A47 Wansford to Sutton Dualling

Scheme Number: TR010039

Volume 6
6.3 Environmental Statement Appendices
Appendix 13.2 – Drainage strategy report

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

April ~~March~~ 2022

Deadline ~~5~~3

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A47 Wansford to Sutton Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 13.2 – Drainage Strategy Report

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Table of contents

1. Introduction

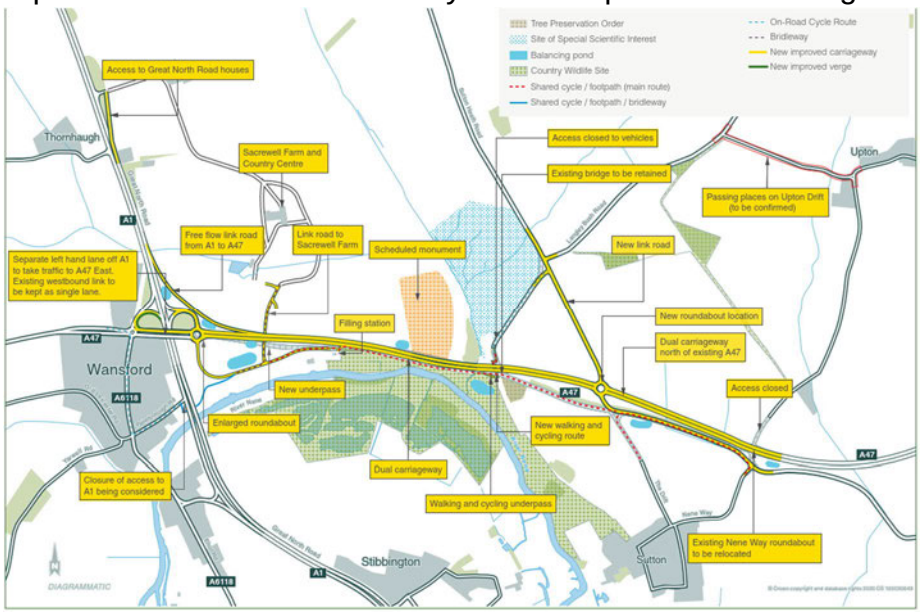
1.1. Scheme Overview

1.1.1. The A47 forms part of the Strategic Road Network (SRN) and provides for a variety of local, medium and long-distance trips between the A1 and the eastern coastline. The corridor connects the cities of Norwich and Peterborough, the towns of Wisbech, Kings Lynn, Dereham, Great Yarmouth and Lowestoft and a succession of villages in what is largely a rural area. A47 Wansford to Sutton is 1 of the 6 schemes considered in the Roads Investment Strategy (RIS).

1.1.2. The A47 Wansford to Sutton dualling scheme is approximately 2.5 kilometres in length located in the county of Cambridgeshire between the A1 / A47 junction and the A47 Nene Way Roundabout in Sutton, west of Peterborough.

1.1.3. The existing A47 single-carriageway is to be upgraded to dual-carriageway standard (D2AP). It will be constructed to the north of the existing A47 alignment until it ties into the existing dual carriageway to the east of the existing Sutton Roundabout. The major design elements of the scheme are as follows:

- dualling of the existing A47 single carriageway section from A1 junction at Wansford to a location immediately east of the existing Nene Way Roundabout
- realignment of the A47, principally to the north of the existing alignment
- a new free flow link between A1 Southbound and A47 Eastbound
- provision of 5 balancing ponds, 2 infiltration basins and 2 wildlife ponds. The Scheme also proposes a flood storage area near the river Nene to compensate for the flood area reduced by the new construction
- provision of a safe route for cyclists and pedestrians along the Scheme.



1.1.4. Statutory consultation on the proposal to upgrade the A47 between Wansford and Sutton was undertaken between September and November 2018. Following the feedback from this consultation the design was updated in 2020. The purpose of the consultation was to seek feedback on the scheme proposals, including the location, purpose and layout of junctions, provision for non-motorised users, and environmental impact and mitigation. The main difference between the 2018 design and the 2020 northern alignment is the crossing of two field drains and an increase in surface water flood risk, which may require additional culverting to maintain drainage pathways. Although compensatory storage is required at Sutton Heath Road for both options, there is less compensatory storage required for the 2020 northern alignment.

1.2. Existing Data and Information

1.2.1. The survey undertaken by SubScan in December 2018 was provided to Sweco on 22 September 2020. This provided additional information to supplement the information provided on HADDMS (Highways England, 2020a). Further drainage surveys were not undertaken and it is anticipated that these are undertaken at Stage 5 to enable detailed design. A location plan showing areas of required drainage survey has been shared with Galliford Try and is shown in Appendix C.

1.2.2. Due to this lack of data, assumptions regarding existing drainage connections have been made. Outstanding drainage survey has been requested and a survey of these areas should be undertaken to be available for detailed design.

2. Consultation

2.1.1. The consultees below are involved in the development and finalising of the highway drainage design:

- Environment Agency (EA) – Flood Risk, and Water Quality for the Nene Catchment. Introduction Meeting 24 May 2018, EA Kettering. Planning Advice notice, refer to appendix C, received 5 June 2018. The EA were also consulted in November 2020 regarding groundwater pollution risk.
- Peterborough City Council (PCC) – Lead Local Flood Authority. PCC were contacted to receive feedback/agreement prior to detailed design received 19 November 2020.

2.1.2. The Peterborough City Council response provided agreement in principle to the drainage strategy proposed. The LLFA did request that a condition survey of the Mill Stream and Wittering Brook would be required to ensure that both are free flowing and to provide details of any existing assets / structures. This should be undertaken to inform Stage 5 design and can be covered off as a walkover survey with photographs to satisfy PCC.

3. Existing Surface Water Drainage

3.1. Existing Drainage

3.1.1. The existing drainage primarily is kerb and gully drainage discharging to a series of drainage ditches which follow the highway alignment linearly.

3.1.2. The drainage strategy is to retain the existing flow routes where possible.

3.2. Watercourses

3.2.1. The significant watercourse within the study area, namely Mill Stream for the west most catchment of the A1 slip, Wittering Brook for the central catchments and an unnamed watercourse which is a tributary of the River Nene for the eastern most catchments. The river Nene, which is designated as a main river, runs along the southern edge of the site.

3.2.2. The existing outfalls; River Nene, existing land drains, and Wittering Brook shall receive the controlled flow for the attenuation features of basins and highway conveyance diches.

3.2.3. The existing flow characteristics of the Wittering Brook and the Mill Stream will be maintained.

4. Design Strategy

4.1. Surface Water

4.1.1. The approach taken in addressing highway runoff is to control the discharge from the site to the existing discharge rate and to attenuate for the net increase of impermeable surfaces between the proposed A47 dualling scheme and the existing A47 highway catchment. The areas where additional widening has occurred will be restricted to greenfield runoff rates.

4.1.2. There are 14 different drainage networks comprising five attenuation basins and two infiltration basins. These are shown on the Stage 3 drainage drawings in Appendix D:

- HE551494-GTY-HDG-000-DR-CD-30001
- HE551494-GTY-HDG-000-DR-CD-30002
- HE551494-GTY-HDG-000-DR-CD-30003
- HE551494-GTY-HDG-000-DR-CD-30004
- HE551494-GTY-HDG-000-DR-CD-30005
- HE551494-GTY-HDG-000-DR-CD-30006
- HE551494-GTY-HDG-000-DR-CD-30007
- HE551494-GTY-HDG-000-DR-CD-30008

4.1.3. A planning advice notice was received from the Environment Agency (EA), and is included in Appendix B. It advises that the scheme shall not result in an increase in discharge to the River Nene or its tributaries. The discharge is to be controlled either a multi-stage complex discharge control structure. This will reflect the original discharge or run-off rates from the site across the range of storm events.

4.1.4. EA agreement will be required at detailed design to allow the proposed outfalls to the River Nene. It is assumed that there are existing outfalls to the River Nene, but without the necessary drainage survey coverage these were not able to be determined. On receipt of the drainage survey at detailed design it is anticipated that existing outfalls may be able to be retained and the number of proposed outfalls to the River Nene may reduce. The drainage proposed along minor roads such as Sutton Heath Road may not be required if the drainage survey discovers existing over the edge drainage to drainage ditches to existing outfalls. The level of drainage required in these locations will be determined at Stage 5.

4.1.5. Peterborough City Council (PCC) were consulted in their role as the Lead Local Flood Authority (LLFA) for the scheme. PCC raised no major objections to the drainage proposals and should be made aware of any updates at detailed design. A record of the email exchange is shown in Appendix B.

4.1.6. The attenuation is to be designed for the 1 in 100 year storm event with 20% additional allowance for climate change. The proposed attenuation will contain a 0.3m freeboard and be designed to take 20% additional allowance for climate change. The design life of the proposed road is to be 60 years, refer to appendix B. This additional 40% of climate change allowance in the attenuation design and freeboard is based on the upper end anticipated climate change, refer to the EA guidance on Flood Risk Assessments: Climate Change Allowances Table 2 (Environment Agency, 2021).

4.1.7. Drainage ditches have been provided at the toe of embankments where possible and existing drainage ditch flow paths have been retained where possible from the existing drainage network. Drainage ditches are not provided to the outfalls into the River Nene to reduce the impact on the land south of the A47.

4.1.8. Where drains pass under the existing A47, drains may have to be retained. It is unclear at this time if additional culverts are required passing beneath the proposed A47 between the new roundabout and where the alignment ties into the existing A47 to the east. The requirement of culverts at this location will be determined at Stage 5 when further drainage survey detailing connectivity is available.

4.1.9. There are passing places proposed at Upton Drift Road. These may encroach on the existing drainage ditch and where this occurs the drainage ditch should be diverted around or piped to maintain connectivity.

4.1.10. The water quality mitigation proposed to capture the surface water runoff from the carriageway. The drainage network includes gullies, filter drainage and catchpits which are intended to capture pollutants. Suitable maintenance of the drainage network should also mitigate pollution. As an additional measure, a pollution control valve will be built upstream of the basins prior to ensure that the receiving watercourses can be protected from pollution incidents. Table 8.6.4N3 in DMRB CG501 (Highways England, 2020c) details the mitigations and these will be finalised at Stage 5.

4.1.11. A grassed central reserve is proposed in at Stage 3 with a concrete v-channel proposed where the carriageway falls towards the centre reserve.

4.2. Drainage Design Parameters

4.2.1. The tables below set out the parameters to be used for the drainage design, in accordance with DMRB CG501 (Highways England, 2020c).

Table 4-1: Design

Storm Return Period	Item	Design Parameters
1 in 1 year *	Pipes Linear channel	No Surcharging
1 in 5 year *	Pipes Linear channel	No Flooding
1 in 100 year *	Outside of scheme boundary	No Flooding

*Climate change allowance included.

4.3. Attenuation

4.3.1. The table below sets out the attenuation volumes required for each network where a basin is required. The basin volumes have been maximised to allow the Stage 5 designer flexibility, allow for possible inclusion of water quality measures and meet invert levels required.

Table A.1 – Attenuation Basins

Network	Basin Type	Required Storage Volume (m3)	Approximate Storage Provided (m3)	100 year +CC Discharge Rate (l/s)	Outfall
E	Attenuation	150	1100	143.9	Mill Stream
F	Infiltration	950	1200	-	-
G	Attenuation	650	1100	115.7	River Nene
H+I	Attenuation	1550	2500	132.7	River Nene
J	Attenuation	450	750	117.7	Wittering Brook (River Nene)
L	Infiltration	1400	1600	-	-
P	Attenuation	500	950	134.0	Existing Drainage/unnamed watercourse

4.3.2. The table below sets out the online attenuation volumes required for each network where a basin is not required. The majority of these networks have oversized pipes and a flow control device restricting surface water flows to existing rates.

Table A.2 -Online Attenuation

Network	Type	Storage Volume (m3)	100 year Discharge Rate (l/s)	Assumed Outfall
A	Ø300mm		47.6	Mill Stream
B	Ø900mm		6.1	Mill Stream
D	Footprint of highway unchanged		106.6	Existing Drainage
K	Ø600mm		17.9	Mill Stream
M	Ø900mm		58.6	River Nene
N	Ø300mm		13.4	River Nene
Q	Footprint unchanged – Soakaway possible if required		-	-

4.4. Flooding

4.4.1. Flood compensatory storage is required where the highway encroaches of floodplain. Attenuation Basin J is required to be out of the floodplain as this is the only basin which is south of the A47.

