

Monitoring and Management Protocol Link Road

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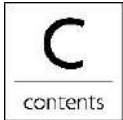
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1. Introduction

One Horton Heath is a masterplan development in Hampshire (National Grid Reference SU 48815 17105) that is being brought forward by Eastleigh Borough Council. Eastleigh Borough Council have set out the following vision for the development:

“People are at the centre of our vision – the community that already live and work in Horton Heath, and the people who will live and work within the village in years to come. This project will create an exemplar development which is integral to Horton Heath engendering pride and a strong sense of place. The local area, and by extension the Borough, will become Greener, Healthier, more Prosperous with a more diverse supply of Housing as a direct result of this project”.

The Link Road is an important component of the wider masterplan, providing an important transport link across the site. The Link Road comprises an area of 7.13 ha linking the southern and north-western boundaries, principally along the western side of the site, as identified in Figure 1.1.

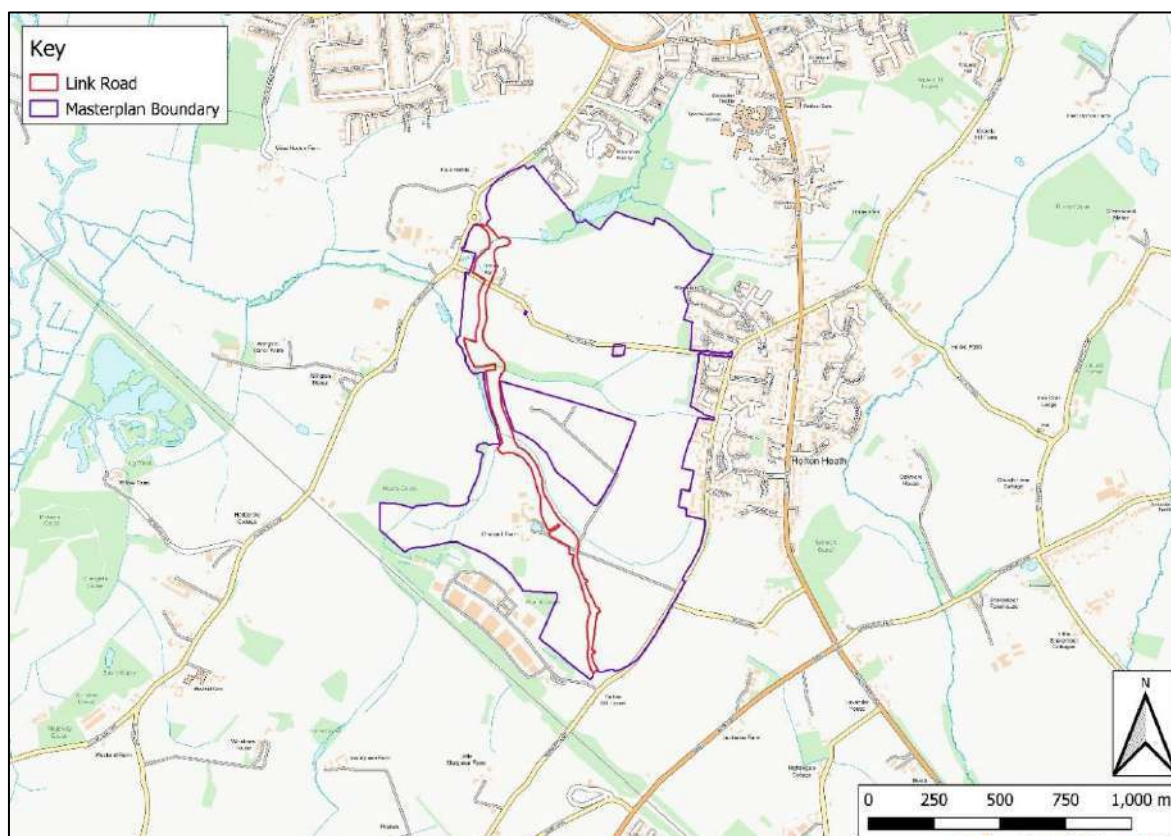


Figure 1.1 Link Road in relation to the One Horton Heath Masterplan Site (Contains Ordnance Survey data © Crown copyright and database right 2022)

1.1. Background

The release of sediments from development schemes within the Itchen catchment is of potential concern in relation to their impact on the riverine environment. The input of fine sediments is of particular concern in relation to the River Itchen Special Area of Conservation (SAC), with the chalk stream habitats, for which the site is designated, being vulnerable to sediment accumulation.

Sediment accumulation also has detrimental impacts on fish populations in the catchment, particularly in relation to salmonids with settlement of sediments reducing the quality of spawning habitats. Developments are, therefore, required to identify appropriate mitigation that minimises sediment losses into the Itchen catchment during construction and through operation of the scheme.

1.2. Purpose

The purpose of this Monitoring and Management Protocol is to set out the proposed monitoring that will be established to review the effectiveness of Sustainable Drainage System (SuDS) features in removing sediments and to set out the adaptive management measures proposed to be undertaken throughout the lifetime of the project.

The following sections set out the methodology by which monitoring will take place, including identification of the determinants to be monitored, locations for monitoring and frequency, and then the management measures required.

1.3. SuDS Design

All surface water runoff from positively drained development areas on the site is to be treated through the SuDS Management Train, consisting of Source Control techniques and Strategic SuDS Features. Runoff will pass through at least one Strategic SuDS Feature, with the management train providing the following treatment process as a minimum:

- Sediment forebays at inlets;
- Extensive wetland areas;
- Wetland planting;
- Secondary sedimentation areas prior to outlets.

The proposals include a series of SuDS features along the Link Road route, identified in Figure 1.2, comprising the following:

- Strategic SuDS Feature A (Detention Basin);
- Strategic SuDS Feature E (Detention Basin);
- Northern Bio-retention Swale;
- Southern Bio-retention Swale;
- Highways SuDS Feature (Detention Basin);
- Strategic SuDS Feature L1 and L2 (Detention Basins).

The proper implementation of a SuDS management/treatment train using a combination of upstream Source Control and Strategic SuDS Features will create greater resilience and allow the system to collect silt at various points, which can be removed during periodic maintenance. Creating a diverse SuDS scheme that encourages sedimentation, filtration and biological uptake throughout the site will reduce the outputs of sediments, nutrients and other pollutants from the site.



Figure 1.2 *Drainage Overview Plan identifying SuDS Locations within Link Road Application*
(From drawing G277/36 Rev D)

2. Methodology

2.1. Approach

The primary function of the SuDS basins is for stormwater attenuation. As such, they have been designed to attenuate the runoff from the developed areas of the proposals for the 1 in 100-year storm event (+ 40 % allowance for climate change) with the outflow limited to Q_{MED} (a return period of 2 years).

With reference to Chapter 22 “Detention Basins” of “The SuDS Manual”¹:

- “Where there is no upstream pre-treatment, on-line detention basins should include a forebay to try to contain accumulating sediments.”
- “Where the basin is vegetated, the soil surface can absorb some runoff, so can be used to support the prevention of runoff from then site for small runoff events (interception)....The principal water quality benefits of vegetated detention basins are associated with the removal of sediment and buoyant materials, but levels of nutrients, heavy metals, toxic materials and oxygen-demanding materials may also be significantly reduced.”
- “The key to delivering reasonable levels of treatment using vegetated detention basins is the effective capture and management of sediments, and the distribution of inflows across a sufficient width of the detention basin – thus maximising the potential vegetated filtration area. Small ponds can be incorporated at the outlet to reduce the risks of resuspension of sediment from larger events can also improve the water quality performance by concentrating finer sediment....The ecological value of the system can be enhanced by including micropools or wetland zones at the base.”

As such, the proposed structures are clearly detention basins and thus the following monitoring approach is considered appropriate.

Monitoring samples should initially be taken on a quarterly basis for the first five years following completion, to gain an accurate understanding of how the system is initially performing on a seasonal basis. Review of the effectiveness of the wetland systems will be carried out on an ongoing basis against the predicted performance at the design stage to ensure the SuDS are operating as expected, and determine whether adaptive management is required to address any issues associated with high sediment yields.

Where the SuDS features are operating effectively following the five-year sampling period, sampling will reduce to a single annual sample. However, where adaptive management is required this should be followed by a period of quarterly samples for a further two years to monitor the effectiveness of those corrective actions.

With all reasonable endeavours, samples will be taken during wet periods where possible, either during or soon after rainfall, to ensure flow is present in the system at the time of sampling. Samples for each SuDS feature should be taken on the same day, although all samples can be collected over a wider period of time.

2.2. Determinants

2.2.1. Flow, DO, pH and Temperature

The water flow will be recorded at each of the inflow locations and at the flow control chamber downstream of the SuDS outlet, recording the water depth and velocity to establish the total flow in

metres per second. Water flow monitoring will not be undertaken at outfall locations, with flows from the flow control chamber used to represent the flow rate.

A suitable flow meter should be utilised, however, the key consideration in kit determination is that the monitoring equipment is suitable for low-flow conditions and is able to be used from the surface. Under no circumstances should entry to an inspection chamber be attempted.

Dissolved oxygen (DO), pH and water temperature will also be recorded at each of the inflow locations and at the flow control chamber downstream of the SuDS outlet, using a suitable portable instrument.

2.2.2. Sediments

Water samples will be collected from all monitoring locations for laboratory analysis of the following parameters:

- Total Suspended Solids (TSS);
- Total Dissolved Solids (TDS); and,
- Turbidity.

All samples will be taken from the surface and under no circumstances will entry to an inspection chamber be attempted. It is recommended that sampling from ground level is facilitated by taping sampling bottles (*e.g.* with filament strapping tape), one at a time, to a pole and lowering the pole into the chamber. Each bottle can be fastened to the pole by holding the bottle against it and wrapping tape tightly around the bottom and the top of the bottle as the bottle is held firmly to the pole. If the flow in the chamber is shallow, the bottle may have to be positioned horizontally with the opening of the bottle somewhat higher than its bottom.

To avoid disturbing channel bed solids, care should be taken not to scrape the bottle against the sides of the pipe.

Where samples are taken from outfalls, and they are safely accessible, then sampling can be facilitated by holding bottles with the bottle opening facing into the flow, taking care not to overfill them. However, if there is any doubt about the safety of the sampling location, then sampling can be carried out using a pole from a safe, stable location, as per the chamber sampling described above.

2.3. Locations

As discussed in Section 1.3, the proposals incorporate a series of SuDS features along the Link Road route through which runoff will be managed. Monitoring locations within each SuDS feature are identified in the following sections, comprising the first manhole upstream of each SuDS inlet, within the flow control chamber on the downstream side of the SuDS outlet and at the first location downstream of the Defender Unit, being either the main outfall to a watercourse or manhole (whichever is foremost).

2.3.1. Strategic SuDS Feature A (Detention Basin)

Strategic SuDS Feature A has two inlets, with upstream monitoring to be taken from the nearest manholes, which are c. 19 m to the north of the northern inlet and c. 31 m south of the southern inlet. The outlet for the SuDS feature is on its western side, with the flow control monitoring location identified in orange in Figure 2.1. Water samples and flow readings are required from each of these locations.

As there are no manholes downstream of the Defender unit, the final sampling location should be taken from the outfall location approximately 14 m to the north-west of the flow control chamber (identified in green in Figure 2.1). A water sample only is required from this location.

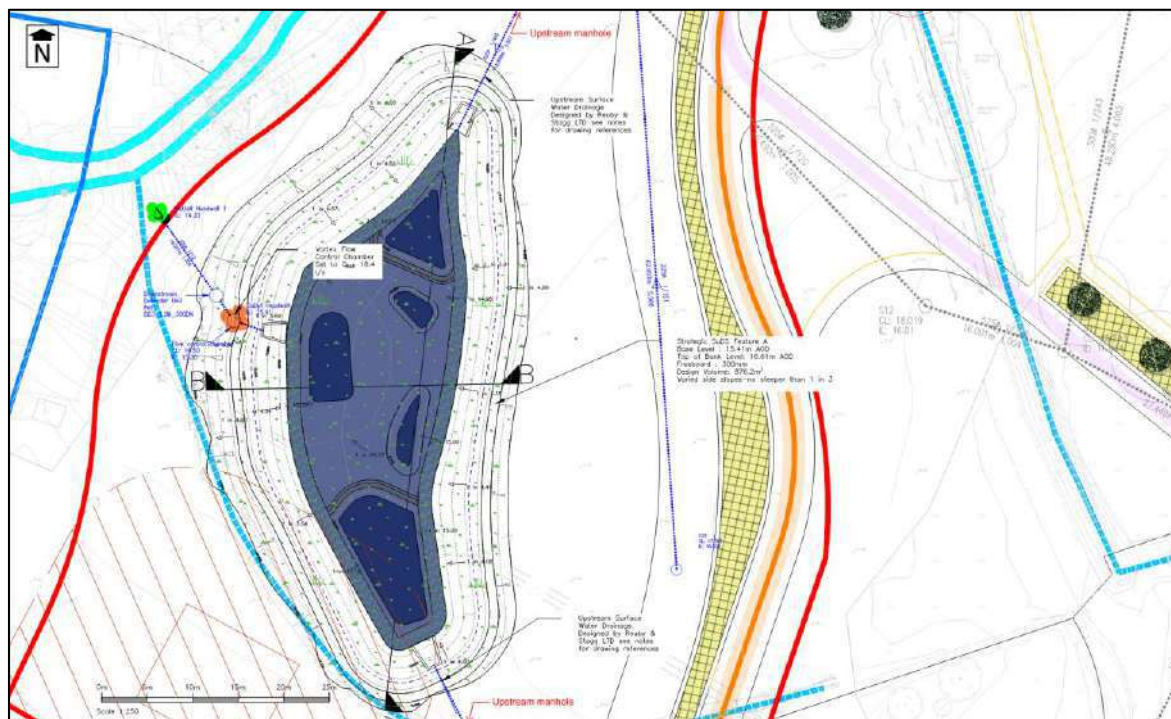


Figure 2.1 Strategic SuDS Feature A Monitoring Locations (from Drawing G277/26 Rev B)

2.3.2. Strategic SuDS Feature E (Detention Basin)

Although Strategic SuDS Feature E has three inlets, two of these allow for future drainage inputs and are not, therefore, relevant for the Link Road application and its initial establishment. Therefore, upstream monitoring from the relevant inlet will be taken from the manhole c. 23 m to the north-east of the inlet. The outlet for the SuDS feature is on the south-western corner, with the flow control monitoring location identified in orange in Figure 2.2. Water samples and flow readings are required from each of these locations.

As there are no manholes downstream of the Defender unit, the final sampling location should be taken from the outfall location approximately 20 m to the south-west of the flow control chamber (identified in green in Figure 2.2). A water sample only is required from this location.

Additional sampling upstream of the additional inlets would be required as drainage aspects of future parcels are brought online and will be addressed through a separate Monitoring and Management Protocol.

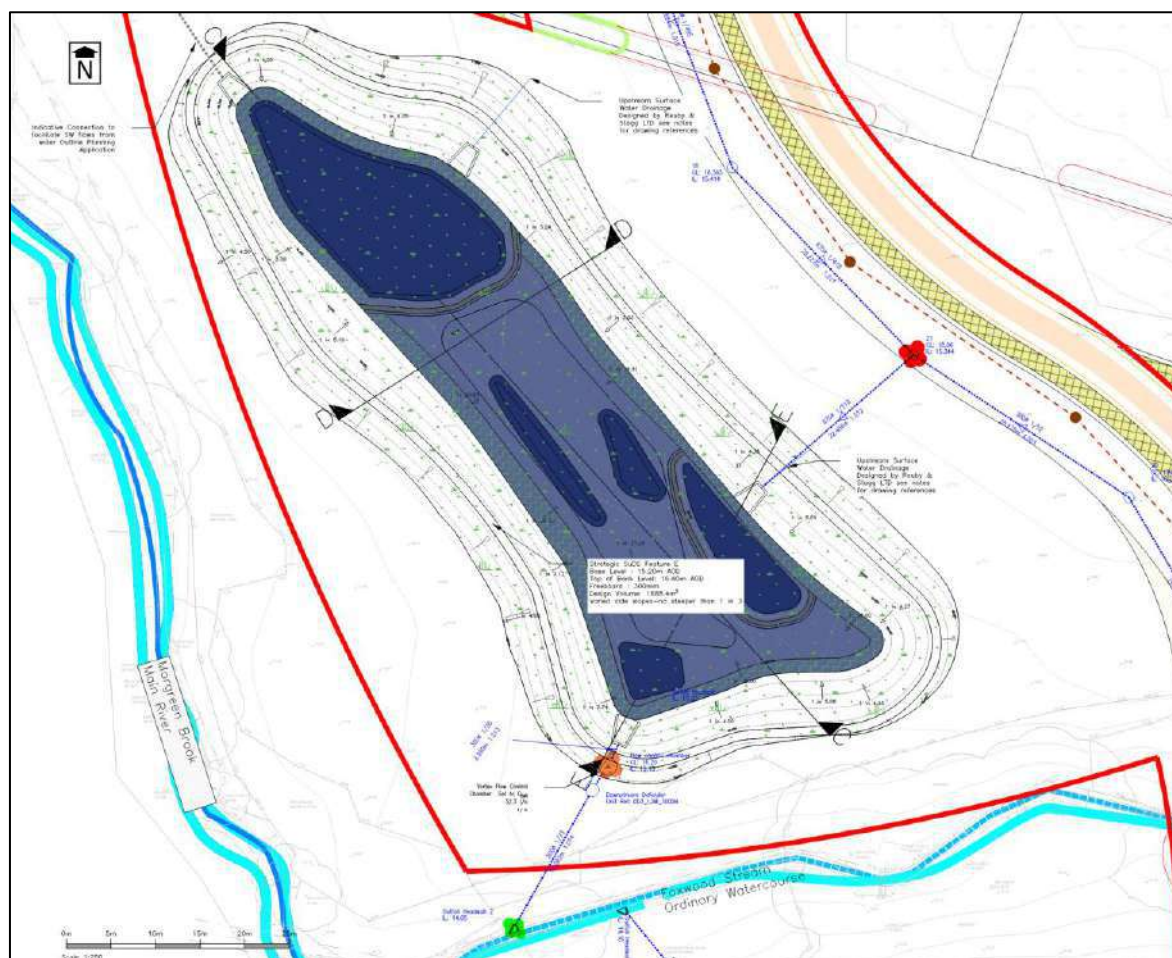


Figure 2.2 Strategic SuDS Feature E Monitoring Locations (from Drawing G277/26 Rev B)

2.3.3. Northern Bio-retention Swale

Although the Northern Bio-retention Swale has three headwalls identified, these are not included within the Link Road drainage design and form part of the wider drainage strategy. Run-off into the SuDS Feature from the Link Road is, therefore, diffuse and thus there is no opportunity for upstream monitoring to be undertaken. As a result, it is proposed to incorporate the upstream monitoring from the drainage channel at the lowest cascade in the system prior to collection within the main basin, identified in red in Figure 2.3. It is, however, proposed that this location is replaced with upstream monitoring locations as the drainage channels allowed for are brought into use in the wider drainage strategy.

The outlet for the SuDS feature is on the north-western corner of the SuDS Feature, with the flow control monitoring location identified in orange in Figure 2.3. Water samples and flow readings are required from each of these locations.

Downstream monitoring will be taken from the manhole identified in green in Figure 2.3, located c. 17 m to the north-west of the flow control chamber prior to the outfall into Foxwood Stream. A water sample only is required from this location.



As there are no manholes downstream of the Defender unit, the final sampling location will be at the outfall into the Toll Brook, approximately 20.5 m to the south of the flow control chamber (identified in green in Figure 2.4). A water sample only is required from this location.

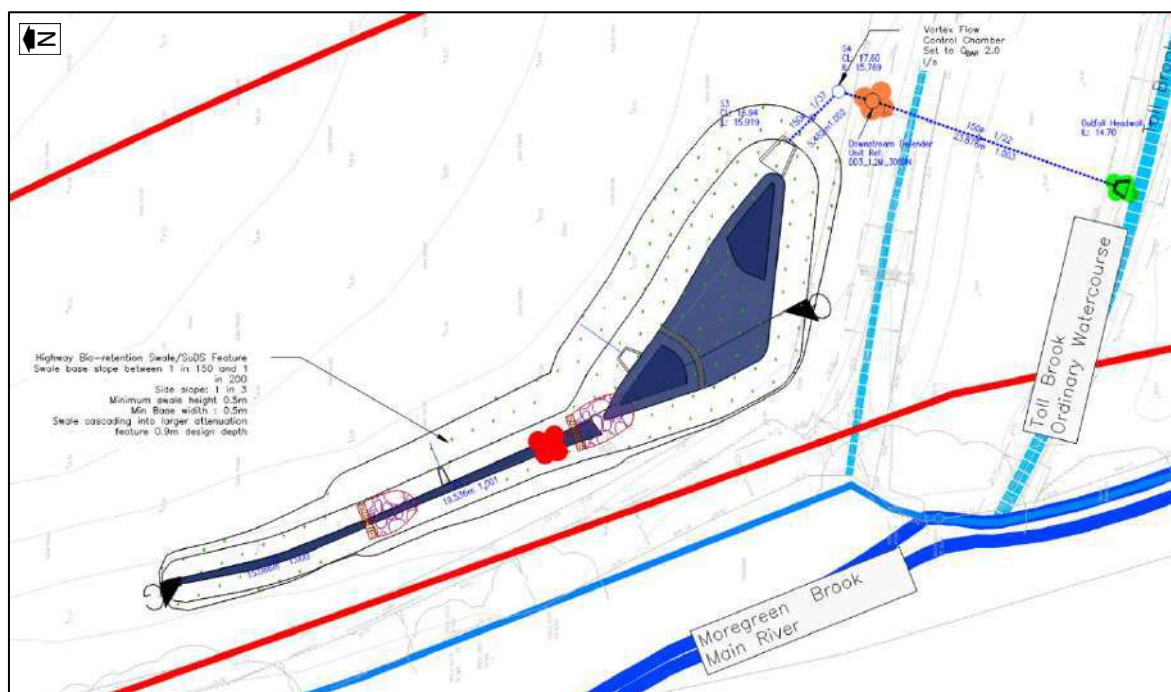


Figure 2.4 Southern Bio-retention Swale Monitoring Locations (from Drawing G277/27 Rev B)

2.3.5. Highways SuDS Feature (Detention Basin)

This SuDS Feature has a single inlet on the eastern side of the basin, with monitoring to be carried out at the manhole upstream of the inlet c. 7.5 m to the east. The outlet for the SuDS Feature is on the north-western side of the basin, with the flow control monitoring location identified in orange in Figure 2.5. Water samples and flow readings are required from each of these locations.

As there are no manholes downstream of the Defender unit, the final sampling location will be at the outfall, approximately 8 m to the north-west of the flow control chamber (identified in green in Figure 2.2). A water sample only is required from this location.

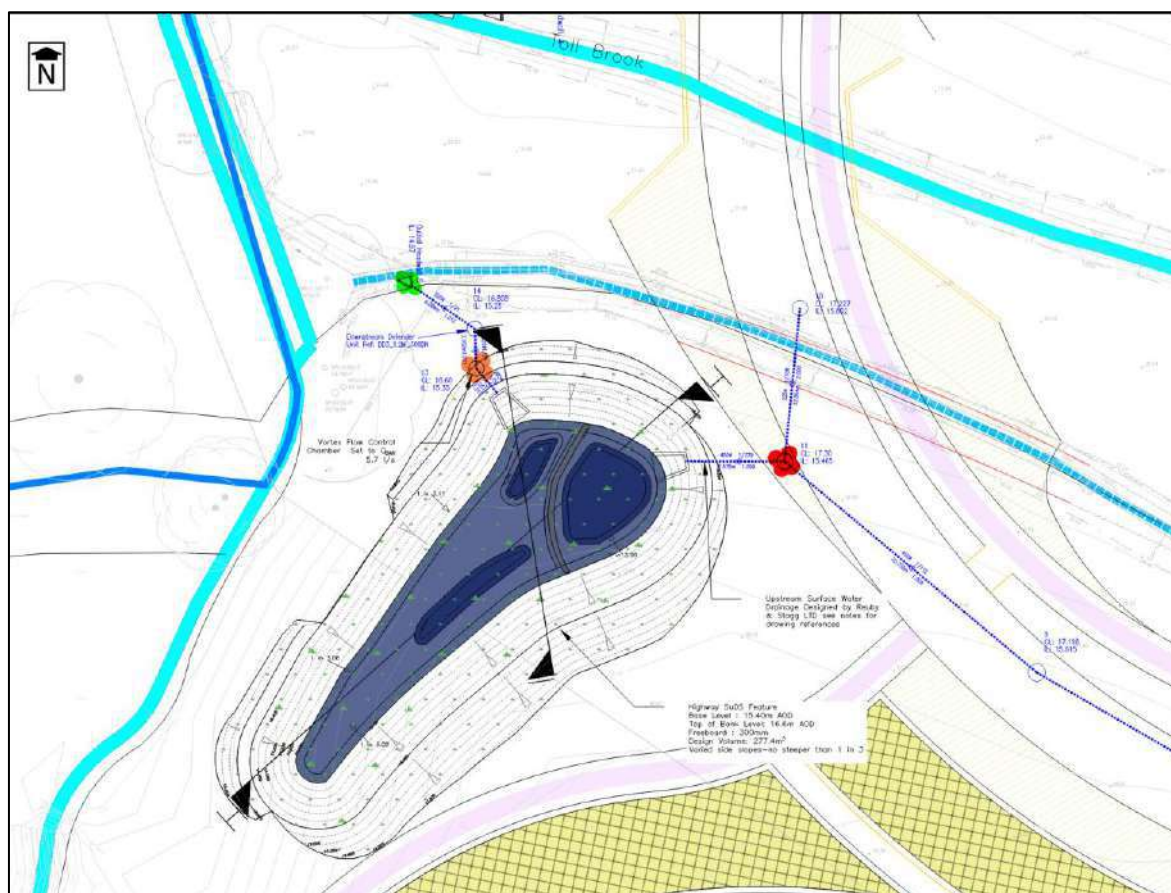


Figure 2.5 *Highways SuDS Monitoring Locations (from Drawing G277/28 Rev C)*

2.3.6. Strategic SuDS Feature L1 and L2 (Detention Basins)

Strategic SuDS Feature L1 and L2 comprises two interlinked detention basins, with one feeding directly into the other. A single inlet is located in the south-eastern corner of SuDS Feature L2, with monitoring to be carried out at the manhole upstream of the inlet c. 6 m to the south-east. The outlet from the combined SuDS Features is on the northern side of L1, with the flow control monitoring location identified in orange in Figure 2.6. In addition to these, monitoring will be undertaken between the two detention basis, from the flow control chamber identified in purple in Figure 2.6. Water samples and flow readings are required from each of these locations.

Downstream monitoring will be carried out at the manhole identified in green in Figure 2.6, located c. 38.5 m to the north-east of the flow control chamber and directly upstream of the outfall. A water sample only is required from this location.

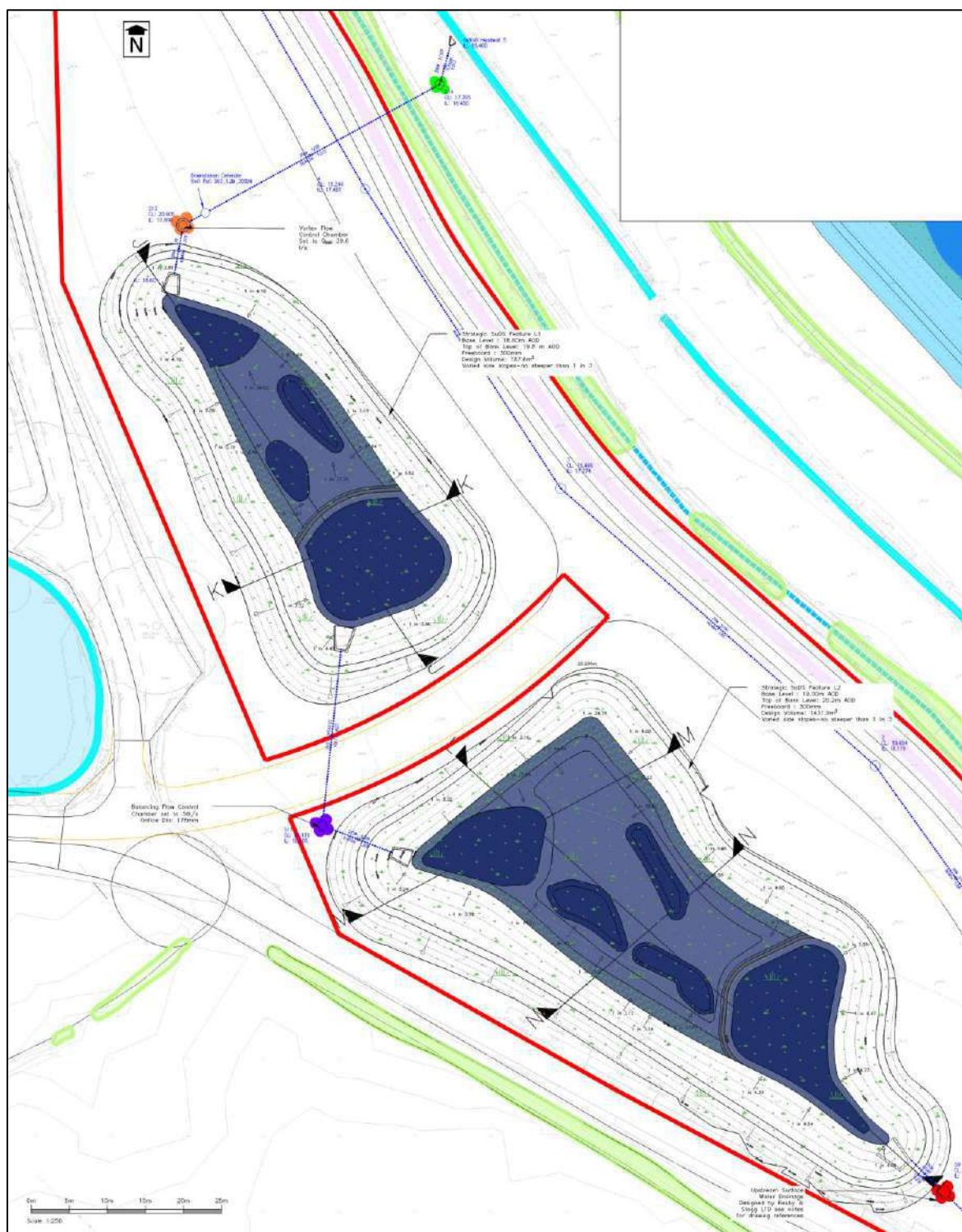


Figure 2.6 Strategic SuDS Feature L1 & L2 Monitoring Locations (from Drawing G277/29 Rev B)

3. Adaptive Management

Adaptive management will be required where the operation of the SuDS Features is shown in the monitoring to fall outside of the expected design parameters. It is expected that this will be as a result of changes in the system that lead to inefficient operation, with a range of corrective measures identified that can address this. Corrective measures have considered best practice recommendations, including the SuDS Manual and Operation and Maintenance of Sustainable Drainage Systems research report³, along with recognised best practice from other countries, notably the Virginia Stormwater Management Handbook⁴. Further information on maintenance practices can be found within these documents.

Appropriate triggers/thresholds within the monitoring results at which action should be taken are discussed in the following sections.

The monitoring locations identified in Section 2.3 have been selected to assist in pinpointing the likely whereabouts in which any issue arising is occurring, and therefore target initial review for corrective measures.

3.1. Sediments

3.1.1. Triggers/Thresholds for Action

Impacts identified from sediments include:

- Excessive fine sediments are lethal to spawning fish species such as salmon; and exposure to fine sediment during incubation lowers the fitness of those salmon alevins that survive hatching;
- Chalk streams are very sensitive to even minor increases in fine sediment concentrations because their riverbeds are unable to flush fines from gravels – hence the long tradition of cleaning gravel beds in these rivers;
- The rate and amount of fine sediments that accumulate in spawning fish nests in riverbed gravels are directly related to the concentration and total load of fine sediment in the river; and
- Fine organic matter is more lethal than inorganic fine sediment for incubating salmonid embryos, and the finest sediments (clays) are much more lethal than larger particles.

To ensure that there is no increase in sediment load arising from the development during operation both alone and in-combination with other projects, the associated SuDS features must function efficiently to minimise the likelihood of sediment transport through carriers into the Itchen SAC. Efficient function requires an appropriate management regime for the SuDS to be produced, agreed and implemented.

Natural England provided draft comments on the outline planning application O/20/89498 in July 2021 and advised that: *“As previously advised, it will be important for the development to demonstrate with sufficient certainty that it will not result in a net increase in fine sediments (‘fines’) reaching the Itchen SAC with adverse effects on Atlantic salmon”*. The advice went on to identify specific mitigation measures that are likely to be required during the construction phase: *“Sediment run-off can be particularly severe during the land clearance, surface contouring and groundworks construction phases, where soils are exposed. It is a particular risk during storms/times of high rainfall. Strict measures will need to be implemented as part of a comprehensive Construction Environmental Management Plan (CEMP). The supporting CEMP outlines a suite of measures that*

may be implemented which are welcomed. It is advised the following measures should also be confirmed for implementation as part of the CEMP:

- *Phasing and timings: no works should occur during periods of heavy rainfall events;*
- *Consideration should be given to timings of ground works close to watercourses to avoid sensitive spawning periods for Atlantic salmon. This can be agreed with the EA as part of the permit to discharge process and incorporated into the CEMP to be overseen by the appointed ECoW [Ecological Clerk of Works];*
- *Installation of temporary SuDS where strategic SuDS features cannot be implemented or not yet effective (e.g. before vegetation establishment which can typically take up to 3 years);*
- *Plans to deal with erosion from flow ‘escapes’ during heavy and extreme rainfall events – e.g. biodegradable netting (erosion ‘blankets’) along ditch/swale/wetland edges before vegetation has established”.*

Likewise the Environment Agency in providing its advice as another statutory consultee, highlighted the need to ensure that the proposed development avoids pollution of the watercourses on site and the River Itchen SAC into which they drain. The detailed advice was as follows:

- *“No development shall take place until a detailed construction environment method statement has been submitted to, and approved in writing by, the local planning authority. Thereafter the development shall be carried out in accordance with the approved scheme and any subsequent amendments shall be agreed in writing with the local planning authority;*
- *The scheme shall include details of the following:*
 - *The timing of the works to avoid important key nesting, breeding, spawning activities;*
 - *The measures to be used during the development in order to minimise environmental impacts of the works (considering impacts such as potential disturbance, noise and vibration, lighting, pollution, water quality impacts, storage of fuels and chemicals;*
 - *Sediment and silt control, hydrological regime changes;*
 - *A map or plan showing habitat areas to be specifically protected during the works;*
 - *Details of mitigation measures for protected species and any associated monitoring and updated habitat and species surveys required;*
 - *Construction methods and phasing of the works;*
 - *Pollution protection and prevention methods;*
- *Details of ecological toolbox talks, training and guidance that will be issued for all contractors and those working on site;*
- *Detail of how undisturbed otter passage will be maintained during construction;*
- *Details of biosecurity arrangements, invasive non-native species control and training for contractors to prevent the spread of non-native species; and*

- *Any additional requirements as referred to in the relevant tables in Chapter 10 of the ES.”*

The EA also reminded the local planning authority and the applicants that the Environmental Permitting (England and Wales) Regulations 2016 require a permit or exemption to be obtained for any construction activities which will take place on or within 8 metres of a main river (16 metres if tidal). Works in such close proximity to watercourses present a particularly high risk of water pollution, especially through the mobilisation of sediments.

Construction and operational sediment issues will be addressed as follows:

- A Construction Environmental Management Plan for the OPA (‘Construction Environmental Management Plan (CEMP), One Horton Health, Outline Planning Application (OPA), June 2022, refOHHOPACEMP/BJM14062022), has been produced which addresses sediment control during the construction phase;
- The relevant drainage and SuDS plans and the CEMP (including any further specifications required) will be secured through appropriately worded planning conditions and provided these are then implemented as agreed there is unlikely to be any adverse impacts on the River Itchen through sediment mobilisation or pollution events during construction.
- Adherence to agreed conditions for the CEMP will be overseen by an appointed ECoW to ensure compliance;
- The early installation of the permanent SuDS features will be implemented to prevent silt contamination of high-risk watercourses including the River Itchen SAC;
- All discharge of water into local watercourses will be in line with relevant Environment agency licenses and permits;

With regard to monitoring of the permanent SuDS features for sediment related determinants, there are currently no statutory standards for TSS, TDS or turbidity for SuDS monitoring in the UK or for surface watercourses within the Water Framework Directive (WFD)⁵. Nevertheless, the following monitoring regimes are proposed.

Turbidity

Suspended sediments may affect organisms in receiving waters, including salmonids, by altering their physiology, behaviour, and habitat, all of which may lead to physiological stress and reduced survival rates. Although turbidity can be used as an indicator of the level of TSS in the water column, the inconsistent correlation between turbidity measurements and mass of suspended solids, as well as the difficulty in achieving repeatability using turbidimeters, results in an inability to confidently use turbidity measurements as a consistent and reliable tool to determine the effects of TSS on salmonids and other organisms. For example, the relationship between turbidity and TSS may change along a downstream gradient from a sediment source. Larger particles, which generally produce less turbidity per unit concentration than smaller particles, gradually settle out, thus shifting the turbidity versus TSS relationship to a higher NTU per unit TSS in reaches progressively further downstream. Furthermore, turbidity may not wholly result from sediment inputs, with elevated readings also resulting from the dispersion of algae and plankton organisms and pigments caused by the decomposition of organic matter. Consequently, turbidity can only be regarded as a relative measurement that has no environmental relevance in itself, unless calibrated to clarity or some other absolute optical quantity or to suspended sediment mass concentration, at each site of interest, whilst other factors, such as life stage, time of year, size and angularity of sediment, availability of off-channel and tributary habitat, and composition of sediment may be more telling in determining the effect of sediment on salmonids and other organisms in UK watercourses.

Nevertheless, the use of turbidity can prove helpful in highlighting atypical upstream conditions or operations, such as the effects of runoff from construction or pollution episodes. However, such measurements will also be backed up by concomitant TSS measurements (see below) with robust trigger levels relating to impacts on freshwater fisheries, derived by the European Inland Fisheries Advisory Committee and taken forward into England and Wales law in 1997 under the Surface Waters (Fishlife) (Classification) Regulations.⁶ Furthermore, the suitability of discharges from the development will also be regulated by the discharge consent (and associated Environment Agency or Local Authority control). Consequently, the proposed turbidity trigger levels below are considered to be appropriate and can be modified, following review of the initial 5-year seasonal monitoring results.

Turbidity ranges are cited within the WFD for transitional and coastal waters, in order to identify the appropriate application of dissolved inorganic nitrogen standards for such waters. Although primarily meant for coastal waters, it is recommended that these are used as indicative indicators for surface runoff quality passing through the SuDS features and reviewed following the initial 5-year monitoring period. The range of turbidity cited by the WFD is presented in Table 3.1.

Table 3.1 *WFD Turbidity Criteria for identifying types of transitional and coastal water to which the dissolved inorganic nitrogen standards apply, together with Nephelometric Turbidity Units (NTU) derived from Nurjaya et al.*

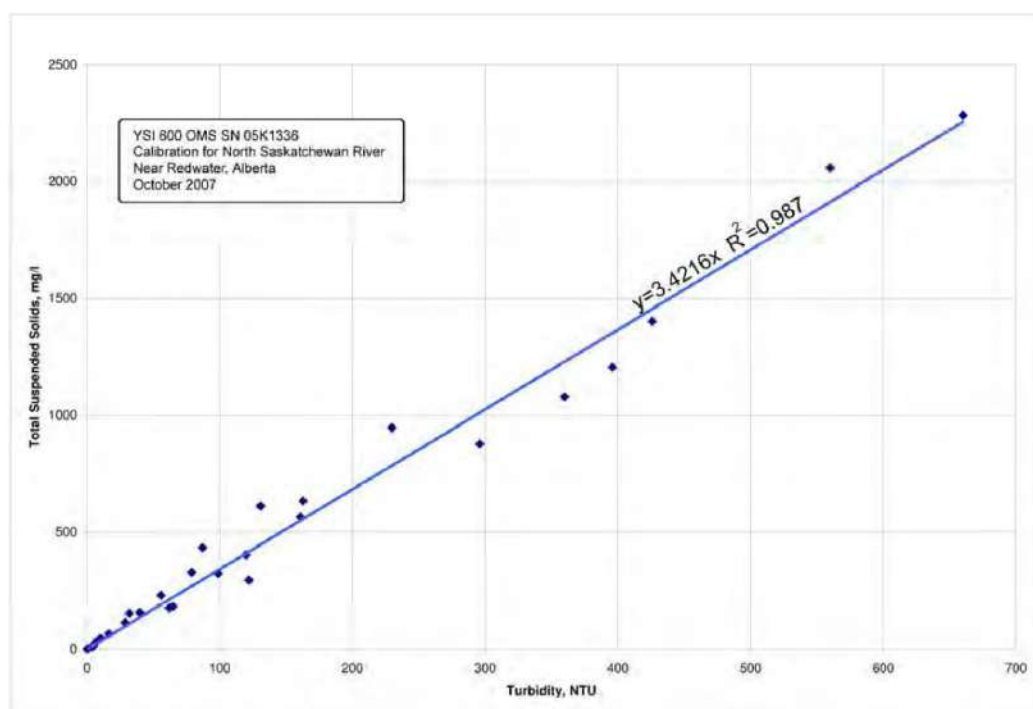
Turbidity	Indicative turbidity in NTU derived from Nurjaya et al ⁷	Annual mean concentration of suspended particulate matter (mg/l)
Very turbid	>88	>300
Turbid	29-88	100-300
Intermediate turbidity	3-29	10-<100
Clear	<3	<10

Turbidity is typically measured in Nephelometric Turbidity Units (NTU), and a conversion from NTU to mg/l TSS can be made on a site-by-site basis, by taking simultaneous turbidity and TSS samples and constructing a calibration graph. In the absence of site specific data, the relationship presented by Nurjaya *et al.* and used elsewhere (e.g. by the Alberta Transportation Department⁸) can be used as an indicative relationship, as shown in Figure 3.1, with derived values also presented in Table 3.1.

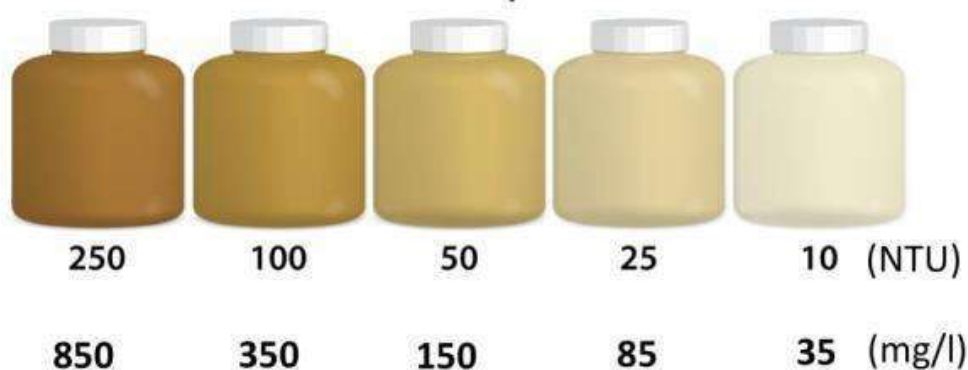
It is hoped that a similar relationship can be built up with the initial 5-year seasonal monitoring campaign, which can be used to inform the need for adaptive maintenance (in tandem with the more accurate TSS results) e.g. using the above example:

- <3 NTU – no action;
- 3-<29 NTU – continue to monitor, but if turbidity continues in this range for 4 consecutive sampling occasions, then investigate upstream cause;
- 29-88 NTU - continue to monitor, but if turbidity continues in this range for 3 consecutive sampling occasions, then investigate upstream cause;
- >88 NTU - continue to monitor, but if turbidity continues in this range for 2 consecutive sampling occasions, then investigate upstream cause.

By adopting the above approach, then occasional storm events which may lead to elevated turbidity, will not unnecessarily instigate unwarranted remedial action.



Water Samples:



$$y = 3.4216x$$

$$R^2 = 0.987$$

$$y = \text{TSS (mg/l)}$$

$$x = \text{Turbidity (NTU)}$$

Figure 3.1 Alberta Transportation Indicative TSS/NTU Relationship

Total Suspended Solids

With regard to TSS, it should be noted that the working party of EIFAC (European Inland Fisheries Advisory Committee) investigated the effect of water pollution, including suspended solids, during the development of Water Quality Criteria for European Freshwater Fish. The studies used to determine the criteria were subsequently summarised by Alabaster and Lloyd⁹ in which a series of

tentative annual mean values for chemically inert solids in suspension were given for the maintenance of freshwater fisheries as follows:

- Less than 25 mg/l - no evidence of harmful effects on fisheries;
- 25 – 80 mg/l – it should usually be possible to maintain good or moderate fisheries;
- 80 – 400 mg/l – unlikely to support good freshwater fisheries; and
- Greater than 400 mg/l – only poor fisheries are likely to be found.

These criteria were taken forward into England and Wales law in 1997 under the Surface Waters (Fishlife) (Classification) Regulations.⁶

A further review in which the risk of suspended solids to fish habitat were assessed was regarding mining operations in the Yukon undertaken by the Canadian Department of Fisheries and Oceans¹¹. The levels of risk were very similar to those outlined by the EIFAC working party and have been adapted below in Table 3.2 to be used as trigger levels for action within this SuDS monitoring protocol. It is anticipated that these may be modified, as deemed necessary, following review of the initial 5-year seasonal monitoring results.

Table 3.2 Suggested TSS Trigger concentrations adapted from EIFAC and Canadian DFO¹²

TSS Concentration	Action
> 400 mg/l	Unacceptable risk – investigate upstream cause immediately
200 - < 400 mg/l	High risk - investigate upstream cause immediately.
100 - < 200 mg/l	Moderate risk- monitor closely - if TSS continues in this range for 2 consecutive sampling occasions, then investigate upstream cause.
25 - < 100 mg/l	Low risk – monitor closely - if TSS continues in this range for 3 consecutive sampling occasions, then investigate upstream cause.
< 25 mg/l	Very low risk – no action required

Total Dissolved Solids

With regard to TDS, these are dissolved ions, including salts, minerals and metals, that can be found in all non-pure water sources. TDS can originate from a wide range of sources. Materials may leach into water from sewage, agricultural runoff or highways (e.g. de-icing salt). Natural sources, like soils and rocks, may also contain TDS.

Consequently a high TDS concentration in water is not necessarily harmful. For example, a TDS reading could be particularly high, but it might simply be because that water has a high mineral content.

The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is not generally considered a primary pollutant (e.g. it is not deemed to be associated with health effects) it is used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of the presence of a broad array of chemical contaminants. As such, TDS monitoring can act as a potential indicator for contamination, especially if a spike in concentration is observed above a lower background.

Although there are currently no statutory standards for TDS in surface water in the UK, US EPA Secondary Regulations advise a maximum contamination level (MCL) of 500 mg/L for TDS. When TDS levels exceed 1,000 mg/L it is considered unfit for human consumption. Changes in the amount of TDS can be harmful to aquatic organisms as the density of TDS determines the flow of water in and

out of an organism's cell. Concentrations that are too high or low can affect fish growth or cause death. A maximum level of 400 mg/L is recommended for most freshwater fish. High TDS can also permit high volumes of algae bloom which detrimentally effect sensitive ecosystems.

Consequently, the concentrations presented in Table 3.3 are recommended to be used as trigger levels for action within this SuDS monitoring protocol. It is anticipated that these may be modified, as deemed necessary, following review of the initial 5-year seasonal monitoring results.

Table 3.3 Suggested TDS Trigger concentrations adapted from EIFAC and Canadian DFO¹³

TSS Concentration	Action
> 1,000 mg/l	Unacceptable risk – investigate upstream cause immediately
400 - < 1,000 mg/l	High risk - investigate upstream cause immediately.
250 - < 400 mg/l	Moderate risk- monitor closely - if TDS continues in this range for 2 consecutive sampling occasions, then investigate upstream cause.
100 - < 250 mg/l	Low risk – monitor closely.- If TDS continues in this range for 3 consecutive sampling occasions, then investigate upstream cause.
< 100 mg/l	Very low risk – no action required

3.1.2. Corrective Measures

Vegetation Establishment and Maintenance

The plant species selection is subject to confirmation. Although there will be an aspiration to avoid reed (*Phragmites*) and bulrush (*Typha*), where possible, due to their invasive nature, research has demonstrated that bulrush has a high efficiency at removing phosphorous (P), attributed to the higher stand and leaf mass compared to other vegetation types and thus will be considered for discrete well managed stands. Consequently, as outlined in the Tyler Grange Open Space Landscape Principles report, plant species selection will focus on native, non-invasive and nitrogen (N) and P removing species, tolerant of wet conditions with habitat and biodiversity enhancing qualities.

Plant establishment and maintenance, including provisions for the prevention of invasive species will follow the guidance provide in the SuDS Manual¹, including:

- All plants will be specified in accordance with BS 3936-10: 1990¹⁴, and the requirements related to seasonality, weather and soil conditions, soils, fertilisers, bed preparation, use of fertilisers and mulches, plant handling and then use of any planting ancillaries should be clearly specified.
- The planting should be carried out under a formal contract with a defects rectification period of 12 months to ensure that planting has fully established through both the dormant and growing season;
- Contract conditions should require that any plants that fail during at least the first year will be replaced by the landscape contractor ;
- It is essential that areas of grass within the SuDS features are established properly before being inundated with water, as areas that do not have sufficient grass cover may suffer soil erosion, or damage may be caused to the developing sward. The timing of the implementation of the SuDS is therefore key in determining how the grass sward is best achieved, and whether any temporary diversion of surface water is possible or practical until the grass is sufficiently well-established to receive surface water;

- Grass areas that are established early in the construction process should be kept free of all debris or waste building materials, or site water constructed by construction use.

Sediment Dredging

Dredging and sediment clearance is an important part of the ongoing and long-term maintenance of the SuDS Features, as accumulation will reduce the efficiency of the system operation. The period following initial construction of the SuDS and upstream development plots can result in rapid sediment accumulation, however, sediment accumulation will also occur can occur post construction and dredging may be required as a corrective measure.

All maintenance operations should follow the guidance presented in the SuDS Manual¹, with particular reference to the nature and frequency of regular, occasional and remedial maintenance requirements described in Chapters 32 “Operation and Maintenance”.

Sediment accumulation in swales is generally small in volume and can be removed using hand tools.

For detention basins, sediment may tend to accumulate around the control device, which increases the risk that either the orifice may become clogged or that sediment may become re-entrained into the outflow. Small volumes of sediment can be removed using hand tools, however, it may be necessary for excavation using a front-end loader or backhoe. Sediment removal will cause some damage to vegetation and potential disturbance to wildlife, including nesting birds, and therefore such activities should be scheduled outside the nesting season and re-establishment of vegetation or planting may be required.

Sediment forebays within detention basins provide pre-treatment for the removal of coarse sediments, and therefore dredging of these may be an important maintenance measure to remove sediment from the system. To assist in the review, inclusion of a fixed vertical sediment depth marker should be installed into each forebay. It is likely that sediment removal would need to be completed by excavation using a front-end loader, backhoe or long-reach excavator depending on the SuDS Feature design*. As before, sediment removal may cause some damage to vegetation, and therefore re-establishment or planting may be required.

Appropriate management and disposal of sediments dredged will be required and follow the guidance in Chapter 33 of the SuDS Manual¹, including the risk based disposal approach recommended by the Environment Agency described in Section 33.2.3 and the sediment categorisation and associated disposal options presented in Figure 33.1 of the guidance.

Downstream Defender Maintenance/Clearance

Inspection of the Downstream Defender should be undertaken to review its performance and establish whether additional maintenance or clearance beyond the routine maintenance is required. Where sediment depths are greater than 75 % of maximum clean out depths specified by the manufacturer, sediment removal is required. A judgement will, however, be made as to whether cleanout is required regardless of sediment depth when considering the period of time to the next routine maintenance cleanout (*i.e.* if there are 9 months remaining and the sediment is at 50 % it may be prudent to clean out to avoid future issue).

* As maintenance is a key component to the long-term operation of the SuDS Feature, consideration should be given to enabling direct access to the sediment forebay to simplify maintenance, ideally with hardened access or a staging pad. Such inclusion will help reduce complexities around maintenance and restrictions on equipment that can complete the maintenance operation.

Clearance of the Downstream Defender comprises removal of the sediments with a sump-vac from the access port in the top of the manhole which provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump. It is, therefore, important that appropriate access and staging pad alongside the device is available for this process to be carried out.

Debris Removal/Clearance

This requires checking and clearing of litter and debris within the drainage system to reduce blockages and minimise pollution risks and sudden and high releases of sediments from SuDS features. This should include inspection of all outlets, inlets and overflows as well as the SuDS features themselves.

Sweeping Pervious Surfaces

A build-up of silt or other sediments on pervious surfaces can affect the infiltration capacity of these features, causing a greater level of run-off into the catchment. A review of pervious surfaces within the catchment upstream of the affected SuDS should be undertaken and, where necessary, sweeping of pervious surfaces using a brush and suction cleaner or rotating brush cleaner combined with power spraying using hot water should be undertaken to removal built up silt and sediment.

Structure Rehabilitation and Repair

A range of rehabilitation and repair measures may be required where damage or deterioration of the SuDS Feature has occurred and is affecting its operation, particularly following any major events such as high stormwater flows or drought. The rehabilitation and repair measures are generally specific to each SuDS feature type, and are thus discussed in turn below:

Detention Basin

Following a review of the SuDS Feature against its design, the following remedial actions may be relevant and should be enacted where relevant:

- Repair erosion or other damage to the banks by reseeding or re-turfing;
- Realignment of rip-rap or other erosion protection measures;
- Repair/rehabilitation of inlets, outlets and overflows; and,
- Relevel uneven surfaces and reinstate design levels.

Bio-Retention Swale

Following a review of the SuDS Feature against its design, the following remedial actions may be relevant and should be enacted where relevant:

- Repair erosion or other damage by re-turfing or reseeding;
- Relevel uneven surfaces or reinstate design levels;
- Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip;
- Infill any holes or scour in filter medium, and improve erosion protection if required;
- Remove and replace filter medium and vegetation; and,
- Repair or realignment of erosion protection measures around outlet headwall.

Following high silt load discharge during a single event it may be necessary for the system to be rehabilitated, which will comprise

- removal of turf;
- removal of accumulated silt (subject to toxicity test) and land apply or dispose of to tip;
- cultivate remaining topsoil to levels; and,
- reuse or returf area to agreed levels.

Pervious Surfaces

If the infiltration capacity of the pervious surfaces continue to be affected by sediment accumulation, consideration may need to be given to the rehabilitation of the system comprising:

- removal of permeable blocks and cleaning;
- removal of bedding grit and geotextile and safe disposal;
- replacement of geotextile and grit bedding layer, and replacement with clean permeable blocks; and,
- removal of accumulated silt from site (subject to toxicity test) and safe disposal.

4. Mechanisms for Delivery

The mechanisms for delivery are an important aspect of the Monitoring and Management Protocol, ensuring clear understanding regarding responsibility of implementation, adequate funding resource is available and clear understanding of what constitutes compliance in the results. The following sections outline these aspects.

4.1. Responsibility

A condition will be placed on the permission requiring the appointment of an Ecological Clerk of works (ECoW) for the lifetime of the development who shall be responsible for the overseeing and compliance with all conditions of this permission including this relating to sustainable drainage, water quality, biodiversity, landscaping, construction, monitoring and maintenance.

The applicant will inform the Local Planning Authority of the relevant contact details for the responsible person prior to the commencement of development. The implementation of the Monitoring and Management Plan, as discussed, will be the responsibility of this person, and they will also ensure the results of the monitoring and any remedial action taken are reported to the local planning authority on an annual basis.

Eastleigh Borough Council will have ultimate responsibility for the monitoring and maintenance of all SuDS structures described in Section 2.3 above and as illustrated in the S38 and S104 plans presented in Appendix A.

4.2. Funding

Eastleigh Borough Council's commitment to environmental protection is evidenced in the Vision for the development, which states that *"the development will be proactively planned to minimise the impact of the development on the existing community and environment during construction and throughout its lifetime. It will protect and enhance natural assets, integrating these with new places and creating a neighbourhood which supports green and sustainable lifestyles for all"*.

The implementation of the Monitoring and Management Protocol forms part of this commitment, ensuring the mitigation within the development continues to protect the River Itchen catchment through effective operation of SuDS. As a result, Eastleigh Borough Council are committed to ensuring appropriate funding is available for the implementation of the Monitoring and Management Protocol for the lifetime of the development (taken to be 80 years). Consequently, a S106 agreement will secure *circa* £90,000 (index-linked) in fees to cover monitoring of the SuDS and water quality to give further security that water quality will not be impacted as a result of this application.

4.3. Mechanisms for Compliance

The identification of trigger thresholds for the implementation of corrective measures, discussed in Section 3, provides the mechanism through which compliance will be achieved.

5. Summary

The following flow diagram in Figure 5.1 provides a summary of the monitoring process and trigger thresholds where further consideration, investigation and corrective measures (maintenance) would be required to maintain effective SuDS operation.

Table 5.1 provides a summary of the various maintenance operations required for the SuDS features and their frequency of application.

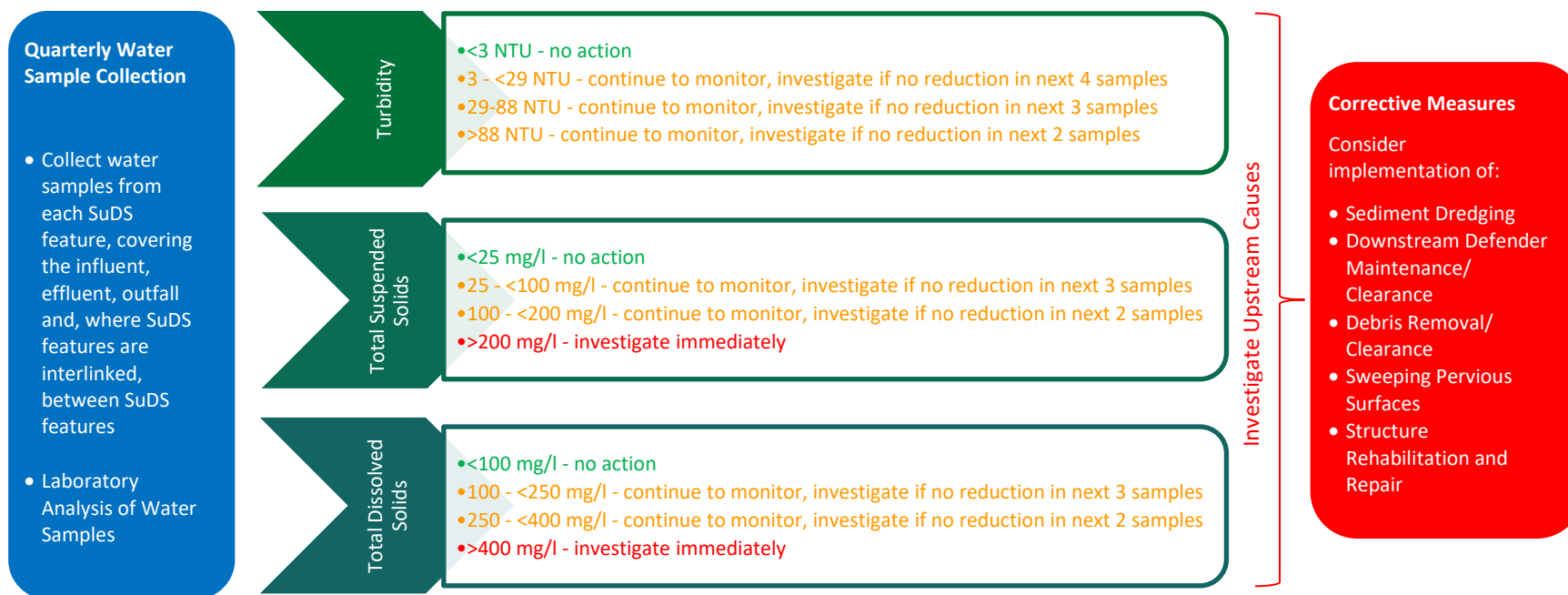


Figure 5.1 Monitoring Process and Trigger Thresholds for Action for Sediments (Turbidity, Total Suspended Solids and Total Dissolved Solids)

Table 5.2 *SuDS Maintenance Regime with Frequencies of Operations*

Maintenance Operation	Frequency	SuDS Feature					
		Strategic SuDS Feature A (Detention Basin)	Strategic SuDS Feature E (Detention Basin)	Northern Bioretention Swale	Southern Bioretention Swale	Highway SuDS Feature (Detention Basin)	Strategic SuDS Features L1 & L2 (Detention Basins)
Establishment							
Initial replacement of failed plants and defects rectification as per landscape contractor’s contract	Throughout first 12 months only	✓	✓	✓	✓	✓	✓
Regular Maintenance							
Remove litter and debris	Monthly, or as required	✓	✓	✓	✓	✓	✓
Cut grass – for spillways and access areas or to retain grass height within specified design range within swales	Monthly (during growing season), or as required	✓	✓	✓	✓	✓	✓
Cut grass – meadow grass in and around basins	Half yearly (spring – before nesting season, and autumn)	✓	✓		✓	✓	✓
Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)	✓	✓	✓	✓	✓	✓
Inspect inlets, and overflows for blockages and clear if required	Monthly	✓	✓	✓	✓	✓	✓
Inspect swale infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly, or when required			✓	✓		

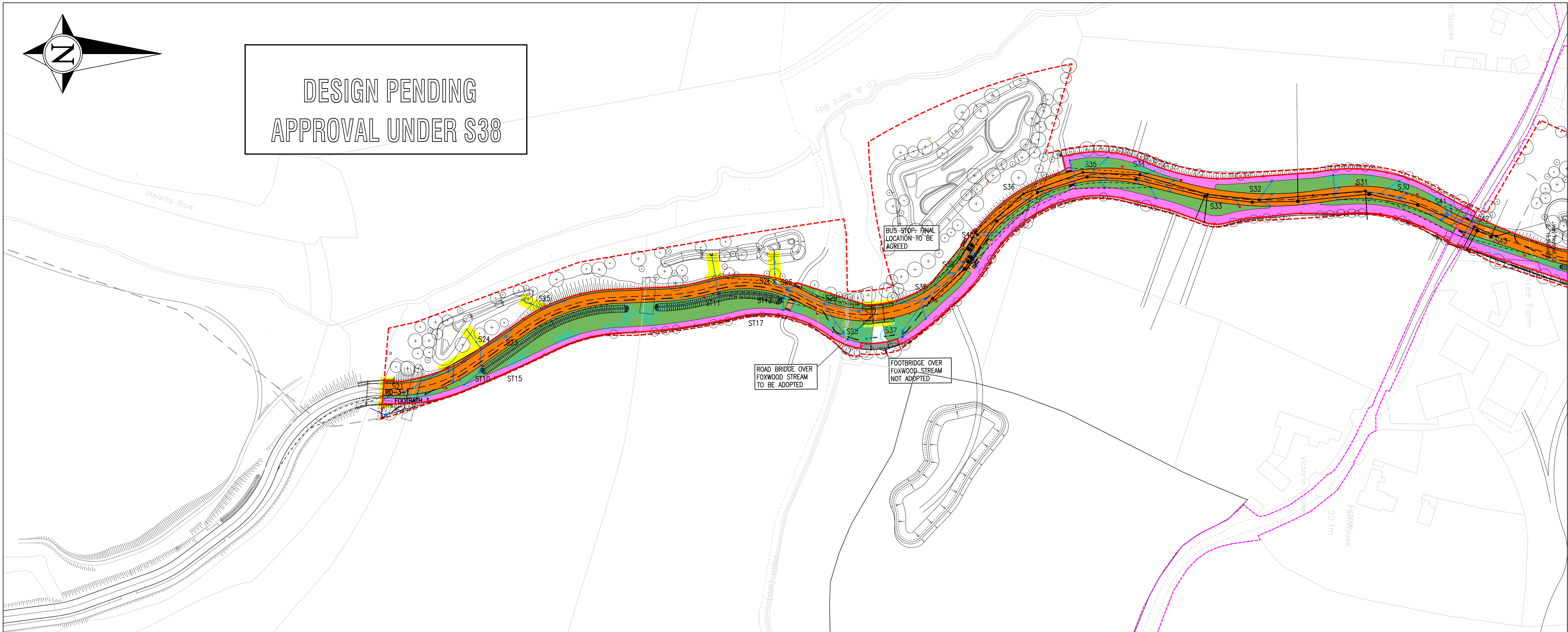
Maintenance Operation	Frequency	SuDS Feature					
		Strategic SuDS Feature A (Detention Basin)	Strategic SuDS Feature E (Detention Basin)	Northern Bioretention Swale	Southern Bioretention Swale	Highway SuDS Feature (Detention Basin)	Strategic SuDS Features L1 & L2 (Detention Basins)
Inspect banksides, structures, pipework <i>etc</i> for evidence of physical damage	Monthly	✓	✓	✓	✓	✓	✓
Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	For detention basins: monthly (for first year), then annually or as required. For swales: half yearly	✓	✓	✓	✓	✓	✓
Check downstream vortex and/or orifice flow chamber	To be inspected at a frequency stipulated by the manufacturer (nominally quarterly)	✓	✓	✓	✓	✓	✓
Downstream Defender inspection	6-monthly	✓	✓	✓	✓	✓	✓
Downstream Defender: removal of floatables, oil and sediment by sump-vac and vactor truck	Accumulation rate and thus clear-out frequency established by means of 6-monthly inspections (nominally annually or as soon as possible after any upstream spill).	✓	✓	✓	✓	✓	✓
Check any penstocks and other mechanical devices, if installed	Annually	✓	✓	✓	✓	✓	✓
Tidy all dead growth before start of growing season	Annually	✓	✓	✓	✓	✓	✓
Inspect swales for vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly			✓	✓		

Maintenance Operation	Frequency	SuDS Feature					
		Strategic SuDS Feature A (Detention Basin)	Strategic SuDS Feature E (Detention Basin)	Northern Bioretention Swale	Southern Bioretention Swale	Highway SuDS Feature (Detention Basin)	Strategic SuDS Features L1 & L2 (Detention Basins)
Remove sediment from basin inlets, outlets and forebay	Annually (or as required)	✓	✓		✓	✓	✓
Manage wetland plants in basin basal pools (where provided)	Annually	✓	✓		✓	✓	✓
Occasional Maintenance							
Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required	✓	✓	✓	✓	✓	✓
Remove sediments from inlets, outlets and overflows	Every 5 years, (likely to be minimal requirements where effective upstream source control is provided).	✓	✓	✓	✓	✓	✓
Infill any holes or scour in the filter medium (if included), improve erosion protection if required	As required			✓	✓		
Remedial Actions							
Repair erosion or other damage by reseedling or re-turfing	As required	✓	✓	✓	✓	✓	✓
Realignment of rip-rap	As required	✓	✓		✓	✓	✓
Repair/rehabilitation of inlets, outlets and overflows.	As required	✓	✓	✓	✓	✓	✓
Relevel uneven surfaces and reinstate design levels	As required	✓	✓	✓	✓	✓	✓

Maintenance Operation	Frequency	SuDS Feature					
		Strategic SuDS Feature A (Detention Basin)	Strategic SuDS Feature E (Detention Basin)	Northern Bioretention Swale	Southern Bioretention Swale	Highway SuDS Feature (Detention Basin)	Strategic SuDS Features L1 & L2 (Detention Basins)
Scarify and spike swale topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required			✓	✓		
Remove and replace filter medium and vegetation above	As required			✓	✓		
Repair or realignment of erosion protection measures around outlet headwall	As required	✓	✓	✓	✓	✓	✓



Appendix A: S38 and S104 Plans of Link Road and SuDS Features



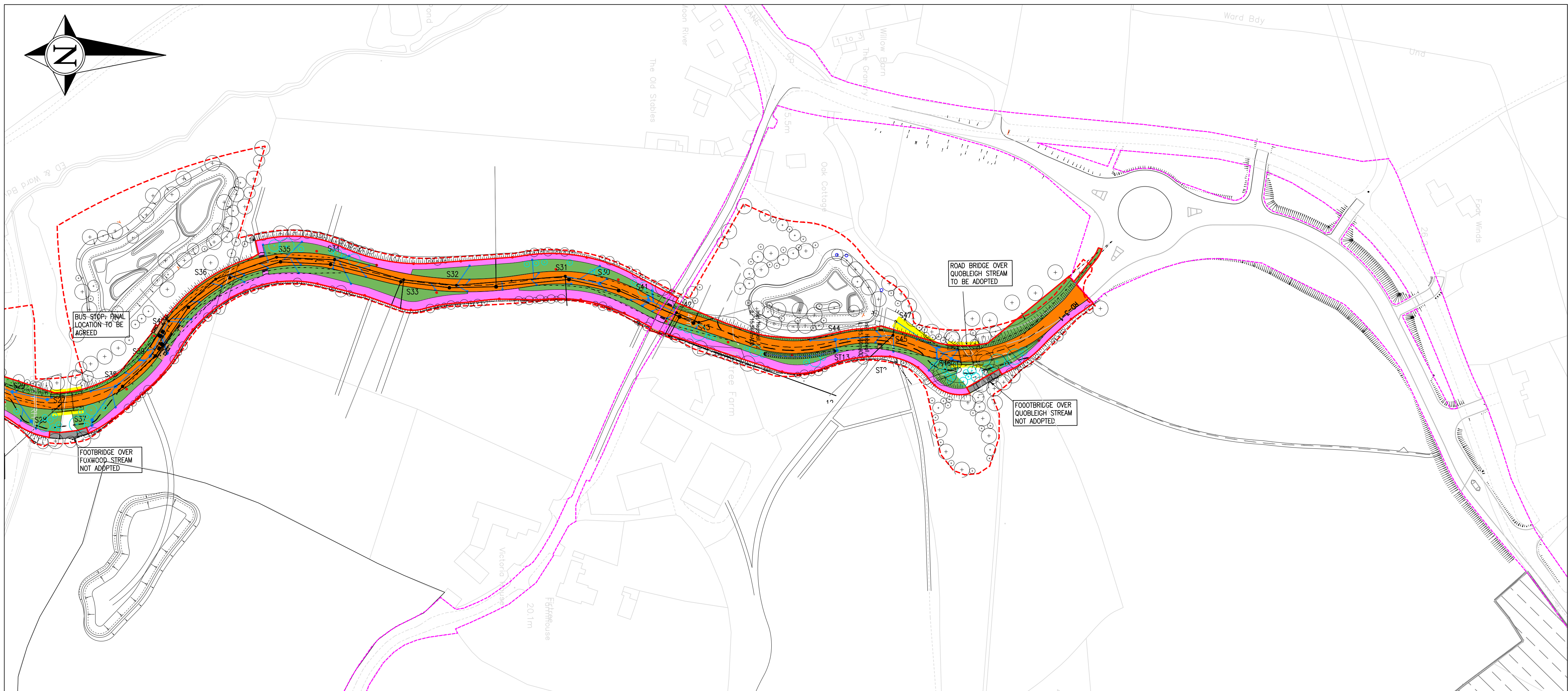
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LEGEND – S38 AGREEMENT

- ORANGE DENOTES S38 ADOPTABLE CARRIAGEWAY
- PURPLE DENOTES ADOPTABLE S38 SHARED USE UNSEGREGATED FOOTWAY
- BROWN DENOTES ADOPTABLE S38 FOOTWAY
- GREEN DENOTES S38 ADOPTABLE VERGE
- DENOTES ROAD SIGN
- DENOTES PROPOSED TACTILE PAVING
- DENOTES PROPOSED LIGHTING COLUMNS, REFER SSE LIGHTING DRAWINGS SSE264130
- DENOTES PROPOSED ADOPTABLE GULLY
- SECTION S38 BOUNDARY
- EXISTING HIGHWAY BOUNDARY
- SITE BOUNDARY
- DENOTES VISIBILITY SPLAY: FORWARD VISIBILITY 43m; JUNCTIONS 2.4mX43m
- DENOTES NMU VISIBILITY SPLAY: PEDESTRIAN 1.5X43m CYCLIST 2.5mX43m AND EQUESTRIAN 3.0mX43m
- DENOTES PROPOSED ADOPTABLE SURFACE WATER HIGHWAY MANHOLE
- DENOTES ADOPTABLE BELOW GROUND SURFACE WATER HIGHWAY DRAINAGE
- DENOTES BELOW GROUND SURFACE WATER DRAINAGE TO BE ADOPTED BY SOUTHERN BY SEPARATE S104 AGREEMENT
- DENOTES BELOW GROUND FOUL WATER DRAINAGE TO BE ADOPTED BY SEPARATE S104 AGREEMENT
- DENOTES BELOW GROUND RISING MAIN TO BE ADOPTED BY SEPARATE S104 AGREEMENT
- BALANCING POND. NOT TO BE ADOPTED
- DENOTES PROPOSED TREES TO BE ADOPTED
- DENOTES ROAD SWALE TO BE ADOPTED
- DENOTES PRIVATE BELOW GROUND SURFACE WATER PIPE
- BUS SHELTER. MONO SHELTER OR SIMILAR APPROVED. BIN
- SOLID YELLOW HATCH DENOTES EASEMENT
- DENOTES LANE MARKINGS ON ADOPTED ROAD

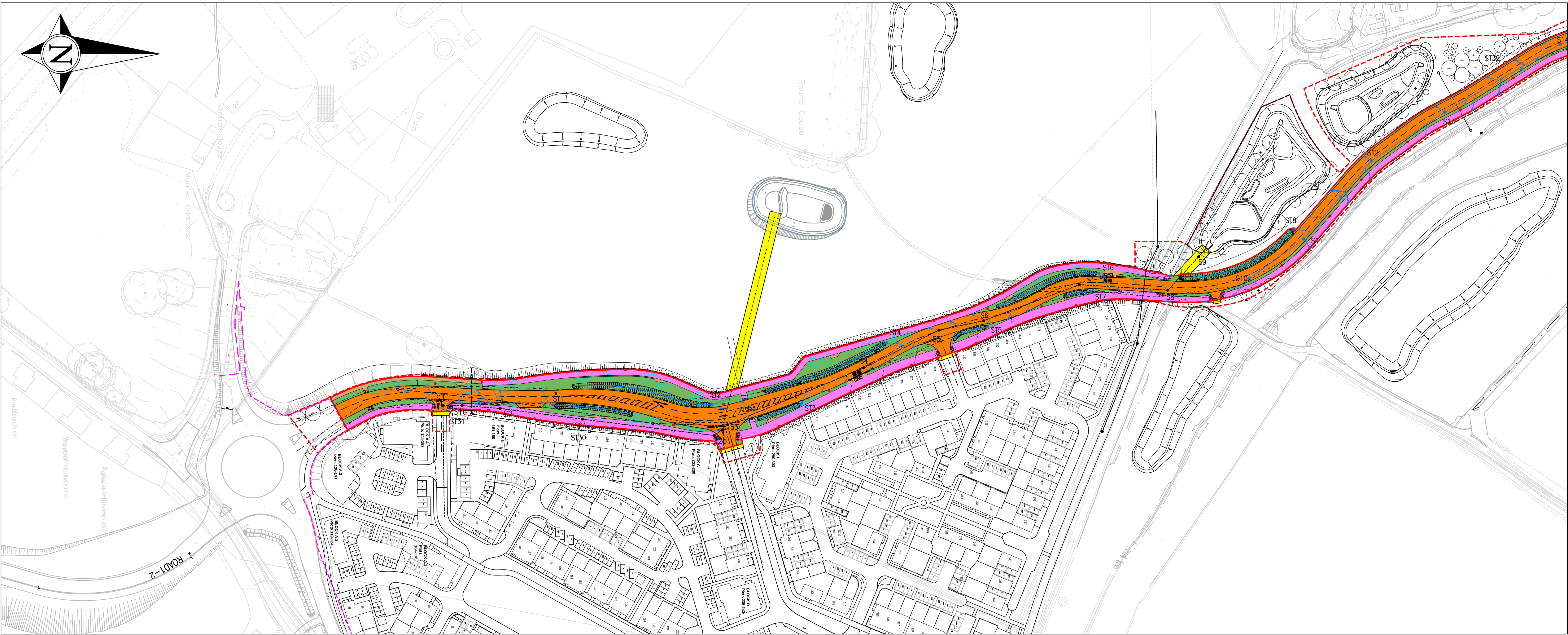


C2	LEGEND AMENDED. PEDESTRIAN CROSSINGS ADDED TO SERVE BUS STOP. S38 BOUNDARY AMENDED TO INCLUDE CROSSING VIS PLAYS	20/10/23	PN
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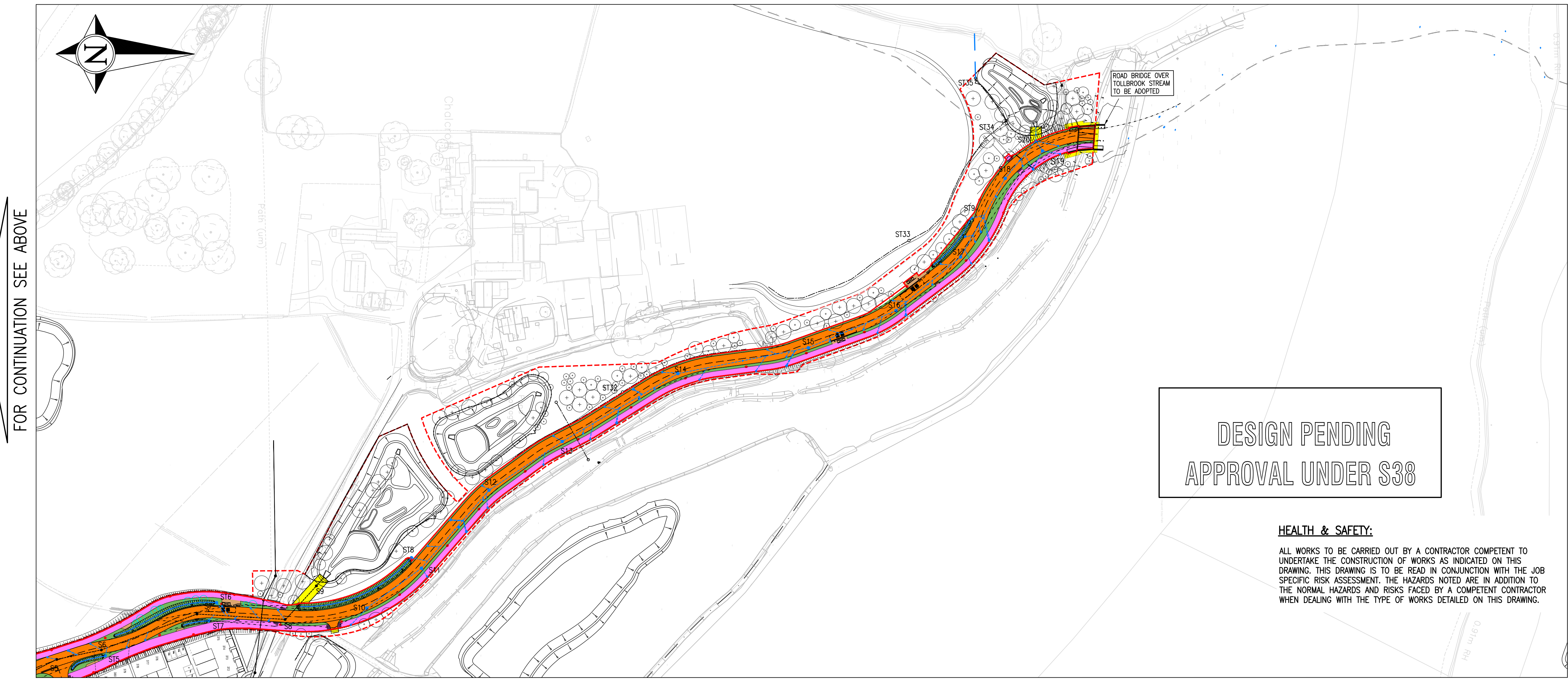
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 - DENOTES BELOW GROUND SURFACE WATER HIGHWAY DRAINAGE ADOPTED BY BURNETTS LANE S278 AGREEMENT R.J506611.01
 - DENOTES BELOW GROUND RISING MAIN TO BE ADOPTED BY SEPARATE S104 AGREEMENT
 - BALANCING POND, NOT TO BE ADOPTED
 - DENOTES PROPOSED TREES TO BE ADOPTED
 - DENOTES ROAD SWALE TO BE ADOPTED
 - DENOTES PRIVATE BELOW GROUND SURFACE WATER PIPE
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 - DENOTES LANE MARKINGS ON ADOPTED ROAD



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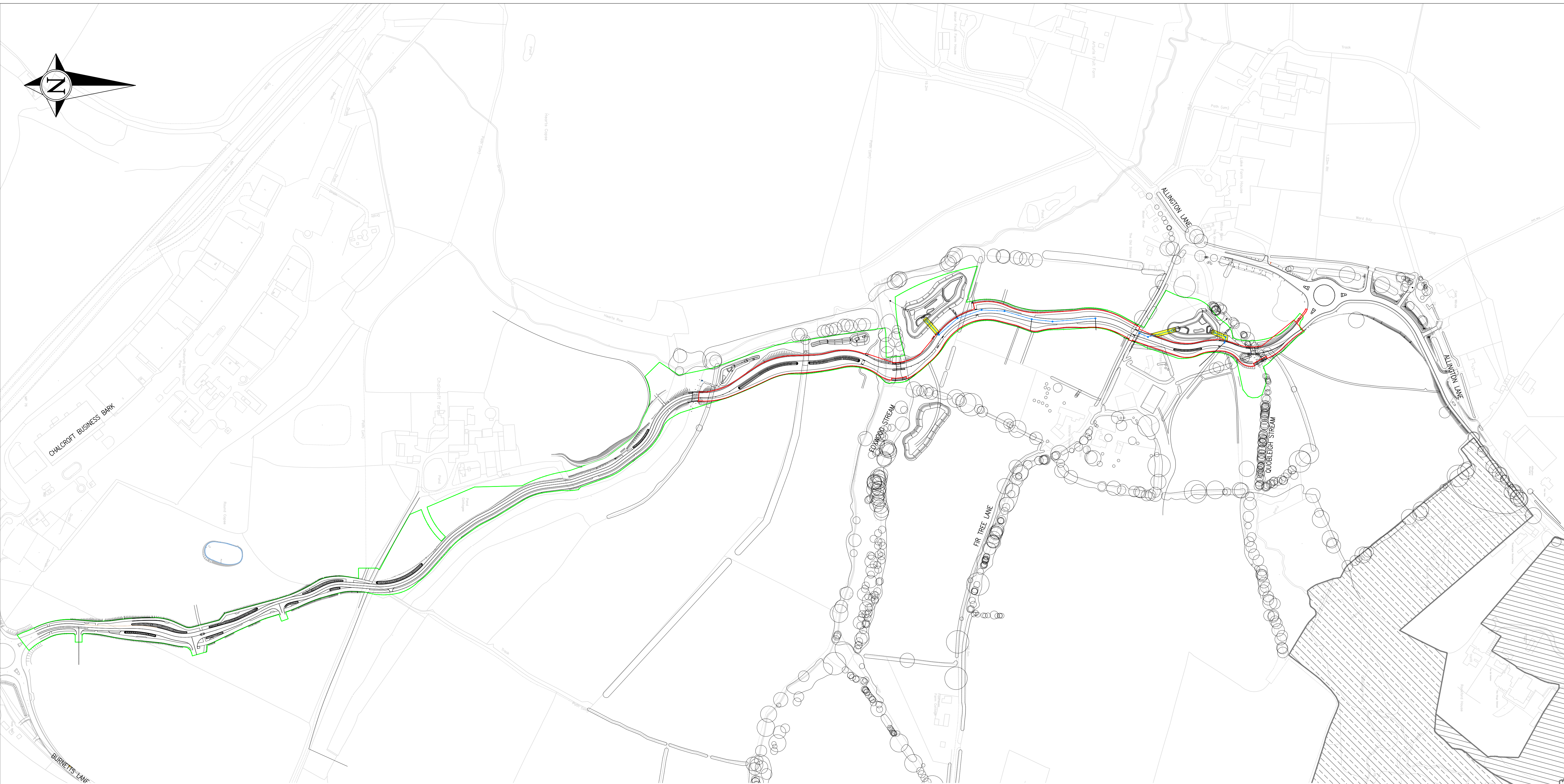
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4. ALL 150mm AND 225mm DIAMETER PIPES TO BE EXTRA STRENGTH VITRIFIED CLAY PIPES (SEE NOTE 15).
5. ALL PIPES OF 300mm DIAMETER OR GREATER TO BE CLASS M CONCRETE.
6. ALL PIPE MATERIALS TO BE CONSISTENT BETWEEN MANHOLES.
7. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH DESIGN AND CONSTRUCTION GUIDELINES, AND THE SPECIFICATION FOR HIGHWAY WORKS 1998 AND ALL SUBSEQUENT AMENDMENTS. WHERE THERE IS CONFLICT BETWEEN THESE DOCUMENTS THE MATTER SHALL BE REFERRED TO THE ENGINEER.
8. FOR CONSTRUCTION DETAILS OF MANHOLES AND SEWERS REFER TO DESIGN AND CONSTRUCTION GUIDELINES 2021, AND UNDERTAKERS STANDARD DETAILS WHICH CAN BE OBTAINED FROM THE LOCAL OFFICE FOR SEWERS ADOPTED BY SOUTHERN WATER
9. INVERT LEVELS OF EXISTING SEWERS TO BE CONFIRMED ON SITE BEFORE ANY SEWER WORK UNDERTAKEN. ANY DISCREPANCIES FOUND SHOULD BE NOTIFIED TO ENGINEERS.
10. WHERE SEWERS HAVE LESS THAN 1.2m OF COVER UNDER ROADS AND 0.9m COVER ELSEWHERE PIPES ARE TO HAVE A 150mm CONCRETE BED AND SURROUND.
11. PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH BS EN 13598-1 AND BS EN 13598-2 OR HAVE EQUIVALENT INDEPENDENT APPROVAL, TO TABLE 11 OF APPROVED DOCUMENT H1 OF THE BUILDING REGULATIONS 2010.
12. ALL BELOW GROUND DRAINAGE TO BE 150mmØ UNLESS OTHERWISE INDICATED WITH A MIN. GRADIENT AS FOLLOWS:--
13. S.W : 150mm Dia. 1:150
14. ALL ADOPTABLE DRAINAGE MATERIALS SHOULD COMPLY WITH THE REQUIREMENTS OF PART E CIVIL ENGINEERING SPECIFICATION INCLUDED WITH SEWERS FOR ADOPTION 7TH EDITION WHICH IS DRAWN FROM CESWI 7TH EDITION BUT IS NOT A FULL REPRODUCTION AND OR HAMPSHIRE COUNTY COUNCIL REQUIREMENTS.
15. JETTING OF NEW DRAINAGE RUNS MUST BE CARRIED OUT AT END OF CONTRACT, IN ORDER TO ENSURE ALL NEW PIPE-WORK IS FREE OF DEBRIS AND FREE RUNNING

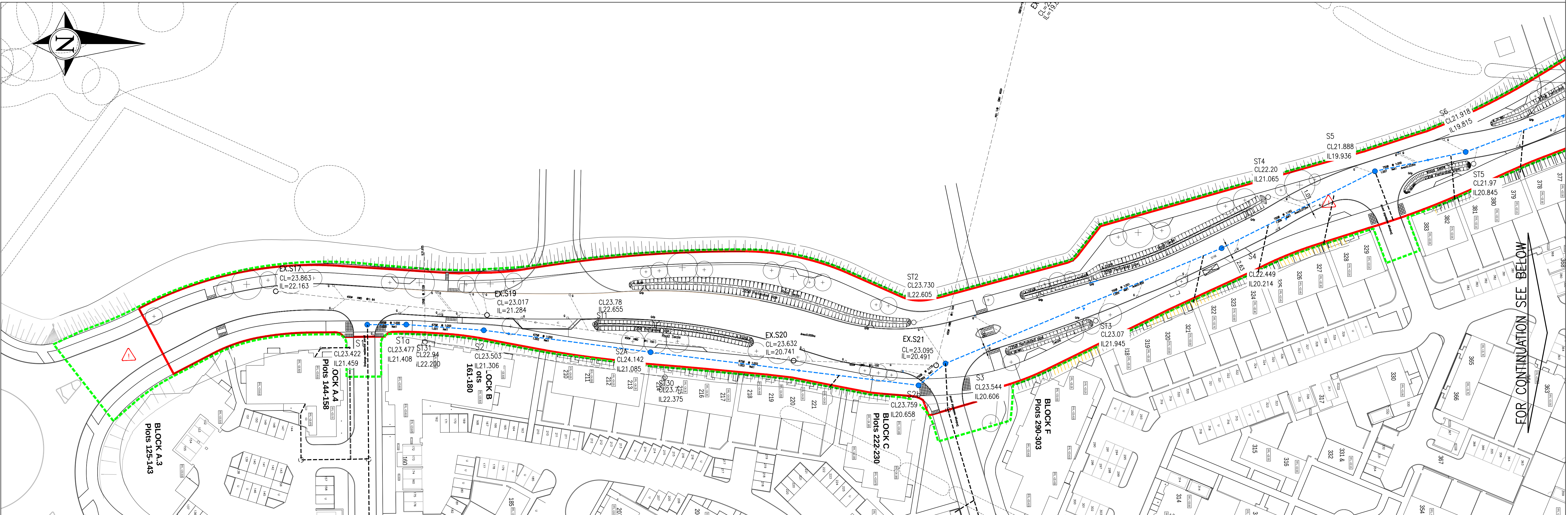
HEALTH & SAFETY:

ALL WORKS TO BE CARRIED OUT BY A CONTRACTOR COMPETENT TO UNDERTAKE THE CONSTRUCTION OF WORKS AS INDICATED ON THIS DRAWING. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE JOB SPECIFIC RISK ASSESSMENT. THE HAZARDS NOTED ARE IN ADDITION TO THE NORMAL HAZARDS AND RISKS FACED BY A COMPETENT CONTRACTOR WHEN DEALING WITH THE TYPE OF WORKS DETAILED ON THIS DRAWING.

LEGEND – S104 AGREEMENT

- DENOTES SURFACE WATER SEWER OFFERED FOR ADOPTION
- DENOTES SURFACE WATER MANHOLE CHAMBER OFFERED FOR ADOPTION
- DENOTES LATERAL/STUB FOR FUTURE SURFACE WATER SEWER
- DENOTES HIGHWAY SURFACE WATER SEWER TO BE OFFERED FOR ADOPTION TO HAMPSHIRE COUNTY COUNCIL
- G○ DENOTES HIGHWAY GULLY TO BE OFFERED FOR ADOPTION TO HAMPSHIRE COUNTY COUNCIL
- DENOTES EXISTING HIGHWAY SURFACE WATER SEWER ADOPTED BY HAMPSHIRE COUNTY COUNCIL
- DENOTES 3m SOUTHERN WATER EASEMENT
- DENOTES SECTION 38 BOUNDARY
- - - - DENOTES SITE BOUNDARY

C1	ISSUED FOR CONSTRUCTION	13/10/23	PN
Rev.	Description	Date	Initial
Drawing Status:	CONSTRUCTION		
RS REUBY & STAGG LTD.		ONE HORTON HEATH	
CONSULTING CIVIL & STRUCTURAL ENGINEERS		Eastleigh Borough Council	
Devey House		Eastleigh House	
55 High Street, Ringwood		Upper Market Street	
Hampshire BH24 1AE		Eastleigh	
T: 01425 484400 F: 01425 484409		SO50 9YN	
Email: admin@reuby-stagg.co.uk		www.eastleigh.gov.uk	
Site:	ONE HORTON HEATH		
Address:	SEGMENT 3		
Org Title:	OVERALL S104 SURFACE AGREEMENT PLAN		
"THE AVENUE NORTHERN SECTION"			
Scale:	1:2500	Page Size:	A1
		Date:	NOV 23
Drawn:	PN	Checked:	MD
Revision:			
Drawing No:	10413-SEG3-122		C1



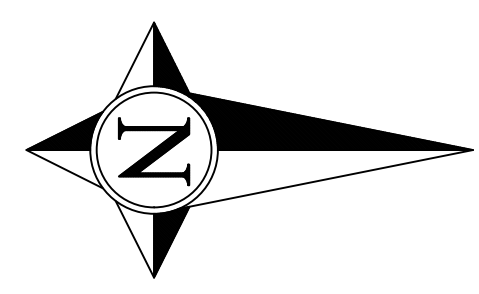
FOR CONTINUATION SEE BELOW

LEGEND – S104 AGREEMENT

- DENOTES SURFACE WATER SEWER OFFERED FOR ADOPTION
- DENOTES SURFACE WATER MANHOLE CHAMBER OFFERED FOR ADOPTION
- DENOTES LATERAL/STUB SURFACE WATER SEWER FOR FUTURE RESIDENTIAL PARCEL OFFERED FOR ADOPTION IN A SEPARATE APPLICATION. REF TO FIRTS RESIDENTIAL PARCE; DRAINAGE LAYOUTS
- DENOTES HIGHWAY SURFACE WATER SEWER TO BE OFFERED FOR ADOPTION TO HAMPSHIRE COUNTY COUNCIL
- GO DENOTES HIGHWAY GULLY TO BE OFFERED FOR ADOPTION TO HAMPSHIRE COUNTY COUNCIL
- DENOTES EXISTING HIGHWAY SURFACE WATER SEWER ADOPTED BY HAMPSHIRE COUNTY COUNCIL
- DENOTES 3m TO CENTER OF PIPE SOUTHERN WATER EASEMENT
- DENOTES SECTION 38 BOUNDARY
- DENOTES SITE BOUNDARY

HEALTH & SAFETY:

ALL WORKS TO BE CARRIED OUT BY A CONTRACTOR COMPETENT TO UNDERTAKE THE CONSTRUCTION OF WORKS AS INDICATED ON THIS DRAWING. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE JOB SPECIFIC RISK ASSESSMENT. THE HAZARDS NOTED ARE IN ADDITION TO THE NORMAL HAZARDS AND RISKS FACED BY A COMPETENT CONTRACTOR WHEN DEALING WITH THE TYPE OF WORKS DETAILED ON THIS DRAWING.



TOTAL CATCHMENT AREA: 2.48HA

OUTFALL TO STRATEGIC SUDS FEATURE L2 DESIGNED BY PFA REFER TO DRAWING G277/29

NOTES(CONT)

- WHERE SEWERS HAVE LESS THAN 1.2m OF COVER UNDER ROADS AND 0.9m COVER ELSEWHERE PIPES ARE TO HAVE A 150mm CONCRETE BED AND SURROUND.
- PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH BS EN 13598-1 AND BS EN 13598-2 OR HAVE EQUIVALENT INDEPENDENT APPROVAL, TO TABLE 11 OF APPROVED DOCUMENT H1 OF THE BUILDING REGULATIONS 2010.
- ALL BELOW GROUND DRAINAGE TO BE 150mmØ UNLESS OTHERWISE INDICATED WITH A MIN. GRADIENT AS FOLLOWS:--
S.W : 150mm Dia. 1:150
- ALL ADOPTABLE DRAINAGE MATERIALS SHOULD COMPLY WITH THE REQUIREMENTS OF PART 5 CIVIL ENGINEERING SPECIFICATION INCLUDED WITH CGD/SEWERS FOR ADOPTION 7TH EDITION WHICH IS DRAWN FROM CESWI 7TH EDITION BUT IS NOT A FULL REPRODUCTION AND OR HAMPSHIRE COUNTY COUNCIL REQUIREMENTS.
- JETTING OF NEW DRAINAGE RUNS MUST BE CARRIED OUT AT END OF CONTRACT, IN ORDER TO ENSURE ALL NEW PIPE-WORK IS FREE OF DEBRIS AND FREE RUNNING

NOTES

- THIS DRAWING IS COPYRIGHT.
- THE CONTRACTOR AND HIS SUBCONTRACTOR ARE TO VERIFY ALL DIMENSIONS ON SITE PRIOR TO MAKING SHOP DRAWINGS OR COMMENCING MANUFACTURE.
- DO NOT SCALE THIS DRAWING. THE CONTRACTOR IS TO BRING TO THE NOTICE OF THE ENGINEER ANY DISCREPANCIES CONTAINED IN THIS DRAWING PRIOR TO WORK COMMENCEMENT.
- ALL 150mm AND 225mm DIAMETER PIPES OFFERED FOR ADOPTION TO SOUTHERN WATER TO BE EXTRA STRENGTH VITRIFIED CLAY PIPES
- ALL PIPES OF 300mm DIAMETER OR GREATER OFFERED FOR ADOPTION TO SOUTHERN WATER TO BE CLASS M CONCRETE.
- ALL PIPE MATERIALS TO BE CONSISTENT BETWEEN MANHOLES.
- ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH DESIGN AND CONSTRUCTION GUIDANCE(DCG)/SEWER FOR ADOPTION 7TH, HAMPSHIRE COUNTY COUNCIL STANDARDS (FOR HIGHWAY DRAINAGE ONLY) AND THE SPECIFICATION FOR HIGHWAY WORKS 1998 AND ALL SUBSEQUENT AMENDMENTS. WHERE THERE IS CONFLICT BETWEEN THESE DOCUMENTS THE MATTER SHALL BE REFERRED TO THE ENGINEER.
- FOR CONSTRUCTION DETAILS OF MANHOLES AND SEWERS REFER TO DESIGN AND CONSTRUCTION GUIDANCE/SEWERS FOR ADOPTION 7TH, HCC STANDARD DETAILS(FOR SEWERS ADOPTED BY HCC HIGHWAYS) AND
- UNDERTAKERS STANDARD DETAILS WHICH CAN BE OBTAINED FROM THE LOCAL OFFICE FOR SEWERS ADOPTED BY SOUTHERN WATER
- INVERT LEVELS OF EXISTING SEWERS TO BE CONFIRMED ON SITE BEFORE ANY SEWER WORK UNDERTAKEN. ANY DISCREPANCIES FOUND SHOULD BE NOTIFIED TO ENGINEERS.

C3	MANHOLES S28, S4, S7, S8 RELOCATED	17/07/23	PN
C2	LATERALS FROM RESIDENTIAL PARCEL ADDED, FUTURE RESIDENTIAL FINISH FLOOR LEVELS ADDED	17/05/23	PN
C1	CONSTRUCTION ISSUE	21/03/23	PN
Rev.	Description	Date	Initial.
Drawing Status: TENDER			
RS REUBY & STAGG LTD.			
CONSULTING CIVIL & STRUCTURAL ENGINEERS			
Devey House 55 High Street, Ringwood Hampshire BH24 1AE T: 01425 864400 F: 01425 484409 Email: admin@reuby-stagg.co.uk			
ONE HORTON HEATH			
Eastleigh Borough Council Eastleigh House Upper Market Street Eastleigh SO50 9YN www.eastleigh.gov.uk			

PENDING S104
APPROVAL

Site:	ONE HORTON HEATH		
Address:	SEGMENT 3		
Org Title:	S104 SURFACE AGREEMENT PLAN		
	"THE AVENUE SOUTHERN SECTION"		
Scale:	1:500	Page Size:	A1
		Date:	JAN 22
		Drawn:	PN
		Checked:	PN
Drawing No:			Revision:
10413-SEG3-120			C3



H.M. Land Registry Boundary
Title number: HP 43055

Southern Water's FW Manhole
M1 Ref: 5001
L (loc by survey): 22.65m AOD
CL (loc by survey): 23.69m AOD

Pipe run F1 to MH5001 to be
constructed by Southern Water
under S98 sewer replacement
application. Southern Water
preferred reposition option
route shown.

Proposed rising main to discharge
into new break manhole chamber

Watercourse bridge crossing

Quobleigh Stream (Fair Oak Stream)
Main River

Quobleigh Stream (Fair Oak Stream)
Main River

SuDS Feature
A

Proposed location of northern pumping station

15m Odour offset



Stratton Park House, Wanborough Road
Swindon, SN3 4HG
Telephone
01793 828000
Website
www.pfapl.co.uk

For Construction
This drawing is produced, together with any related data, to inform
the setting out and construction of the works, subject to the grant of
Technical Approval(s) and Consent(s). To be read in conjunction with
all working drawings.

- NOTES**
- This drawing is based on the Topographical Survey undertaken by
Mayer Brown Limited, Drawing No: R/SAV 1.21.1, Rev E, dated 05 May
2014.
 - All drainage works shall be constructed in accordance with the
Design and Construction Guidance (DCG) and Southern Water's
Addendums and Standard Details.
 - Any conflict between the proposals and the DCG then the DCG
shall override.
 - All materials to be handled/laid in accordance with the relevant
British Standard or accepted Quality Assurance Scheme.
 - All covers within the highway (including private chambers) shall be
in accordance with BS EN 242, stamped to indicate accreditation BS,
LRQA, or SGSYS and all those within the carriageway shall be grade
D400.
 - Sewers and drains of different diameters should be laid soffit to
soffit unless specified otherwise.
 - All sewers in adoptable highways with less than 1.2m cover, or
0.9m cover in verges, to have 150mm Type 2 Class 2 concrete
surround. Concrete to be C25/30 to BS8500, 20mm max size aggregate,
Class S2 conformance.
 - The Contractor shall verify the invert levels of any existing
inspector chamber/manhole or pipe, where drainage connections are to
be made, prior to commencement of drainage works. Any discrepancies
with levels and gradients shown on the construction issue drawings must
be reported to PFA Consulting and the Contractor shall seek clarification
regarding any construction issue prior to continuing the drainage works.
 - All dimensions shown in millimetres (mm) unless otherwise stated,
and all levels relate to Ordnance Datum.
 - The backfilling of drainage trenches which are in close proximity
to foundations must be in accordance with any special requirements set
out by the Structural Engineer.
 - All in-situ concrete and precast concrete components shall be
designed to BRE Special Digest 1 Concrete in aggressive ground.
Concrete shall be to BS8500.
 - The invert levels of any existing manholes and pipes and/or
manholes constructed by others are to be verified on site prior to
commencement of drainage work.
 - Pipes built into manholes should have a flexible joint as close as
feasible to the external face of the structure and the length of the next
rocker pipe should be:

Nominal Diameter (mm)	Rocker Pipe Length (M)
150 - 450	0.60
601 - 750	1.00
Over 750	1.25

- Subject to S104 Technical Approval and structural design.
- To be read in conjunction with current versions of the MSE
suppliers drawings.
14. The Contractor shall confirm the CBR of the subgrade, in
order to determine the required sub-base thicknesses, in accordance
with Table 1. Highway Inspector to be present during inspections/CBR
testing.
- Compound hardstanding should be a brushed concrete finish,
which shall be level with covers and 150mm above tanker hardstanding
to Southern Water's specifications.
- The levels of the compound should slope slightly towards fence
line where a single drain off area should be provided around the whole
of the inner fence line to aid drainage.
- Sewers are designed and proposed for adoption as per Design
and Construction Guidance/Sewer Sector Guidance (DCG/SSG).
- Existing trees/vegetation shown within the 3m offsets of their
proposed sewers will be removed - no sewers will be located within tree
canopy.

- KEY**
- Foul Water Sewer & Manhole
 - Foul Rising Main
 - As-built Foul Water Sewer & Manhole
 - Indicative Upstream Foul Water Sewer & Manhole
 - Surface Water Sewer & Manhole
 - Highway Sewer & Manhole
 - Site Boundary
 - 1m Contour
 - Ordinary Watercourse
 - Main River
 - Pumping station proposed for adoption
 - 3m Easement
 - 3m Offset
 - RM Washout
 - RM Air Valve

Rev	Date	Description	Drawn	Check
A	24/06/22	First issue	DAB	SAM
B	01/08/22	Surface water sewers added	DAB	SAM
C	31/10/22	Foul drainage updated	DAB	SAM
D	13/12/22	For technical approval	DAB	SAM
E	08/02/23	Drawing updated in accordance with Southern Water's further information request	JM	DAB
F	27/02/23	Drawing updated in accordance with Southern Water's further information request	JM	DAB
G	15/03/23	Title plan boundary added & drawing status update	DAB	SAM
H	23/05/23	Updated in accordance with SW comments	DAB	SAM
I	28/06/23	Drawings updated in line with SW comments	DAB	SAM
J	12/07/23	S98 Sewer colouring updated	DAB	SAM
K	28/08/23	Drawings updated in line with SW comments	DAB	SAM
L	18/09/23	Foul outfall route amended due to clash	DAB	SAM
M	15/11/23	RM updated to As-built foul drainage along Arlington Lane	DAB	SAM

Status
FOR CONSTRUCTION

Client

Eastleigh Borough Council

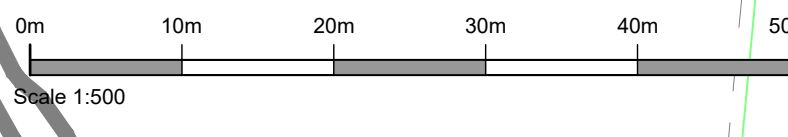
Project

One Horton Heath

Drawing Title
**S104
Site Layout Plan
Sheet 1 of 4**

Drawing No. **G277/82** Rev L

Date: June 2022 Scale: 1:500 @ A0
E-Mail: Dbusiak@pfapl.co.uk





Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Website
www.pfaplc.com

For Construction

This drawing is produced, together with any related data, to inform the setting out and construction of the works, subject to the grant of Technical Approval(s) and Consent(s). To be read in conjunction with all working drawings.

NOTES

1. This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:RB.SAV 1.2.1.1, Rev E, dated 05 May 2014.
2. All drainage works shall be constructed in accordance with the Design and Construction Guidance (DCG) and Southern Water's Addendums and Standard Details.
3. Any conflict between the proposals and the DCG then the DCG shall override.
4. All materials to be hand-laid in accordance with the relevant British Standard or accepted Quality Assurance Scheme.
5. All covers within the highway (including private chambers) shall be in accordance with BS EN124, stamped to indicate accreditation by BS, LQA, or ISO9001 and all those within the carriageway shall be grade D400.
6. Sewers and drains of different diameters should be laid soffit to soffit unless specified otherwise.
7. All sewers in adoptable highways with less than 1.2m cover, or 0.9m cover in verges, to have 150mm Type 2/Class 2 concrete surround. Concrete to be G60 to BS6500, 20mm max size aggregate, Class S2 consistence.
8. The Contractor shall verify the invert levels of any existing inspection chambers/manholes or pipe, where drainage connections are to be made, prior to commencement of drainage works. Any discrepancies with levels and gradients shown on the construction issue drawings must be reported to PFA Consulting and the Contractor shall seek clarification regarding any construction issue prior to continuing the drainage works.
9. All dimensions shown in millimetres (mm) unless otherwise stated, and all levels relate to Ordnance Datum.
10. The backfilling of drainage trenches which are in close proximity to foundations must be in accordance with any special requirements set out by the Structural Engineer.
11. All in-situ concrete and precast concrete components shall be designed to BRE Special Digest 1: Concrete in aggressive ground. Concrete shall be to BS8500.
12. The invert levels of any existing manholes and pipes and/or manholes constructed by others are to be verified on site prior to commencement of drainage work.
13. Pipes built into manholes should have a flexible joint as close as possible to the external face of the structure and the length of the next rocker pipe should be:

Nominal Diameter (mm)	Rocker Pipe Length (M)
150 - 450	0.60
451 - 750	1.00
Over 750	1.25

14. Subject to S104 Technical Approval and structural design.
15. To be read in conjunction with current versions of the MSEI suppliers drawings.
16. 14. The Contractor shall confirm the CBR of the subgrade, in order to determine the required Sub-base Thicknesses, in accordance with Table 1: Highway Inspector to be present during inspections/CBR testing.
17. Compound handstanding should be a finished concrete finish, which shall be level with covers and 150mm above tanker handstanding to Southern Water's specifications.
18. The levels of the compound should slope slightly towards fence line where a change drain off area should be provided around the whole of the inner fence line to aid drainage.
19. Sewers are designed and proposed for adoption as per Design and Construction Guidance/Sewer Sector Guidance (DCG/SSG).
20. Existing trees/vegetation shown within the 3m offsets of their proposed sewers will be removed - no sewers will be located within tree canopy.

KEY

- Foul Water Sewer & Manhole
- Foul Rising Man
- Indicative Upstream Foul Water Sewer & Manhole
- Surface Water Sewer & Manhole
- Highway Sewer & Manhole
- Site Boundary
- 1m Contour
- Ordinary Watercourse
- Main River
- Pumping station proposed for adoption
- 3m Easement
- 3m Offset
- RM Washout
- RM Air Valve

Rev	Date	Description	Drawn	Check
A	01/08/22	Surface water sewers added	DAB	SAM
B	31/10/22	Foul Drainage updated	DAB	SAM
C	13/12/23	For technical approval	DAB	SAM
D	08/02/23	Drawing updated in accordance with Southern Water's further information request.	JM	DAB
E	27/02/23	Drawing updated in accordance with Southern Water's further information request.	JM	DAB
F	16/03/23	Drawing status updated	DAB	SAM
G	23/05/23	Updated in line with SW comments	DAB	SAM
I	28/05/23	Drawing updated in line with SW comments	DAB	SAM
J	10/08/23	Washout chamber location updated	DAB	SAM

Status
FOR CONSTRUCTION

Client

Eastleigh Borough Council

Project

One Horton Heath

Drawing Title

**S104
Site Layout Plan
Sheet 2 of 4**

Drawing No.

