Wilde Project No: 683-013 –(E1310)
Document Ref: Depot Drain Review DDRT

Depot Re-development Drainage Review
On land at rear of
London School of Hygiene & Tropical Medicine
15-17 Tavistock Place
London. WC1H 9SH

In confidence – pre-development.

Project for
University College London
Project Number 683-013

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Revision History

Date	Issue	Description	By	Approved
19-6-13	P1	Comment	RLG	
26-6-13	A	Consultation	RLG	ST
15-1-15	B	Pre-development Consultation	RLG	ST

Contents

Purpose of this Document

To set out the feasibility of options for the discharge of rainfall run-off from the proposed re-development depot building area to the rear of 15-17 Tavistock Place.

To identify significant project risks to the planned re-development of the site arising from drainage discharge.

Provide a basis for determining the offsite surface water discharges to public sewer connections.

Executive Summary – Rev B

This drainage report considers the prospective redevelopment by University College London (UCL) of a former Depot (steel framed shed building) lying to the rear of 15-17 Tavistock Place along with parts of the present courtyard and two storey brick built buildings lying between them. The proposed re-development will house a new laboratory and office facility. The existing building at 15-17 Tavistock Place is the School of Tropical Medicine (STM) and will remain unaltered.

The whole of the existing site, both STM and the re-development site to the rear (North) of it are presently fully drained with either existing impermeable roofs or impermeable paving at ground level.

The drainage of the STM and its courtyard areas and peripheral buildings is via two combined sewer connections into the 1245mm x 813mm combined sewer flowing NE along Tavistock Place. Each of these connections is 225mm diameter.

The drainage of the Depot building at the rear of the STM was found to mainly discharge to the NW via a damaged and blocked connection thought to run under new properties recently constructed in Woolf Mews. The repair of this connection is not considered feasible nor desirable for the proposed development. Approximately 1000m2 of roof area presently flowing to that defective sewer is now proposed to drain to the South Crescent Mews and Tavistock Place connections. In line with the SuDS requirements of Camden Council the integration of substantial green roof areas is proposed to assist with the reduction in run off rates and help reduce dependency on tank storage. Approximately 700m2 (70%) of that roof area is proposed to be replaced with a green roof to help attenuate rainfall run off flows.

No flooding is presently reported to either the STM building or the Depot site at the rear however CCTV inspection of the Depot connection has shown it to be substantially blocked due to the construction of some recent domestic properties in Woolf Mews.

A Sustainable Drainage System (SuDS) approach to the re-development will be adopted in line with current statutory requirements. The proposed re-development run off area from the Depot and part of the courtyard will require surface water management attenuation measures that will accommodate increases in rainfall of 30% to account for climate change at the same time as reducing the storm water discharge flow rate from the area by 50%. Given the ground conditions of the site, the built up nature of the area and the need to

protect basements, other SuDS approaches such as infiltration methods and surface landscape features are not considered feasible.

There is not likely to be any statutory requirement for a Flood Risk Assessment (FRA) however there is a need for a Storm Water Strategy for the re-development, and when fully developed this will constitute an FRA.

The risk to the existing basements by routing additional flows near to them and/or through pipework beneath them is considered. This risk will also be present for the new basement areas.

This drainage report identifies the preliminary preferred option for the future drainage of the proposed new development at the rear of 15-17 Tavistock Place as the continued use of the connections into Tavistock Place and South Crescent Mews along with the abandonment of the blocked connection flowing into Woolf Mews.

The above preference has been formulated by considering the assessment of flood risk, engineering risk, future maintenance and simplicity. The feasibility of a single point of discharge connection to the public sewer network is not considered to be high as flows will need to be collected and disposed of from all sides of the new development.

The preferred routes for storm water discharge from the site will need to be regularly reviewed as the main building design is developed to ensure that they are not adversely affected by ongoing changes in other design elements.

Early consultations with Thames Water Utilities Ltd (TWUL) were made on all the connection options, and at that time TWUL did not highlight any particular concerns. More recently however a formal pre-development enquiry has been made to TWUL and more information (this report) is now required to help TWUL determine whether any hydraulic modelling by their team is required to assess the capacity of the main public sewers in the area. Typically these are the 1200mm x 800mm brick egg sewers in Tavistock Place and Marchmont Street which have invert depths of approximately 6.0m. As part of this formal consultation some intrusive inspections and CCTV surveys of the sewer connections will be appropriate to assess their structural and hydraulic condition and their actual arrangement in detail.

Introduction

The property at 15-17 Tavistock place houses the School of Tropical Medicine (STM) which forms part of the University College London (UCL) estate. Wilde Consultants have been appointed to review the current situation and re-development proposals relating to the drainage of the former depot building and courtyard buildings to the rear of the STM along with the existing public sewer connections from it into Tavistock Place and South Crescent Mews. We report on both the re-development issues and the feasibility of options to remedy the current drainage problems.

The whole of the site is owned by UCL see Appendix A drawing – ***Title Plan 15-17 Tavistock Place***. The main building to the rear of the site is a depot building constructed at some time between the 1920's and 1950's as a milk distribution centre. Within the courtyard another small two storey Edwardian building also abuts the south wall of the depot. The drainage of the depot building is seriously impaired and could not be traced to public sewer although there are no reports of flooding issues in the old depot.

UCL is proposing demolition of the Depot and the Edwardian courtyard buildings in order to construct a new laboratory and office facility to the rear of the existing STM building. The whole of the present site is built over with impermeable surfaces and all its rainfall run off currently discharges to the public combined sewers in the surrounding streets. The new development is to have a double level basement and so all of the current depot drainage will be obliterated in the process of its construction requiring new discharge routes for the run off to be determined.

Existing situation

The arrangement of drainage to the depot area is shown in Appendix A drawing – ***D-101 Existing Drainage – Depot Area***. The main surface water discharge pipe from the depot is reported as partially obstructed and all previous attempts to clear it have failed. The blockage is reported to be associated with a pipe failure. Investigations in 2009 into the pipe failure determined that the location of the failure was at a point now outside the legal ownership of the depot area where a mews of new houses have been built (Woolf Mews).

The depot building is constructed exactly up to the ownership boundary on three of its four sides (East, North and West) which limits the accessibility for repairs and alternative routes.
The present condition of the drainage limits the present use of the depot building and will hamper any redevelopment of the depot area in the future.

UCL require that the drainage from the depot area is properly provided for, fully functional and maintainable into the future. This may involve;

- Attempting to rehabilitating its existing discharge route (which appears to run under newly constructed domestic buildings in Woolf Mews);
- or providing a new alternative route through other existing discharges to public sewer connections;
- and/or constructing a new connection to public sewer.

Any of the approaches listed above will require the consent of Thames Water Utilities Ltd (TWUL) before they could be enacted and so the relevant approaches and applications will be made to TWUL regarding the way forward. Formal written confirmation will be required from TWUL that the public sewers being considered are judged to have sufficient capacity to accommodate the run off flows which are intended to be redistributed.

The general areas involved are summarized on the two ***Wilde Consultants*** drawings:-

683-013-D001 Existing Run Off Areas and Connections
683-013-D002 Proposed Run Off Areas and Existing Connections.

The first drawing ***D001*** shows that the existing STM and the courtyard buildings etc cover 1790m2 and discharge through two 229mm diameter basement connections (2 & 3) into the 1245mm x 813mm egg sewer in Tavistock Place which is over 6m deep. The depot building to the rear covers 1000m2 and mainly discharges to the blocked 150mm sewer under properties in Woolf Mews. Some areas of the depot building may also discharge to a 457mm public combined sewer connection (1) in South Crescent Mews but this is yet to be surveyed.

The second drawing ***D002*** shows the proposed area to be redeveloped (1428m2); the run off from which will need to be controlled and routed to the approval of TWUL and Camden council. The remaining STM building and courtyard which will remain unaltered will have an area of 1362m2. It is anticipated that the surface water flows from both parts of the site will in future be routed to the connections at locations 1, 2 and 3 and that connection 4 into Woolf Mews will be abandoned.

