being vested in a sewerage undertaker in its capacity as such, whether vested in that undertaker—

(a) by virtue of a scheme under Schedule 2 to the Water Act 1989**(9)**;

(b) by virtue of a scheme under Schedule 2 to the 1991 Act**(10)**;

(c) under section 179 of the 1991 Act**(11)**; or

(d) otherwise;

"public sewer map" means the map made available under section 199(5) of the 1991 Act**(12)**;

"resource main" means (subject to section 219(2) of the 1991 Act) any pipe, not being a trunk main, which is or is to be used for the purpose of—

(a) conveying water from one source of supply to another, from a source of supply to a regulating reservoir or from a regulating reservoir to a source of supply; or

(b) giving or taking a supply of water in bulk;

"sewerage services" includes the collection and disposal of foul and surface water and any other services which are required to be provided by a sewerage undertaker for the purpose of carrying out its functions;

"sewerage undertaker" means the company appointed to be the sewerage undertaker under section 6(1) of the 1991 Act for the area in which the property is or will be situated;

"surface water" includes water from roofs and other impermeable surfaces within the curtilage of the property;

"water main" means (subject to section 219(2) of the 1991 Act) any pipe, not being a pipe for the time being vested in a person other than the water undertaker, which is used or to be used by a water undertaker or licensed water supplier for the purpose of making a general supply of water available to customers or potential customers of the undertaker or supplier, as distinct from for the purpose of providing a supply to particular customers;

"water meter" means any apparatus for measuring or showing the volume of water supplied to, or of effluent discharged from any premises;

"water supplier" means the company supplying water in the water supply zone, whether a water undertaker or licensed water supplier;

"water supply zones" in relation to a calendar year means the names and areas designated by a water undertaker within its area of supply that are to be its water supply zones for that year; and

"water undertaker" means the company appointed to be the water undertaker under section 6(1) of the 1991 Act for the area in which the property is or will be situated.

In this report, references to a pipe, including references to a main, a drain or a sewer, shall include references to a tunnel or conduit which serves or is to serve as the pipe in question and to any accessories for the pipe.

(**1**) 1991 c. 56.

(**2**) S.I. 2000/3184. These Regulations apply in relation to England.

(**3**) S.I. 2001/3911. These Regulations apply in relation to Wales.

(**4**) Section 51A is inserted by section 92(2) of the Water Act 2003 (c. 37). Section 104(1) is amended by section 96(4) of that Act.

(**5**) To which there are various amendments made by sections 102 and 104 by section 96 of the Water Act 2003.

(**6**) Inserted by section 56 of and Schedule 4 to the Water Act 2003.

(**7**) Subsection (1A) is inserted by section 92(5) of the Water Act 2003.

(**8**) Section 106(1A) is inserted by section 99 of the Water Act 2003.

(**9**) 1989 c. 15.

(**10**) To which there are various amendments made by section 101(1) of and Schedule 8 to the Water Act 2003.

(**11**) To which there are various amendments made by section 101(1) of and Schedule 8 to the Water Act 2003.

(**12**) Section 199 is amended by section 97(1) and (8) of the Water Act 2003.

CON29DW DRAINAGE & WATER ENQUIRY (DOMESTIC).
TERMS AND CONDITIONS

The Customer the Client and the Purchaser are asked to note these terms, which govern the basis on which this drainage and water report is supplied

Definitions

'The Company' means Thames Water who produces the Report.
'Order' means any request completed by the Customer requesting the Report.
'Report' means the drainage and/or water report prepared by The Company in respect of the Property.
'Property' means the address or location supplied by the Customer in the Order.
'Customer' means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.

'Client' means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property

"Purchaser" means the actual or potential purchaser of the Property including their mortgage lender.

Agreement

1. The Company agrees to supply the Report to the Customer and the Client subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client and the Purchaser.

1.1 The Customer the Client and the Purchaser agree that the placing of an Order for a Report and the subsequent provision of a copy of the Report to the Purchaser indicates their acceptance of these terms.

The Report

2. Whilst The Company will use reasonable care and skill in producing the Report, it is provided to the Customer the Client and the Purchaser on the basis that they acknowledge and agree to the following:-

1.2 The information contained in the Report can change on a regular basis so The Company cannot be responsible to the Customer the Client and the Purchaser for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.

1.3 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as a substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.

1.4 The information contained in the Report is based upon the accuracy of the address supplied by the Customer or Client.

1.5 The Report provides information as to the location & connection of existing services and other information in relation to drainage and water enquiries and should not be relied on for any other purpose. The Report may contain opinions or general advice to the Customer the Client and the Purchaser The Company cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.

1.6 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes and the maps must not be relied on in the event of excavation or other works made in the vicinity of The Company's apparatus.

Liability

3.1 The Company shall not be liable to the Client or the Purchaser for any failure defect or non-performance of its obligations arising from any failure of or defect in any machine, processing system or transmission link or anything beyond The Company's reasonable control or the acts or omissions of any party for whom The Company are not responsible.

3.2 Where a report is requested for an address falling within a geographical area where two different companies separately provide Water and Sewerage Services, then it shall be deemed that liability for the information given by either company will remain with that company in respect of the accuracy of the information supplied. A company supplying information which has been provided to it by another company for the purposes outlined in this agreement will therefore not be liable in any way for the accuracy of that information and will supply that information as agent for the company from which the information was obtained.

3.3 The Report is produced only for use in relation to individual domestic property transactions which require the provision of drainage and water information and cannot be used for commercial development of domestic properties or commercial properties for intended occupation by third parties. When the Report is used for land only transactions the Company's entire liability (except to the extent provided by clause 3.4) in respect of all causes of action arising by reason of or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall be limited to £5,000.

3.4 The Company shall accept liability for death or personal injury arising from its negligence.

Copyright and Confidentiality

4.1 The Customer the Client and the Purchaser acknowledge that the Report is confidential and is intended for the personal use of the Client and the Purchaser. The copyright and any other intellectual property rights in the Report shall remain the property of The Company. No intellectual or other property rights are transferred or licensed to the Customer the Client or the Purchaser except to the extent expressly provided

4.2 The Customer or Client is entitled to make copies of the Report but may only copy Ordnance Survey mapping or data contained in or attached to the Report, if they have an appropriate licence from the originating source of that mapping or data

4.3 The Customer the Client and the Purchaser agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.

4.4 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.

4.5 The enquiries in the Report are protected by copyright by the Law Society of 113 Chancery Lane, London WC2A 1PL and must not be used for any purpose outside the context of the Report.

4.6 The Customer the Client and the Purchaser agree to indemnify The Company against any losses, costs, claims and damage suffered by The Company as a result of any breach by either of them of the terms of paragraphs 4.1 to 4.4 inclusive.

Payment

5. Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by The Company, without any set off, deduction or counterclaim. Unless the Customer or Client has an account with The Company for payment for Reports, The Company must receive payments for Reports in full before the Report is produced. For Customers or Clients with accounts, payment terms will be as agreed with The Company.

General

6.1 If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.

6.2 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.

6.3 Nothing in these terms and conditions shall in any way restrict the Customer the Clients or the Purchasers statutory or any other rights of access to the information contained in the Report.

6.4 These terms and conditions may be enforced by the Customer the Client and the Purchaser.

These Terms & Conditions are available in larger print for those with impaired vision.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800.

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to him at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS.	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE