Russia Dock Woodland

Version	Date	Description	Prepared	Approved
1	December 2023	For Information	LR	JM

1. Project Summary

The London Borough of Southwark (Southwark) approached Metis NRP to deliver a concept design for Russia Dock Woodland, SE16 6QG. Surface water is currently attenuated within an underground storage crate on site at the Sitka House development. Southwark is aiming to redirect this surface water towards the Russia Dock Woodland channel.

The design will investigate options to redirect the surface water from the existing network into the Russia Dock Woodland channel aiming to include Natural Flood Management (NFM) elements and/or Sustainable Drainage System (SuDS) features. Therefore, traditional gravity fed systems along with other solutions will be investigated.

Southwark have requested Metis to carry out the following tasks:

- To undertake a site visit to identify opportunities and constraints of the area
- To procure and manage the required survey work of the drainage assets and topograpy of the study area
- Creating concept design drawings
- Estimating the costs of the options
- Developing a Design Risk register
- Production of a programme with milestones

2. BACKGROUND

Russia Dock Woodland (SE16 6QG) is situated in the northeast of the London Borough of Southwark. Sitka House, part of the new developments at 20 Quebec Way, has installed a storage feature that accumulates stormwater from the roofs of the buildings which is then redirected towards the Russia Dock Woodland through a 225 mm diameter pipe capped after SW EMH3 (Figure 1).

A Thames Water (TW) Surface Water (SW) pipe with a diameter of 1050 mm runs from west to east before making a 90° bend along Russia Dock Woodland, changing direction from south to north and increasing in diameter to 1200 mm. A 600 mm Foul Water (FW) pipe runs in the same west to east direction, adjacent to the surface water pipe. The FW pipe continues until it reaches a T-junction, whereafter the flow is from north to south.

Additionally, a 225mm diameter stormwater pipe redirects water from the storage feature towards Russia Dock Woodland until reaching a cap after Manhole SW EMH3, as depicted in Figure 1.

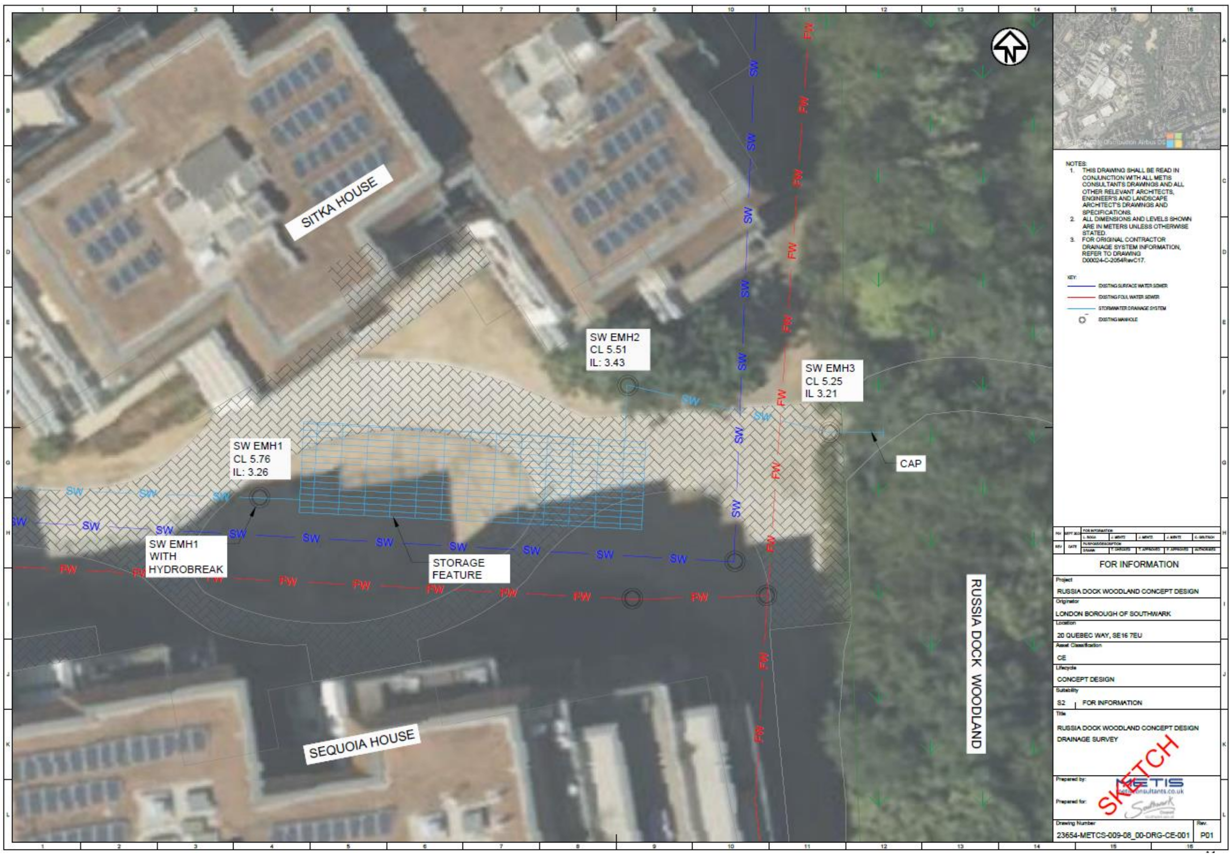

Figure 1: Study Area (Metis drawing 23654-METCS-009-08_00-DRG-CE-001)