4.5. Culverts

4.5.1. The piped culvert underneath the A1 requires extending to accommodate the widened carriageway. This has been determined from the TRIB03 Cross-section data drawing (HE551494-06).

4.5.2. The existing culvert beneath the A47 at the railway bridge will be demolished rather than extended. A new culvert (S04) conveying Wittering Brook is proposed and has an outfall from Attenuation Basin J downstream of its southern end.

4.6. Maintenance

4.6.1. The A47 drainage network is to be owned and maintained by Highways England. The majority of the side roads will be maintained by Peterborough County Council with the remaining section being maintained by Sacrewell Farm. The consultation with the maintainer should take place during detailed design as the design becomes fixed and the assets are confirmed. A 3m wide access track has been provided around the perimeter of the basins to allow for access.

4.6.2. The proposed basins should be fenced, and signage erected to deter unauthorised access. Where possible, the basins are access off network to reduce likelihood of unauthorised access.

4.6.3. The pollution control valves will have to be manually operated during a fuel spill to mitigate pollutants discharging into the groundwater and watercourses.

4.6.4. Routine drainage maintenance activities are expected to remove the sediment and pollutants prior to discharge to basin. If not, the drainage assets will have reduced performance and this should be communicated to the maintainer at detailed design.

4.7. Surface water quality

4.7.1. The combination of attenuation basins, infiltration basins, drainage ditches and filter drain are expected to provide a sufficient level of mitigation against pollution risks. Additional measures such as vortex separators may be required and this will be further analysed at Stage 5.

4.7.2. An assessment of pollution impacts from routine runoff to surface waters was undertaken using the Highways England Water Risk Assessment Tool (HEWRAT), as described in DMRB LA113 (Highways England, 2020b). The HEWRAT assessment uses information from the drainage design for the Proposed Scheme, the receiving local water environment and annual average daily traffic (AADT) data to establish potential impacts of pollutants in routine highway runoff, impacts of spillages from the Proposed Scheme upon the watercourses within the study area and the requirement for mitigation measures to adequately reduce the risk. The assessment shows that currently there is a negligible impact following dilution in the channel for both soluble and sediment-bound pollutants when the additional measures from the drainage design have been included. The results of this assessment are included in Volume 3, Appendix 13.3 Surface water quality assessment.

4.7.3. Water quality sampling was not required as it had been undertaken by the Environment Agency upstream of the Proposed Scheme on the River Nene at Wansford Bridge (Environment Agency, 2020). Results obtained indicate the average ambient background concentrations for copper in this reach of the River Nene is 0.14 µg/l for 2018 and 2019.

4.7.4. Drainage catchments A, B, D, E, Q and P are proposed to tie into the existing drainage for these areas. See drainage layout drawing HE551494-GTY-HDG-000-DR-CD-30008 in Appendix D. The existing drainage areas for both catchments have been estimated from the topography, measuring between the high points along the carriageway and show the majority of the drainage catchments are outside of the Proposed Scheme boundary. This will be confirmed once the drainage survey has been completed. Both drainage catchments have been assessed with and without the tie.

4.7.5. It was initially assumed drainage catchment N and M also ties in with existing drainage. However, due to lack of information and lack of evidence from virtual assessments using Google Earth street view, it is assumed this is no longer the

case as there are no roadside gullies. It is likely the road drainage currently drains off the kerb to the grassed verges. Due to this, the existing drainage area was not included in the assessment for this catchment.

4.7.6. A summary of the parameters used in the HEWRAT assessment can be found in Table 3.1.

Table 4.2 Parameters used in the HEWRAT assessment

Network	Discharge location	Proposed Scheme		Existing road area tie in (ha)	Total impermeable area (ha)	Required water quality mitigation	Proposed scheme mitigation
		Road Area	Green/verge Area				
ABDEQ	Mill Stream	1.345	0.8863	4.8	6.145	Not required	Filter drains, vegetated attenuation basin and penstock
G	River Nene	0.793	0.962	N/A	0.793	Not required	Filter drains, vegetated attenuation basin and penstock
H & I	River Nene	2.779	0.58	N/A	2.779	Not required	Filter drains, vegetated attenuation basin and penstock
J	Wittering Brook	0.941	0.312	N/A	0.941	Not required	Filter drains, vegetated attenuation basin and penstock
K	Mill Stream	0.12	0.123	N/A	0.12	Not required	Filter drains and penstock
N&M	Tributary of Wittering Brook	0.46	0.43	N/A	0.46	Not required	Filter drains and penstock
P	Unnamed watercourse	1.89	0.8313	3.738	5.628	Vegetated attenuation basin	Filter drains, vegetated attenuation basin and penstock
G, H and I(cumulative)	River Nene	3.572	1.542	N/A	3.572	Not required	Filter drains, vegetated attenuation basins and penstocks

4.7.7. A summary of the HEWRAT assessment for each outfall is provided below:

- Drainage catchment ABDEQ outfall passed the HEWRAT assessment (both with and without the existing drainage area) for soluble pollutants and sediment bound pollutants.
- Drainage catchment G outfall passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
- Drainage catchment H and I outfall passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
- Drainage catchment J outfall passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
- Drainage catchment K outfall passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
- Drainage catchment N and M outfall passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants with the inclusion of filter drains as a proposed measure. However, an alert was raised as it discharges into a watercourse which runs through Sutton Heath Bog Site of Special Scientific Interest (SSSI). In order to provide protection to the SSSI, a penstock will be included.
- Drainage catchment P123 outfall is part of a larger existing drainage catchment, where the majority of the drainage area (approximately 66%) and the outfalls are located outside of the Proposed Scheme boundary. Filter drains and vegetated ditches, as existing treatment measures, are currently in place within this drainage catchment area. The HEWRAT assessment was reviewed under baseline and proposed conditions:
  - The baseline assessment indicates that the outfall is failing for copper (EQS and acute) and sediment.
  - The proposed drainage catchment P123 including the existing catchment and existing treatment measures (filter drains and vegetated ditches) failed the HEWRAT assessment due to soluble pollutants (copper EQS and acute copper) and sediment bound pollutants. When a vegetated attenuation basin was included as proposed mitigation (on the P123 Proposed Scheme drainage catchment area only, which accounts for approximately 34% of the drainage catchment) in line with the proposed drainage design the outfall also failed, but only for copper (EQS and acute). Although the outfall is still failing once mitigation is included, it does show an improvement on the baseline which is currently failing for copper (EQS and acute) and sediment. Given there is an existing pollution risk identified at the existing outfall (where the majority of the drainage area and the outfall are outside of the Proposed Scheme boundary), the Proposed Scheme results in a reduction in pollutant loads, in turn, improving an already failing outfall.
  - P123 Proposed Scheme drainage catchment was assessed without the existing drainage area. The results indicated it passed the HEWRAT

assessment, both pre and post mitigation, confirming there is no impact from the Proposed Scheme on the already failing outfall.

4.7.8. A cumulative assessment was undertaken for catchments G, H and I as they are within 1km of each other. The outfalls passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.

4.7.9. Vegetated attenuation basins have also been included in the design for the catchments A, B, D, E, Q, G, H, I and J, in addition to the one that is required on catchment P123. There is also an intention in the proposed drainage design to provide filter drains. However, these are to be considered further during detailed design.

4.7.10. Assessment of pollution impacts from spillages using HEWRAT as described in Appendix D of DMRB LA113. The method initially estimates the risk of there being an incident causing the spillage of a potentially polluting substance somewhere on the length of road being assessed. It then calculates the risk, assuming a spillage has occurred, that the pollutant will reach and impact on the receiving watercourse. All outfalls passed this assessment with the results indicating all drainage areas would have <0.5% annual risk of pollution. The output from these assessments can be found in Volume 3, Appendix 13.3 (Surface water quality assessment).

4.8. Groundwater

4.8.1. Groundwater quality and runoff risk assessments were completed for all catchments containing filter drains and infiltration basins to assess the risk of impact upon groundwater quality from routine runoff. The assessment used the Highways England Water Risk Assessment Tool (HEWRAT) for groundwater, as described in DMRB LA113 (Highways England, 2020b).

4.8.2. Filter drains are proposed along the A1 – A47 eastbound slip road (catchments A, B, E and F), the A47 east and westbound (catchments F, H, I, J, L and P), the Sacrewell Farm access road (catchment K) and the Sutton Heath slip road and junction with the existing Sutton Heath Road (catchments L, M and N). Infiltration basins are also included in catchments F and L as the final point of discharge for road drainage.

4.8.3. Input parameters were derived from ground investigation data and publicly available information. These are in line with the conceptualisation outlined in Volume 3, Appendix 13.4 (Groundwater assessment). Where no information is available, for example along the Sutton Heath slip road (catchments L, M and N), worst case parameters have been used to give a conservative result. Results

are summarised in Table 3.2 and show that infiltration of untreated routine road runoff presents a medium risk to groundwater in all catchments. This is primarily due to the depth to the water table and low organic matter content in the unsaturated zone.

4.8.4. As the HEWRAT assessment for infiltration to ground produced a medium risk result, consultation was undertaken with the Environment Agency, in line with the assessment guidance. Initial consultation with the Environment Agency on 11 November 2020 focused on the infiltration basins, and the Environment Agency confirmed that their key concerns were as follows:

- That shallow groundwater levels may reduce the potential effectiveness of the infiltration basins, should groundwater mounding occur, for example
- Spillage containment should be included for the infiltration features

4.8.5. The potential effectiveness of the infiltration basins, in terms of infiltration capacity and potential for groundwater mounding was reviewed in Appendix 13.4 (Groundwater assessment). This found that groundwater mounding is unlikely to be issue directly below the infiltration basins due to the highly permeable nature of the underlying Lincolnshire Limestone Formation and river terrace deposits.

4.8.6. The use of filter drains requires review at detailed design stage, however, due to the following issues identified in Appendix 13.4 (Groundwater assessment):

- Shallow groundwater levels and groundwater mounding risk resulting in a reduction in the potential effectiveness of the filter drains in some catchments.
- A lack of groundwater monitoring and infiltration capacity information in catchments J, L, M and N.
- Filter drains in catchments M and N have the potential to discharge untreated road drainage into the Sutton Heath and Bog SSSI with limited potential for natural attenuation within the unsaturated zone.

4.8.7. Should no other solution be identified, the filter drains should be lined with an impermeable barrier to ensure that they can provide primary treatment without posing a risk of discharging untreated road drainage directly to groundwater. Where filter drains are required for subsurface drainage, road runoff should be isolated from the filter drains, and conveyed to the drainage system via carrier drains.

4.8.8. The risk to groundwater quality from spillage during operation of the Proposed Scheme was assessed using the methodology outlined in Appendix D of DMRB LA113 (Highways England, 2020b). Results from the spillage assessments completed for catchments discharging to infiltration basins are presented in Appendix 13.4 (Groundwater assessment) and show that the infiltration basins

passed the accidental spillage assessment with the results indicating that drainage area would have <0.5% annual risk of pollution.

Table 4.3 HEWRAT assessment results for road drainage to groundwater

Catchment	A	B	E	F	H	I	J	K	L	M	N	P
Traffic flow	<50,000	<50,000	<50,000	>50,000 & <100,000	<50,000	<50,000	<50,000	<50,000	>50,000 & <100,000	<50,000	<50,000	<50,000
Rainfall depth	<740mm (nearest rainfall site: Huntingdon)											
Drainage ratio	<50											
Infiltration method	Continuous	Continuous	Continuous	Region	Continuous	Continuous	Continuous	Continuous	Region	Continuous	Continuous	Continuous
Unsaturated zone	<5	>5	>5	>5	<5	<5	>5	<5	<5	<5	<5	<5
Flow Type	Flow dominated by fractures/ fissures	Flow dominated by fractures/ fissures	Flow dominated by fractures/ fissures	Flow dominated by fractures/ fissures	Flow dominated by fractures/ fissures	Mixed fracture and intergranular flow	Mixed fracture and intergranular flow	Flow dominated by fractures/ fissures	Mixed fracture and intergranular flow	Dominantly intergranular flow	Dominantly intergranular flow	Mixed fracture and intergranular flow
Unsaturated zone clay content	<1%	<1%	<1%	<15%	<1%	<15%	<15%	<1%	<1%	<1%	<1%	<15%
Organic Carbon	<1%	<1%	<1%	<1%	<1%	>1%	>1%	<1%	<1%	<1%	<1%	>1%
pH	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Risk score	200 **Medium**	185 **Medium**	185 **Medium**	205 **Medium**	180 **Medium**	175 **Medium**	175 **Medium**	180 **Medium**	210 **Medium**	165 **Medium**	165 **Medium**	175 **Medium**

5. Conclusion

5.1.1. The report is to support the Flood Risk Assessment for the A47 Wansford to Sutton upgrade.

5.1.2. The drainage strategy does not exceed the existing surface water discharge rates. Flow controls are required to ensure this and a climate change allowance of 20% has been allowed for across the scheme. The climate change allowance has been increased to 40% at attenuation areas.

5.1.3. Pollution mitigation measures have been proposed and are to be agreed with the various stakeholders at detailed design

5.1.4. Consultation shall continue throughout the life of the project, with the following statutory/governmental bodies: EA, PCC, Anglian Water, Wildlife Trust and Natural England.

5.1.5. The maintenance activities to mitigate pollution and to service the network are to be discussed at detailed design when the design becomes fixed.

6. References

- Environment Agency (2020) Water Quality Archive; R. Nene Wansford Old Rd.Br. Available at: https://environment.data.gov.uk/water-quality/view/sampling-point/AN-NENE550W, accessed December 2020
- Environment Agency (2021) Flood risk assessments: climate change allowances. Available online at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, accessed February 2021
- Highways England (2020a) Highways Agency Drainage Data Management System v5.12.0 (HADDMS). Available at: [redacted], accessed November 2020
- Highways England (2020b) Design Manual for Roads and Bridges LA113 Road Drainage and the Water Environment. Revision 1. Available at [redacted] accessed November 2020
- Highways England (2020c) Highways England Design Manual for Roads and Bridges CG501, Design of highway drainage systems. Revision 2. Available at [redacted], accessed November 2020.

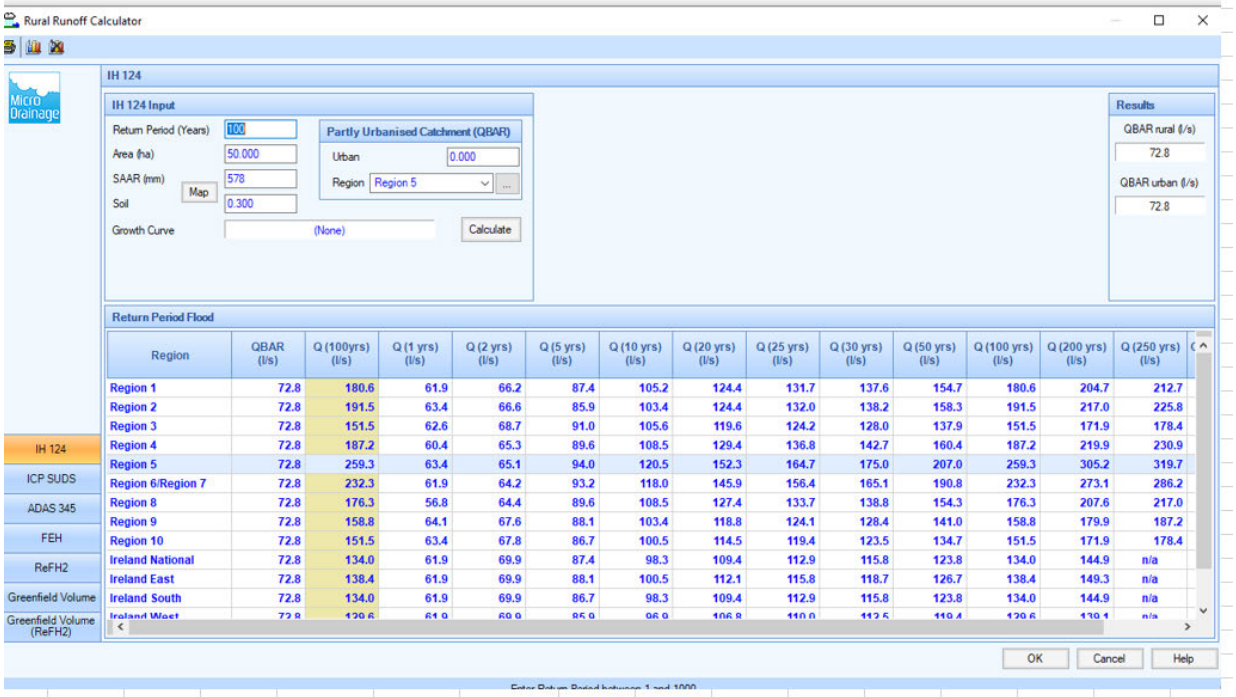
Appendix A. Greenfield calculations

Green Field Runoff Calculation

SAAR	600	From Map of MD model
R	0.45	From Map of MD model

IH 124 method

Area(ha)	Avg (l/s)	1 Yr greenfield (l/s)	5 Yr greenfield (l/s)	100 Yr greenfield (l/s)
50	72.8	63.4	94	259.3
1		**1.268**	**1.88**	**5.186**



Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (2 yrs) (l/s)	Q (5 yrs) (l/s)	Q (10 yrs) (l/s)	Q (20 yrs) (l/s)	Q (25 yrs) (l/s)	Q (30 yrs) (l/s)	Q (50 yrs) (l/s)	Q (100 yrs) (l/s)	Q (200 yrs) (l/s)	Q (250 yrs) (l/s)
Region 1	72.8	180.6	61.9	66.2	87.4	105.2	124.4	131.7	137.6	154.7	180.6	204.7	212.7
Region 2	72.8	191.5	63.4	66.6	85.9	103.4	124.4	132.0	138.2	158.3	191.5	217.0	225.8
Region 3	72.8	151.5	62.6	68.7	91.0	105.6	119.6	124.2	128.0	137.9	151.5	171.9	178.4
Region 4	72.8	187.2	60.4	65.3	89.6	108.5	129.4	136.8	142.7	160.4	187.2	219.9	230.9
Region 5	72.8	259.3	63.4	65.1	94.0	120.5	152.3	164.7	175.0	207.0	259.3	305.2	319.7
Region 6/Region 7	72.8	232.3	61.9	64.2	93.2	118.0	145.9	156.4	165.1	190.8	232.3	273.1	286.2
Region 8	72.8	176.3	56.8	64.4	89.6	108.5	127.4	133.7	138.8	154.3	176.3	207.6	217.0
Region 9	72.8	158.8	64.1	67.6	88.1	103.4	118.8	124.1	128.4	141.0	158.8	179.9	187.2
Region 10	72.8	151.5	63.4	67.8	86.7	100.5	114.5	119.4	123.5	134.7	151.5	171.9	178.4
Ireland National	72.8	134.0	61.9	69.9	87.4	98.3	109.4	112.9	115.8	123.8	134.0	144.9	n/a
Ireland East	72.8	138.4	61.9	69.9	88.1	100.5	112.1	115.8	118.7	126.7	138.4	149.3	n/a
Ireland South	72.8	134.0	61.9	69.9	86.7	98.3	109.4	112.9	115.8	123.8	134.0	144.9	n/a
Ireland West	72.8	129.6	61.9	69.9	85.9	96.9	106.8	110.0	112.5	119.4	129.6	139.1	n/a

Appendix B. Consultation

Environment Agency

Jacqueline Fookes
Mott Macdonald
East Wing
69-75 Thorpe Road
Norwich
NR1 1UA

Our ref: AN/2018/127282/02-L01
Your ref: EA/Wansford

Date: 05 June 2018

Dear Jacqueline

Planning advice for Wansford Peterborough

Thank you for accepting our offer to provide advice on this development covering

- A review of the Environmental Impact Assessment Scoping Report with particular emphasis on flood risk, drainage and water protection; and
- Attending a meeting with representatives from Highways England and Mott MacDonald Sweco.

We are providing our planning advice under our agreement no. ENVPAC/1/LNA/00004. The review has taken 11 hours and an invoice for £1100 will be issued in July.

Following the meeting held at our offices on Thursday 24 May 2018 we provide the following advice on the proposed development:

1.0 Flood Risk
1.1 Floodplain compensation
Parts of the site are adjacent to the River Nene and Wittering Brook designated `Main Rivers' and lie partly within a high risk flood zone (flood zone 3). It is important that there is no loss of floodplain as a result of the proposals and the Flood Risk Assessment (FRA) should provide further details on any raising or lowering of land within the floodplain. Any loss of floodplain should be compensated for on a level for level, volume for volume basis (i.e. re-grade the land at the same level as that taken up by the development) therefore providing a direct replacement for the lost storage volume.

The FRA will need to provide detailed information to demonstrate how this can be achieved. The location of any compensation works must relate hydraulically and hydrologically to the location of the site. The FRA must also confirm and provide detailed information of any temporary floodplain compensation that may be required for the works.

Further advice and guidance on the provision of floodplain compensation can be found in the Section A3.3.10 Compensatory Flood Storage of CIRIA Guide C624: Development and Flood Risk, guidance for the construction industry. We stipulate that

excavation of the compensation is complete before infilling commences to ensure that flood plain capacity is maintained during construction of the development.

Compensation schemes must conserve and where possible enhance the biodiversity value of a site. Where developers are providing compensatory storage close to normal river levels, we would encourage the creation or restoration of wetlands and any opportunities to improve the river corridor and add value to the landscapes character.

We do not hold flood level data from the model for the Wittering Brook or the Mill Stream. The flood zones for this area have been produced based on national scale generalised modelling and not from local scale detailed modelling. We are therefore unable to provide detailed information such as flood levels. The national scale generalised modelling covers all watercourses with a catchment greater than 3km^2.

1.2 Surface Water drainage
The Lead Local Authority (LLFA) (in this case Peterborough City Council) is responsible for commenting on all surface water drainage schemes. We therefore recommend that you contact the LLFA at your earliest convenience to discuss the surface water management scheme for this development.

For discharge into the River Nene (Main River), the discharge rate will be based on the calculated pre-development (Greenfield) runoff rate for the site. For a simple control structure this will be based on the QBAR rate. Complex discharge controls should reflect the original discharge or run-off rates from the site across the range of storm events. E.g. QBAR, 3.3% (1in30), 1% (1in100), 1% (1in100) plus climate change; OR they should only limit discharge for all events to the flow predicted by the QBAR event. Ultimately, there should be no increase in run off as a result of the development up to and including the 1% (1 in 100) event with an allowance for climate change.

1.3 Climate change
The FRA will need to take into account the effects of climate change on the development. Information relating to our new climate change guidance is available at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

1.4 Floodline Warnings Direct
During the meeting we discussed the possibility of you signing on to the Environment Agency's Floodline Warnings Direct Service for the construction phases of the works to ensure you have advanced warning of high flows within the River Nene. This would be by way of an Emergency Contacts Arrangement form. We are happy to provide you with this document nearer the time.

1.5 Environmental Permitting
Under the terms of the Environmental Permitting Regulations 2016, a permit or exemption may be required for any proposed works or structures, in, under, over or within 8m of the River Nene designated a 'main river'. For more information please visit https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

During the meeting we discussed our intention to incorporate the permit requirements into the future Development Consent Order.

2.0 Drainage
All of the advice provided in the following section is derived from modelled data and not empirical observations, so caution should be used.

2.1 Groundwater interactions with Mill Stream and Wittering Brook

We have a groundwater model which gives expected indicative interactions between groundwater and surface water, under different scenarios (wet, average and dry recharge conditions).

The model indicates the following:
Dry periods of rainfall:

- Stream flow in Mill Stream is around 0.5-5 Ml/d, with a very small baseflow contribution from groundwater of around <0.1 Ml/d.
- Stream flow in Wittering Brook is higher, >5 Ml/d, but again the baseflow contribution is very small, <0.1 Ml/d.

Average periods of rainfall:

- Stream flow in Mill Stream is around 5-50 Ml/d, with a small baseflow contribution from groundwater of around <0.5 Ml/d.
- Stream flow in Wittering Brook is higher, >50 Ml/d, but again the baseflow contribution is small, <0.5 Ml/d.

Wet periods of rainfall:

- Stream flow in Mill Stream is around >50 Ml/d, with a more baseflow contribution from groundwater, up to 1 Ml/d.
- Stream flow in Wittering Brook is also >50 Ml/d, but again the baseflow contribution is small, <0.5 Ml/d.

There doesn't seem to be any condition where we would expect the watercourses to loose water to ground. Vertical flow volumes under all recharge scenarios supports this data, showing a small amount of upward leakage from both the superficial deposits (where present) and also from the bedrock into the superficial deposits along the watercourse routes. The model confirms that groundwater level should be close to the ground level, as expected and stated in the Environmental Impact Assessment Scoping Report.

2.2 Hydrogeological requirements of Sutton Heath Bog

The Bog appears to sit directly on Lincolnshire Limestone outcrop, with no drift deposits. The limestone outcrop gives way to the underlying Grantham Formation and Whitby Mudstone to the western boundary of the Bog. Our groundwater model doesn't give any indication of vertical leakage from the Limestone to the bog, but stream leakage indicates that the direction of water flow is likely to be downward, i.e. infiltrating into the Limestone. Under wet conditions, up to 1 Ml/d may infiltrate into the limestone in the area of the Bog. The infiltration volumes become negligible in dry scenarios, because they are entirely dependent on effective rainfall (i.e. the rainfall which infiltrates, so total rainfall minus evapotranspiration and other losses such as runoff). Limestone is quite permeable so is likely to allow rapid infiltration.

The Bog sites on sloping ground, with several springs emerging within it from the base of the limestone outcrop where it meets the less permeable Grantham Formation/Whitby Mudstone. This is further evidence of the higher permeability of the limestone – rainfall appears to infiltrate at higher elevations to the east and emerge again downslope within the bog, heading westwards. These springs or seepages, which feed into Wittering Brook, are likely to be important features within the Bog.

There are three groundwater monitoring points within Sutton Heath Bog. It is our understanding that you already hold this data. This data will help in interpreting groundwater/surface water interactions. We are unable to provide a definitive response

on the hydrogeological requirements of the Bog, but would surmise that it appears to be entirely rainfall-dependent. Rainfall will rapidly infiltrate and re-emerge downslope with little residence time.

2.3 HAWRAT Assessment (Q95 flow)
Natural Q95 flow data for the area is contained in the CAMS Ledger and is as follows:

- Wansford at grid ref 508124, 299560 – 111.5Ml/d (Natural flow)
- Orton Lock at grid ref 516603, 297215 – 120.6 Ml/d (Natural flow)

Unfortunately we don't have Q95 values for the Mill Stream or Wittering Brook.

There is some information on the National River Flow Archive that may be useful [redacted]

2.4 Gauging station
To ensure that the development does not impact on the existing gauging station measurements, we advise that an unaltered channel is protected all the way up to the A1 road bridge (approximately 450 meters upstream of the gauge).

Please note, this response is based on the information you have made available at this time. It is based on current national planning policy, associated legislation and environmental data/information.

3.0 Water Framework Directive
The effects of the proposed development on Water Framework Directive (WFD) water bodies will need to be considered. In particular, the impacts on the River Nene and Wittering Brook. The development must not result in a deterioration of a water body or failure to meet WFD objectives.

We have some reservations that road drainage from the existing carriageway is not to be upgraded during the development and that surface water will enter the River Nene without passing through interceptors. Justification will need to be provided as to why this is not considered a pollution risk.

Investigation into improving fish, eel and otter passage through the existing A47 culvert should also be carried out. This work would ties into the improved culvert design that is to be installed under the new carriageway.

We are investigating potential WFD related mitigation and environmental enhancement opportunities within the area and will provide this to you when we have more information.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours faithfully

Jennifer Moffatt
Sustainable Places Planning Adviser

[redacted]

Peterborough City Council

Howcroft, Jack

From: Drainage <Drainage@peterborough.gov.uk>
Sent: 11 December 2020 17:42
To: Howcroft, Jack
Cc: Craig Campbell; Joely Norris; Murrell, Matthew; Cano Munoz, Sheila; Pickering, Jack
Subject: Re: A47 Wansford to Sutton Dualling Scheme - Drainage

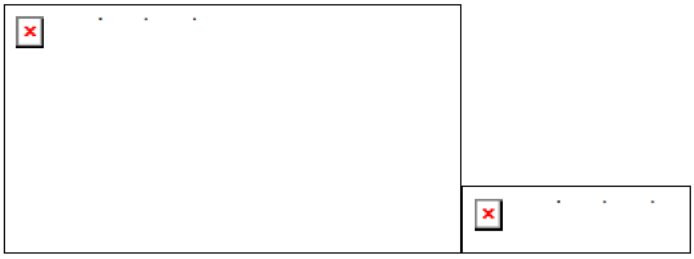
Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jack,

Thank you for your email and providing the additional information. If at any stage, you need to get in touch with our team again then please feel free to drop us another email.

Kind regards,
Joely Norris

Sustainable Drainage Team
Peterborough City Council
Dodson House
Fengate
Peterborough, PE1 5XG
01733 747474
drainage@peterborough.gov.uk



To find out more about Sustainable Drainage please go [redacted]

From: Howcroft, Jack [redacted]
Sent: 10 December 2020 16:58
To: Drainage <Drainage@peterborough.gov.uk>
Cc: Craig Campbell [redacted]; Joely Norris [redacted] Murrell, Matthew [redacted] Cano Munoz, Sheila [redacted]; Pickering, Jack [redacted]
Subject: RE: A47 Wansford to Sutton Dualling Scheme - Drainage

Hi Joely,

Thanks for the comments. We are currently at preliminary design (Stage 3) another designer will be taking on the project at (Stage 5) detailed design. At Stage 5 I would expect the discharge rates to be confirmed and the design to be finalised.
I will make sure that these comments are captured in the Drainage Strategy Report that is passed onto the Stage 5 designer.

Stage 5 is programmed for September 2022 and I would expect further correspondence from the Stage 5 designer. As this is an outline design, at this stage we are responsible to determine the strategy.

I expect that the third general bullet point will be addressed when the drainage survey is carried out. This will also allow the detailed design to determine the existing catchments and how the existing outfalls can be maintained.
Kind regards,

Jack Howcroft CEng MICE
Senior Engineer
Leeds
[redacted]

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Leeds, LS7 4DN
+44 113 262 0000
[redacted]

[redacted]

From: Drainage <Drainage@peterborough.gov.uk>
Sent: 04 December 2020 13:18
To: Howcroft, Jack [redacted]
Cc: Craig Campbell [redacted]>; Joely Norris [redacted] Murrell, Matthew [redacted]; Cano Munoz, Sheila [redacted]; Pickering, Jack [redacted]
Subject: Re: A47 Wansford to Sutton Dualling Scheme - Drainage

Hi Jack,

Thanks for your email and providing the information to address our queries; Craig and I have had a discussion in regards to this and the attachments showing the proposed drainage network plans, and we would have the following points to make which would need to be considered and /or addressed at the detailed design stage.

Firstly, in relation to the information in your email;

1. We note that the drainage survey of the existing system hasn't been completed to date, as such will any of the existing outfalls be retained or will this be removed completely and a new positive system be put in place as per the attached plans.
2. When is Stage 5 (detailed design) proposed to begin and currently which stage are you working in?
3. I note the table that you have provided, however we need to see more information on this which would include but is not limited to; a breakdown of the catchment area for each network (proposed and existing), details of how all run off rates have been calculated and hydraulic calculations to demonstrate that all networks will be able to attenuate flows for up to and including the 1 in 100-year storm event plus the climate change allowance.

Craig and I also spent some time looking at the attached plans, we understand that this scheme is a work in progress but we have the following comments which I have broken down into smaller lists for ease of reference.

Sheet 1 and 2

1. Network A is shown to be restricted by a flow control device, as such we need confirmation of how and where flows will be attenuated for up to the 1 in 100yr rainfall event + CC allowance and how much storage is required and provided as part of this system.
2. Network D - as we understand it there is an existing system on this junction and no changes are proposed to this section of road, if this is correct then the network (D1-D7) need to be eliminated from the drawing.

Sheet 3

1. Clarification is required of the ownership of the link road (South of the A47 that serves as an access to Sacrewell Farm and then ties into the roundabout.
2. Infiltration basin F - ground investigation information and infiltration test results need to be provided, which should also include the levels of the water table.
3. Clarification is needed to understand how the access road to Sacrewell Farm will function e.g. bridge or box structure. As well as how confirmation of how the proposed drainage will function as a result, as currently this is unclear.
4. Network B - A manhole is required at the head of the system, upstream of B1.
5. Network F - manhole F12 could discharge to F9 instead of F17 as this may save the need for a bigger length of carrier drain needing to be put in.
6. Network F - it appears from the drawing that the kerb drain system that serves the roundabout does not have a connection to the rest of network F. Should this be amended it would be logical to connect this to network G (F23 to G23 and F24 to G21).
7. System G - the proposed filter drain that crosses the junction between manhole G3 and G4, should be changed to a carrier drain.
8. Network K - where will this system discharge? Drainage survey is required to understand the condition, size, capacity and ownership of any existing system. Further investigation is needed to understand how said existing system discharges (i.e discharge to watercourse/soakaway, etc).

Sheet 4

1. Network H - Clarification of the need for the carrier drain between manholes H5-H8.
2. Attenuation H/I - Clarification of where the flow control device is located.
3. Network I - Clarification of the need for the carrier drains between manholes I13-I2 and I15-I15, and also clarification of the need for the carrier drain across the carriageway (I10-I18).
4. Network J - where does the ditch north of the A47 discharge to? A drainage survey is required to understand the condition, size, capacity and ownership of any existing system. Further investigation is needed to understand how said existing system discharges (i.e discharge to watercourse/soakaway, etc).

Sheet 5

1. Network M - In relation to the proposed outfall at manhole M21, as we understand it this existing drain is in a poor condition / now non-existent due to cattle occupying the adjacent field. As such we would be cautious of a positive system discharging into said ditch. As stated on the drawing a drainage survey will be required.
2. Network N - In relation to the proposed outfall at manhole N4, a drainage survey is required as we are not aware of any existing positive drainage system on Sutton Heath Road.

Sheet 6

1. Infiltration basin L - ground investigation information and infiltration test results need to be provided, which should also include the levels of the water table.
2. In relation to the proposed new road north of the roundabout and the associated culvert, if these were intended to be offered for adoption to the Local Highways Authority, then we would recommend that you get in touch with the PCC's Highway Control team regarding this.
3. Network P - we note the drawing references a connection into S11 or to continue along side road, as such we require clarification of what this refers to.

Sheet 7

1. In relation to the continuation of Peterborough Road, if these were intended to be offered for adoption to the Local Highways Authority, then we would recommend that you get in touch with the PCC's Highway Control team regarding this.
2. Attenuation basin P - shows two outfalls and one does not have a clear discharge point (located between P20 and P21), as such we require clarity on where and how this will discharge.
3. Network P - we require clarification of where the proposed outfalls discharge to, which includes manholes P21, P22, P58 and P60. A drainage survey is required to understand the condition, size, capacity and ownership of any existing system. Further investigation is needed to understand how said existing system discharges (i.e discharge to watercourse/soakaway, etc).
4. In relation to the proposed outfall at manhole P58, as we understand it the majority of Peterborough does not have a positive drainage system. As such a drainage survey will be required to understand the condition, size, capacity and ownership of any existing system. Further investigation is needed to understand how said existing system discharges (i.e discharge to watercourse/soakaway, etc).
5. We query the need for the filter drain and proposed drainage ditch alongside each other.
6. Clarification is needed regarding the purpose of the black could surface water drains, e.g. from P9 to P18.
7. Wildlife pond, is this proposed or existing? If this were to be a new pond or any changes proposed then we would recommend getting in contact with PCC's Wildlife Officer.

I appreciate that this is an extensive list, so if you wished to discuss this further or had any questions then please feel free to let us know and we'd be happy to arrange another Microsoft Teams meeting with you.

Kind regards,
Joely Norris

Sustainable Drainage Team
Peterborough City Council
Dodson House
Fengate
Peterborough, PE1 5XG
01733 747474
drainage@peterborough.gov.uk

To find out more about Sustainable Drainage please go [redacted]

From: Howcroft, Jack [redacted]
Sent: 23 November 2020 16:26
To: Drainage <Drainage@peterborough.gov.uk>
Cc: Craig Campbell [redacted]>; Joely Norris [redacted]
Murrell, Matthew [redacted]>; Cano Munoz, Sheila [redacted] Pickering, Jack [redacted]
Subject: RE: A47 Wansford to Sutton Dualling Scheme - Drainage

Howcroft, Jack

From: Howcroft, Jack
Sent: 23 November 2020 16:26
To: Drainage
Cc: Craig Campbell; Joely Norris; Murrell, Matthew; Cano Munoz, Sheila; Pickering, Jack
Subject: RE: A47 Wansford to Sutton Dualling Scheme - Drainage
Attachments: HE551494-GTY-HDG-000-DR-CD-30003.pdf; HE551494-GTY-HDG-000-DR-CD-30004.pdf; HE551494-GTY-HDG-000-DR-CD-30005.pdf; HE551494-GTY-HDG-000-DR-CD-30006.pdf; HE551494-GTY-HDG-000-DR-CD-30007.pdf; HE551494-GTY-HDG-000-DR-CD-30001.pdf; HE551494-GTY-HDG-000-DR-CD-30002.pdf

Hi,

Thanks for the call this morning to discuss the points below.
I have attached the Draft drainage drawings which are still WIP but very close to being finalised and show the strategy proposed.

As discussed we are proposing to restrict the proposed development to existing SW discharge rates. The betterment will be generated by restricting the flows through flow control devices whereas previously they are assumed to freely discharge.
Due to the lack of existing drainage survey we have been unable to identify existing outfall locations as so new locations have been proposed. It is anticipated that the survey data will be reviewed at Stage 5 (detailed design).

See table below for limiting discharge rates to Mill Stream and Wittering Brook

TABLE: Calculated

Network	Total Catchment (ha)	1 in 1 year Discharge rate (l/s)	1 in 5 year Discharge rate (l/s)	1 in 100 year Discharge rate (l/s)	Outfall
A	0.4	15.2	23.8	47.8	Mill Stream
B	0.4	1.8	2.8	6.1	Mill Stream
E	0.6	20.2	31.8	63.7	Mill Stream
K	0.2	5.6	8.8	17.9	Unnamed Watercourse
J	1.2	11.3	17.7	36.9	Wittering Brook
M	0.7	18.5	29.0	58.6	Unnamed Watercourse
N	0.1	4.2	6.7	13.4	Unnamed Watercourse
P	2.9	152.8	240.4	480.0	Unnamed Watercourse

Note: Discharge rates vary due to proportion of existing carriageway within catchments

As discussed the attenuation climate change allowance value of 40% has been designed to. The gullys make up a small fraction of the proposed drainage design as shown on the attached plans. The majority of the drainage is carrier/filter drain which is acceptable.

On the points below I have provided response as discussed on the call.

- Means of access for the maintenance of the proposed basins and any other drainage assets would need to be considered as a priority. Access will be provided to HE to maintain all basins in the form of access tracks which will allow drainage vehicles for activities such as silt removal etc.
- Myself and my colleague Craig Campbell (cc'd) recently attended a meeting with Sweco on Tuesday 17th November to discuss the proposals of culverting the A47 as part of this scheme. It was stated that there would be no surface water discharged into Mill Stream, whereas I see that your email states the opposite, as such we would need clarification on this. Additionally, we would need to understand what the flows rates and volumes will be for each outfall and its contributing system and catchment, and details of the locations of said outfalls. See attached plans and table above – as described on the phone call it is assumed due to the road levels that the highway currently discharges to Mill Stream.
- Clarification of what looks like additional culverts on the attached Drainage Catchment Plan. Additional culverts proposed have been removed in some locations but have been proposed where an outfall to the River Nene is required.
- A condition survey of the Mill Stream and Wittering Brook would be required to ensure that both are free flowing and to provide details of any existing assets / structures. It is anticipated that this is picked up at Stage 5 and this will be recorded in the Drainage Strategy report passed on to the Stage 5 designer.

Kind regards,

Jack Howcroft CEng MICE
Senior Engineer
Leeds
[redacted]

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+44 113 262 0000
[redacted]

[redacted]

From: Drainage <Drainage@peterborough.gov.uk>
Sent: 19 November 2020 14:24
To: Howcroft, Jack [redacted]
Cc: Craig Campbell [redacted]>; Joely Norris [redacted]
Subject: Re: A47 Wansford to Sutton Dualling Scheme - Drainage

Good afternoon Jack,

Thank you for your email, which has been forwarded onto our team.

Overall, we have no major concerns with the proposals that you have outlined. However, it should be noted that we would expect to see betterment provided in relation to the proposed runoff rates. So, where the runoff rate is being calculated for the existing impermeable areas, we would expect to see the runoff rate set to greenfield or betterment provided unless this is physically not possible, with an explanation / evidence to demonstrate this.

In relation to the climate change allowance, we would expect to see the scheme and the attenuation and infiltration basin set at a 40% climate change allowance.

Additionally, we would look to see gullies avoided in the drainage design where possible and SuDS systems prioritised to drain the carriageway. The use of carrier / filter drains as per your email would be acceptable and in principle, we would have no concerns with them being used.

I understand that currently you are in the process of undertaking the drainage design for the scheme and as such I wanted to highlight some key points that would need to be considered:

- Means of access for the maintenance of the proposed basins and any other drainage assets would need to be considered as a priority.
- Myself and my colleague Craig Campbell (cc'd) recently attended a meeting with Sweco on Tuesday 17th November to discuss the proposals of culverting the A47 as part of this scheme. It was stated that there would be no surface water discharged into Mill Stream, whereas I see that your email states the opposite, as such we would need clarification on this. Additionally, we would need to understand what the flows rates and volumes will be for each outfall and its contributing system and catchment, and details of the locations of said outfalls.
- Clarification of what looks like additional culverts on the attached Drainage Catchment Plan.
- A condition survey of the Mill Stream and Wittering Brook would be required to ensure that both are free flowing and to provide details of any existing assets / structures.

Please let us know if you have any questions or require any further information.

Kind regards,
Joely Norris

Sustainable Drainage Team

Peterborough City Council

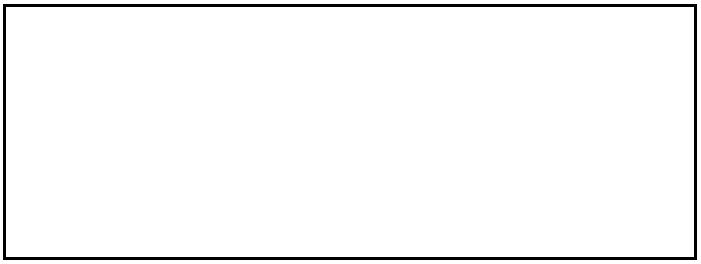
Dodson House

Fengate

Peterborough, PE1 5XG

01733 747474

drainage@peterborough.gov.uk



To find out more about Sustainable Drainage please go to [redacted]

From: Nick Greaves [redacted]
Sent: 12 November 2020 15:58
To: Drainage <Drainage@peterborough.gov.uk>
Subject: FW: A47 Wansford to Sutton Dualling Scheme - Drainage

Afternoon guys,

Please see below. Are you able to review and respond?

Regards,

Nick Greaves
Principal Engineer
Highway Control Team
Peterborough City Council
Dodson House
Fengate
Peterborough
PE1 5XG
[redacted]

From: Lewis Banks
Sent: 12 November 2020 15:41
To: Howcroft, Jack [redacted]; Nick Greaves [redacted]
Cc: Cano Munoz, Sheila [redacted]>
Subject: Re: A47 Wansford to Sutton Dualling Scheme - Drainage

Hi Jack

Apologies for the delay on this. My colleague Nick who's copied in will be able to assign this to a colleague in his team to review.

Kind regards

Lewis Banks
Principal Sustainable Transport Planning Officer
Transport and Environment Team
Place and Economy
Peterborough City Council
Sand Martin House
Bittern Way

Fletton Quays
Peterborough
PE2 8TY
[redacted]

To find out more about Peterborough City Council please go to:
www.peterborough.gov.uk or visit [redacted]

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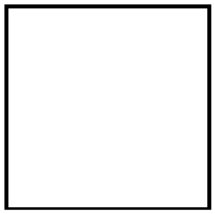

From: Howcroft, Jack [redacted]
Sent: 14 October 2020 14:23
To: Lewis Banks [redacted]
Cc: Cano Munoz, Sheila [redacted]; Murrell, Matthew [redacted]>; Andrew Dudley [redacted]; Rebecca Casa-Hatton [redacted]>; Lee Moore [redacted] Janet MacLennan [redacted]
Subject: RE: A47 Wansford to Sutton Dualling Scheme - Drainage

Apologies for the mass email, however I want to ensure that the email below gets to the right person at PCC.

I have previously sent the email below regarding drainage on the A47 Wansford scheme.

Please can you forward on to the correct person at the LLFA if this has not already occurred.

Kind regards,

Jack Howcroft CEng MICE
Senior Engineer
Leeds
[redacted]

Sweco UK Limited
Grove House
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+44 113 262 0000
[redacted]

SWECO

[redacted]

From: Howcroft, Jack
Sent: 07 October 2020 15:09
To: [redacted]
Cc: Cano Munoz, Sheila [redacted]>; Murrell, Matthew [redacted]
Subject: A47 Wansford to Sutton Dualling Scheme - Drainage

Hi Lewis,

Apologies if you have previously been contacted regarding the A47 Wansford to Sutton dualling scheme regarding the drainage design.
I have recently taken over the project and been tasked with undertaking the Stage 3 (preliminary) drainage design for the highway.
WIP drainage catchment plan attached for the scheme.

Liaison with the EA has taken place at an earlier stage as shown below.

1.2 Surface Water drainage
The Lead Local Authority (LLFA) (in this case Peterborough City Council) is responsible for commenting on all surface water drainage schemes. We therefore recommend that you contact the LLFA at your earliest convenience to discuss the surface water management scheme for this development.

For discharge into the River Nene (Main River), the discharge rate will be based on the calculated pre-development (Greenfield) runoff rate for the site. For a simple control structure this will be based on the QBAR rate. Complex discharge controls should reflect the original discharge or run-off rates from the site across the range of storm events. E.g. QBAR, 3.3% (1in30), 1% (1in100), 1% (1in100) plus climate change; OR they should only limit discharge for all events to the flow predicted by the QBAR event. Ultimately, there should be no increase in run off as a result of the development up to and including the 1% (1 in 100) event with an allowance for climate change.

The scheme is to be designed to the DMRB as it is a Highway England scheme. The strategy is to collect the surface water run-off generated primarily by combined carrier/filter drainage and gullys.
The networks then discharge to existing drainage ditches or via new drainage ditches where the alignment has widened. These flows ultimately discharge to the River Nene and the Mill Stream, often being attenuated in storage ponds prior to outfalling, to ensure that the discharge rate does not increase beyond existing rates.

Due to limited survey information at this stage the outfalls and network connectivity are not fully understood. The drainage strategy adopted is to not increase the run-off discharging to the watercourse as a result of the development. A greenfield run-off rate has been calculated where the scheme increases the impermeable area and widens into greenfield. For those areas that are currently hardstanding, and therefore discharge at existing rates, a brownfield rate has been calculated to ensure that overall the net discharge rate does not increase.

A climate charge allowance has been allowed for of 20% across the scheme and a 40% climate change allowance is designed into the attenuation basins and infiltration basins.

