A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.7 Environmental Statement – Appendix 10.5 Drainage Strategy Report

Part A

APFP Regulation 5(2)(a)

Planning Act 2008

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

June 2020

Infrastructure Planning

Planning Act 2008

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

The A1 in Northumberland: Morpeth to Ellingham

Development Consent Order 20[xx]

Environmental Statement - Appendix

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010041
Application Document Reference	TR010041/APP/6.7
Author:	A1 in Northumberland: Morpeth to Ellingham Project Team, Highways England

Version	Date	Status of Version
Rev 0	June 2020	Application Issue

A1 in Northumberland
Morpeth to Felton
PCF Stages 3 & 4

Drainage Strategy Report

HE551459-WSP-HDG-ZZ-RP-CD-0002

Document Control

Document Title	A1 in Northumberland Morpeth to Felton Stages 3 & 4 Drainage Strategy Report
Author	Seamus Ryan (WSP Senior Drainage Engineer)
Owner	Tsuwun Bevan (Highways England Senior Project Manager)
Distribution	Mark Stoneman (Highways England Project Manager)
Document Status	S3 – For review and comment

Record of Issue

Revision	Status	Author	Date	Checked	Date	Approver	Date	Authorised for Issue	Date
P01	S3 – for review and comment	Seamus Ryan	12/01/2018	Rob Sharpe	12/01/2018	Simon Gilliland	12/01/2018	David Morrow	12/01/18
P02	S3 – for review and comment	Seamus Ryan	12/01/2018	Rob Sharpe	12/02/2018	Simon Gilliland	12/02/2018	David Morrow	12/02/18
P03	S3 – for review and comment	Gero Pitanza	14/01/2019	Rob Sharpe	12/02/2019	Simon Gilliland	12/02/2019	David Morrow	24/09/19

Document Reference

Scheme	Reference
A1 in Northumberland	HE551459-WSP-HDG-ZZ-RP-CD-0002

Reviewer List

Name	Role

Approvals

Name	Signature	Title	Date of Issue	Version
Nanette Hoyle		Highways England – Project Manager	12/01/2018	P01
Nanette Hoyle		Highways England – Project Manager	12/02/2018	P02
Mark Stoneman		Highways England – Project Manager		P03

Table of Contents

1 Purpose

This document presents the drainage design strategy for the A1 in Northumberland (A1iN) Section A (Morpeth to Felton) highway design. It includes a review of the Stage 2 drainage proposals and the baseline information currently available.

For the Morpeth to Felton section the proposed trunk highway has been divided into sub-sections based on chainage. The proposed drainage strategy in each sub-section depends to some degree on whether the proposed upgrades are along the line of the existing A1 or whether they run offline through existing greenfield areas.

In Section 5 of this document each drainage element is listed under its own heading within each sub-section. Any further changes made to the drainage proposals from the beginning of Stage 3 onwards will be described in Section 5 with reasons for the change included.

2 Project Background

2.1 Introduction

The A1 is one of the longest roads in the country, connecting London to Newcastle and Edinburgh. The route currently consists of motorway standard and dual carriageway standard sections; with some single carriageway sections running between Morpeth and Ellingham and north of Ellingham to Berwick. In Northumberland the A1 runs through an extensive rural landscape close to the coastline. Over the last decade there have been significant upgrades to the A1 south of Newcastle, with many sections upgraded to motorway standard. The Highways England "A1iN Improvement Scheme" proposes to improve a single carriageway section of the A1 north of Newcastle.

The Scheme is in Northumberland extending for 12.6 km between Warreners House Interchange at Morpeth to the dual carriageway at Felton. This Scheme includes approximately 6.5 km of online widening and approximately 6.1 km of new offline highway to provide more lanes and increase capacity. The proposals are for the existing carriageway to be widened on its current line up to Priest's Bridge from here the proposed offline section of the Scheme moves west of the current road and passes west of Tindale Hill and Causey Park Bridge. North of Burgham Park the carriageway re-joins the line of the existing A1 with online widening of the existing road northwards until it meets the existing dual carriageway north of Felton.

Dualling of the existing single carriageway section of the A1 will begin at the termination of the existing A1 dual carriageway where it meets the A697 near Northgate Hospital, Morpeth. Between the A679 junction and Priest's Bridge, the existing A1 will be used as the southbound carriageway and a new northbound carriageway will be constructed to the west. The current A1 will be de-trunked and retained as a local road between Priests Bridge and Felmoor Park. A 1.3km section of new single carriageway is proposed to connect the de-trunked A1 to the dualled A1 at West Moor junction to allow access to the villages and properties along the route. North of Felmoor Park, the existing A1 will be used as the northbound carriageway and a new southbound carriageway will be constructed to the east.

A new bridge over the River Coquet is proposed parallel to the existing bridge. Three compact grade separated junctions are proposed, at Highlaws, Fenrother and West Moor.

A Flood Risk Assessment (FRA) has been undertaken for this Scheme, refer to Appendix 10.1 Chapter 10: Road Drainage and the Water Environment in Volume 1 of the Environmental Statement (HE551459-WSP-EGN-M2F-RP-LE-1942).

The current design proposal will increase the impermeable area coverage and as such the drainage strategy presented in this report is developed to manage the increased surface water runoff. The currently available baseline flood risk data has been considered in the siting of drainage infrastructure.

The works are planned to start in March 2020. The Scheme will open to traffic in 2023.

2.2 Objectives

The objective of this report is to present the proposed drainage strategy for the A1iN Improvement Scheme (Morpeth to Felton) and provide recommendations on how surface water runoff from the Scheme will be managed whilst complying with the requirements of principal stakeholders.

2.3 Principal Stakeholder Requirements

The principal Client and stakeholder requirements are as follows:

2.3.1 Highways England

Develop a safe and robust design in accordance with current design standards taking into consideration the requirements for routine maintenance.

The design standards followed in this drainage strategy are:

- DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB) VOLUME 6 SECTION 1 PART 2 - TD27_05 – CROSS-SECTIONS AND HEADROOMS
- DMRB VOLUME 4 SECTION 2 PART 1 - HA 78_96 - DESIGN OF OUTFALLS FOR SURFACE WATER CHANNELS
- DMRB VOLUME 4 SECTION 2 PART 1 - HA 103_06 - VEGETATED TREATMENT SYSTEMS FOR HIGHWAY RUNOFF
- DMRB VOLUME 4 SECTION 2 PART 1 - HA 106_04 - DRAINAGE OF RUNOFF FROM NATURAL CATCHMENTS
- DMRB VOLUME 4 SECTION 2 PART 1 - HD 33_16 - DESIGN OF HIGHWAY DRAINAGE SYSTEMS
- DMRB VOLUME 4 SECTION 2 PART 1 - HD 49_16 - HIGHWAY DRAINAGE DESIGN PRINCIPLE REQUIREMENTS
- DMRB VOLUME 4 SECTION 2 PART 4 - HA 37_97 - HYDRAULIC DESIGN OF ROAD-EDGE SURFACE WATER CHANNELS
- DMRB VOLUME 4 SECTION 2 PART 4 - HA 83_99 - SAFETY ASPECTS OF ROAD EDGED DRAINAGE FEATURES
- DMRB VOLUME 4 SECTION 2 PART 6 - HA 113_05 - COMBINED CHANNEL AND PIPE SYSTEM FOR SURFACE WATER DRAINAGE
- DMRB VOLUME 4 SECTION 2 PART 9 - HA 119_06 - GRASSED SURFACE WATER CHANNELS FOR HIGHWAY RUNOFF
- DMRB VOLUME 11 SECTION 3 PART 10 - HD 45_09 - ROAD DRAINAGE AND THE WATER ENVIRONMENT

2.3.2 Lead Local Flooding Authority (LLFA) - Northumberland County Council

The requirements of Northumberland County Council (NCC) as the Lead Local Flood Authority (LLFA) are set out in correspondence received from NCC in Appendix C. NCC's main requirements are summarised below:

- A drainage strategy is required for the Scheme.

- NCC recommended that surface water be kept in its original (existing) catchments. As such a plan looking at the existing catchments (and sub-catchments) was devised. Information from the Flood Estimation Handbook (FEH) and LiDAR was available and used within this assessment. Surface water runoff from the new highway needs to be kept to their current catchments.

- NCC requires adherence to the Department for Environment, Food and Rural Affairs (DEFRA) non-statutory guidance for sustainable drainage with regards to the surface water drainage Scheme. This outlines restricted discharge rates and attenuation volumes will be required. In summary, NCC requires the allowable discharge rate to be restricted to the existing greenfield runoff rate for the 1 in 1 year and 1 in 30 year events, and that attenuation is provided for the 1 in 100 year plus climate change event; an additional allowance for urban creep is not required. Associated calculations will be required for all drainage networks and catchments for this Scheme.

- NCC requires SuDS measures to be included within the drainage proposals. All these features need to be shown on a plan drawing. NCC asked that all SuDS features be designed in accordance with the CIRIA C753 SuDS Manual. Health and safety for these features need to adhere to CIRIA RP992 Health and Safety Principles for SuDS. There is no preference for ponds or basins; however, the nearby airfields may preclude ponds and longstanding open water areas from being considered. Additional mitigation may be required at these locations.

- All SuDS features to be located outside of Flood Zones 2 and 3.

- In addition to the DEFRA non-statutory guidance for sustainable drainage it is also advisable that the best practice in the Local Authority SuDS Officer Organisation (LASOO) document: Non-statutory Technical Standards for Sustainable Drainage Practice Guidance is followed.

- The drainage of any new highways that will be adopted by NCC should be separated from Highways England's drainage infrastructure. Therefore, the drainage for these sections of highway should be distinguished and designed on a separate network accordingly.

- A drainage survey of the de-trunked section of the A1 will be undertaken separately for discussion with Highways England and NCC.

Note – refer to Appendix C for relevant correspondence on NCC requirements.

2.3.3 Local Highway Authority - Northumberland County Council (NCC)

NCC policy relating to the separation of trunk highway drainage and local highway drainage requires that in cases where the drainage systems cannot be separated to resort to a Memorandum of Understanding. This will set out the responsibilities of both parties for the operation and maintenance of the shared assets.

2.3.4 Natural England (NE)

NE queried the proposed form of the central reservation indicating that it should not be grassed to avoid use by barn owls.

2.3.5 Environment Agency (EA)

Where outfalls are proposed into existing EA “Main Rivers”, the runoff is to be limited to greenfield values, and SuDS features are to be located outside of Flood Zones 2 and 3.

3 Baseline Information

3.1 Existing Highway Drainage

The preliminary appraisal of the existing highway drainage included below is based upon HADDMS data and supplemented by site visits and Google Maps observations.

A review of the currently available data is presented below.

General

In general, drainage from existing side roads appears to discharge primarily to existing ditches/ watercourses via informal verge drainage. In places, usually local to property entrances, this drainage has been formalised to kerb collection. There are a number of existing roads, tracks, Private Means of Access (PMAs), and other rights-of-way which are affected by the proposed A1 improvement works.

The existing drainage system on the A1 is divided into sub-sections based on chainage as outlined in Section 1 of this document and described below:

1. Chainage 10800 to 14000 (Online Upgrade Proposed)

The existing A1 north from approximately chainage 10800 rises, past the existing Highlaws Junction, to chainage 12650. From Ch10800 to 11000 there is a transition from dual to single carriageway. The central reserve ends at Ch11000 and beyond this the road is single carriageway to the north.

The HADDMS data indicates the A1 highway drainage to be running southwards on both verges with pipes varying from 150mm to 450mm in diameter. Also, there is a 150mm diameter pipe, vitrified clay, which is in the central reserve from Ch 11800 to 11880 collecting surface runoff. This reflects the general longitudinal fall of the highway.

The HADDMS data is incomplete but it appears that the surface drainage south of chainage 10800 is connected to EA culverts or unnamed watercourses.

From chainage 10800 north to 11800 it appears that the highway drains to the culvert on Cotting Burn (418215, 588421). There is no highway drainage shown on HADDMS in the vicinity of the existing A697 overbridge. A CCTV and GPR survey has picked up the location and extent of the drainage in this area.

From chainage 11800 north to 12650 it appears that the highway drains to the culverted Shieldhill Burn (418311, 589444).

From chainage 12650 north to 13750 it appears that the highway drains to the culverted Floodgate Burn (418532, 591284).

From chainage 13750 north to 14000 it appears that the highway drains to the culverted River Lyne (418562, 591627).

The exact locations of the outfalls were confirmed from connectivity/outfall surveys.

At approximately chainage 12100 (Highlaws Junction), there are side roads from the east and west accessing the existing A1 in a staggered junction formation. Surface water drainage for both these existing roads appears to be to adjacent ditches via

verge runoff and occasional formal gully arrangements. This location is the site of the proposed new Highlaws Junction. The new slip roads, connector road and bridge drainage will form part of the proposed A1 trunk highway drainage system.

At approximately chainage 13300 there is an access road joining onto the A1 from the west. Surface water drainage on this track is believed to be to local watercourses/ land drains.

2. Chainage 14000 to 20030 (Offline Upgrade Proposed)

The proposed A1 route moves offline from the existing A1 at approximately chainage 14000 adjacent to the River Lyne crossing. HADDMS data for the existing A1 north of the divergence (to be de-trunked) indicates that it drains in a northerly direction, except for the outfalls to the River Lyne.

At approximately chainage 14950 there is an existing road (Fenrother Lane) crossing the route of the proposed A1. Adjacent to the lane at this location is a culverted watercourse which eventually discharges to the River Lyne. This location is the position of the proposed Fenrother Junction. The new slip roads, connector road and bridge drainage will form part of the proposed A1 trunk highway drainage system.

The sections of the existing road which will not be part of the A1 trunk network, will continue to discharge to local watercourses/ land drains as previously. Surface water drainage from Fenrother Lane is believed to be to local watercourses/ land drains.

At chainage 16550 the new highway crosses and severs the New Houses Farm track, the new farm track is to run parallel to the west of the A1. This track will have no formal drainage.

At chainage 17060, the new highway crosses the Earsdon Burn (418706, 594615).

At approximately chainage 17670 there is an existing road (Causey Park Road) crossing the route of the proposed A1. Surface water drainage on this existing road is believed to be to local watercourses/land drains. This location is the position of the proposed Causey Park Overbridge. This road which is an adopted NCC road will continue to discharge to local watercourses/ land drains as previously.

New outfalls are required on the unnamed tributary to Longdike Burn at chainage 18260 (418470, 595759) and to Longdike Burn at chainage 19400 (418026, 596732).

At approximately chainage 19500 there is an existing road (Burgham Park Road) crossing the route of the proposed A1. Surface water drainage on this road is believed to be to local watercourses/ land drains. This location is the position of the proposed Burgham Underbridge. This road which is an adopted NCC road will continue to discharge to local watercourses/ land drains as previously.

3. Chainage 20030 to 23600 (Online Upgrade Proposed)

The offline section of the proposed A1 trunk road upgrade realigns with the existing A1 at approximately chainage 20030 just north of the Longdike Burn crossing.

There are outfalls shown on HADDMS at chainage 20600, 20800 and 20960, these are to un-named watercourses.

North of Longdike Burn, HADDMS data indicates that the existing highway drainage, as far as approximate chainage 20800, follows the fall of the existing highway southwards to outfall at Longdike Burn.

A new outfall will be required on Longdike Burn at chainage 19980 (417866, 597338) this is to provide for the proposed detention basins that serve the Highways England and the NCC roads in this area.

North of approximately chainage 20800 HADDMS data indicates that the existing A1 highway drainage runs northwards. There are outfalls indicated at the un-named watercourse at approximately chainage 21850 which is referenced as the Glenshotton Culvert under the A1.