Effect of Redevelopment on Drainage Routing

The ongoing proposals to develop the rear of the STM site are shown on a series of plans by ***bmj architects*** numbered ***SK(00) 133 to SK(00) 138*** which cover floor levels -2 to +4. A plan by ***Wilde Consultants*** showing a more detailed area take off for the proposed development is numbered ***683-013-D003***. This also shows which roof areas have been designated green roof and shows a

ground level (level 0) perimeter path over the piled basement walls and light wells. In addition to fully occupying the site of the present depot this proposal also removes all of the present drainage infrastructure and services from the area.

The line of the proposed redevelopment footprint has been sketched onto a marked up drawing ***MU02-CCTV – Ground – UD-02F-LAout-A1*** and this shows the likely extent of disruption to the existing buried services in the courtyard area including the removal of MH 6 which was one of the possible drainage connection manholes that are discussed later and which has already been identified to TWUL.

Effect of Redevelopment on Sustainability and Permitted Drainage Discharge

In addition to the effects on the physical drainage routes that may be possible for the new building there are planning effects relating to sustainability. Camden Council acting as Lead Local Flood Authority (LLFA) is responsible for coordinating managing and responding to the flood risk overall within the borough and applying any necessary restrictions to ensure continued abatement and improvement of flooding within the area along with increasing the sustainability of drainage performance.

Given the size, nature and environs of the Tavistock place site, there is not likely to be any requirement for a Flood Risk Assessment (FRA) however there is a need for a Storm Water Strategy for the site as a whole.

The main effect of Camden's new responsibility is that the planning authority will always consult the LLFA over any re-development work and will place a condition on the planning to allow for 30% climate change into the future and at the same time reduce the storm water discharges off site from redeveloped areas by 50% using Sustainable Drainage Systems (SuDS).

This is a difficult condition to meet within any well developed city site on account of there being no open ground which could be used for infiltration or other means of avoiding the discharge of the current flow rates from the site.

Green and brown roofs have become an almost de-facto consideration for providing flow attenuation and reduction in discharge. Rainwater harvesting is also very much encouraged in order to avoid using more potable water than necessary for non-potable applications and to reduce marginally the quantity of water overall discharged from site. In addition to these approaches however some attenuation storage volume is likely to be required to help towards achieving the 50% reduction in discharge flows. It is envisaged that a series of linked tanks with a controlled discharge could be situated in the basement vaults

of the STM building which lie under the pavement of Tavistock Place. There is estimated to be capacity for approximately 25m3 of storage in these vaults. The flows thus held back in the green roof and the basement tanks would then be released into the public sewers once the peak of the storm flows had passed. In this way attenuation and storage can have a marked effect on the flooding performance of an area.

Any system installed to control discharges will need to be capable of coping with any duration of storm event up to a return period of 1 in 100 years which is a rare event. Coupled with this there is also a requirement to accommodate the effects of climate change on the predicted rainfall and so the flows arising from the 1 in 100 year rainfall event would need to be enhanced by a 30% increase in intensity (the current prediction for climate change for the years 2085 to 2115).

The various aspects of controlling storm water run off from the site will need to be brought together within the Storm Water Strategy. The different types of control are usually implemented by different professional designers (Rainwater harvesting by M&E, Green Roofs and building rainwater goods by architect, Storage and attenuation, and hydraulic modeling by civil/hydraulic engineer) and the Storm Water Strategy will provide an integrated view of all these measures. Providing and updating the Storm Water Strategy should help to avoid unnecessary delays that can arise due to resolving queries and consultations.

Engineering Constraints and Options

The reporting of alternative discharge option locations considered in this section were initially prepared in 2009 and were addressed as if no re-development were to take place and as if disposal of the depot site might be considered. In the intervening years the potential disposal of the depot site has become much less likely and re-development much more certain. Although the proposals for re-development have now become much more firm, the content and comparisons of this section still form a valid approach for general considerations until such time as the proposed routing of the various drainage connections and discharges can be agreed in principle with the relevant authorities. The overall areas of run off involved will not vary markedly and the existing public sewer connections will not change. The costs identified in this section should be viewed as comparative only and also do not reflect the need for or the means by which SuDS will be incorporated into the new development.

At some point the feasibility of designing and integrating storm water storage and attenuation measures into the new building will be needed and the options set out below for connections to public sewer will be revisited during that design process.