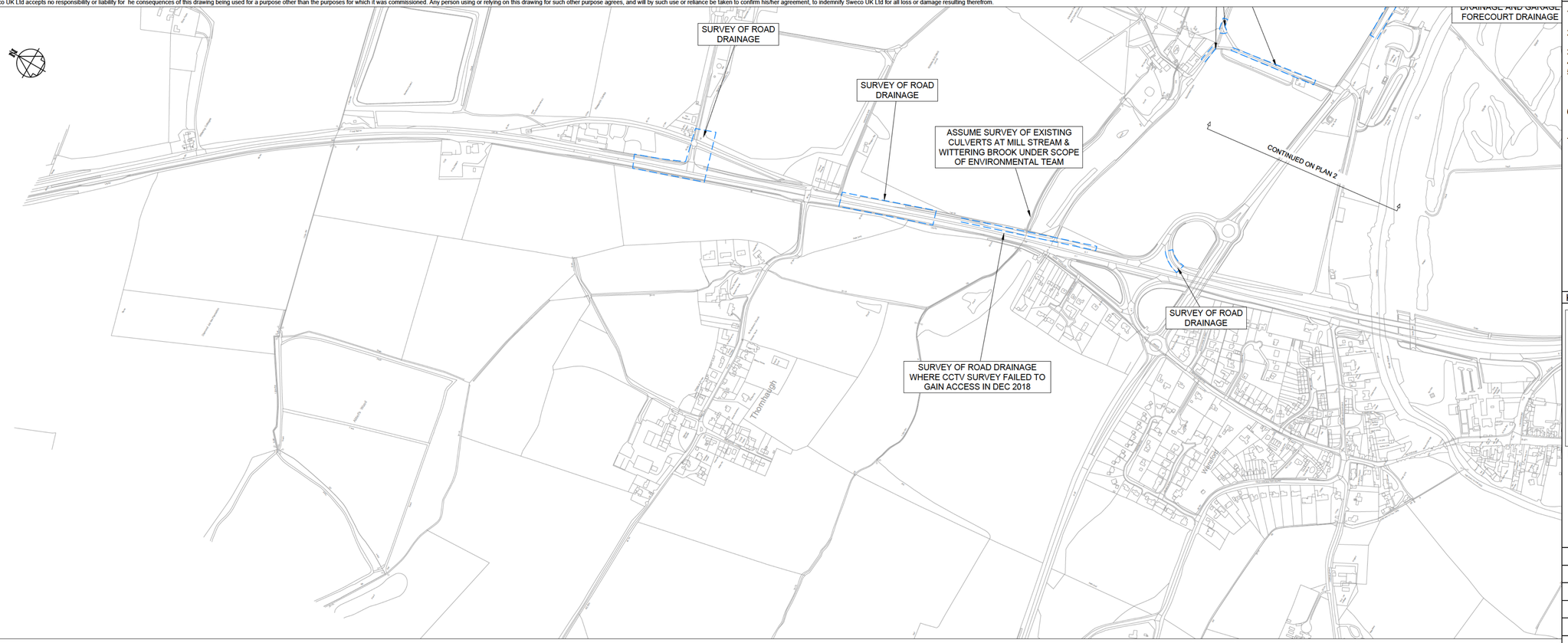
Can you confirm as the LLFA that the strategy outlined is acceptable?
If you want to discuss the drainage design further please give me a call, my contact details are below.

Kind regards,

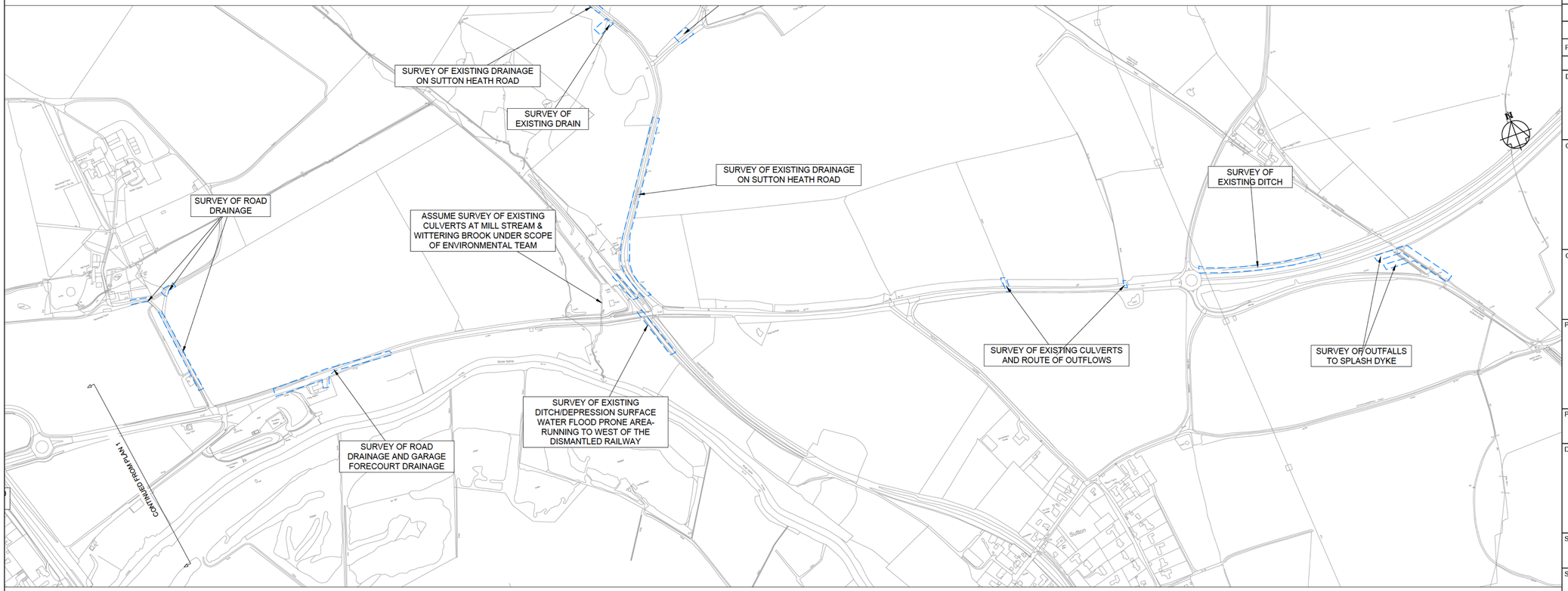
Jack Howcroft CEng MICE
Senior Engineer
Leeds

Sweco UK Limited
Grove House
Mansion Gate Drive

Appendix C. Additional Drainage Survey



PLAN 1



PLAN 2

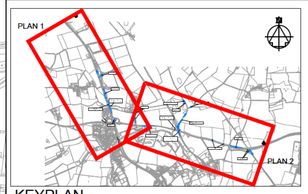
1:5000 0 250m 500m

NOTES

1. DO NOT SCALE FROM THIS DRAWING. IN CASE OF DOUBTS, OMISSIONS OR ERRORS SURVEY ADVISOR.
2. THIS DRAWING SHALL ONLY BE USED FOR THE DESIGN ELEMENT STATED IN THE DRAWING TITLE.
3. ONLY WRITTEN DIMENSIONS SHALL BE USED.
4. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
5. THIS DRAWING IS PROVIDED FOR INDICATIVE PURPOSES ONLY AND IS BASED ON DATA COLLECTED FROM A NUMBER OF SOURCES. ITS ACCURACY IS NOT GUARANTEED. ALL PARTIES SHOULD SATISFY THEMSELVES TO ITS ACCURACY WHERE NECESSARY.
6. THIS SURVEY IS TO BE UNDERTAKEN WITH REFERENCE TO HE551494-GTY-VTO-000-SP-VT- 30001 TOPOGRAPHICAL SURVEY SPECIFICATION.
7. NO ACCESS TO BE TAKEN ONTO PRIVATE LAND WITHOUT WRITTEN PERMISSION FROM THE SURVEY ADVISOR.

DRAFT

KEY TO SYMBOLS



KEYPLAN

– – – – – – – – REQUIRED TOPOGRAPHICAL SURVEY AREA

REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER
SWECO

CONTRACTOR
GallifordTry

CLIENT
highways england

PROJECT TITLE
A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE
PCF STAGE 3

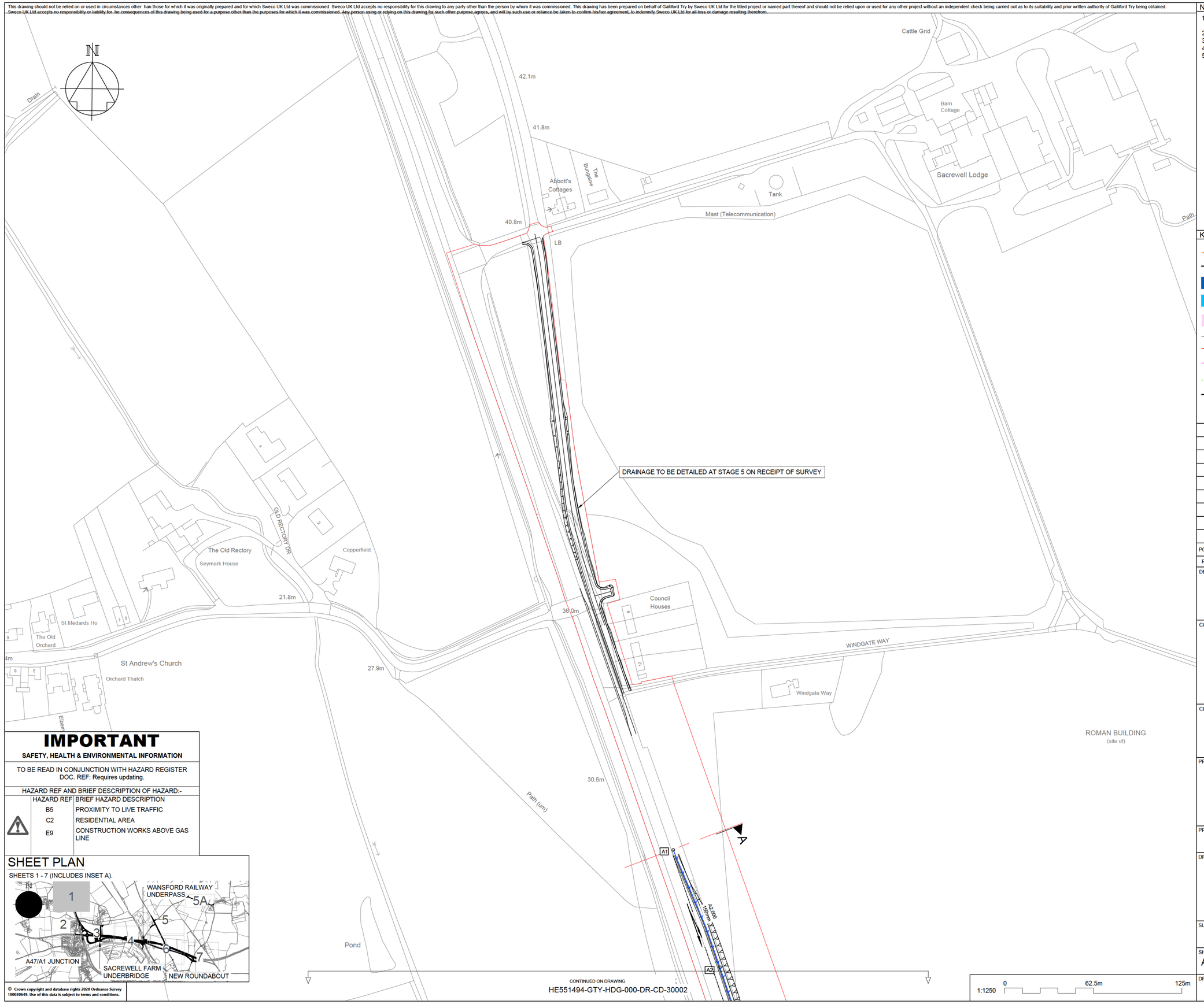
DRAWING TITLE
TOPOGRAPHICAL SURVEY AREA

SUITABILITY
WORK IN PROGRESS

SHEET SIZE	SCALE	STATUS	REVISION
A1	1:5000	S0	P01.01

DRAWING NUMBER
HE551494-GTY-VDS-000-DR-VT-30001

Appendix D. Drainage Drawings



IMPORTANT

SAFETY, HEALTH & ENVIRONMENTAL INFORMATION

TO BE READ IN CONJUNCTION WITH HAZARD REGISTER
DOC. REF: Requires updating.

HAZARD REF AND BRIEF DESCRIPTION OF HAZARD:-

HAZARD REF	BRIEF HAZARD DESCRIPTION
B5	PROXIMITY TO LIVE TRAFFIC
C2	RESIDENTIAL AREA
E9	CONSTRUCTION WORKS ABOVE GAS LINE

SHEET PLAN

SHEETS 1 - 7 (INCLUDES INSET A).