North of approximately chainage 21850, as far as the northern extent of the Scheme at approximately chainage 23600, the status of the existing highway drainage is unclear from the HADDMS records. However, there is evidence on site of some discharge to the River Coquet. Highways England also advised that there was a detention basin to the east of the carriageway at approximately chainage 23150. This was investigated as part of the Scheme. The basin will not be a part of the future drainage network and will be built over as part of the widening works.

The as-constructed River Coquet bridge drawings show that the deck drainage discharges at two locations one to the south abutment and one to the north pier. These outfalls discharge directly into the River Coquet via catchpits.

North of Longdike Burn, there is a looped access road to the east which joins the existing A1 at approximately chainage 20000 and again at approximately chainage 20400. Surface water drainage on this road appears to be to local watercourses/ land drainage. It is understood that, post the A1iN improvement works, access to this loop road will be via the new (local authority) parallel link road to be built to the east of the A1 to connect the de-trunked A1 with the proposed West Moor Junction at approximately chainage 21500. The north end of the loop road will be stopped up.

At approximately chainage 20600 there is an existing side access road from the west (Bywell Road); opposite Eshott Airfield. Surface water drainage on this road appears to be to local watercourses/land drains.

At approximately chainage 21500 the proposed West Moor junction is to be constructed. This proposed junction will encompass existing access roads from east and west. The new slip roads, connector road, bridge drainage and roundabout will form part of the proposed A1 trunk highway drainage system. Existing surface water drainage on both these roads, beyond the extent of the new construction works, appears to be to local watercourses/land drains. These sections of road which are not part of the proposed A1 trunk road will continue to discharge to local watercourses/land drains as previously.

4. De-trunked Section Chainage 14000 to 20030

The de-trunked section of the A1 is to be "handed over" to NCC. NCC have requested that the condition of the drainage assets be determined to allow them to ascertain whether the drainage network on the de-trunked section is in full working order.. To this end a review has been undertaken of the HADDMS data.

There are some 17,000m of drains in this area, of which CCTV survey records and results are summarised below. The data indicates that there are 17,102m of surveyed drainage assets. It should be noted that there are a number of duplicated sections and typically 13,000m of drainage pipes would reasonably be expected for this section of carriageway.

A number of surveys (9,622m) were dated 30/12/1899 and have been ignored, this leaves 7,481m of assets that have been CCTV surveyed. These surveys were undertaken in four tranches: 2006 (31%), 2009 (1%), 2014 (64%) and 2015 (4%).

Of the 7,481m of drainage assets that have been surveyed, 2,347m have been identified with structural grades of 4 or 5.

Discussions have been undertaken with NCC, the outcome of which was that they would accept the 2014 and 2015 survey data but requested that additional surveys are to be undertaken on the remainder of the network to determine its structural grade.

A summary of the 2014/15 CCTV survey information is included below.

Group	Length (m)
Not Surveyed	12,022
Surveyed	5,080
Survey Date	**Length (m)**
2015	260
2014	4,820
Structural Grade	**Length (m)**
1, 2 or 3	4,178
4 or 5	902

Table 1 HADDMS data

3.2 Existing Topography and Ground Investigations

Topographic surveys have been carried out as the drainage strategy was developed. As this information became available the drainage strategy has been revised.

GI data is available for the Scheme and this has been considered in the drainage design. However, no GI has been undertaken to date specifically for the purposes of the drainage design.

3.3 Environment Agency Main Rivers

The nearest EA “Main Rivers” that cross the proposed Scheme are the River Coquet, and Longdike Burn. There are also Ordinary Watercourses (River Lyne, Tributary of Thirston Burn, Bywell Letch, Linden Burn, Shieldhill Burn, Floodgate Burn, Cotting Burn, Fenrother Burn, Earsdon Burn and a number of unnamed watercourses and land drains) that cross the existing A1 and the route of the offline A1iN Section A (Morpeth to Felton) Scheme.

3.4 Flood Risk

Data from HADDMS and the EA has been used to identify areas of flood risk along the route of the A1iN Section A (Morpeth to Felton). The proposed Scheme is mainly located in EA Flood Zone 1. However, there are sections of the highway that pass through/across Flood Zones 2 and 3. HADDMS also identifies localised areas of shallow surface water flood risk along the existing A1.

The Flood Risk Assessment has been completed and is to be found in Appendix 10.1 of the Environmental Impact Assessment.

3.5 Ground Infiltration

Information supplied from the geotechnical team, suggests that the ground is predominantly glacial till for up to a depth of 20m, and is therefore of low permeability and as such unsuitable for infiltration drainage solutions.

3.6 Existing Services

Existing utilities information along the route has been collated. Significant under and over ground services and/ or proposed diversions have been proposed along the route. The routes of the diversions have been considered in this drainage strategy.

3.7 Landowners

The landowners affected by the proposed works have been contacted and the proposed works have been discussed with them. With regards to the drainage works, this has affected the proposed locations of detention basins and their relevant accesses.

4 Design Parameters

4.1 Return Periods

The highways drainage network is being designed by WSP in consultation with the project design team: Highways England, NCC and the EA to the following criteria:

- No flooding or surcharging of the network in a 1 in 1 year storm event;
- No flooding in a 1 in 5 year storm event and no surcharge must exceed the chamber cover level;
- The 1 in 100 year event was used to determine the storage requirements so that the proposed works don't exceed the Greenfield Runoff rates.

4.2 Discharge Limits

In line with the Department for Environment, Food and Rural Affairs (DEFRA) document Sustainable Drainage Systems: Non-statutory Technical Standards for Sustainable Drainage Systems, dated March 2015, the following controls have been set to limit the discharge from the new works and to determine the storage volume required. The base greenfield runoff rates do not include any allowance for Climate Change.

Peak flow control

S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Volume control

S4 Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

4.3 Climate Change

The impacts of Climate Change need to be taken into account when designing new drainage infrastructure.

In order to manage the risks associated with the long term impacts of climate change, it was proposed that the peak rainfall intensity of the 1 in 1, 5 and 100 year rainfall events be increased by 20% in line with the DMRB HD33/16 Design of Highway Drainage Systems. This allowance is in line with the recommendations given in the National Planning Policy Framework (NPPF) Technical Guidance and EA Climate Change Guidance for the central band.

A Technical Note entitled “Climate change allowances review” (HE551459-WSP-HDG-M2F-RP-CD-00002) was prepared to consider the effects of the different climate change allowances between the LLFA requirement for a 40% (upper band) increase in rainfall intensities and the DMRB guidance for a 20% increase. Highways England confirmed that the 20% allowance was appropriate for this Scheme. The LLFA (NCC) were informed and each of the detention options were individually discussed, assessed and deemed to be satisfactory as proposed.

4.4 Hydraulic Modelling Parameters

Hydraulic modelling of the highways drainage network has been undertaken using the Micro Drainage software package (2016 Build). The Flood Estimation Handbook (FEH) has been used to obtain rainfall parameters representative of local hydrological conditions.

The proposed drainage network has been modelled to determine the discharge rates for the 1 in 1 year, 1 in 5 year and 1 in 100 year storm events including climate change allowances.

No infiltration has been allowed for within the model reflecting the known ground conditions.

4.5 Surface Water Channels

Where surface water channels are proposed along the A1iN Morpeth to Felton route, they have been based on HA 37_97 – Hydraulic Design of Road Edge Surface Water Channels. The key parameters are as outlined in the following table.

Location of SWC	Drain type	Design return period
1 in 40 crossfall to central reservation	1.5m Wide Surface Channel - Concrete	1 in 5 year
1 in 40 crossfall to verge	2.5m Wide Surface Channel - Concrete	1 in 5 year

Table 2: Surface Water Channels

5 Proposed Drainage Strategy

5.1 Design Elements

The following section details the proposed drainage design elements according to each drainage catchment and also presents the key assumptions and the risks.

Generally, filter drains, kerb and gully, combined kerb drainage and concrete surface water channels are proposed as the primary means of removing surface water runoff from the highway. They are sited adjacent to the hardstrip at the edges of the carriageway.

To achieve the required greenfield discharge rates for the proposed network, vortex control devices have been used together with detention basins/swales/tanks in the proposed Scheme as attenuation methods.

All drainage design elements proposed in this strategy will need to be reviewed at detailed design stage. The HAWRAT (Highways Agency Water Risk Assessment Tool) assessments show that the proposals are acceptable.

The Drainage Strategy Layout drawings showing details of the proposed drainage layout and storage locations required are provided in Appendix B. These drawings have been prepared to inform the DCO application.

The proposed drainage strategy is summarised as follows:

- Runoff from the A1 trunk upgrade is discharged into the existing watercourses via storage swales/detention basins/tanks where required.
- Drainage discharge from highways remaining part of the local road network is kept separate from discharge associated with the proposed A1 Trunk Road as agreed with NCC. This strategy includes separate detention basins or SuDS features where appropriate. However, controlled runoff from both trunk and non-trunk detention basins/features will discharge to a common outfall to minimise the overall project footprint.
- Maintenance of trunk and local drainage assets will be subject to a 'Memorandum of Understanding' between Highways England and NCC.
- Roads/tracks which are not to be incorporated as access roads to the new trunk road system, are assumed to be abandoned/truncated, and will continue to drain as existing. All existing watercourses crossing the proposed route, to which these roads/tracks may drain, will be maintained using culverts or other means.
- Locations of detention features were agreed with Highways England, NCC, and EA.
- Allowable runoff rates are restricted to the existing greenfield runoff values for the equivalent storm event.
- Highway drainage is designed to accommodate a 1 in 1-year design flow without surcharging; and a 1 in 5 year flow without surface flooding of the running carriageways (with a 20% allowance for climate change).
- Attenuation controls will be provided for the 1 in 1, 30 and 100-year events plus climate change.

- Where detention basins, tanks or storage swales are used for attenuation these are located outside of EA Flood Zone 2 and 3 areas.
- Online controls will be provided to restrict discharges to allowable values.
- It is assumed that any new local access tracks, bridleways and private means of access (PMAs) are drained to local land drains and watercourses.
- Runoff from the running lanes and hardstrips will follow the road camber to both channels, and the central reservation where there is a crossfall.
- Runoff to the central reservation will be to concrete V-channels.
- Where the highway is to be within a cutting the runoff from the cutting will be to the single filter drain at either side of the highway, except in one location where a surface water channel is proposed.
- Where the highway is to be within a cutting it is proposed that the field runoff will be taken by a cut-off ditch at the top of the cutting slope and will discharge through private ditches, etc and will not contribute to the highway drainage network.
- Where the highway is to be on an embankment it is proposed that the embankment runoff will be collected in a ditch at the bottom of the embankment and will be conveyed to the local ditches and watercourses.
- Where the highway is to be on an embankment it is proposed that the field runoff will be taken by a drainage ditch to be built within the field and connected to local ditches and watercourses.
- As there is a requirement (further to the HAWRAT assessment) to provide treatment prior to discharge to many of the watercourses, a permanent wet shallow area is required in the detention basins. The size and depth of this permanently wetted area is envisaged to be a small part of the overall basins, and this will be confirmed in the detailed design. The exception to this are detention basins DB15 and DB15a where there is a requirement to keep them as dry as possible in order to mitigate the issue of birds affecting Eshott Airfield.
- The design strategy for each distinct drainage area is summarised in Section 5.3. The first set of tabled data is the calculated runoff figures for each distinct catchment. The second set of tabled data is the available data relating to each storage feature i.e. detention basins, tanks or swales.

5.2 Design Strategy Risks and Assumptions

5.2.1 Risks

- At the time of writing this document the available geotechnical data was used. The GI indicated that there were high water tables throughout the Scheme.
- The drainage strategy of attenuation storage in detention basins/tanks/swales prior to discharging to watercourses remains at risk at a few locations due to the lack of information relevant to the proposed storage location.
- Unknown underground utilities may be present.

5.2.2 Assumptions

- Runoff from the running lanes and hardstrips will follow the road camber to both channels unless indicated otherwise.

- Central reservations, hardstrips, and verges will be continuous across underbridges and across overbridges unless otherwise indicated.
- Detention basins have generally been proposed with a storage depth of 500mm. This is to limit the extent of excavation due to the expected high groundwater levels and to improve the opportunities to connect to the watercourses.
- Detention basins will be lined.
- In cases where the detention basins are set in deep excavations the upper slopes of the basins will require some form of land drainage to ensure that the runoff from the slopes does not discharge directly to the flow control structure.
- Where there are high water tables, the detention solutions are to be designed to mitigate the impact of the groundwater, by providing specific drainage for the side slopes above the storage depth.
- Runoff directly to existing ground will be minimal due to the nature of the existing ground. Alluvial clay is understood to overlay the catchment to a depth of up to 20m.
- It is not considered feasible to re-use the existing A1 drainage in the proposed Scheme though there are some small sections where the carriageway is already dualled and at the existing River Coquet bridge where reuse is feasible.

5.3 Design Strategy by chainage

5.3.1 Chainage 10800 to 12180

Preliminary Design Strategy:

- The whole of this section drains to the verges. Run-off from the carriageway will be collected in filter drains located within the west verge, and with a mix of combined kerb drainage (CKD) and kerb and gully drainage to the east. The use of CKD at this location was suggested by Highways England Operations Directorate (Area 14) in order to avoid excavation to the east verge where there are a number of trees and underground utilities, the presence of which would make trench excavation problematic.
- Controlled discharge from this section outfalls to the existing Highways England culvert on Cotting Burn.
- It is intended that the existing drainage is to be retained where the section is already dualled i.e. from 10800 to 11000. The condition of the existing assets is to be confirmed.
- The preferred attenuation option is Swale S1, this is located to the west of the carriageway at approximate chainage 11100. The swale will require check dams.

Chainage 10800 to Chainage 12180 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	15.5
1 in 30 year return period greenfield run-off rate (l/s)	31.7
1 in 100 year return period greenfield run-off rate (l/s)	37.6
1 in 100 year return period +CC design storage volume (m^3)	1980

Table 3: Run-off Data

Swale S1 – Trunk Road Drainage	
Chainage	West 11000-11230
Swale width (m)	14
Discharge watercourse:	Existing Highways England culvert on Cotting Burn
Watercourse invert level (mAOD)	87.5 TBC

Table 4: Swale Data

Design Risks

- Potential unknown underground utilities associated with Northgate House (to be demolished) present a specific risk at this location.
- There is no geotechnical information in the area of the storage swale.
- The as-yet-undefined outfall location at Cotting Burn is a risk.

5.3.2 Chainage 12180 to 12650

Preliminary Design Strategy:

- The whole of this section drains to the verges. Run-off from the carriageway will be collected in filter drains located within the northbound verge, and by combined kerb drainage (CKD) on the southbound side. The use of CKD at this location was suggested by Highways England Operations Directorate (Area 14) in order to avoid excavation to the east verge where there are a number of trees and underground utilities, the presence of which would make trench excavation problematic.
- Detention basin DB2 will be located at the Highlaws Junction, and will collect run-off from the new A1, and the junction slip roads, connector road and the bridge. Controlled discharge from detention basin DB2 will outfall to Shieldhill Burn.

Chainage 12180 to Chainage 12650 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	8.3
1 in 30 year return period greenfield run-off rate (l/s)	16.9
1 in 100 year return period greenfield run-off rate (l/s)	20.0
1 in 100 year return period +CC design storage volume (m^3)	1070

Table 5: Run-off Data

Detention Basin DB2 – Trunk Road Drainage			
Chainage	12200	**Proposed Detention Basin Inlet Invert Level (mAOD)**	106.25
Proposed Detention Basin Outlet Invert Level (mAOD)	105.75	**Watercourse Invert Level (mAOD)**	104.3
Discharge Watercourse		Shieldhill Burn	

Table 6: Detention basin Data

Design Risks

- There is limited geotechnical information in the area of the detention basin.

5.3.3 Chainage 12650 to 13650

Preliminary Design Strategy:

- The run-off from the carriageway will generally be collected in combined kerb drainage to the east and filter drains to the west.
- Where there is super-elevation between chainages 12920 and 13240, the run-off from the southbound carriageway will be collected in concrete surface water channels at the central reservation and will be drawn off to the filter drain on the northbound verge.
- Surface water run-off will be controlled and discharged to Floodgate Burn via Detention Basin DB4, which will be located to the west of the new highway at approximate chainage 13550.

Chainage 12650 to Chainage 13650 Trunk Road Drainage

1 in 1 year return period greenfield run-off rate (l/s)	10.3
1 in 30 year return period greenfield run-off rate (l/s)	21.0
1 in 100 year return period greenfield run-off rate (l/s)	24.9
1 in 100 year return period +CC design storage volume (m^3)	1350

Table 7: Run-off Data

Detention Basin DB4 – Trunk Road Drainage			
Chainage	13550	**Proposed Detention Basin Inlet Invert Level (mAOD)**	85.11
Proposed Detention Basin Outlet Invert Level (mAOD)	84.61	**Watercourse Invert Level (mAOD)**	No data
Discharge Watercourse		Floodgate Burn	

Table 8: Detention basin Data

Design Risks:

- The as-yet-undefined outfall location at Floodgate Burn is a risk.
- There is no geotechnical information in the area of the detention basin.

5.3.4 Chainage 13650 to 15000

Preliminary Design Strategy:

- Run-off from the carriageway will be collected in filter drains located in the verges at the edge of each carriageway. There are short discrete lengths of kerb and gully drainage beneath the Fenrother junction overbridge and at the laybys.
- Detention Basin DB6, which will be located to the east of the new highway at approximate chainage 14100, within the divergence of the existing A1 with the new off-line route, will collect runoff and allow controlled discharge to the River Lyne.

Chainage 13650 to Chainage 15000 Trunk Road Drainage

1 in 1 year return period greenfield run-off rate (l/s)	17.7
1 in 30 year return period greenfield run-off rate (l/s)	36.2
1 in 100 year return period greenfield run-off rate (l/s)	42.8
1 in 100 year return period +CC design storage volume (m^3)	2150

Table 9: Run-off Data

Detention Basin DB6 – Trunk Road Drainage			
Chainage	14100	**Proposed Detention Basin Inlet Invert Level (mAOD)**	82.315
Proposed Detention Basin Outlet Invert Level (mAOD)	81.815	**Watercourse Invert Level (mAOD)**	78.8
Discharge Watercourse		River Lyne	

Table 10: Detention basin Data

Design Risks:

- There is no geotechnical information in the area of the detention basin.

5.3.5 Chainage 15000 to 16150

Preliminary Design Strategy:

- The runoff will be collected in filter drains located in the verges at the edge of each carriageway.
- Surface water runoff flows southwards from the carriageway high-point at chainage 16150, to be discharged to the diverted tributary of the Fenrother Burn via Detention Basin DB7 which will be located to the west of the new highway.
- The surface water run-off from the bridge, connector road and junction slip roads at Fenrother Junction will also be discharged via DB7.

Chainage 15000 to Chainage 16150 Trunk Road Drainage

1 in 1 year return period greenfield run-off rate (l/s)	15.7
1 in 30 year return period greenfield run-off rate (l/s)	32.1
1 in 100 year return period greenfield run-off rate (l/s)	38.0
1 in 100 year return period +CC design storage volume (m^3)	1950

Table 11: Run-off Data

Detention Basin DB7 – Trunk Road Drainage			
Chainage	15050	**Proposed Detention Basin Inlet Invert Level (mAOD)**	88.50
Proposed Detention Basin Outlet Invert Level (mAOD)	88.00	**Watercourse Invert Level (mAOD)**	88.00
Discharge Watercourse		Tributary to Fenrother Burn	

Table 12: Detention basin Data

Design Risks:

- There is no geotechnical information in the area of the detention basin.
- There is minimal fall achievable in this area for the final pipe before the detention basin. As such, the detention basin will cause surcharge in this pipe.

5.3.6 Chainage 16150 to 16800

Preliminary Design Strategy:

- For the majority of this section, runoff from the carriageway will be collected in filter drains located in the verges at the edge of each carriageway. There is a short discrete length of kerb and gully drainage at the layby on the southbound carriageway.
- Surface water run-off from the highway flows northwards from the carriageway high-point at chainage 16150, to be controlled and discharged to Earsdon Burn via Detention Basin DB9 which will be located to the west of the new highway south of Earsdon Burn.

Chainage 16150 to Chainage 16800 Trunk Road Drainage

1 in 1 year return period greenfield run-off rate (l/s)	8.3
1 in 30 year return period greenfield run-off rate (l/s)	17.0
1 in 100 year return period greenfield run-off rate (l/s)	20.2
1 in 100 year return period +CC design storage volume (m^3)	1000

Table 13: Run-off Data

Detention Basin DB9 – Trunk Road Drainage			
Chainage	16800	**Proposed Detention Basin Inlet Invert Level (mAOD)**	83.5
Proposed Detention Basin Outlet Invert Level (mAOD)	83.0	**Watercourse Invert Level (mAOD)**	78.00 TBC
Discharge Watercourse		Earsdon Burn	

Table 14: Detention Basin Data

Design Risks:

- There is no geotechnical information in the area of the detention basin.
- There is a risk to the detention basin attenuation strategy due to as-yet-undefined outfall level.

5.3.7 Chainage 16800 to 17830

Preliminary Design Strategy:

- Run-off from the carriageway will mainly be collected in filter drains located in the verges at the edge of each carriageway. There are short discrete lengths of kerb and gully drainage at the layby on the northbound carriageway and beneath Causey Park overbridge.
- The preferred storage option is a detention basin.
- The storage depth at this detention basin is to be 0.7m so that the basin can be accommodated in the land available.
- Surface water run-off from the trunk highway is to be discharged to Earsdon Burn via Detention Basin DB11 which will be located to the east of the new highway at approximate chainage 17150.
- Causey Park Road is an adopted NCC road. The existing carriageway drainage is over the edge. The proposed road has a footway to the south side, and kerb and gully drainage is proposed. The gully outlets are to be taken down the embankments to discharge into the ditches at the toe of the embankments. These

drainage ditches, connected by a pipe under the road, are proposed to take the runoff from the road and embankments to a ditch to the north

Chainage 16800 to Chainage 17830 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	12.8
1 in 30 year return period greenfield run-off rate (l/s)	26.2
1 in 100 year return period greenfield run-off rate (l/s)	31.0
1 in 100 year return period +CC design storage volume (m^3)	1600

Table 15: Run-off Data

Detention Basin DB11 – Trunk Road Drainage			
Chainage	17150	**Proposed Detention Basin Inlet Invert Level (mAOD)**	76.60
Proposed Detention Basin Outlet Invert Level (mAOD)	75.90	**Watercourse Invert Level (mAOD)**	75.75 TBC
Discharge Watercourse		Tributary of Earsdon Burn	

Table 16: Detention Basin Data

Design Risks:

- There is no geotechnical information in the area of the detention basin.
- There is a risk to the detention basin attenuation strategy due to as-yet-undefined outfall level.
- The southern end of the detention basin is near to the Flood Zones 2 and 3. The layout of the basin is to be constructed outside the Flood Zones.

Services:

- An existing High Pressure (HP) gas main crosses the proposed highway at approximate chainage 17300. The HP gas main is due to be diverted in advance of the A1 improvements. The diversion will cross the Scheme at approximate chainage 17490.

5.3.8 Chainage 17830 to 18480

Preliminary Design Strategy:

- The runoff will be collected in filter drains located in the verges at the edge of each carriageway. The preferred storage option is a detention basin.
- Surface water run-off from the trunk highway will flow northwards from the high point at chainage 17830, and southwards from the high point at chainage 18480, to be controlled and discharged to a tributary of Longdike Burn via Detention Basin DB12, which will be located to the west of the new highway.
- A wildlife culvert has been proposed at chainage 18300, as it will be below the existing ground level, drainage pipework has been added to provide an outfall to the watercourse.

Chainage 17830 to Chainage 18480 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	7.3
1 in 30 year return period greenfield run-off rate (l/s)	14.8
1 in 100 year return period greenfield run-off rate (l/s)	17.6
1 in 100 year return period +CC design storage volume (m^3)	900

Table 17: Run-off Data

Detention Basin DB12 – Trunk Road Drainage			
Chainage	18280	**Proposed Detention Basin Inlet Invert Level (mAOD)**	77.8
Proposed Detention Basin Outlet Invert Level (mAOD)	77.30	**Watercourse Invert Level (mAOD)**	75.00 TBC
Discharge Watercourse		Tributary of Longdike Burn	

Table 18: Detention Basin Data

Design Risks:

- There is no geotechnical information in the area of the detention basin.
- There is a risk to the detention basin attenuation strategy due to as-yet-undefined outfall level.

5.3.9 Chainage 18480 to 19500

Preliminary Design Strategy:

- The runoff will mainly be collected in filter drains located in the verges at the edge of each carriageway. There is a short discrete length of kerb and gully drainage at the layby on the southbound carriageway.
- The preferred storage option is a detention basin.
- Surface water run-off from the trunk highway will flow northwards from the high point at chainage 18480, and southwards from the high point at chainage 19500, to be controlled and discharged to Longdike Burn via Detention Basin DB13, which will be located to the east of the new highway.

Chainage 18480 to Chainage 19500 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	13.3
1 in 30 year return period greenfield run-off rate (l/s)	27.1
1 in 100 year return period greenfield run-off rate (l/s)	32.1
1 in 100 year return period +CC design storage volume (m^3)	1500

Table 19: Run-off Data

Detention Basin DB13 – Trunk Road Drainage			
Chainage	19250	**Proposed Detention Basin Inlet Invert Level (mAOD)**	63.2
Proposed Detention Basin Outlet Invert Level (mAOD)	62.7	**Watercourse Invert Level (mAOD)**	54.8
Discharge Watercourse		Longdike Burn	

Table 20: Detention Basin Data

Design Risks:

There is no geotechnical information in the area of the detention basin.

5.3.11 Chainage 19500 to 20680

Preliminary Design Strategy:

- Run-off from the carriageway will generally be collected in filter drains located in the verges at the edge of each carriageway. There is a short discrete length of kerb and gully drainage at the layby on the northbound carriageway.
- Between chainages 20210 and 20680, there is super-elevation, so that runoff from the northbound carriageway will be to the central reservation where there are to be concrete surface water channels which can be drawn off to the southbound filter drain.
- A detention basin is the only option at this location due to the proximity of the local road network.
- Controlled discharge from Detention Basin DB15 will be discharged to Longdike Burn.
- The proposed local road to the east, linking the de-trunked A1 with the dualled A1 at the West Moor junction, will be drained to filter drains from chainage 20300 to chainage 20680, to be connected to Detention Basin DB15a which will then discharge to the Longdike Burn.
- The Eshott Airfield is to the north of the proposed detention basins. Due to concerns regarding standing water and the fact that this may be a bird attractant it is proposed that a filter drain is constructed within DB15 and DB15a to provide a positive means of ensuring that the basins are fully drained between storm events.
- At chainage 19670 there is a drainage pipe to connect the low point at the toe of the embankment in the east to the toe of the embankment to the west, to allow the surface water from the east to drain to the west.

Chainage 19500 to Chainage 20680 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	12.2
1 in 30 year return period greenfield run-off rate (l/s)	24.9
1 in 100 year return period greenfield run-off rate (l/s)	29.5
1 in 100 year return period +CC design storage volume (m^3)	1630

Table 21: Run-off Data

Detention Basin DB15 – Trunk Road Drainage			
Chainage	20150	**Proposed Detention Basin Inlet Invert Level (mAOD)**	54.55
Proposed Detention Basin Outlet Invert Level (mAOD)	54.05	**Watercourse Invert Level (mAOD)**	51.1
Discharge Watercourse		Longdike Burn	

Table 22: Detention Basin Data

Chainage 19500 to Chainage 20880 Local Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	3.1
1 in 30 year return period greenfield run-off rate (l/s)	6.4
1 in 100 year return period greenfield run-off rate (l/s)	7.5
1 in 100 year return period +CC design storage volume (m^3)	400

Table 23: Run-off Data

Detention Basin DB15a – Local Road Drainage			
Chainage:	20300	**Proposed Detention Basin Inlet Invert Level (mAOD)**	58.5
Proposed Detention Basin Outlet Invert Level (mAOD)	58.0	**Watercourse Invert Level (mAOD)**	51.1
Discharge Watercourse		Longdike Burn	

Table 24: Detention Basin Data

Design Risks:

There is no geotechnical information in the area of the detention basins.

5.3.12 Chainage 20680 to 21810

Preliminary Design Strategy:

- Run-off from the carriageway will be collected in filter drains located in the verges at the edge of each carriageway. There are discrete lengths of kerb and gully drainage on the A1 beneath the West Moor junction overbridge and through the junction.
- Between chainages 20680 and 20740, there is super-elevation, so that runoff from the northbound carriageway will be to the central reservation where there are to be concrete surface water channels which can be drawn off to the filter drain on the northbound carriageway.
- Surface water run-off from the trunk highway will flow northwards from the high point at chainage 20680, as far as Detention Basin 17 at chainage 21800. Detention basin 17 is to north of the West Moor Junction.
- Due to the proximity of the local roads, swales are not an option here.
- Controlled discharge from Detention Basin 17 will be discharged to the Thirston Burn tributary, downstream of the Glenshotton Culvert.
- A new junction (West Moor junction) will be constructed at approximate chainage 21600 linking the new A1 with the local road network. The surface water run-off from the connector road, overbridge, roundabout and junction slip roads will also be discharged via DB17.
- The existing junction of A1 / Bywell Road will be closed and a new link road will be constructed to extend Bywell Road, connecting with the local road network and the A1 at West Moor junction. This link road will run to the west and parallel with the A1 Trunk Road from approximate chainage 20620 as far as West Moor junction at approximate chainage 21600. This new link road will be part of the local (NCC) road network, and will discharge to Detention Basin 17a.
- A new link road will be constructed connecting the existing de-trunked A1 with the existing local road network. This link road will run to the east and parallel with the A1 Trunk Road from approximate chainage 20030 as far as West Moor Junction at approximate chainage 21600. This new link road will be part of the local (NCC) road network, and will discharge to Detention Basin 17b.
- Run-off from the A1 running lanes and hardstrips will follow the road camber to both channels.

Chainage 20680 to Chainage 21810 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	16.5
1 in 30 year return period greenfield run-off rate (l/s)	33.7
1 in 100 year return period greenfield run-off rate (l/s)	39.9
1 in 100 year return period +CC design storage volume (m^3)	2200

Table 25: Run-off Data

Detention Basin DB17 – Trunk Road Drainage			
Chainage:	21800	**Proposed Detention Basin Inlet Invert Level (mAOD)**	57.802
Proposed Detention Basin Outlet Invert Level (mAOD)	57.302	**Watercourse Invert Level (mAOD)**	57.2 TBC
Discharge Watercourse		Thirston Burn Tributary	

Table 26: Detention Basin Data

Chainage 20960 to Chainage 21600 Local Road - Bywell Road- Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	3.6
1 in 30 year return period greenfield run-off rate (l/s)	7.4
1 in 100 year return period greenfield run-off rate (l/s)	8.8
1 in 100 year return period +CC design storage volume (m^3)	450

Table 27: Run-off Data

Chainage 20960 to Chainage 21600 Local Road – Link Road North - Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	4.4
1 in 30 year return period greenfield run-off rate (l/s)	9.1
1 in 100 year return period greenfield run-off rate (l/s)	10.7
1 in 100 year return period +CC design storage volume (m^3)	600

Table 28: Run-off Data

Detention Basin DB17a – Local Road-Bywell Road- Drainage			
Chainage:	21550 West	**Proposed Detention Basin Inlet Invert Level (mAOD)**	58.362
Proposed Detention Basin Outlet Invert Level (mAOD)	57.862	**Watercourse Invert Level (mAOD)**	57.7 TBC
Discharge Watercourse		Thirston Burn Tributary	

Table 29: Detention Basin Data

Detention Basin DB17b – Local Road – Parallel Link Road Drainage			
Chainage:	21550 East	**Proposed Detention Basin Inlet Invert Level (mAOD)**	58.7
Proposed Detention Basin Outlet Invert Level (mAOD)	58.2	**Watercourse Invert Level (mAOD)**	57.7 TBC
Discharge Watercourse		Thirston Burn Tributary	

Table 30: Detention Basin Data

Design Risks:

- There is limited geotechnical information in the area of the detention basins.
- There is a risk due to as-yet-undefined outfall levels.

5.3.13 Chainage 21810 to 22470

Preliminary Design Strategy:

Run-off from the carriageway will be collected in filter drains located in the verges at the edge of each carriageway

- Run-off from the running lanes and hardstrips will follow the road camber to both channels.
- Due to the location of the detention basin and the site topography, the excavation required is large. The detention basin will require its own drainage design. Controlled discharge from Detention Basin DB18 will be discharged to the River Coquet. It should be noted that the outfall from the detention basin will need to convey the discharge to the river some 20m below.

Chainage 21810 to Chainage 22470 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	15.5
1 in 30 year return period greenfield run-off rate (l/s)	31.6
1 in 100 year return period greenfield run-off rate (l/s)	37.4
1 in 100 year return period +CC design storage volume (m^3)	1200

Table 31: Run-off Data

Detention Basin DB18 – Trunk Road Drainage			
Chainage:	22350	**Proposed Detention Basin Inlet Invert Level (mAOD)**	54.36
Proposed Detention Basin Outlet Invert Level (mAOD)	53.86	**Watercourse Invert Level (mAOD)**	33
Discharge Watercourse		River Coquet	

Table 32: Detention Basin Data

Design Risks:

- The proposed site for the detention basin is key as it is to be the site of the proposed bridge works, the programming of the construction works will need to account for this.
- There is no geotechnical information in the site of the detention basin, however it is understood that rock will be encountered in this area.

5.3.14 Chainage 22470 to 23100 Northbound Carriageway

Preliminary Design Strategy:

- Run-off from the northbound carriageway will be collected in filter drains located in the verge at the edge of the carriageway. Surface water run-off will flow northwards from the River Coquet Bridge crossing as far as the Parkwood Subway where it is directed to Detention Tank T21.
- Controlled discharge from T21 will be discharged to the Bradley Brook a tributary of Back Burn.
- Due to the shallow deck at the subway it was not possible to take the filter drain across it, hence the need to provide attenuation at this location. A detention tank was selected to fit within the local constraints, it is proposed that this would be a geocellular tank
- It is proposed that the existing River Coquet Bridge surface drainage is retained. The As-Constructed drawings show that gratings connect to drainage pipework within the bridge deck which discharges to the River Coquet. The runoff flows through catchpits which would provide a means of silt removal. The emptying of these catchpits will remain as a maintenance task for Highways England.

Chainage 22700 to Chainage 23550 Northbound Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	5.0
1 in 30 year return period greenfield run-off rate (l/s)	10.1
1 in 100 year return period greenfield run-off rate (l/s)	12.0
1 in 100 year return period +CC design storage volume (m^3)	300

Table 33: Run-off Data

Detention Tank T21 – Northbound Trunk Road Drainage Only			
Chainage:	23120	**Proposed Detention Tank Inlet Invert Level (mAOD)**	38.1
Proposed Detention Tank Outlet Invert Level (mAOD)	38.0	**Watercourse Invert Level (mAOD)**	37.8 TBC
Discharge Watercourse		Bradley Brook	

Table 34: Detention Tank Data

Design Risks:

There is no geotechnical information at the site of the detention tank. However, it is understood that the ground conditions are unusual in this location. The detention tank is a major construction item which will require significant design input.

5.3.15 Chainage 22470 to 23550

Preliminary Design Strategy:

- The northbound carriageway in this section of the A1 from chainage 22470 to chainage 23100 is connected to Detention Tank T21 and was covered in section 5.3.14 above.
- The new River Coquet bridge run-off from chainage 22470 to 22710, will be collected in deck drainage units and connect to the concrete surface water channel (SWC) on the southbound carriageway.
- Run-off from the southbound carriageway (Chainage 22710 to 23100) will be collected in a SWC located in the verge at the edge of the carriageway, this will discharge to DB19. The SWC is connected to a pipe that is to be attached to the eastern side of the Parkwood Culvert extension. This pipe will then connect to a filter drain north of the subway.
- Controlled discharge from DB19 will be discharged to Bradley Brook a tributary of Back Burn.
- The storage depth at this detention basin is to be 1.0m so that the basin can have a reduced footprint.

Chainage 23100 to Chainage 23550 Trunk Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	13.6
1 in 30 year return period greenfield run-off rate (l/s)	27.8
1 in 100 year return period greenfield run-off rate (l/s)	32.9
1 in 100 year return period +CC design storage volume (m^3)	1000

Table 35: Run-off Data

Detention Basin DB19 – Trunk Road Drainage			
Chainage	25300	**Proposed Detention Basin Inlet Invert Level (mAOD)**	50.288
Proposed Detention Basin Outlet Invert Level (mAOD)	49.288	**Watercourse Invert Level (mAOD)**	@ 37.725
Discharge Watercourse		Bradley Brook	

Table 36: Detention Basin Data

Design Risks:

- There is no geotechnical information in the site of the detention basin. The detention basin is a major construction item which will require significant design input.

5.4 Non-Trunk Network & Side Roads

Maintenance boundaries at junctions have been agreed in principal between Highways England and Northumberland County Council. The drainage networks associated with access roads, local tracks and local roads that will be constructed as part of the A1iN M2F upgrade beyond the Highways England maintenance boundary extents, will not become part of the trunk road drainage network. These areas of non-trunk carriageway construction will be drained separately from the trunk road.

Drainage details for the proposed local road drainage modifications for the existing junctions and the proposed junction works can be found in the relevant sections in 5.3 and are shown on Drawings HE551459-WSP-HDG-M2F-DR-CD-0016 and 17.

Where there is similar proposed carriageway replacing the existing carriageway, new drainage works are proposed to connect the new carriageway to the existing drainage network. This is proposed at the four locations at Highlaws junction, Fenrother junction, the south end of Bywell Road and West Moor junction. Kerb and gulley drainage is proposed here and the details are shown on the drawings, mentioned above.

5.4.1 The Fenrother Free Flow Link Road

The alignment of Fenrother Lane (east) is to be altered to create a free-flow link from the proposed Fenrother junction to the de-trunked A1 to the north. Traffic using this free-flow link would have priority over traffic using the de-trunked A1 to the south which is to be stopped up directly south of Detention Basin DB6.

Preliminary Design Strategy:

- Run-off from the carriageway will be collected in kerb and gully drainage located in both verges.
- Surface water runoff will be directed eastwards to Detention Basin DB20.
- Controlled discharge from DB20 will be discharged to the un-named watercourse to the east.

Local Road –Fenrother Free Flow Link Road Drainage	
1 in 1 year return period greenfield run-off rate (l/s)	3.4
1 in 30 year return period greenfield run-off rate (l/s)	7.0
1 in 100 year return period greenfield run-off rate (l/s)	8.3
1 in 100 year return period +CC design storage volume (m^3)	420

Table 37: Run-off Data

Detention Basin DB20 – Local Road Fenrother Free Flow Link Drainage			
Chainage	12150 EAST	**Proposed Detention Basin Inlet Invert Level (mAOD)**	82.53
Proposed Detention Basin Outlet Invert Level (mAOD)	82.03	**Watercourse Invert Level (mAOD)**	81.5 TBC
Discharge Watercourse		Unnamed watercourse	

Table 38: Detention Basin Data

Design Risks:

- There is no geotechnical information in the site of the detention basin.
- Unknown underground utilities are a risk at this location. Existing utilities which are not already included in the Scheme diversion proposals may require diversion for the construction of DB20.
- The as-yet-undefined outfall location is a risk.

6 Operation & Maintenance Strategy

The operation and maintenance strategy for the A1iN Section A (Morpeth to Felton) will follow the existing guidance published by Highways England. For the overall Scheme refer to the report 'A1 in Northumberland Morpeth to Felton - Maintenance and Repair Strategy Statement (MRSS) (HE551459-WSP-GEN-M2F-RP-ZZ-0003)'. The maintenance relevant to the drainage works are outlined below.

HA 217 gives guidance on the maintenance of combined surface drains where used as a highway drainage system. No actual maintenance programme is prescribed.

For the swales and detention basins, the maintenance requirements would be in line with the SuDS Manual (CIRIA Guide C753). This is similar to the maintenance required for grassed surface water channels (see DMRB HA 119/06) but would also include clearance of grilles at headwalls and removal of sediment.

Special maintenance is required for DB 15 and 15a where planting is restricted to grassland habitat that shall be managed at a higher frequency then elsewhere along the Scheme in order to maintain a short sward height, to discourage use by ground nesting birds in the vicinity of Eshott Airfield. The filter drains in these detention basins will need to be included in an inspection and maintenance programme to ensure they are operational.

There is no maintenance works required directly to the Parkwood storage tank (T21), the maintenance will be the removal of silt at the upstream catchpits.

The maintenance requirements for the filter drains will be the cleaning of the filter material which would be expected to be undertaken every 20 years.

7 Summary of Proposed Drainage Strategy

A summary of the proposed drainage strategy for the A1iN Section A (Morpeth to Felton) is provided below. The drainage strategy is subject to final confirmation as the drainage design progresses.

- Runoff from the A1 trunk upgrade will be discharged into the existing watercourses via storage swales, detention basins and tanks where required. In this scenario discharge rates will be limited to existing (unfactored) values.
- Drainage discharge from highways remaining part of the local road network will be kept separate from discharge associated with the proposed A1 Trunk Road as agreed with NCC. This strategy includes separate detention basins or SuDS features where possible. However, controlled runoff from both trunk and non-trunk detention basins/features will discharge to a common outfall to minimise the overall project footprint. Maintenance of trunk and local drainage assets will be subject to a 'Memorandum of Understanding' between Highways England and NCC.
- Roads/tracks which are not to be incorporated as access roads to the new trunk road system, are assumed to be abandoned/truncated, and will continue to drain as existing. All existing watercourses crossing the proposed route, to which these roads/tracks may drain, will be maintained using culverts or other means.
- Locations of detention basins have been agreed with Highways England, NCC, and EA.
- Allowable runoff rates have been restricted to existing greenfield runoff values for the equivalent storm events i.e. the 1 in 1, 30 and 100 year return periods.
- Highway drainage has been designed to accommodate a 1 in 1 year design flow without surcharging; and a 1 in 5 year flow without surface flooding of the running carriageways (with a 20% allowance for climate change).
- Attenuation has been provided for the 1 in 100 year event plus 20% climate change.
- Where detention basins or storage swales are used for attenuation these are located outside of EA Flood Zone 2 and 3 areas.
- Online controls have been modelled to restrict discharges to allowable values.
- It is assumed that any new local access tracks, bridleways, and private means of access (PMAs) will be drained to local land drains and watercourses.
- Runoff from the running lanes and hardstrips will follow the road camber to both channels, and to central reservation where there is a crossfall.
- Runoff to central reservation will be to concrete V-channels.
- Where the highway is accommodated within a cutting the runoff from the cutting will be to a combined toe drain if possible.
- Where the highway is accommodated within a cutting the runoff from the adjacent fields will be to a drainage ditch at the edge of the field.
- Where the highway is on an embankment, the runoff from the embankment will be to a toe drainage ditch if possible.

- Where the highway is on an embankment, the field runoff will be taken by a drainage ditch to be built at the edge of the field.

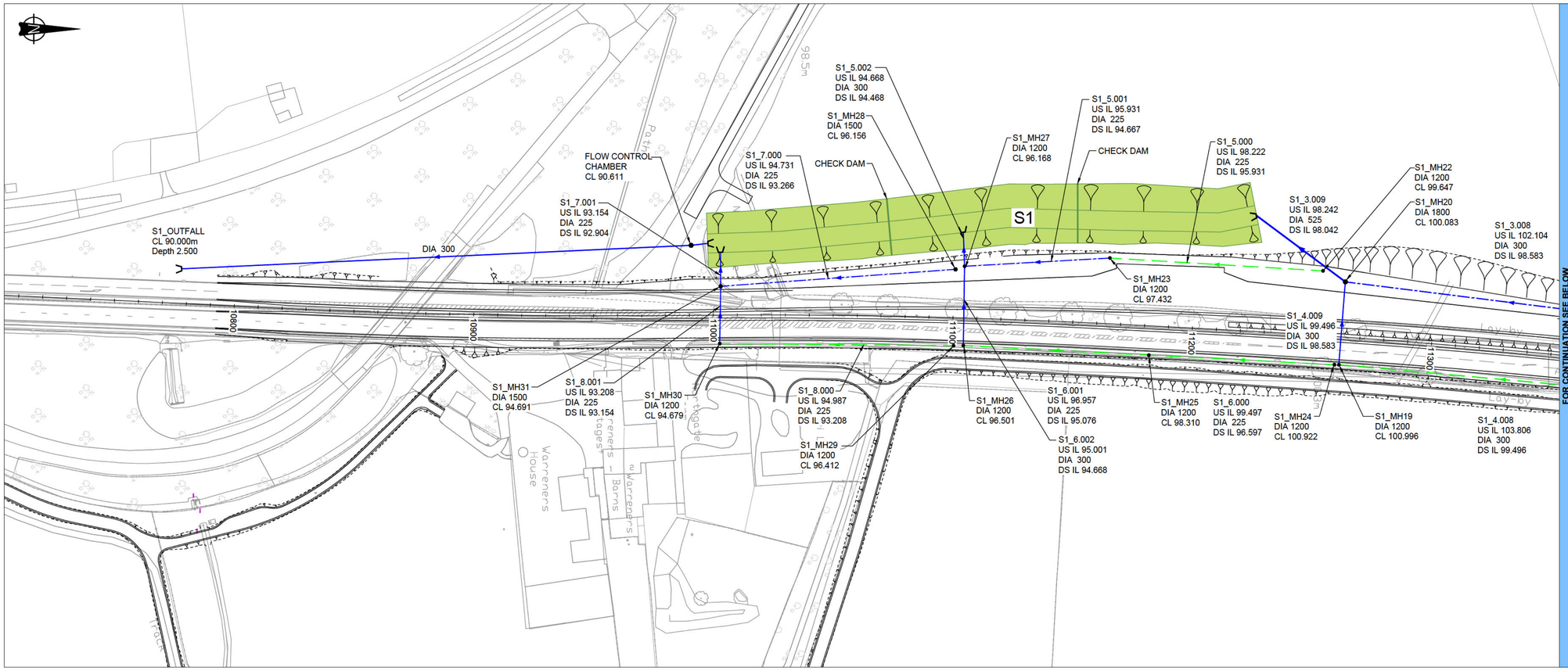
Appendix A – Hydraulic Model

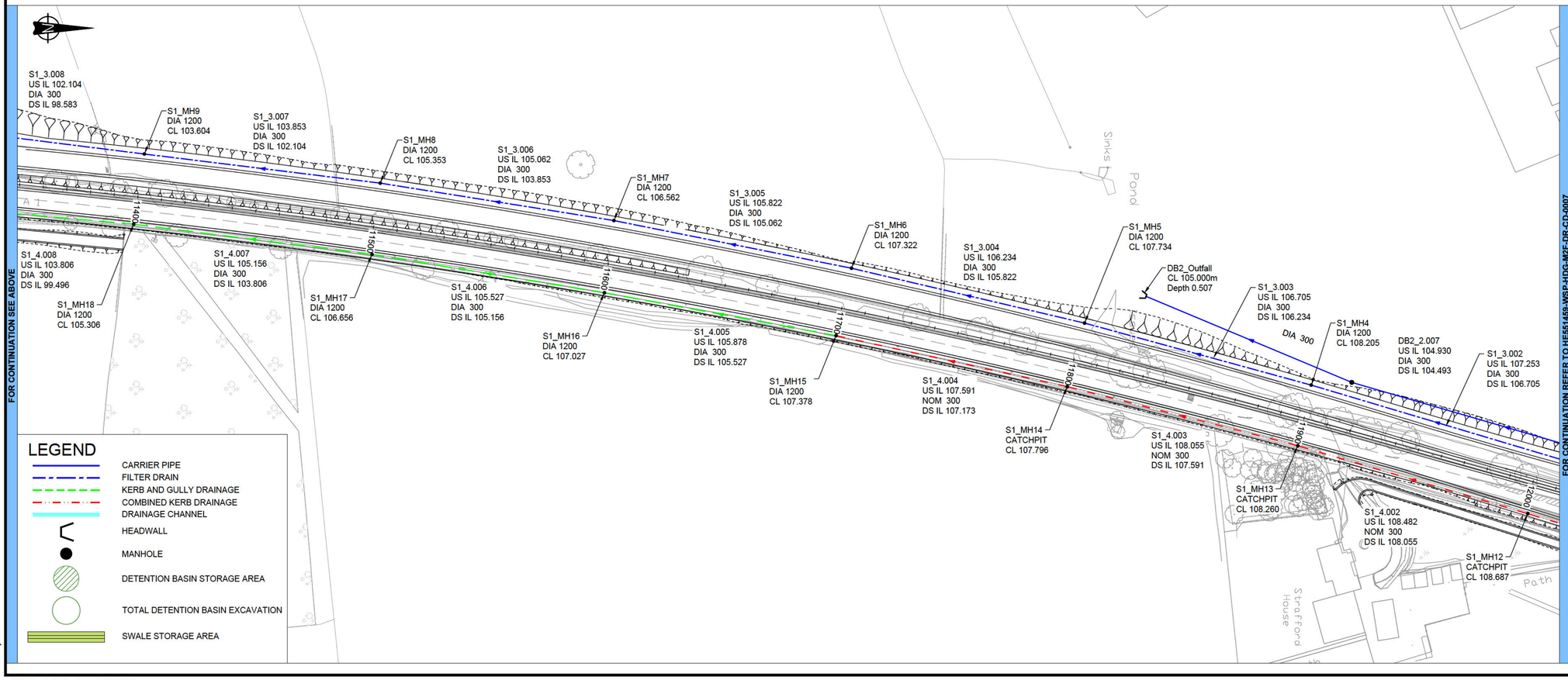
APPENDIX A – HYDRAULIC MODEL IS NOT REQUIRED TO BE APPENDED TO THE A1 IN NORTHUMBERLAND: MORPETH TO FELTON ENVIRONMENTAL STATEMENT **(Application Document Reference: TR010041/APP/6.7)**

Appendix B – Drainage Strategy Layout Drawings

DO NOT SCALE

Millimetres 0 10 100





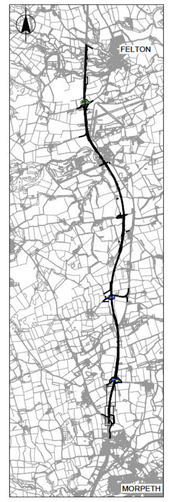
LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN

(Scale 1:100,000)

0 50 100 m

SCALE 1:1000

Rev.	Date	Description	By	Eng' Chk	Disc' Chk	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION

Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 1 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size	**Date**	**Date**	**Date**	**Date**
A1	18.10.18	19.10.18	25.10.18	25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0006

Revision: P05

PW Stg Code: 3

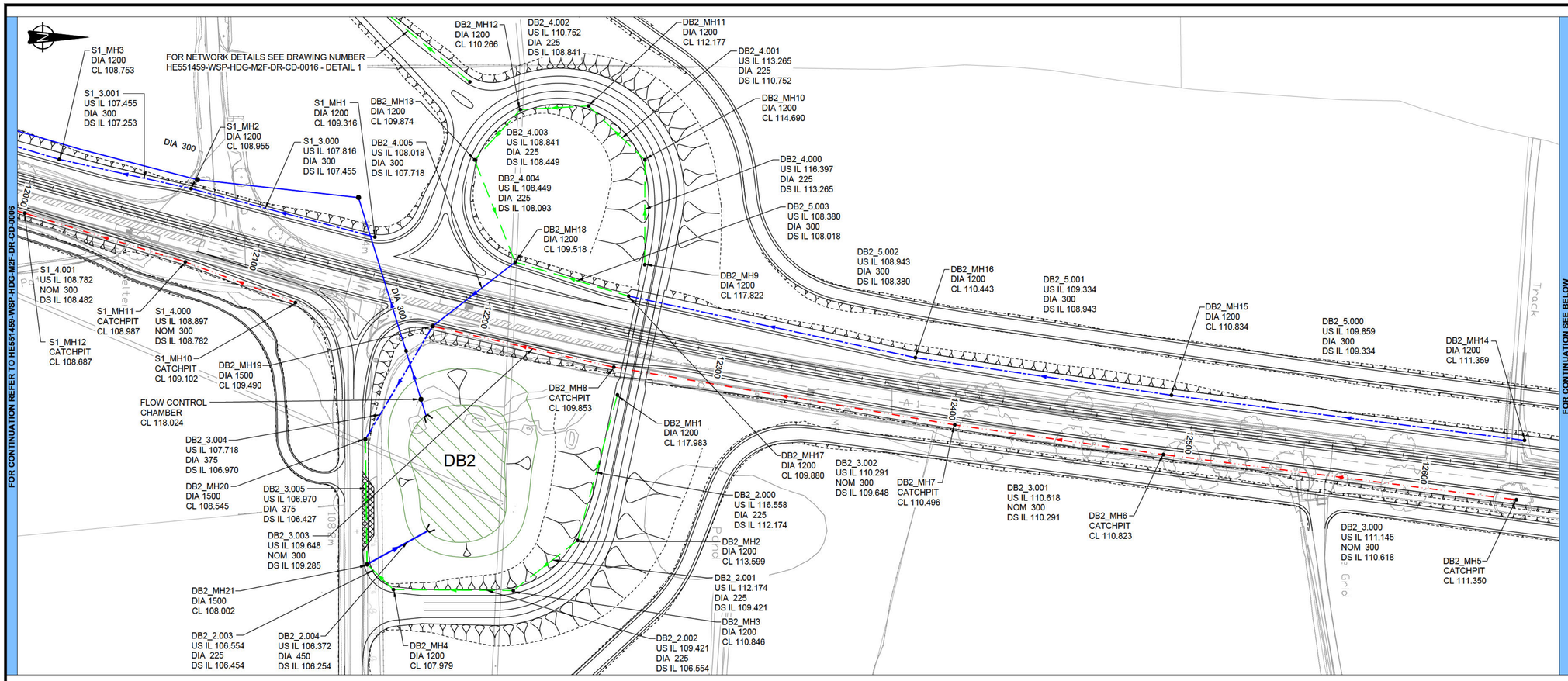
Security Class

WSP Project Number: 70038006

DO NOT SCALE

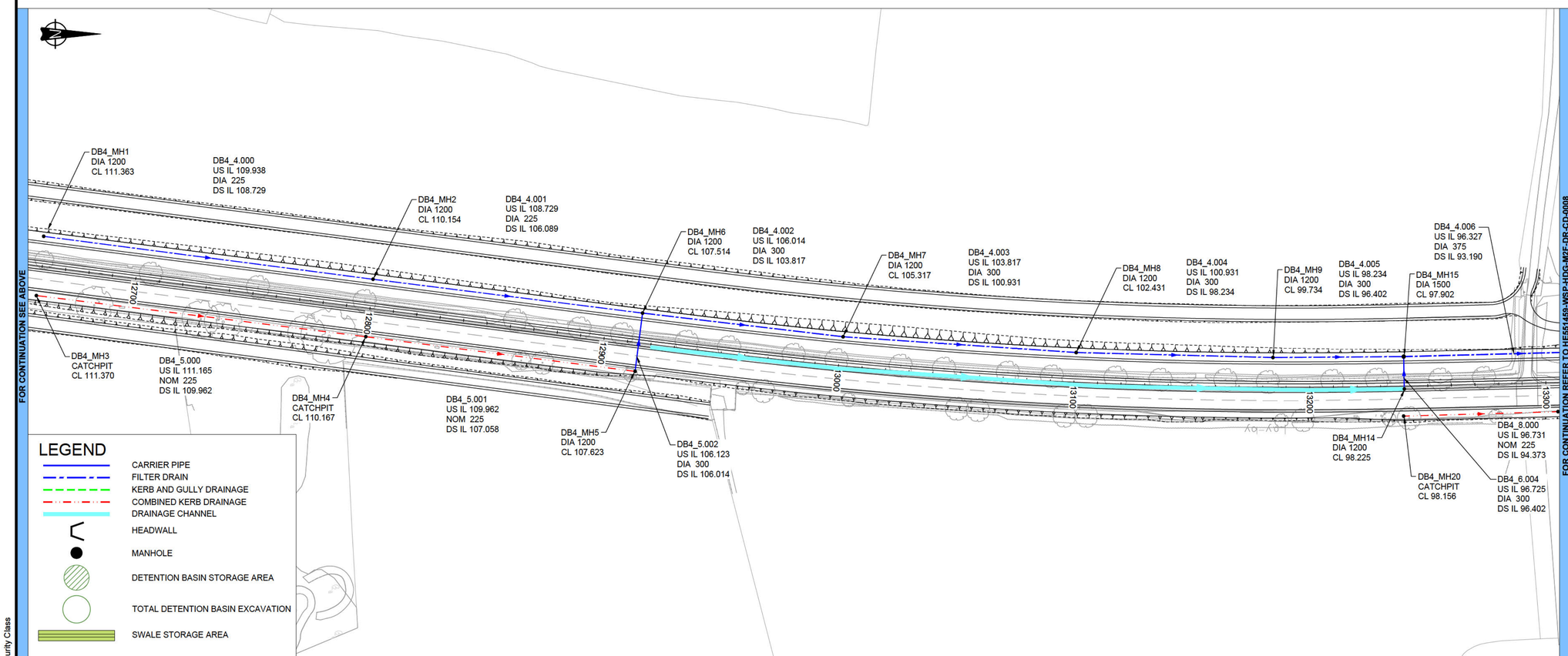
Millimetres 100 0 10

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0006



FOR CONTINUATION SEE BELOW

FOR CONTINUATION SEE ABOVE



FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0008

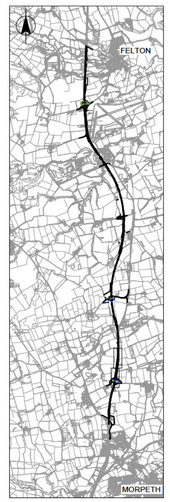
LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. EMBANKMENT DRAINAGE WORKS FOR HIGHLAWS JUNCTION ARE SHOWN ON DRAWING HE551459-WSP-HDG-M2F-DR-CD-0018.
12. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m
SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT
SHEET 2 OF 13
REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0007
Revision: P05
PW Stg Code: 3

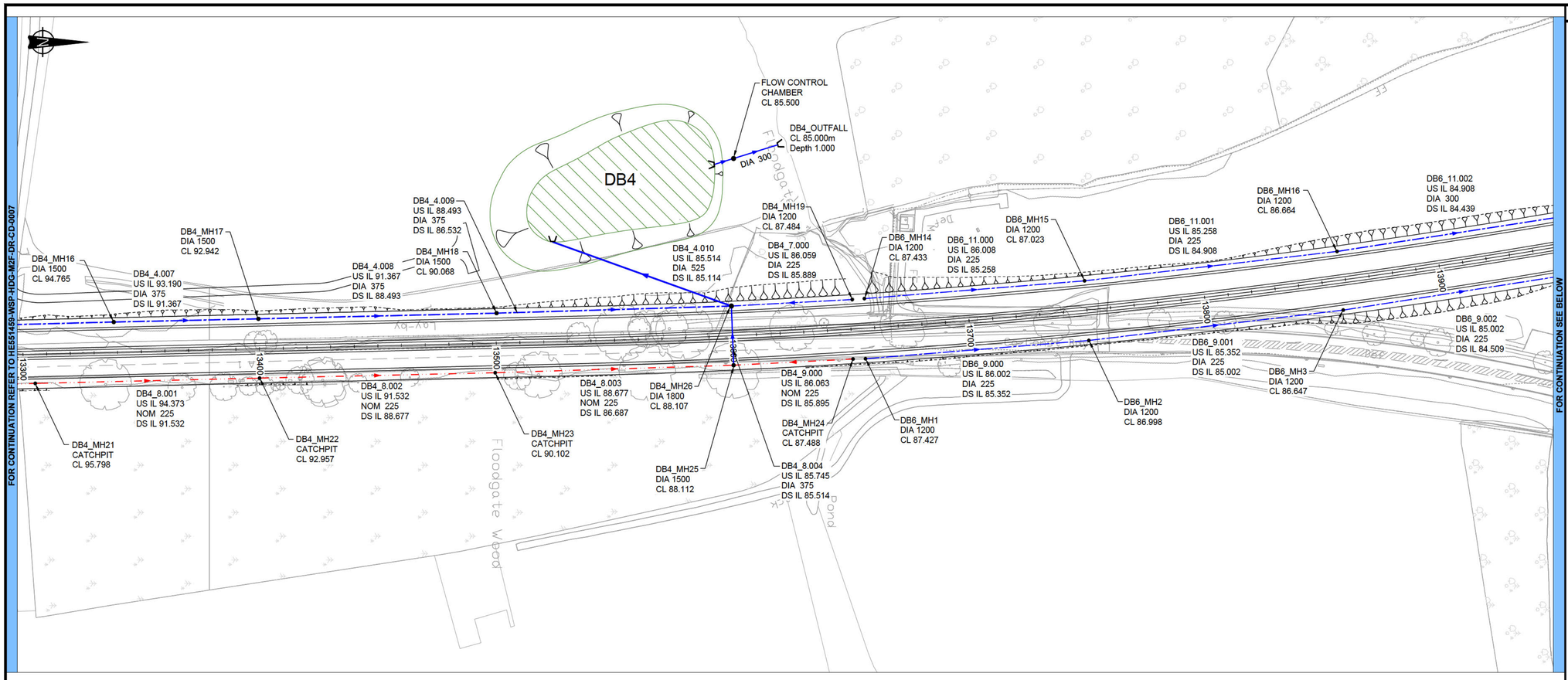
Security Class

WSP Project Number: 70038006

DO NOT SCALE

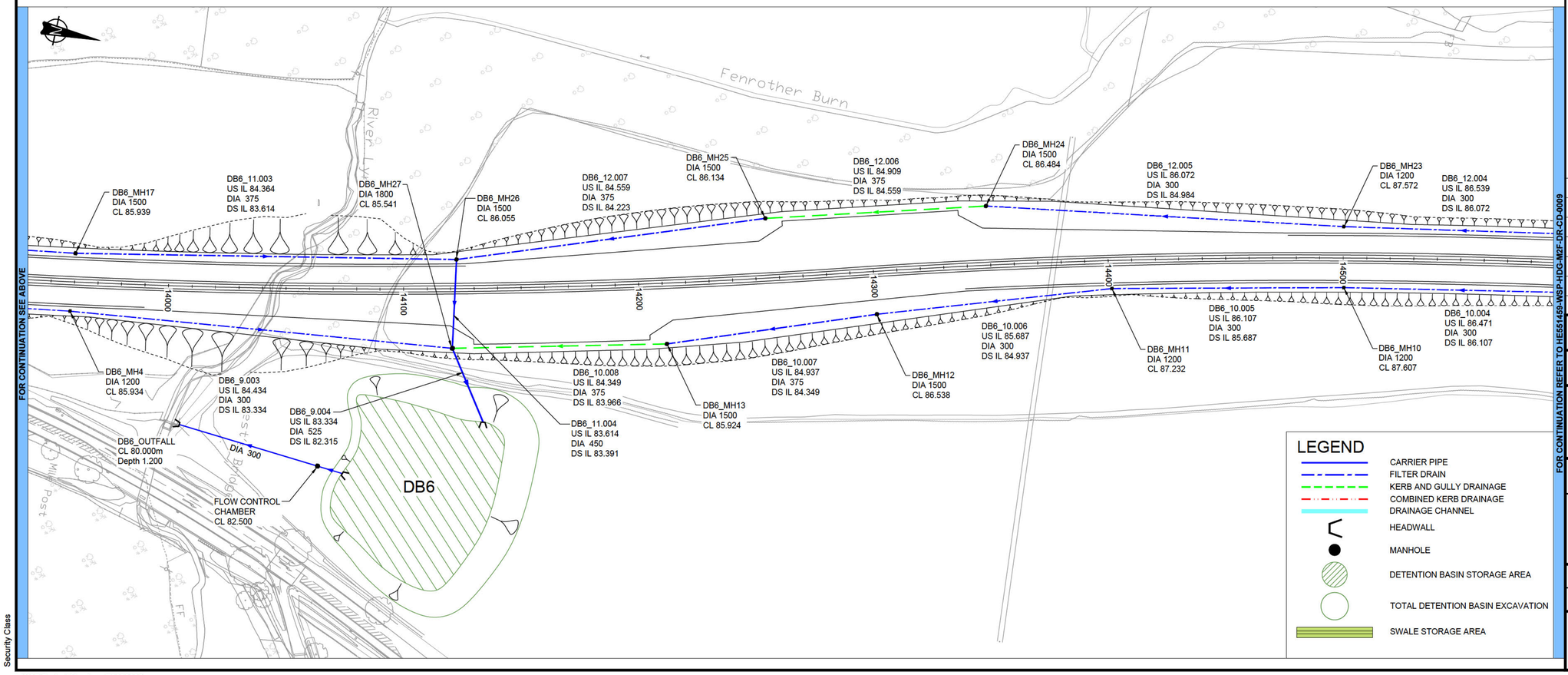
Millimetres 0 10 100

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0007



FOR CONTINUATION SEE BELOW

FOR CONTINUATION SEE ABOVE

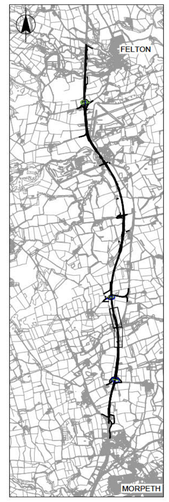


FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0009

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100m
SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 3 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0008
Revision: P05
PW Stg Code: 3

Security Class

WSP Project Number: 70038006

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0008

FOR CONTINUATION SEE BELOW

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0017

FOR CONTINUATION SEE ABOVE

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0010

Fenrother Burn

DB7

DB7_OUTFALL
CL 90.000m
Depth 2.000

DB7_MH36 DIA 1200 CL 92.222

DB7_13.001 US IL 93.124 DIA 225 DS IL 90.797

DB7_MH35 DIA 1200 CL 94.549

DB7_13.000 US IL 96.243 DIA 225 DS IL 93.124

DB7_MH34 DIA 1200 CL 97.668

FLOW CONTROL CHAMBER CL 90.500

DB7_13.002 US IL 90.797 DIA 225 DS IL 88.691

DB7_MH37 DIA 1200 CL 90.116

DB7_13.003 US IL 88.691 DIA 225 DS IL 88.348

DB7_MH38 DIA 1200 CL 89.773

DB7_8.012 US IL 88.150 DIA 600 DS IL 88.100

DB7_MH33 DIA 1800 CL 89.889 m

DB7_13.004 US IL 88.273 DIA 300 DS IL 88.225

DB7_12.005 US IL 88.187 DIA 300 DS IL 88.150

DB7_MH32 DIA 1200 CL 89.826 m

DB7_MH25 DIA 1500 CL 89.880 m

DB7_8.011 US IL 88.250 DIA 600 DS IL 88.150

DB7_11.000 US IL 88.305 DIA 375 DS IL 88.200

DB7_MH26 DIA 1800 CL 90.183 m

DB7_MH11 DIA 1500 CL 90.525 m

DB7_8.010 US IL 88.950 DIA 375 DS IL 88.608

DB7_8.009 US IL 89.369 DIA 375 DS IL 88.950

DB6_MH22 DIA 1200 CL 88.039

DB6_12.003 US IL 86.952 DIA 300 DS IL 86.539

DB6_MH21 DIA 1200 CL 88.452

DB6_12.002 US IL 87.269 DIA 300 DS IL 86.952

DB6_MH20 DIA 1200 CL 88.872

DB6_MH19 DIA 1200 CL 89.219

DB6_12.001 US IL 87.719 DIA 300 DS IL 87.269

14600

14700

14800

14900

15000

15100

15200

DB6_MH9 DIA 1200 CL 88.033

DB6_10.003 US IL 86.871 DIA 300 DS IL 86.471

DB6_MH8 DIA 1200 CL 88.438

DB6_10.002 US IL 87.371 DIA 300 DS IL 86.871

DB6_MH7 DIA 1200 CL 88.871

DB6_10.001 US IL 87.647 DIA 300 DS IL 87.371

DB6_10.000 US IL 87.947 DIA 300 DS IL 87.647

DB6_MH6 DIA 1200 CL 89.248

DB6_12.000 US IL 87.993 DIA 300 DS IL 87.719

DB6_MH5 DIA 1200 CL 89.447

DB6_MH18 DIA 1200 CL 89.493

DB7_MH27 DIA 1200 CL 97.101

DB7_12.000 US IL 95.676 DIA 225 DS IL 92.501

DB7_MH28 DIA 1200 CL 93.926

DB7_12.001 US IL 92.501 DIA 225 DS IL 89.882

DB7_MH29 DIA 1200 CL 91.307

DB7_12.002 US IL 89.882 DIA 225 DS IL 88.312

DB7_12.003 US IL 88.312 DIA 225 DS IL 88.212

DB7_MH30 DIA 1200 CL 89.737

DB7_MH23 DIA 1500 CL 89.928 m

DB7_10.000 US IL 88.353 DIA 375 DS IL 88.300

DB7_12.004 US IL 88.212 DIA 300 DS IL 88.187

DB7_MH24 DIA 1800 CL 90.191 m

DB7_MH31 DIA 1200 CL 89.846 m

DB7_9.010 US IL 88.918 DIA 375 DS IL 88.518

DB7_9.011 US IL 88.300 DIA 525 DS IL 88.250

DB7_9.009 US IL 89.305 DIA 375 DS IL 88.918

DB7_MH22 DIA 1500 CL 90.493 m

DB7_8.009 US IL 89.369 DIA 375 DS IL 88.950

DB7_MH10 DIA 1500 CL 90.944

DB7_8.008 US IL 89.802 DIA 375 DS IL 89.369

DB7_MH9 DIA 1500 CL 91.377

DB7_8.007 US IL 91.305 DIA 300 DS IL 89.877

DB7_MH8 DIA 1200 CL 92.805

DB7_8.006 US IL 92.786 DIA 300 DS IL 91.305

DB7_MH7 DIA 1200 CL 94.286

DB7_8.005 US IL 94.359 DIA 225 DS IL 92.861

DB7_MH6 DIA 1200 CL 95.784

DB7_8.004 US IL 95.876 DIA 225 DS IL 94.359

DB7_MH5 DIA 1200 CL 97.301

DB7_8.003 US IL 97.349 DIA 225 DS IL 95.876

15300

15400

15500

15600

15700

15800

DB7_9.009 US IL 89.305 DIA 375 DS IL 88.918

DB7_MH21 DIA 1500 CL 90.936

DB7_9.008 US IL 89.705 DIA 375 DS IL 89.305

DB7_MH20 DIA 1500 CL 91.348

DB7_9.007 US IL 91.305 DIA 300 DS IL 89.705

DB7_MH19 DIA 1200 CL 92.805

DB7_9.006 US IL 92.769 DIA 300 DS IL 91.305

DB7_MH18 DIA 1200 CL 94.296

DB7_9.005 US IL 94.369 DIA 225 DS IL 92.769

DB7_MH17 DIA 1200 CL 95.794

DB7_9.004 US IL 95.881 DIA 225 DS IL 94.369

DB7_MH16 DIA 1200 CL 97.306

DB7_9.003 US IL 97.331 DIA 225 DS IL 95.881

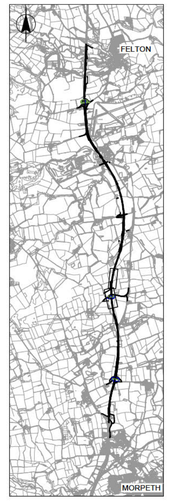
LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. EMBANKMENT DRAINAGE WORKS FOR FENROTHER JUNCTION ARE SHOWN ON DRAWING HE551459-WSP-HDG-M2F-DR-CD-0018.
12. PROPOSED WATERCOURSE DIVERSION AT WEST OF CARRIAGEWAY AT APPROXIMATELY CH 14900 - CH 15400.
13. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m
SCALE 1:1000

Rev.	Date	Description	By	Eng' Chk	Disc' Chk	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 4 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size	Date	Date	Date	Date
A1	18.10.18	19.10.18	25.10.18	25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0009
Revision: P05
PW Stg Code: 3

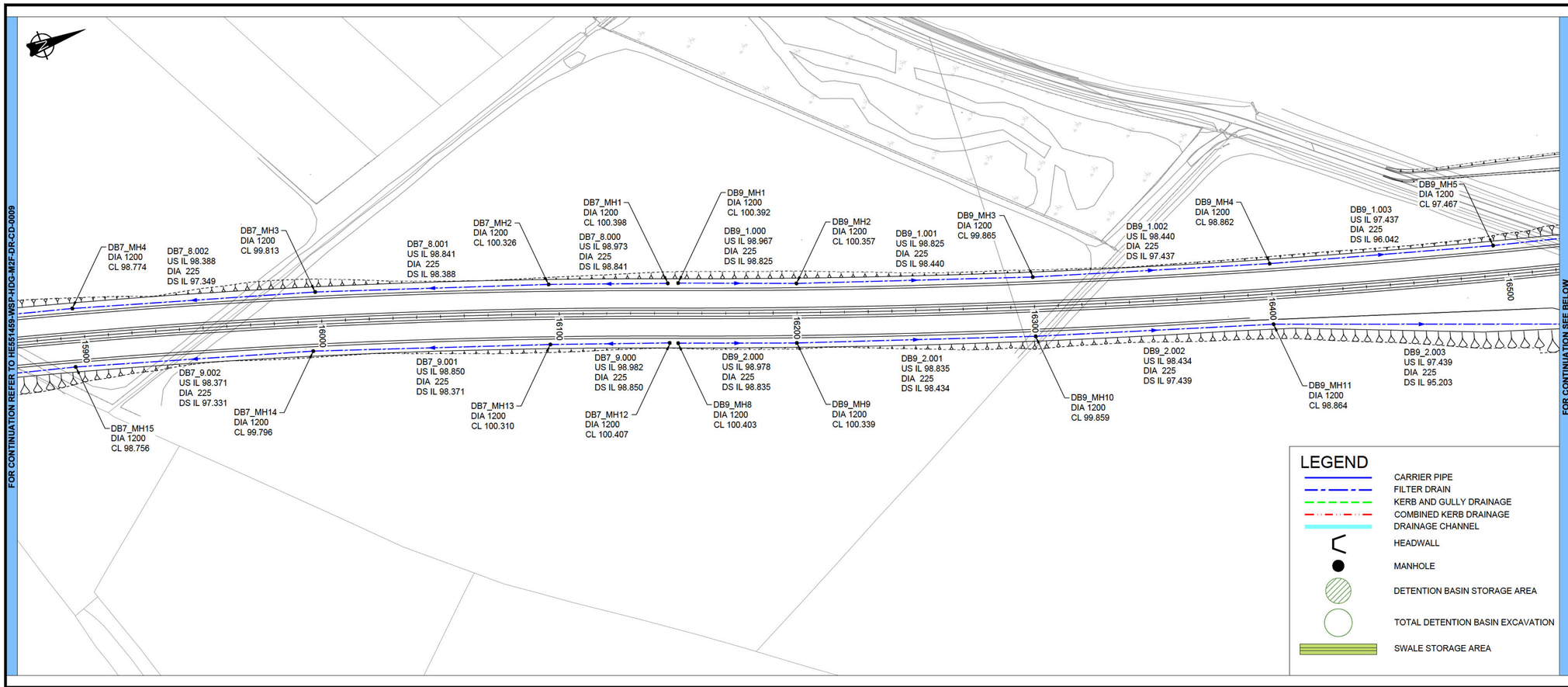
Security Class

WSP Project Number: 70038006

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0009

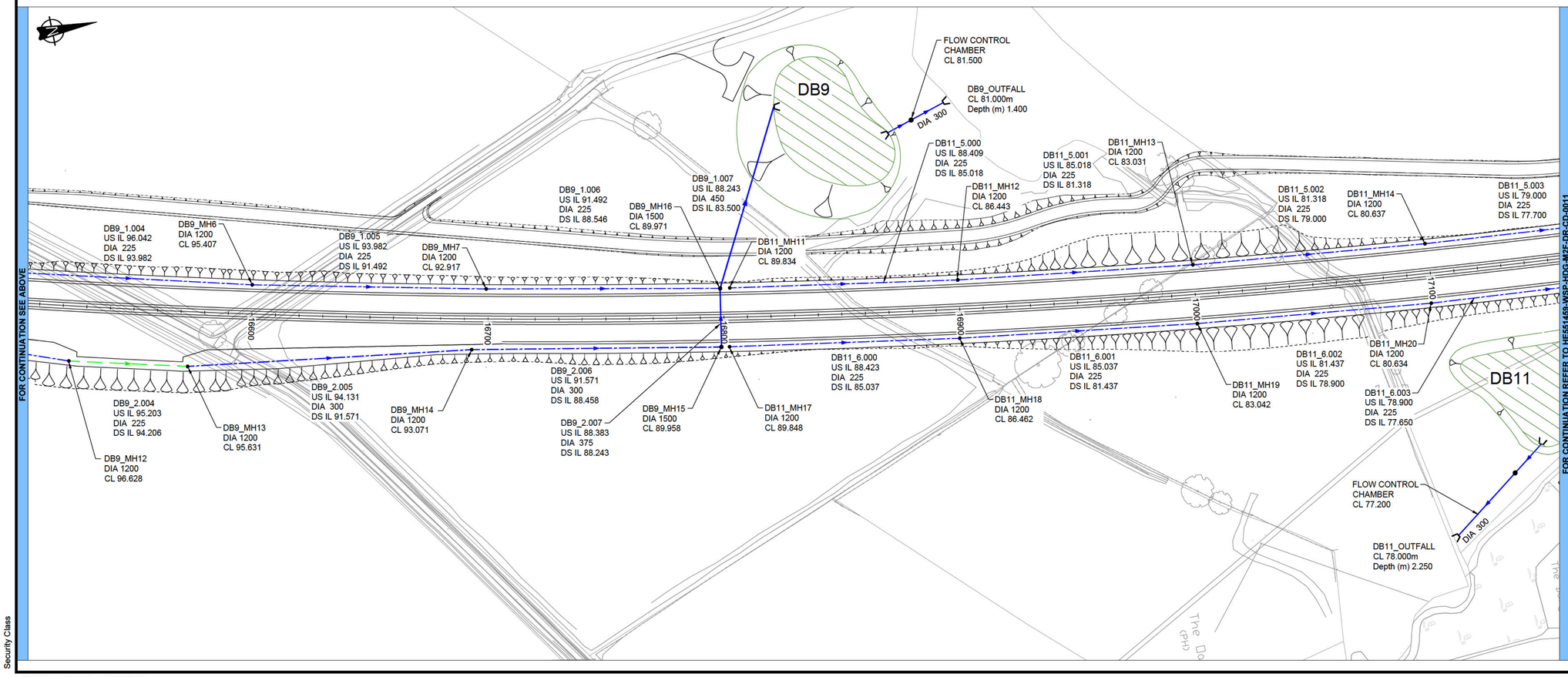


LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

FOR CONTINUATION SEE BELOW

FOR CONTINUATION SEE ABOVE

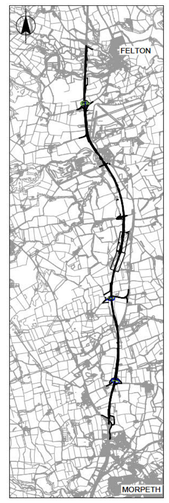


FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0011

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. THE EXISTING WATERCOURSES WILL BE DIVERTED AT THE WEST OF THE MAINLINE AT APPROXIMATELY CH 16980 - CH 17470.
12. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100m
SCALE 1:1000