Areas and comparative run-off

The main buildings and courtyard of 15-17 Tavistock Place have a run off area of approximately 1790m2 made up of a variety of surfaces (roof and paved). Based on an extreme rainfall run-off from a 90mm/hour rainfall rate (e.g. 100 yr with climate change) this area would generate a flow rate of 45 Litres/sec which is about the capacity of a 225mm connection pipe at 1 in 150 gradient and there are two such pipes serving the building.

The former depot building situated at the back of the courtyard has a run off area of approximately 1000m2 which is wholly roof run off. Based on a typical rainfall run-off from a 90mm/hour rainfall rate this area would generate a flow rate of 25 Litres/sec.

For any detailed design analysis utilising actual rainfall profiles for various return periods and calculating discharges, the above rates would vary in proportion to the actual storm profiles being considered.

Investigation of existing depot area discharge drain

The roof drainage from the former depot is routed via a manhole (MH 19 on **D-101 Existing Drainage – Depot Area**) located internally approximately in middle of the depot floor area. The 150mm diameter outlet pipe from MH19 is routed in a westerly direction towards the recently constructed Woolf Mews development.

This surface water drain is constantly surcharged and it has been high pressure jetted on two occasions in recent years without success.

We are advised that a survey by Waterflow on 13/11/08 had found found this pipe to be collapsed adjacent to the foundation of a house (No. 4 Woolf Mews) which makes excavation in the garden of the house a difficult option. In addition it means that the route of this pipe is likely to pass through many other property ownerships on its way to whichever public sewer it discharges into. We assume this will either be the public sewer in Burton Place or the one in Burton Street. If this pipe could be repaired at the location where it is reported to have failed, it is likely that it has other collapses further along its length as it passes through the Woolf Mews development.

Options for the future drainage of the depot area

Refer to appendix A drawings ***MU01-CCTV*** and ***MU02a-CCTV*** which are mark-ups of Bolton Priestly underground drainage drawings UD/01 (basement level) and UD/02 (ground floor level). These were marked up in yellow highlighter to identify CCTV work required to inform this report.

In order to provide the depot area with a secure drainage outlet into the future, that is wholly within land owned by UCL and under their control, UCL seeks to redirect the flows arising from the depot area to another discharge point. One approach would be to divert the flows to one of the two existing connections to the 1245mm x 813mm public sewer flowing East in Tavistock Place. This sewer is estimated to be 6.85m deep at the corner of Marchmont Street and Tavistock Place. This approach is described in Options 1 & 2 below.

Another alternative is also possible by diverting flows into a new connection into the 457mm diameter sewer at the east of the depot area in South Crescent Mews. This would mean applying for a new connection and would rely upon proof that this sewer is in sufficiently good condition and of sufficient depth for the intended flows. The depth of this sewer at the point where it joins the 1143mm x 762mm sewer flowing North in Marchmont Street is estimated to be 6.16m deep. This approach is discussed below as Option 4.

The final approach would be to construct a fully new connection from the depot area in a southerly direction to Tavistock Street (or alternatively an easterly direction to Marchmont Street). This option however is unlikely to be preferred by either TWUL or UCL. It is discussed below as Option 3.

Option 1

To interconnect with the main building system at the existing courtyard manhole number 6, being 3.08M in depth. This existing 225mm drain extends under the

basement area and connects to Thames Water sewer within Tavistock Place. The manholes in the basement are approx 750mm to 1200mm deep
Refer to Appendix A – ***MU01-CCTV*** and ***MU02a-CCTV*** for existing details and chamber numbers. Alternatively connections could be made directly into the basement chamber (e.g. manhole number 12).

Preliminary Budget Estimate: - £20,000.00

Effects
Any blockages in the basement area would result in a higher risk of surcharging into the basement area. If the depot area is ever sold on there would be shared responsibility and access agreement issues.

Option 2

To interconnect with the main building system in the existing service yard manhole number 18, being 3.15M in depth. This existing 225mm drain extends under the boiler room at basement level and connects to Thames Water sewer within Tavistock Place. Alternatively connections could be made directly into the basement chamber (e.g. manhole number 16).
The manholes in the basement are approx 750mm to 1200mm deep.

Refer to Appendix A – ***MU01-CCTV*** and ***MU02-CCTV*** for existing details and chamber numbers.