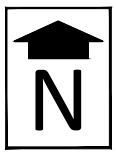
G277/83

Rev J

Date: June 2022

Scale: 1:500 @ A0

E-Mail: DBuckak@pfaplc.com



Stratton Park House, Wanborough Road
Swindon, SN3 4HG
Telephone
01793 828000
Website
www.pfapl.com

For Construction
This drawing is produced, together with any related data, to inform the setting out and construction of the works, subject to the grant of Technical Approval(s) and Consent(s). To be read in conjunction with all working drawings.

- NOTES**
- This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:IR SAV 1.21.1, Rev E, dated 05 May 2014.
 - All drainage works shall be constructed in accordance with the Design and Construction Guidance (DCG) and Southern Water's Addendums and Standard Details.
 - Any conflict between the proposals and the DCG then the DCG shall override.
 - All materials to be handled/used in accordance with the relevant British Standard or accepted Quality Assurance Scheme.
 - All covers within the highway (including private chambers) shall be in accordance with BS EN 24, stamped to indicate accreditation BS, LRQA or SGS and all those within the carriageway shall be grade D400.
 - Sewers and drains of different diameters shall be laid soffit to soffit unless specified otherwise.
 - All sewers in adoptable highways with less than 1.2m cover, or 0.9m cover in verges, to have 150mm Type Z Class 2 concrete surround. Concrete to be C25 to BS8500, 20mm max size aggregate, Class S2 consistence.
 - The Contractor shall verify the invert levels of any existing inspection chamber/manhole or pipe, where drainage connectors are to be made, prior to commencement of drainage works. Any discrepancies with levels and gradients shown on the construction issue drawings must be reported to PFA Consulting and the Contractor shall seek clarification regarding any construction issue prior to continuing the drainage works.
 - All dimensions shown in millimetres (mm) unless otherwise stated, and all levels relate to Ordnance Datum.
 - The backfilling of drainage trenches which are in close proximity to foundations must be in accordance with any special requirements set out by the Structural Engineer.
 - All in-situ concrete and precast concrete components shall be designed to BRE Special Digest 1 Concrete in aggressive ground. Concrete shall be to BS8500.
 - The invert levels of any existing manholes and pipes and/or manholes constructed by others are to be verified on site prior to commencement of drainage work.
 - Pipes built into manholes should have a flexible joint as close as feasible to the external face of the structure and the length of the next rodder pipe should be:
- | Nominal Diameter (mm) | Rocker Pipe Length (M) |
|-----------------------|------------------------|
| 150 - 450 | 0.60 |
| 601 - 750 | 1.00 |
| Over 750 | 1.25 |
- Subject to S104 Technical Approval and structural design.
 - To be read in conjunction with current versions of the M&E suppliers drawings.
 14. The Contractor shall confirm the CBR of the subgrade, in order to determine the required Sub-base thickness, in accordance with Table 1. Highway Inspector to be present during inspections/CBR testing.
 - Compound hardstanding should be a brushed concrete finish, which shall be level with covers and 150mm above tanker hardstanding to Southern Water's specifications.
 - The levels of the compound should slope slightly towards fence line where a single drain off area should be provided around the whole of the inner fence line to aid drainage.
 - Sewers are designed and proposed for adoption as per Design and Construction Guidance/Sewer Sector Guidance (DCSGSS).
 - Existing trees/vegetation shown within the 3m offsets of their proposed sewers will be removed - no sewers will be located within tree canopy.

- KEY**
- Foul Water Sewer & Manhole
 - Foul Rising Main
 - Inductive Upstream Foul Water Sewer & Manhole
 - Surface Water Sewer & Manhole
 - Highway Sewer & Manhole
 - Site Boundary
 - 1m Contour
 - Ordinary Watercourse
 - Main River
 - Pumping station proposed for adoption
 - 3m Easement
 - 3m Offset
 - RM Washout
 - RM Air Valve

Rev	Date	Description	Drawn	Check
#	24/06/22	First Issue	DAB	SAM
A	01/08/22	surface water added	DAB	SAM
B	31/03/22	Foul drainage updated	DAB	SAM
C	13/12/22	For technical approval	DAB	SAM
D	08/02/23	Drawing updated in accordance with Southern Water's further information request	JM	DAB
E	27/02/23	Drawing updated in accordance with Southern Water's further information request	JM	DAB
F	16/03/23	Drawing status updated	DAB	SAM
G	23/05/23	Drawing updated in accordance with SW comments	DAB	SAM
I	28/06/23	Drawing updated in line with SW comments	DAB	SAM
J	10/08/23	Washout chamber location updated	DAB	

Status
FOR CONSTRUCTION

Client
Eastleigh Borough Council

Project
One Horton Heath

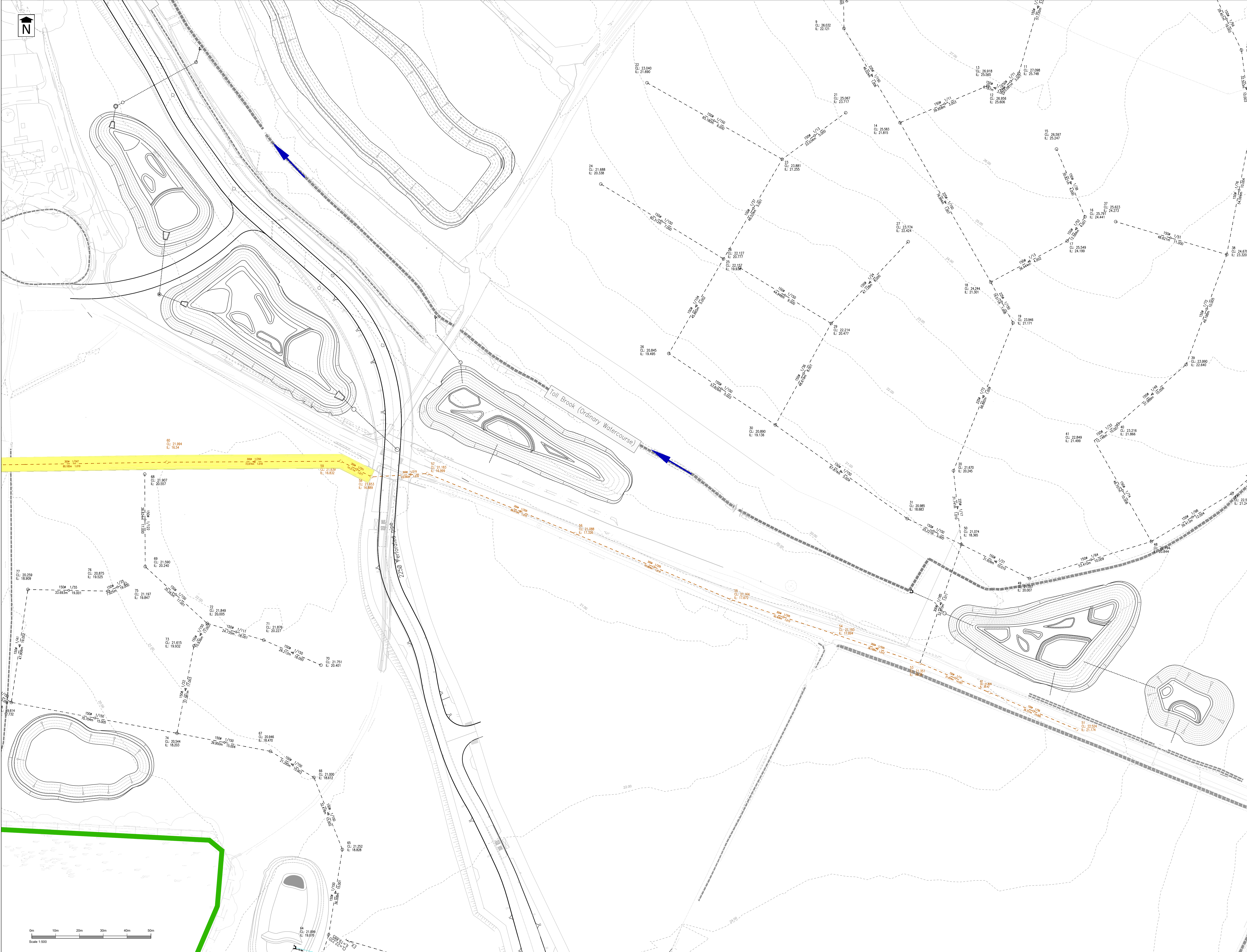
Drawing Title
**S104
Site Layout Plan
Sheet 3 of 4**

Drawing No.
G277/84

Date: June 2022 **Scale:** 1:500 @ A0

E-Mail: DBucak@pfapl.com

Scale 1:500



For Construction
This drawing is produced, together with any related data, to inform the setting out and construction of the works, subject to the grant of Technical Approval(s) and Consent(s). To be read in conjunction with all working drawings.

- NOTES
- This drawing is based on the Topographical Survey undertaken by Mayne Brown Limited, Drawing No:RS-SAV-1.21.1, Rev E, dated 05 May 2014.
 - All drainage works shall be constructed in accordance with the Design and Construction Guidance (DCG) and Southern Water's Addendums and Standard Details.
 - Any conflict between the proposals and the DCG then the DCG shall override.
 - All materials to be handled/used in accordance with the relevant British Standard or accepted Quality Assurance Scheme.
 - All covers within the highway (including private chambers) shall be in accordance with BS EN124, stamped to indicate accreditation by BSI, UKCA, or SCST and all those within the carriageway shall be grade D400.
 - Sewers and drains of different diameters should be laid soffit to soffit unless specified otherwise.
 - All sewers in adoptable highways with less than 1.2m cover, or 0.9m cover in verges, to have 150mm Type 2/Class 2 concrete surround. Concrete to be CEN3 to BS6500, 20mm max size aggregate, Class S2 concrete.
 - The Contractor shall verify the invert levels of any existing inspection chamber/manhole or pipe, where drainage connections are to be made, prior to commencement of drainage works. Any discrepancies with levels and gradients shown on the construction issue drawings must be reported to PFA Consulting and the Contractor shall seek clarification regarding any construction issue prior to continuing the drainage works.
 - All dimensions shown in millimetres (mm) unless otherwise stated, and all levels relate to Ordnance Datum.
 - The backfilling of drainage trenches which are in close proximity to foundations must be in accordance with any special requirements set out by the Structural Engineer.
 - All in-situ concrete and precast concrete components shall be designed to BRE Special Digest 1: Concrete in aggressive ground. Concrete shall be to BS8500.
 - The invert levels of any existing manholes and pipes and/or manholes constructed by others are to be verified on site prior to commencement of drainage work.
 - Pipes built into manholes should have a flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be:

Nominal Diameter (mm)	Rocker Pipe Length (M)
150 - 450	0.60
450 - 750	1.20
Over 750	1.35

- Subject to S104 Technical Approval and structural design.
- To be read in conjunction with current versions of the M&E suppliers drawings.
- The Contractor shall confirm the CBR of the subgrade, in order to determine the required sub-base thicknesses, in accordance with Table 1: Highway Inspector to be present during Inspection/CBR testing.
- Compound handstanding should be a brushed concrete finish, shall be level with covers and 150mm above kerb handstanding to Southern Water's specifications.
- The levels of the compound should slope slightly towards fence line where a single drain off area should be provided around the whole of the inner fence line to aid drainage.
- Sewers are designed and proposed for adoption as per Design and Construction Guidance/Sewer Sector Guidance (DCG/SSG).
- Existing trees/vegetation shown within the 3m effects of their proposed sewers will be removed - no sewers will be located within tree canopy.

- KEY
- Foul Water Sewer & Manhole
 - Foul Rising Main
 - Indicative Upstream Foul Water Sewer & Manhole
 - Surface Water Sewer & Manhole
 - Highway Sewer & Manhole
 - Site Boundary
 - 1m Contour
 - Ordinary Watercourse
 - Main River
 - Pumping station proposed for adoption
 - 3m Easement
 - 3m Offset
 - RM Manhole
 - RM Air Valve

Rev	Date	Description	Drawn	Check
#	24/06/22	First issue.	DAB	SAM
A	01/08/22	Surface water sewers added	DAB	SAM
B	31/10/22	Foul Drainage updated	DAB	SAM
C	13/12/22	For technical approval	DAB	SAM
D	08/02/23	Drawing updated in accordance with Southern Water's further information request.	JM	DAB
E	27/02/23	Drawing updated in accordance with Southern Water's further information request.	JM	DAB
F	16/03/23	Drawing status updated	DAB	SAM
G	24/04/23	Manhole S7 relocated	DAB	SAM
H	23/05/23	Drawings updated in line with SW comments	DAB	SAM
I	28/06/23	Drawings updated in line with SW comments	DAB	

Status

FOR CONSTRUCTION

Client

Eastleigh Borough Council

Project

One Horton Heath

Drawing Title

S104
Site Layout Plan
Sheet 4 of 4

Drawing No. **G277/85**

Date: June 2022 Scale: 1:500 @ A0

E-Mail: DBuciak@pfaplc.com

References

- ¹ Woods Ballard, B., Wilson, S., Udale-Clarke, H., Illman, S., Scott, T., Ashley, R. and Kellagher, R. (2015) The SuDS Manual. CIRIA Report C753. CIRIA, London.
- ³ HR Wallingford (2004) The Operation and Maintenance of Sustainable Drainage Systems (and Associated Costs). Report SR 626, February 2004.
- ⁴ Virginia Department of Conservation and Recreation (1999) Virginia Stormwater Management Handbook. Volume 1. First Edition, 1999.
- ⁵ UK Government (2015). The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2015 available at <https://www.legislation.gov.uk/uksi/2015/1623/resources> [accessed 29/09/2022].
- ⁶ UK Government (1997). The Surface Waters (Fishlife) (Classification) Regulations 1997, UK Statutory Instrument No. 1331 available at: <https://www.legislation.gov.uk/uksi/1997/1331/contents/made> accessed 29/09/2022.
- ⁷ Nurjaya I.W., Surbakati H. and Natih N.M.N. (2019). Model of Total Suspended Solid (TSS) distribution due to coastal mining in Western Coast of Kundur Island part of Berhala Strait. IOP Conf. Series: Earth and Environmental Science 278 (2019) 012056
- ⁸ Alberta Transportation. (2021). Conversion Relationship between Nephelometric Turbidity Units (NTU) into mg/l for Alberta Transportations' Turbidity specification available at <https://www.alberta.ca/assets/documents/tr-conversion-of-nephelometric-turbidity-units.pdf> accessed on 29/09/2022).
- ⁹ Alabaster, J.S. and Lloyd, R. (1980). Water quality criteria for freshwater fish. Food and agriculture organization of the United Nations, Butterworths, London.
- ¹¹ Canadian Department of Fisheries and Oceans (2000). Effects of sediment on fish and their habitat. DFO Pacific Region Pacific Region Habitat Status Report 2000/01 E.
- ¹² Canadian Department of Fisheries and Oceans (2000). Effects of sediment on fish and their habitat. DFO Pacific Region Pacific Region Habitat Status Report 2000/01 E.
- ¹³ Canadian Department of Fisheries and Oceans (2000). Effects of sediment on fish and their habitat. DFO Pacific Region Pacific Region Habitat Status Report 2000/01 E.
- ¹⁴ British Standards Institution (1990). BS 3936-10:1990 Nursery stock. Specification for ground cover plants.