Rev.	Date	Description	By	Eng' Chk	Disc' Chk	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 5 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0010
Revision: P05
PW Stg Code: 3

Security Class

WSP Project Number: 70038006

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0010

FOR CONTINUATION SEE BELOW

FOR CONTINUATION SEE ABOVE

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0012

LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

3m WIDE SWALE

300Ø DRAINAGE PIPE

WILDLIFE CULVERT

DB11_MH15 DIA 1200 CL 79.229

DB11_5.004 US IL 77.700 DIA 300 DS IL 76.950

DB11_MH16 DIA 1500 CL 78.734

DB11_4.004 US IL 77.180 DIA 375 DS IL 76.880

DB11_MH10 DIA 1500 CL 78.805

DB11_4.003 US IL 77.756 DIA 300 DS IL 77.256

DB11_MH9 DIA 1200 CL 79.378

DB11_4.002 US IL 79.556 DIA 225 DS IL 77.756

DB11_MH8 DIA 1200 CL 80.981

DB11_4.001 US IL 80.790 DIA 225 DS IL 79.556

DB11_MH7 DIA 1200 CL 82.514

DB11_4.000 US IL 81.647 DIA 225 DS IL 80.790

DB11_5.003 US IL 79.000 DIA 225 DS IL 77.700

17200 17300 17400 17500 17600 17700

DB11

DB11_3.005 US IL 76.730 DIA 600 DS IL 76.550

DB11_6.004 US IL 77.650 DIA 300 DS IL 76.750

DB11_4.005 US IL 76.880 DIA 450 DS IL 76.730

DB11_3.004 US IL 77.897 DIA 300 DS IL 76.947

DB11_3.003 US IL 78.947 DIA 300 DS IL 77.897

DB11_3.002 US IL 80.078 DIA 225 DS IL 79.022

DB11_3.001 US IL 80.976 DIA 225 DS IL 80.078

DB11_3.000 US IL 81.619 DIA 225 DS IL 80.976

DB11_MH21 DIA 1200 CL 79.227

DB11_MH22 DIA 1800 CL 78.791

DB11_MH5 DIA 1200 CL 79.397

DB11_MH4 DIA 1200 CL 80.447

DB11_MH3 DIA 1200 CL 81.503

DB11_MH2 DIA 1200 CL 82.506

DB11_6.003 US IL 78.900 DIA 225 DS IL 77.650

DB12_OUTFALL CL 75.000m Depth (m) 0.700

DIA 300

FLOW CONTROL CHAMBER CL 77.850

DB12

CONNECTION TO CULVERT 8A

DB12_MH1 DIA 1200 CL 83.061

DB11_MH6 DIA 1200 CL 83.072

DB12_1.000 US IL 81.636 DIA 225 DS IL 81.436

DB12_MH2 DIA 1200 CL 82.968

DB12_1.001 US IL 81.436 DIA 225 DS IL 80.955

DB12_MH3 DIA 1200 CL 82.380

DB12_1.002 US IL 80.955 DIA 225 DS IL 79.810

DB12_MH4 DIA 1200 CL 81.235

DB12_1.003 US IL 79.810 DIA 225 DS IL 78.328

DB12_MH16 DIA 1500 CL 80.112

DB12_1.004 US IL 78.328 DIA 450 DS IL 77.800

DB12_2.002 US IL 79.220 DIA 225 DS IL 78.420

DB12_MH7 DIA 1200 CL 80.704

DB12_2.001 US IL 79.920 DIA 225 DS IL 79.220

DB12_MH6 DIA 1200 CL 81.368

17800 17900 18000 18100 18200 18300 18400

DB12_3.000 US IL 81.626 DIA 225 DS IL 81.426

DB12_3.001 US IL 81.426 DIA 225 DS IL 80.952

DB12_3.002 US IL 80.952 DIA 225 DS IL 79.813

DB12_3.003 US IL 79.600 DIA 225 DS IL 78.528

DB12_4.002 US IL 79.272 DIA 225 DS IL 78.678

DB12_4.001 US IL 79.912 DIA 225 DS IL 79.272

DB11_MH1 DIA 1200 CL 83.044

DB12_MH8 DIA 1200 CL 83.051

DB12_MH9 DIA 1200 CL 82.970

DB12_MH10 DIA 1200 CL 82.378

DB12_MH11 DIA 1200 CL 81.238

DB12_3.004 US IL 78.528 DIA 375 DS IL 78.328

DB12_MH15 DIA 1500 CL 80.103

DB12_MH14 DIA 1200 CL 80.697

DB12_MH13 DIA 1200 CL 81.358

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. SIDE ROAD EMBANKMENT DRAINAGE TO DISCHARGE TO FIELD DRAINAGE NETWORK TO NORTH OF ROAD.
11. THE EXISTING WATERCOURSES WILL BE DIVERTED AT THE WEST OF THE MAINLINE AT APPROXIMATELY CH 16980 - CH 17470.
12. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT

KEY PLAN
(Scale 1:100,000)

0 50 100 m

SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	COVER LEVELS REVISED	MJC	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION

Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 6 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0011

Revision: P05

PW Stg Code: 3

Security Class

WSP Project Number: 70038006

DO NOT SCALE

Millimetres 100 0 10

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0011

FOR CONTINUATION SEE BELOW

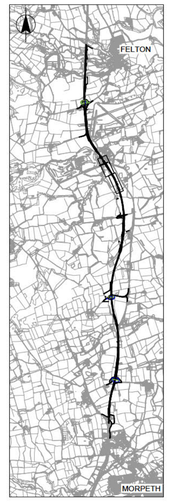
FOR CONTINUATION SEE ABOVE

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0013

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m
SCALE 1:1000

DB12_2.000
US IL 80.020
DIA 225
DS IL 79.920

DB12_MH5
DIA 1200
CL 81.446

DB13_MH11
DIA 1200
CL 81.457

DB13_7.000
US IL 80.032
DIA 225
DS IL 79.294

DB13_MH12
DIA 1200
CL 80.719

DB13_7.001
US IL 79.294
DIA 225
DS IL 77.548

DB13_MH13
DIA 1200
CL 78.973

DB13_7.002
US IL 77.548
DIA 225
DS IL 74.842

DB13_MH14
DIA 1200
CL 76.268

DB13_7.003
US IL 74.842
DIA 225
DS IL 71.142

DB13_MH15
DIA 1200
CL 73.192

DB13_7.004
US IL 70.552
DIA 225
DS IL 66.562

DB13_MH16
DIA 1200
CL 70.318

DB13_7.005
US IL 66.660
DIA 300
DS IL 66.056

DB12_4.000
US IL 80.012
DIA 225
DS IL 79.912

DB13_MH1
DIA 1200
CL 81.448

DB12_MH12
DIA 1200
CL 81.437

DB13_5.000
US IL 80.023
DIA 225
DS IL 79.296

DB13_MH2
DIA 1200
CL 80.721

DB13_5.001
US IL 79.296
DIA 225
DS IL 77.558

DB13_MH3
DIA 1200
CL 78.983

DB13_5.002
US IL 77.558
DIA 225
DS IL 74.825

DB13_MH4
DIA 1200
CL 76.251

DB13_5.003
US IL 74.825
DIA 225
DS IL 70.880

DB13_MH5
DIA 1200
CL 72.705

DB13_5.004
US IL 70.805
DIA 300
DS IL 68.939

DB13_MH6
DIA 1200
CL 71.457

DB13_5.005
US IL 67.500
DIA 300
DS IL 65.771

DB13_OUTFALL
CL 56.000m
Depth (m) 1.200

DIA 300

DB14a_2.001
US IL 57.974
DIA 225
DS IL 57.874

DB14a_MH3
DIA 1200
CL 59.399

CONNECT TO EXISTING NETWORK

DB14a_MH4
DIA 1200
CL 59.388

DB14a_2.000
US IL 63.110
DIA 225
DS IL 57.974

DB15_4.000
US IL 67.968
DIA 225
DS IL 66.350

DB15_MH19
DIA 1200
CL 69.393

DB15_MH20
DIA 1200
CL 67.775

DB15_4.001
US IL 66.350
DIA 225
DS IL 63.694

DB15_MH21
DIA 1200
CL 65.119

DB13_8.000
US IL 68.344
DIA 225
DS IL 68.106

DB13_MH17
DIA 1200
CL 69.769

DB13_8.001
US IL 68.106
DIA 225
DS IL 67.843

DB13_MH18
DIA 1200
CL 70.329

DB13_MH19
DIA 1200
CL 69.973

DB13_8.002
US IL 67.843
DIA 225
DS IL 67.238

DB13_MH20
DIA 1200
CL 69.510

DB13_8.003
US IL 67.238
DIA 225
DS IL 66.138

DB13_MH21
DIA 1500
CL 69.650

DB13_7.005
US IL 66.600
DIA 300
DS IL 66.056

DB15_MH3
DIA 1200
CL 65.117

DB15_1.001
US IL 66.358
DIA 225
DS IL 63.692

300Ø DRAINAGE PIPE

DB15_1.000
US IL 67.989
DIA 225
DS IL 66.358

DB15_MH2
DIA 1200
CL 67.783

DB15_MH1
DIA 1200
CL 69.414

DB14a_1.000
US IL 63.095
DIA 225
DS IL 57.963

DB13_MH7
DIA 1200
CL 69.789

DB13_6.000
US IL 68.364
DIA 225
DS IL 68.129

DB14a_MH1
DIA 1200
CL 64.520

DB14a_MH2
DIA 1200
CL 64.535

FLOW CONTROL CHAMBER
CL 64.500

DB13_6.001
US IL 68.129
DIA 225
DS IL 67.867

DB13_MH8
DIA 1200
CL 70.316

DB13_MH23
DIA 1800
CL 65.940

DB13_5.007
US IL 63.533
DIA 600
DS IL 63.200

OPEN COVER MANHOLE

DB13_5.006
US IL 65.000
DIA 600
DS IL 63.553

DB13_MH9
DIA 1200
CL 69.972

DB13_6.003
US IL 67.202
DIA 225
DS IL 66.202

DB13_MH10
DIA 1200
CL 69.499

DB13_6.002
US IL 67.867
DIA 225
DS IL 67.202

DB13_MH22
DIA 1800
CL 69.647

DB13_7.006
US IL 66.100
DIA 375
DS IL 65.900

DB13

LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	COVER LEVELS REVISED	MJC	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 7 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0012
Revision: P05
PW Stg Code: 3

Security Class

WSP Project Number: 70038006

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0011

FOR CONTINUATION SEE BELOW

DB15_4.002 US IL 63.694 DIA 225 DS IL 59.694
DB15_MH22 DIA 1200 CL 61.376
DB15_4.003 US IL 59.964 DIA 225 DS IL 55.944
DB15_MH23 DIA 1200 CL 57.968
DB15_4.004 US IL 55.944 DIA 300 DS IL 55.344
DB15_MH30 DIA 1200 CL 56.887
DB15_4.005 US IL 55.237 DIA 450 DS IL 55.057
DB15_4.006 US IL 55.075 DIA 450 DS IL 54.912
DB15_MH26 DIA 1500 CL 57.581
DB15_2.006 US IL 58.550 DIA 300 DS IL 56.470
DB15_MH25 DIA 1200 CL 58.501
DB15_5.001 US IL 57.076 DIA 225 DS IL 56.156
DB15_5.000 US IL 58.618 DIA 225 DS IL 57.076
DB15_3.005 US IL 58.855 DIA 300 DS IL 58.550
DB15_MH24 DIA 1200 CL 60.043
DB15_MH17 DIA 1200 CL 60.355
DB15_MH18 DIA 1200 CL 60.050
DB15_2.005 US IL 59.141 DIA 300 DS IL 58.550
DB15_MH11 DIA 1200 CL 60.641
DB15_2.004 US IL 59.712 DIA 300 DS IL 59.141
DB15_MH10 DIA 1200 CL 61.212
DB15a_MH9 DIA 1200 CL 60.313 m
DB15a_1.005 US IL 59.388 DIA 300 DS IL 58.813
DB15a_1.006 US IL 58.813 DIA 300 DS IL 58.500
DB15a
DB15
DB15_1.005 US IL 55.425 DIA 375 DS IL 55.050
DB15_MH27 DIA 1800 CL 57.970
DB15_1.006 US IL 54.912 DIA 525 DS IL 54.550
DB15_1.004 US IL 55.800 DIA 375 DS IL 55.425
DB15_1.003 US IL 59.692 DIA 225 DS IL 56.192
DB15_MH5 DIA 1500 CL 57.948
DB15_OUTFALL CL 54.000m Depth (m) 3.255
DIA 300
DB15_1.002 US IL 63.692 DIA 225 DS IL 59.692
DB15_MH4 DIA 1200 CL 61.370
DB15a_MH12 CL 58.000 m
FLOW CONTROL CHAMBER CL 56.466
DB15a_1.008 US IL 54.168 DIA 300 DS IL 52.418
DB15a_1.007 US IL 58.000 DIA 300 DS IL 56.000
FLOW CONTROL CHAMBER CL 61.000
DB15a_MH11 CL 58.271 m
1990
1990
2000
2010
2020
2030

LEGEND
- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

FOR CONTINUATION SEE ABOVE

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0013

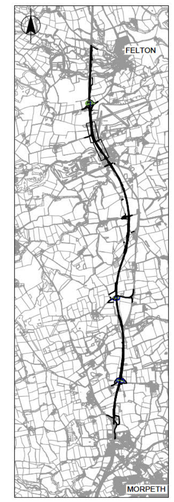
FOR NETWORK DETAILS SEE DRAWING NUMBER HE551459-WSP-HDG-M2F-DR-CD-0016 - DETAIL 2