Preliminary Budget Estimate: - £35,000.00

Effects
Any blockages in the basement area would result in a higher risk of surcharging into the basement area. Will require additional works to existing branch drain lines to accommodate and construction through existing student areas.
If the depot area is ever sold on there would be shared responsibility and access agreement issues.

Option 3

To provide a new separate drain line and form a new sewer connection to the existing TWUL sewer within Tavistock place. The route would be across the existing courtyard.

Preliminary Budget Estimate: - £65,000.00

Effects
May require other courtyard services to be diverted to allow gravity flows.
If the depot area is ever sold on there would be shared responsibility and access agreement issues.across the courtyard.

Option 4

This option relys upon the existing TWUL sewer shown running East along South Crescent Mews. Although this sewer is shown on the TWUL public sewer record, there are no visual clues on site to indicate its location. The sewer record shows a 457mm combined sewer within South Crescent Mews, which terminates just outside of the steel doors to the depot area.
The depth of this sewer where it connects with the 1143mm x 762mm sewer in Marchmont St is estimated to be 6.16m (IL 18.04m, FGL 24.20).
We would assume that the existing 457mm branch ramps down to connect to the main sewer and estimate that it may be around 1.2m to 2.0m deep within South Crescent Mews but this would need to be confirmed by investigation and excavation.

Preliminary Budget Estimate: - £20000.00 excluding excavation costs to verify public sewer.
If a new connection is required cost would be in the region £65,000.00

Effects
If left as existing public record and all is adequate, there would be no negative effects.
If the depot area is ever sold on there would be no shared responsibility or access agreement issues.as the sewer in Marchmont Street is already an adopted public sewer.

Conclusion and Option Recommendations

Drainage Flows and SuDS

The prospective redevelopment of the depot and parts of the present courtyard into a new laboratory and office facility brings a large potential cost and complexity risk to the project. The design needs to accommodate increases in rainfall by 30% to account for climate change at the same time as reducing the storm water discharges from the site by 50% and providing Sustainable Drainage Systems (SuDS). No rainfall modeling has been carried out but a storage volume in the order of 50 m3 would not be unusual and will need to be accommodated within the building or site. It is estimated that approximately 25m3 could potentially be stored in basement tanks and green roofing provided to supplement this where feasible.

Consideration and where possible integration of green measures such as green roofs and rainwater harvesting systems will in any case be required by Camden

Council. A Storm Water Strategy will provide the means of documenting and integrating these measures.

The risk to the existing basements by routing additional flows through the pipework beneath them is considered low. This risk will also be present for the new basement areas.

Drainage Routing and Public Sewer Connections

On a risk, simplicity and cost basis Option 4 would be the preferred option however this assumes that the sewer in South Crescent Mews is still extant and in good order with a serviceable connection to the main sewer. This will require investigation which will take time. TWUL will need to inspect the main sewer in Marchmont Street and check if there is a connection present. They will also need to excavate part of South Crescent Mews to locate the pipe. Works in South Crescent Mews will require Highways permissions unless the Mews is private.

The other options in order of preference would be Option 1, then Option 2 followed by Option 3.

All of these options have been reviewed on a preliminary basis by TWUL to ascertain their likely views regarding the possible diversion of flows and connections that may be involved, and where there is likely to be more capacity in the main public sewers. In order to obtain a formal response to these matters then a formal connection application would need to be made and the appropriate fee provided to TWUL.

TWUL have informally expressed no significant concern regarding the diverting of flows to one or other of the main public sewers in the street however TWUL did caution that Camden Council would as LLFA impose significant restrictions on any discharges from the re-developed site.

Appendix A – Reference Documents & Drawings

The drawings listed below are provided separately in Adobe pdf format files

Title Plan 15-17 Tavistock Place

D-101 Existing Drainage – Depot (Warehouse) Area

683-013-D001 Existing Run Off Areas and TWUL Connections

683-013-D002 Proposed Run Off Areas and Existing TWUL Connections

bmj architects Sketch Plans SK(00) 133 to SK(00) 138

Wilde Consultants drawing 683-013-D003

MU01-CCTV Basement –UD-01E-Layout (Drainage Plan)

MU02-CCTV Ground –UD-02E-Layout (Drainage Plan)