3. CALCULATIONS

An initial feasibility analysis was conducted using LiDAR and TWUL data to evaluate various options for redirecting water flows into the Russia Dock Woodland channel. This assessment was later refined and adjusted based on the results of the topographic and drainage surveys. Three options were explored, as indicated in drawing 23654-METCS-011-08_00-DRG-CE-001.

The drainage survey confirmed the invert level of the outflow pipe at SW MNH3, located at 3.21 mAOD. Since the channel remains dry for most of the year, an outfall, 150 mm above the bed level, was assumed for the pipe design. Using the data and stated assumptions, a design slope was determined for each option. The corresponding flow and velocity for each option was calculated using Manning's equation (Equation 1).

$$Q = V \times A = \frac{1.00}{n} \times A \times R^{\frac{2}{3}} \times \sqrt{S} \quad [SI]$$

Equation 1: Manning's equation.

Where:

- Q = Discharge (m^3/s)
- V = Velocity (m/s)
- A = Cross-sectional area of flow in the pipe (m^2)
- n = Manning's roughness coefficient (unitless)
- R = Wetted perimeter (m)
- S = Slope of the pipe (m/m)

3.1 Pipe routes

Three routes were assessed for discharging water from the storage tank into the Russia Dock Woodland channel. Each route accommodates a traditional open trench pipe installation. The designs for these routes were modelled using Autodesk Civil 3D software, and excavation volumes were extracted from the model. Notably, the footprint of the excavation, accounting for safe excavation slopes, was observed to impact a substantial number of trees, as illustrated in Figure 2.

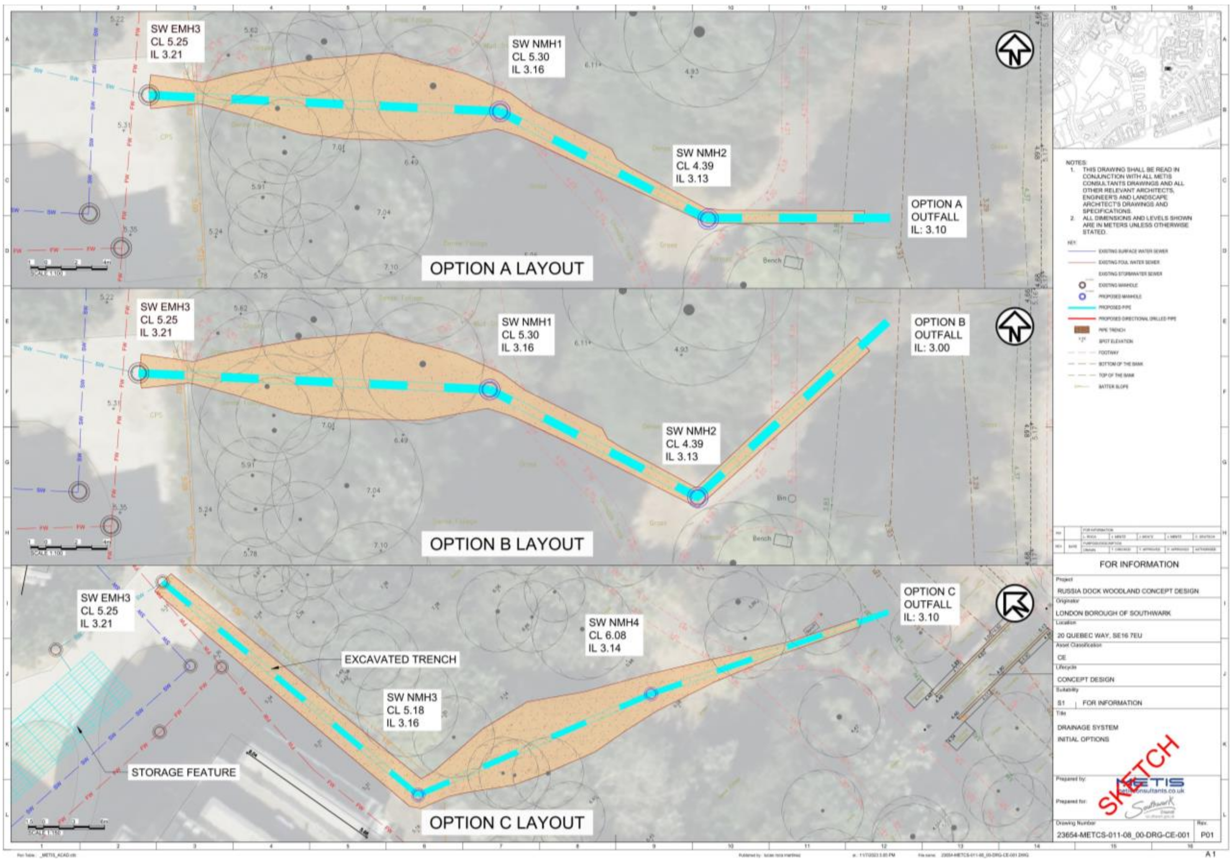

Figure 2: Metis drawing 23654-METCS-011-08_00-DRG-CE-001

The design parameters and discharge values for each pipe route is shown in Table 1.