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KEY TO SYMBOLS

- DRAINAGE DITCH
- CLEAN WATER OUTFALL TO SOAKWAY
- ATTENUATION BASIN
- INFILTRATION BASIN
- FLOOD STORAGE BASIN
- GULLY/CKDU OUTFALL
- DCO BOUNDARY
- CKDU KERB SPLAY
- CKDU KERB HALF BATTER
- DECK DRAINAGE
- FILTER DRAIN
- ROAD CARRIER DRAIN
- CONCRETE SURFACE WATER CHANNEL
- CONCRETE SURFACE WATER CHANNEL & CARRIER DRAIN
- CULVERTS
- OUTFALL DRAIN
- GULLY
- MANHOLE
- HEADWALL

REV	DATE	REVISION NOTE	ORG	CHKD	APP'D
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER: SWECO

CONTRACTOR: GallifordTry

CLIENT: highways england

PROJECT TITLE: A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN
SHEET 1 OF 7

SUITABILITY: WORK IN PROGRESS

SHEET SIZE	SCALE	STATUS	REVISION
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DRAWING NUMBER: HE551494-GTY-HDG-000-DR-CD-30001

1:1250 0 62.5m 125m

CONTINUED ON DRAWING
HE551494-GTY-HDG-000-DR-CD-30002

N

FB
1.22m RH
1.22m RH
Def
Cs
Pond
Ky-Ln
23.5m
A2
A2.001 150mm
A3
A2.002 150mm
A4
A2.003 225mm
A2.004 300mm
A5
LP
A6
B2
B1.004 300mm
B1.003 300mm
B2.000 600mm
B1.002 300mm
B11
B3
B1.001 525mm
B1.000 600mm
B1
FLOW CONTROL DEVICE POLLUTION CONTROL VALVE
FLOW CONTROL DEVICE POLLUTION CONTROL VALVE
Dtl
24.1m
OLD NC
A 1
A 1
THACKERS CLOSE
29.9m
WANSFORD WEST ROUNDABOUT
MP
A 1
DRAINAGE TIE IN SURVEY REQUIRED ON RECEIPT OF DRAINAGE SURVEY AT STAGE 5
WESTERN SECTION OF EASTBOUND CARRIAGEWAY OF LINK TO BE UPGRADED FROM 1 TO 2 LANES
D
D3
D1.001 150mm
D2
D1.000 150mm
D1
HP
Subway
A47
A 47
ROBINSWOOD
Black Swan Hill
34.1m
BLACK SWAN SPINNEY
ORTH ROAD
CONTINUED ON DRAWING
HE551494-GTY-HDG-000-DR-CD-30003

1:1250 0 62.5m 125m

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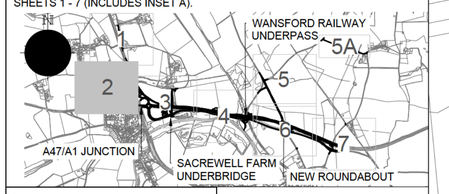
C2	RESIDENTIAL AREA
E9	CONSTRUCTION WORKS ABOVE DRAINAGE SEWER

SHEET PLAN

SHEETS 1 - 7 (INCLUDES INSET A).



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REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER: SWECO

CONTRACTOR: GallifordTry

CLIENT: highways england

PROJECT TITLE: A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN
SHEET 2 OF 7

SUITABILITY: WORK IN PROGRESS

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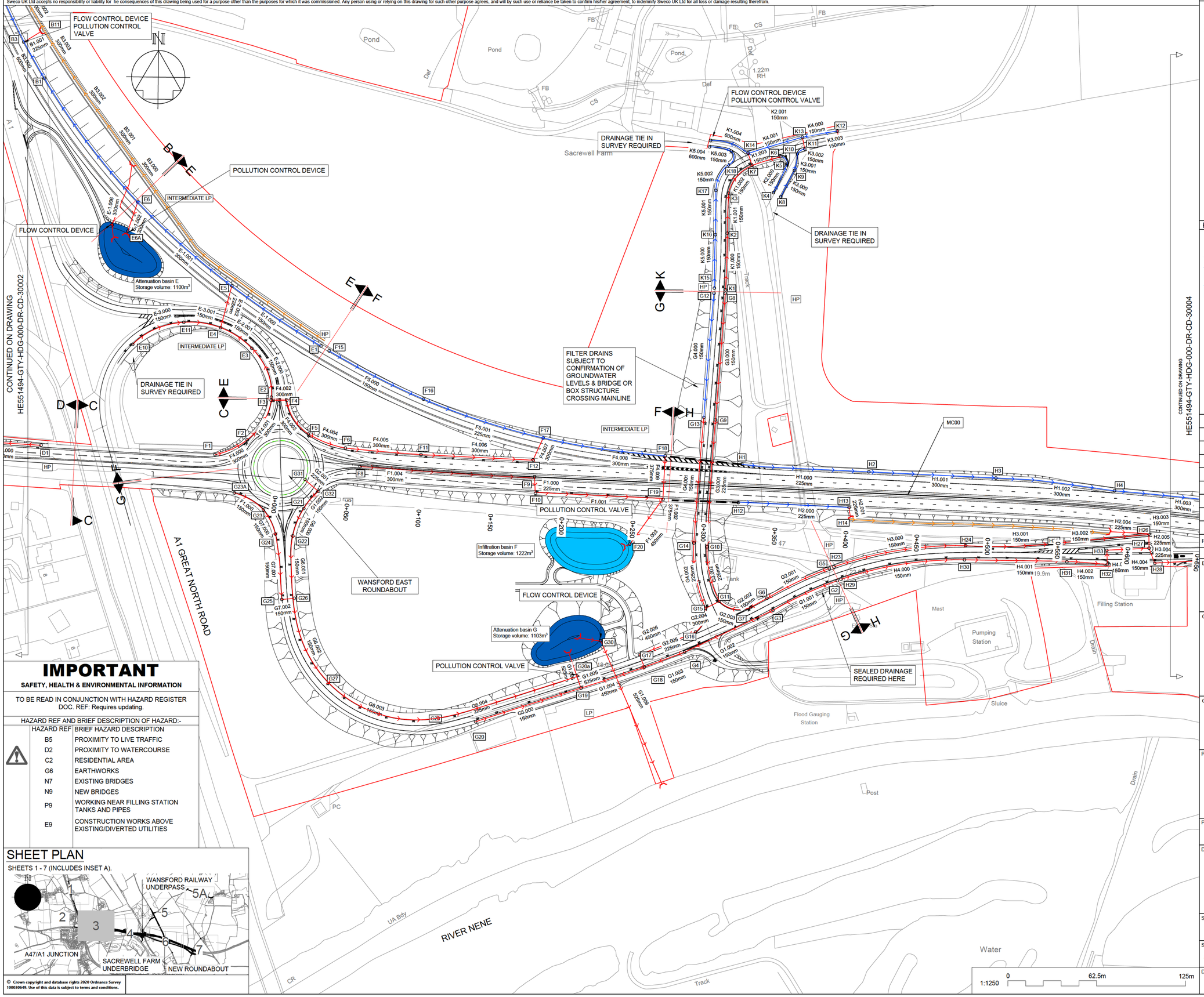

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C2	RESIDENTIAL AREA
G6	EARTHWORKS
N7	EXISTING BRIDGES
N9	NEW BRIDGES
P9	WORKING NEAR FILLING STATION TANKS AND PIPES
E9	CONSTRUCTION WORKS ABOVE EXISTING/DIVERTED UTILITIES

SHEET PLAN

SHEETS 1 - 7 (INCLUDES INSET A).

REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER: SWECO

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CLIENT: highways england

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PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN
SHEET 3 OF 7

SUITABILITY: WORK IN PROGRESS

SHEET SIZE	SCALE	STATUS	REVISION
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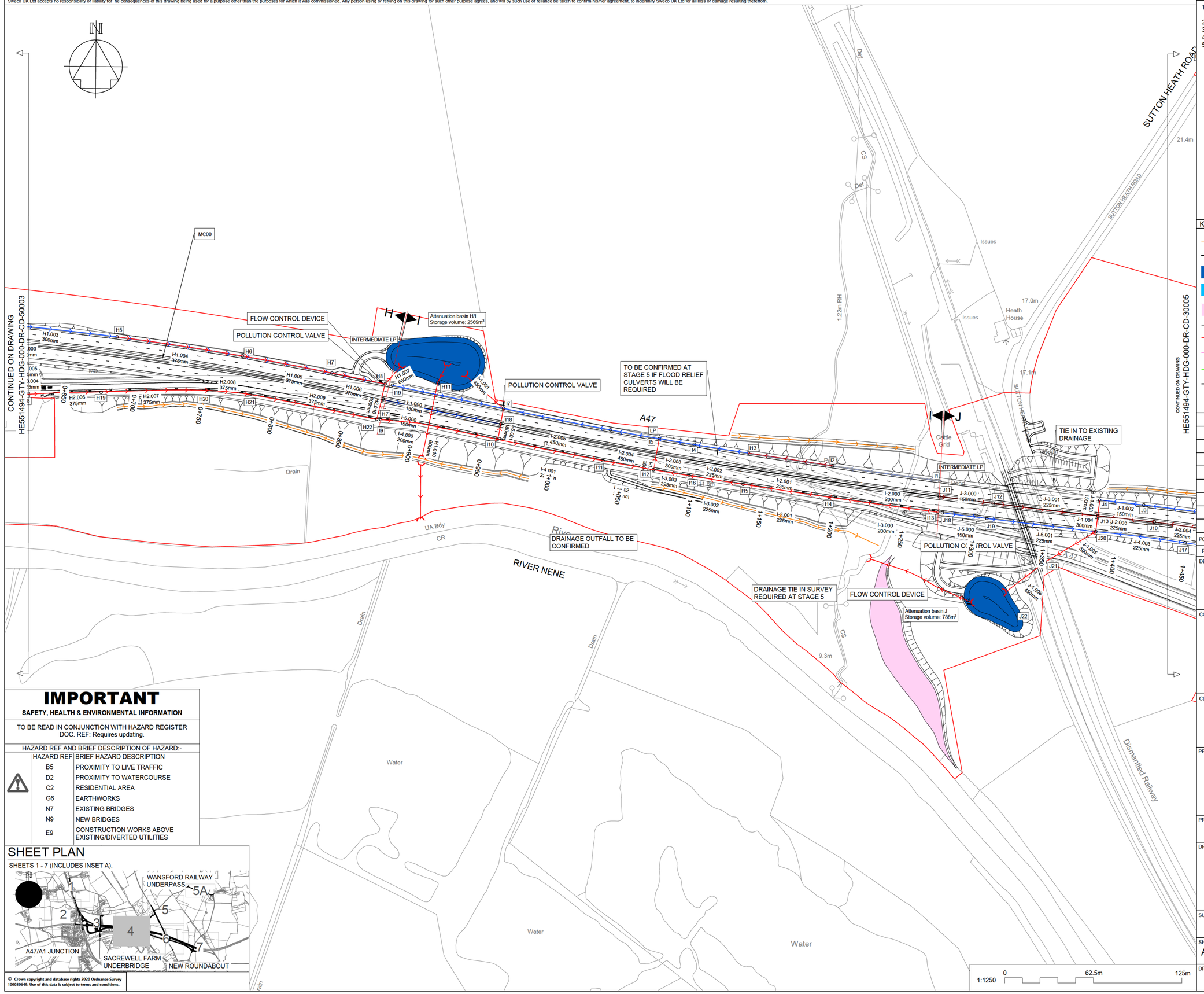
DRAWING NUMBER: HE551494-GTY-HDG-000-DR-CD-30003

1:1250 0 62.5m 125m



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REV	DATE	REVISION NOTE	ORG	CHKD	APPD
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER: SWECO

CONTRACTOR: GallifordTry

CLIENT: highways england

PROJECT TITLE: A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN
SHEET 4 OF 7

SUITABILITY: WORK IN PROGRESS

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DRAWING NUMBER: HE551494-GTY-HDG-000-DR-CD-30004

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IMPORTANT

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G6	EARTHWORKS
N7	EXISTING BRIDGES
N9	NEW BRIDGES
E9	CONSTRUCTION WORKS ABOVE EXISTING/DIVERTED UTILITIES

SHEET PLAN

SHEETS 1 - 7 (INCLUDES INSET A).

INSET A

EXISTING DRAINAGE DITCH CONNECTIVITY TO BE RETAINED. PIPED CONNECTION BENEATH PASSING PLACE IF DITCH CANNOT BE ACCOMMODATED BEHIND.