Table 1: Flow characteristics summary for the route options at Russia Dock Woodland

Route	Pipe Diameter (mm)	Slope (%)	Roughness Coefficient (n)	Discharge (ℓ/s)	Flow velocity (m/s)
Option A		500		20	0.49
Option B	225	300	0.014	22	0.56
Option C		1400		11	0.28

3.2 Excavation optimised pipe routes

To mitigate the impact on trees and minimize excavation volume, an optimized approach combining open trench excavation with directional drilling was explored for each route. The outcomes of these calculations are detailed in Table 2.

Table 2: Design parameters and calculation results for the options.

Approach	Pipe Length (m)	Excavation volume (m^3)	Water velocity (m/s)	Initial cost estimate (£)
Open trench A	51	110	0.49	67,000
Open trench B	53	110	0.56	69,000
Open trench C	82	160	0.28	87,000
Open trench & directional drilling A	51	30	0.49	49,000
Open trench & directional drilling B	53	30	0.56	51,000
Open trench & directional drilling C	82	80	0.28	71,000

3.3 Route evaluation

Route C is deemed the least optimal path for advancement, primarily due to hydraulic constraints and initial cost estimates. Both Route A and Route B present viable hydraulic options, with Route B offering marginally more favourable slopes and velocity. While the costs for both alternatives are comparable, Route B carries a slightly higher price tag compared to Option A.

Moreover, the discharge angle of Route B into the channel may necessitate the installation of a more expensive headwall, an aspect not factored into the initial cost estimate. Consequently, Route A emerges as the preferred choice. Its hydraulic characteristics are sufficient for the required discharge, promising a simpler construction process and making it the overall most cost-effective option.

4. DESIGN SUMMARY

Metis has reviewed the information from existing data, drainage, and topographic surveys and have summarised the design as follows:

- None of the options can achieve self-cleansing velocities due to the feasible designed slope. Therefore, a maintenance programme will need to be set up to avoid clogging issues and malfunctioning.
- Option C was discarded due to its poor hydraulics and high estimated cost
- Options A and B have similar hydraulic characteristics and excavation volumes and could effectively attenuate some stormwater from the storage feature.
- Directional drilling decreases excavation volumes significantly and avoids tree removal and their respective costs, reducing the cost estimates considerably.
- Options A and B using directional drilling are preferred, considering their cost-effectiveness and lesser impact.

5. DELIVERY PROGRAMME

For the detail design and delivery of the project, the expected timelines are as follows:

• Site visit:	Start up
• Data review, initial concept design and commissioning of surveys:	2 weeks
• Survey work:	4 weeks
• Review of survey data, preparation of the concept designs, note and drawings:	5 weeks
• Client review:	1 weeks

The timeline shall be confirmed and updated on acceptance of the concept design and commitment from Southwark for the project to proceed

6. MAINTENANCE

The purpose of maintenance interventions is to ensure that all those involved in the maintenance and operation of the SuDS system understand its functionality and maintenance requirements in terms of supporting long-term performance to design the criteria for which it was designed for.

6.1 Maintenance for manholes

Maintenance for the manhole will be required every 6 months or after a large storm event. On every maintenance check:

- Check for accumulation of debris and silt and clean as necessary.
- Covers and frames to be checked for damage.
- Exposed concrete and adjacent surfacing are to be checked for cracking and general damage.
- Check the condition of inlet and outlet pipes, flap valves, baffles, etc.

On Occasional maintenance checks:

- Clean as necessary.
- All manhole and inspection chamber covers and frames are to be replaced as necessary.
- Repair exposed concrete and surfacing as necessary.
- Repair/rehabilitation of inlets, outlets, overflows, and vents, as required.

6.2 Maintenance for pipes

Maintenance for the pipes will be required every 6 months or after a large storm event. On every maintenance check:

- Visual inspection: Look for any signs of damage, corrosion, leaks, or unusal wear.
- Inspect the pipe for any blockages, obstructions or debris. If blockages are found, clear them to ensure the free flow of water.
- Examine all pipe joints and connections for any sign of leaks.

On occasional maintenance checks:

- Periodically clean the interior of the pipes to remove accumulated sediment and debris.
- When pipes show excessive corrosion, damage, or wear that cannot be repaired, replace the affected sections.
- Keep detailed records of all maintenance activities, including dates, inspection findings, repairs, and replacements.