FLOW CONTROL DEVICE POLLUTION CONTROL VALVE

OUTFALL TO EXISTING DRAIN - SURVEY OF EXISTING DRAIN REQUIRED

TIE-IN TO EXISTING DRAINAGE - SURVEY REQUIRED

SUTTON HEATH ROAD

Top Field Spinney

Track

Drain

ETL

GP

LB

HP

Und

37.8m

34.2m

37.4m

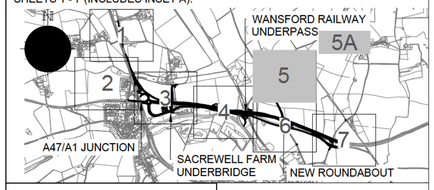
21.4m

1.22m RH

CONTINUED ON DRAWING
HE551494-GTY-HDG-000-DR-CD-30006

SHEET PLAN

SHEETS 1 - 7 (INCLUDES INSET A).



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1:1250 — 0 — 62.5m — 125m

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REV	DATE	REVISION NOTE	ORG	CHKD	APP'D
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER: SWECO

CONTRACTOR: GallifordTry

CLIENT: highways england

PROJECT TITLE: A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN
SHEET 5 OF 7

SUITABILITY: WORK IN PROGRESS

SHEET SIZE	SCALE	STATUS	REVISION
A1	1:1250	S0	P01.01

DRAWING NUMBER: HE551494-GTY-HDG-000-DR-CD-30005

CONTINUED ON DRAWING
HE551494-GTY-HDG-000-DR-CD-30005

CONTINUED ON DRAWING
HE551494-GTY-HDG-000-DR-CD-30004

CONTINUED ON DRAWING
HE551494-GTY-HDG-000-DR-CD-30007

DRAINAGE TO BE DEVELOPED FURTHER HERE FOLLOWING ROUNDABOUT DESIGN

OUTFALL TO INFILTRATION BASIN

INTERCEPTOR DRAINAGE SET BACK TO ALLOW FOR ROUNDABOUT DESIGN & AVOIDING DEEP DITCHES & CLASHES

POLLUTION CONTROL VALVE

THIS AREA IS PRONE TO SURFACE WATER FLOODING - INTERCEPTOR DITCHES UPSLOPE WILL ALLEVIATE THIS ACCUMULATION

Infiltration basin L
Storage volume: 1637m³

OUTFALL TO INFILTRATION BASIN

POLLUTION CONTROL VALVE

EXISTING A47

MC00

MC01

ROMAN ROAD

Deep Springs

Dismantled Railway

THE DRIFT

Drain

LB

MS

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PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN
SHEET 6 OF 7

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1:1250 0 62.5m 125m

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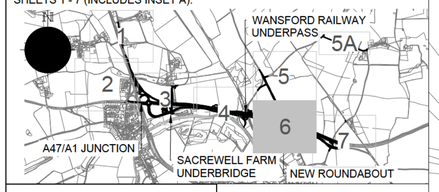
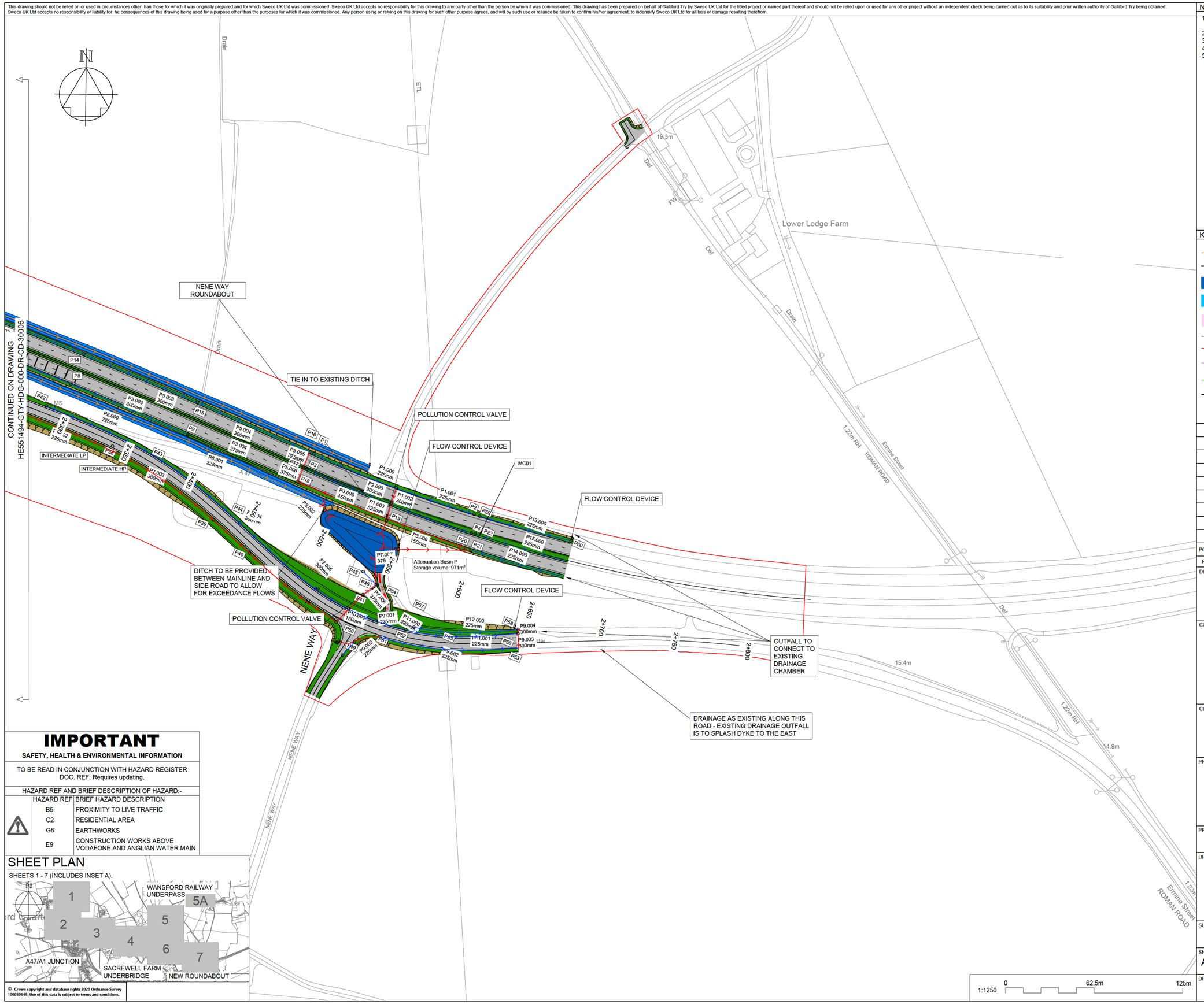
SHEET PLAN

SHEETS 1 - 7 (INCLUDES INSET A).





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SHEETS 1 - 7 (INCLUDES INSET A).

1:1250 0 62.5m 125m

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DESIGNER: SWECO

CONTRACTOR: GallifordTry

CLIENT: highways england

PROJECT TITLE: A47 WANSFORD TO SUTTON DUALLING

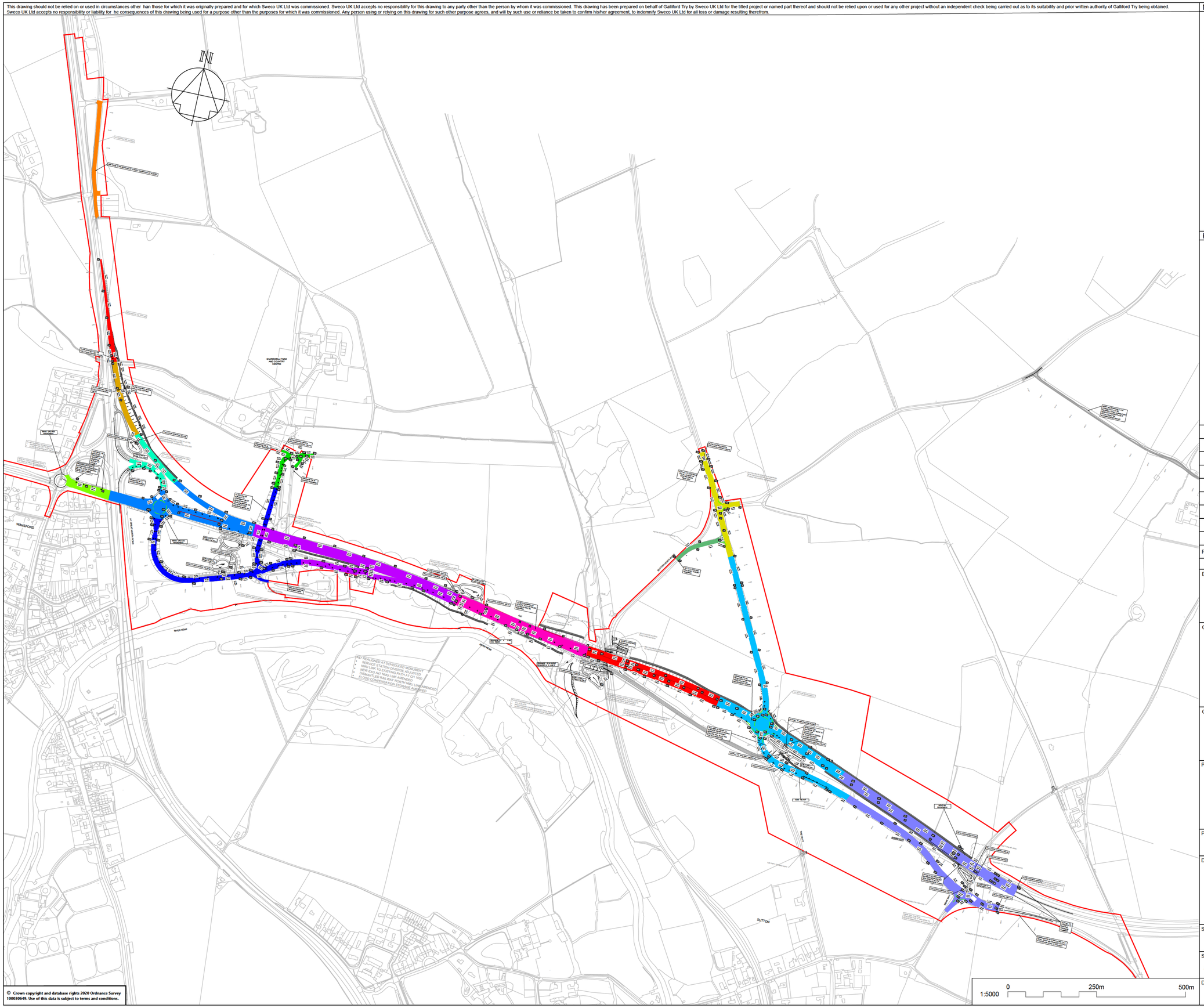
PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: DRAINAGE LAYOUT PLAN SHEET 7 OF 7

SUITABILITY: WORK IN PROGRESS

SHEET SIZE	SCALE	STATUS	REVISION
A1	1:1250	S0	P01.01

DRAWING NUMBER: HE551494-GTY-HDG-000-DR-CD-30007



NOTES

1. THIS DRAWING SHALL BE USED FOR THE PURPOSE SHOWN IN THE TITLE BOX ONLY.
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. ALL LEVELS ARE ABOVE ORDNANCE DATUM.
4. DO NOT SCALE FROM THIS DRAWING.
5. ALL MODELS SHOWN IN THIS DRAWING ARE CURRENTLY WORK IN PROGRESS.

KEY TO SYMBOLS

- CATCHMENT A
- CATCHMENT B
- CATCHMENT D
- CATCHMENT E
- CATCHMENT F
- CATCHMENT G
- CATCHMENT H
- CATCHMENT I
- CATCHMENT J
- CATCHMENT K
- CATCHMENT L
- CATCHMENT M
- CATCHMENT N
- CATCHMENT P
- CATCHMENT Q

REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01.01	---	WORK IN PROGRESS	---	---	---

DESIGNER
SWECO

CONTRACTOR
GallifordTry

CLIENT
highways england

PROJECT TITLE
A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE
PCF STAGE 3

DRAWING TITLE
SIDEROADS DRAINAGE
LAYOUT PLAN
SHEET 1 OF 5

SUITABILITY
WORK IN PROGRESS

SHEET SIZE	SCALE	STATUS	REVISION
A1	1:5000	S0	P01.01

DRAWING NUMBER
HE551494-GTY-HDG-000-DR-CD-30008