DB15_MH9 DIA 1200 CL 61.679
DB15_2.003 US IL 60.111 DIA 300 DS IL 59.712
DB15_MH8 DIA 1200 CL 62.086
DB15_2.002 US IL 60.661 DIA 225 DS IL 60.111
DB15_2.001 US IL 61.013 DIA 225 DS IL 60.661
DB15_MH7 DIA 1200 CL 62.490
DB15_2.000 US IL 61.206 DIA 225 DS IL 61.013
DB15_MH6 DIA 1200 CL 62.631
DB17_MH22 DIA 1200 CL 62.631
DB17a_MH6 DIA 1200 CL 62.402
DB17_MH3 DIA 1200 CL 63.105
DB17_1.001 US IL 61.747 DIA 225 DS IL 61.675
DB17a_4.000 US IL 60.977 DIA 225 DS IL 60.677
DB17_MH23 DIA 1200 CL 62.852
DB17_1.002 US IL 61.686 DIA 225 DS IL 61.286
DB17_MH4 DIA 1200 CL 62.775
DB17a_MH7 DIA 1200 CL 62.339
DB17a_4.001 US IL 60.000 DIA 225 DS IL 59.870
DB17_1.003 US IL 61.286 DIA 300 DS IL 61.026
DB17_MH5 DIA 1200 CL 62.523
DB17a_MH8 DIA 1200 CL 62.041
DB17_MH6 DIA 1200 CL 62.512
DB17_MH25 DIA 1200 CL 62.509
DB17_MH24 DIA 1200 CL 62.502
DB17_1.004 US IL 60.298 DIA 300 DS IL 60.173
DB17_1.005 US IL 60.173 DIA 300 DS IL 60.017
DB17a_4.002 US IL 59.870 DIA 300 DS IL 59.720
DB17_MH7 DIA 1200 CL 62.537
DB17a_MH9 DIA 1200 CL 62.067
DB15a_1.003 US IL 60.092 DIA 300 DS IL 59.862
DB15a_1.004 US IL 59.862 DIA 300 DS IL 59.388
DB15a_MH8 DIA 1200 CL 60.889 m
DB15a_MH7 DIA 1200 CL 61.537 m
DB15a_MH6 DIA 1200 CL 61.930 m
DB15a_1.002 US IL 60.323 DIA 300 DS IL 60.092
DB15a_MH5 DIA 1200 CL 62.225 m
DB17_4.000 US IL 61.136 DIA 300 DS IL 60.000
DB15a_1.001 US IL 60.516 DIA 300 DS IL 60.323
DB17_MH2 DIA 1200 CL 63.172
DB15a_MH4 DIA 1200 CL 62.472 m
DB15a_MH3 DIA 1200 CL 62.586 m
DB15a_2.001 US IL 60.566 DIA 300 DS IL 60.516
DB15a_1.000 US IL 60.851 DIA 225 DS IL 60.588
DB15a_2.000 US IL 60.831 DIA 225 DS IL 60.566
DB17_4.001 US IL 60.000 DIA 300 DS IL 59.700
DB15a_MH2 DIA 1200 CL 62.256 m
DB15a_MH1 DIA 1200 CL 62.276 m
DB17b_MH5 DIA 1200 CL 62.259
DB17b_MH1 DIA 1200 CL 62.275
DB17b_2.000 US IL 60.850 DIA 225 DS IL 60.622
DB17b_3.000 US IL 60.834 DIA 225 DS IL 60.602
DB17_4.002 US IL 59.700 DIA 300 DS IL 59.616
DB17b_MH6 DIA 1200 CL 62.218
DB17b_MH2 DIA 1200 CL 62.219
DB17_4.003 US IL 59.616 DIA 300 DS IL 59.533
DB17b_3.001 US IL 60.602 DIA 225 DS IL 60.310
DB17_MH26 DIA 1200 CL 62.534
DB17b_2.001 US IL 60.622 DIA 225 DS IL 60.331
2060
2070
2080
2090
2100

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. THE CURRENT DRAINAGE PROPOSAL FROM CH. 20310 TO 21550 ON THE PARALLEL LINK ROAD IS FOR FILTER DRAINS. THIS COULD BE AMENDED TO KERB AND GULLY OR COMBINED KERB DRAINAGE IF REQUIRED TO SUIT THE SHARED FOOTWAY/CYCLEWAY.
12. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m

SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 8 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0013
Revision: P05
PW Stg Code: 3

Security Class

WSP Project Number: 70038006

DO NOT SCALE

Millimetres 100 0 10

LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

FOR NETWORK DETAILS SEE DRAWING NUMBER HE551459-WSP-HDG-M2F-DR-CD-0016 - DETAIL 3

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0013

FOR CONTINUATION SEE BELOW

FOR CONTINUATION SEE ABOVE

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0015

DB17a

DB17b

DB17

DB18

Lay-by

FLOW CONTROL CHAMBER CL 60.500

FLOW CONTROL CHAMBER CL 59.300

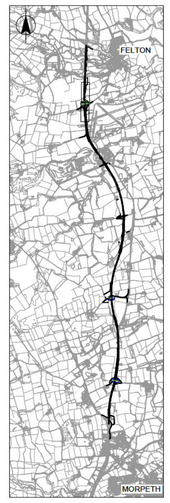
DB13_OUTFALL CL 59.270m Depth 1.570

DB17_OUTFALL CL 58.600m Depth 1.400

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. EMBANKMENT DRAINAGE WORKS FOR WEST MOOR JUNCTION ARE SHOWN ON DRAWING HE551459-WSP-HDG-M2F-DR-CD-0018.
12. THE CURRENT DRAINAGE PROPOSAL FROM CH. 20310 TO 21550 ON THE PARALLEL LINK ROAD IS FOR FILTER DRAINS. THIS COULD BE AMENDED TO KERB AND GULLY OR COMBINED KERB DRAINAGE IF REQUIRED TO SUIT THE SHARED FOOTWAY/CYCLEWAY.
13. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN

(Scale 1:100,000)

0 50 100 m

SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	TEXT REVISED	MJC	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION

Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 9 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0014

Revision: P05

PW Stg Code: 3

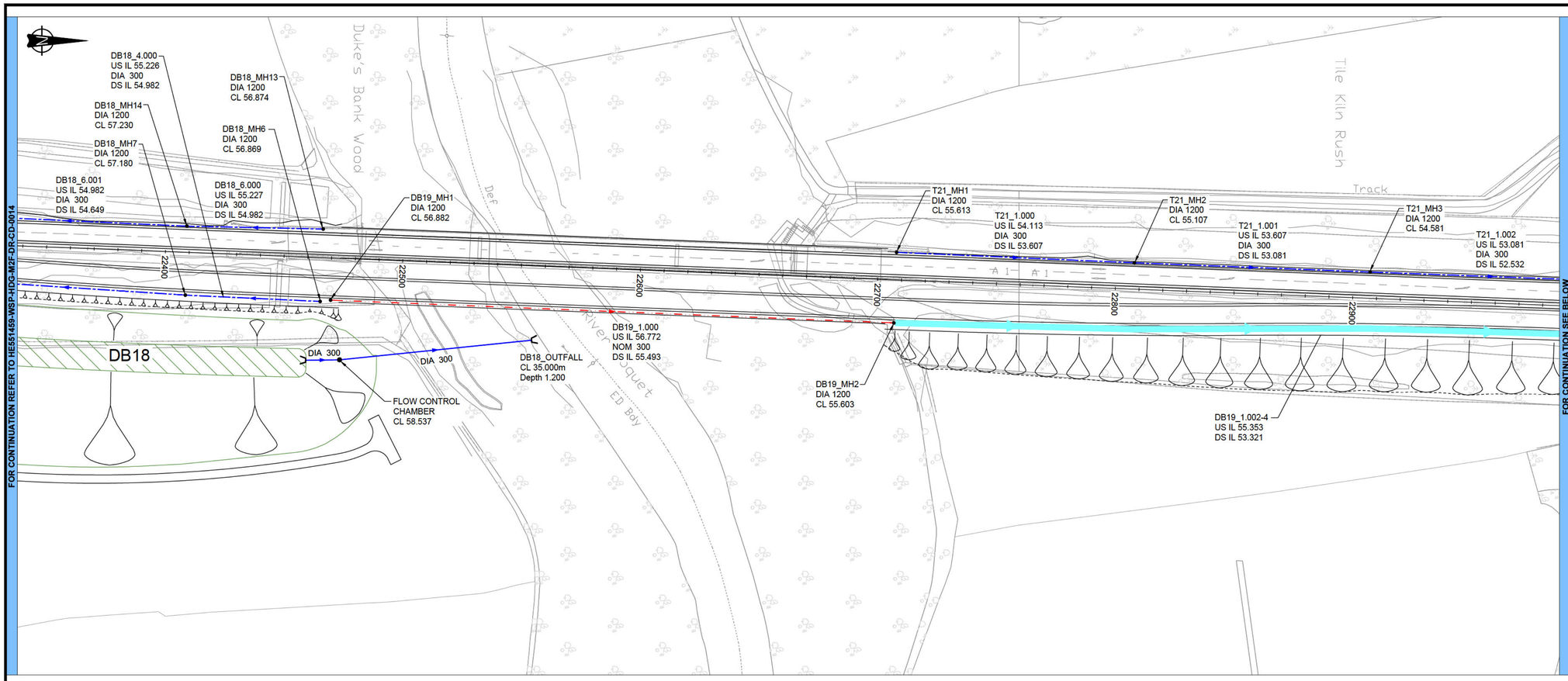
Security Class

WSP Project Number: 70038006

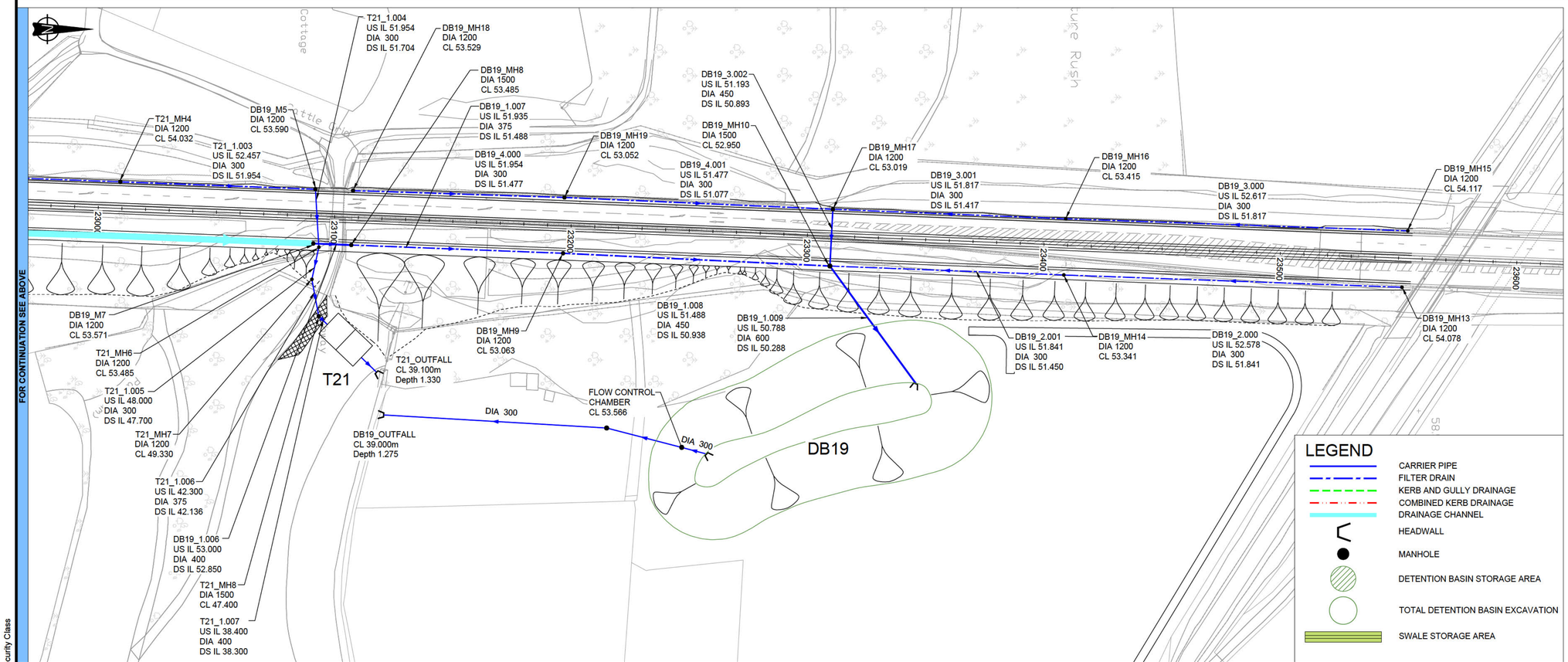
DO NOT SCALE

Millimetres 100 0 10

FOR CONTINUATION REFER TO HE551459-WSP-HDG-M2F-DR-CD-0014



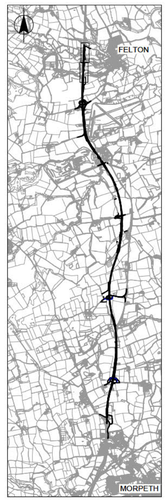
FOR CONTINUATION SEE ABOVE



NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. THE OUTFALL PIPE FROM DB18 TO THE RIVER COQUET IS ON A STEEP ROCKFACE AND WILL REQUIRE CAREFUL CONSIDERATION.
12. THE EXISTING (N/B CARRIAGEWAY) DRAINAGE PIPEWORK ON THE RIVER COQUET BRIDGE IS TO BE RETAINED.
13. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m

SCALE 1:1000

Rev.	Date	Description	By	Eng' Chk	Disc' Chk	App'd
P05	20.05.19	T21 LEVELS REVISED	MJC	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION

Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 10 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

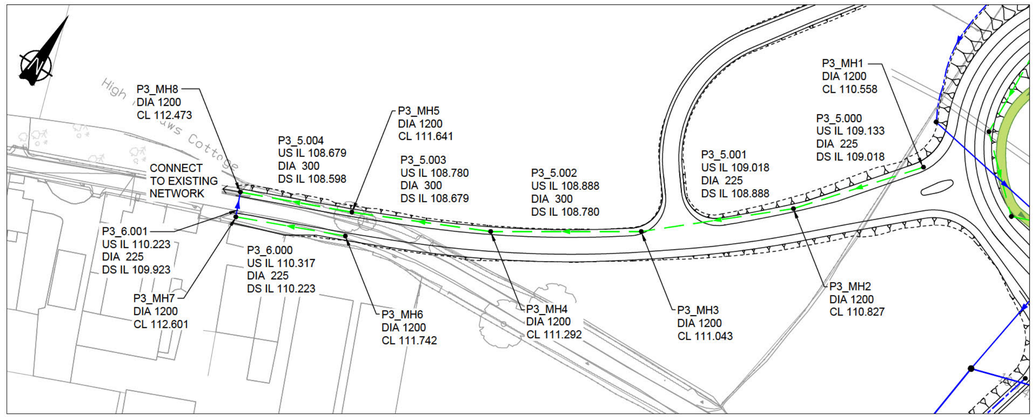
Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0015

Revision: P05

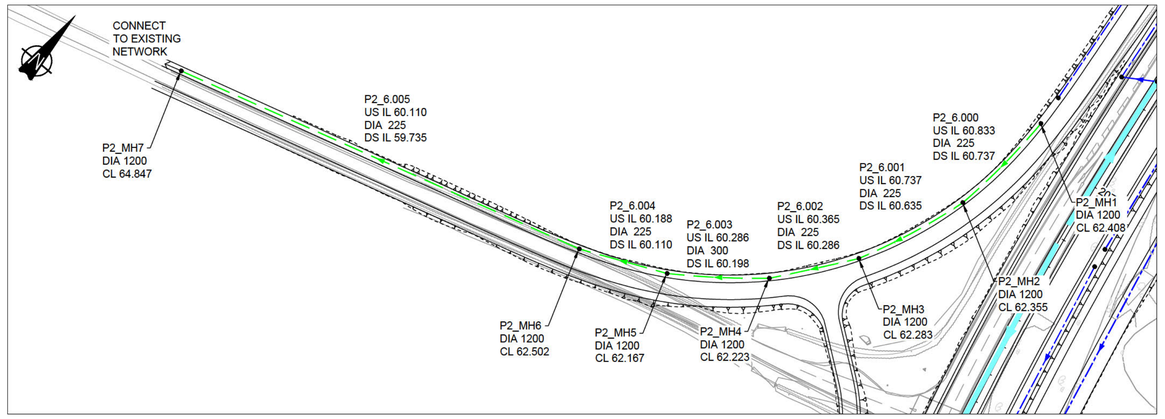
PW Stg Code: 3

Security Class

WSP Project Number: 70038006



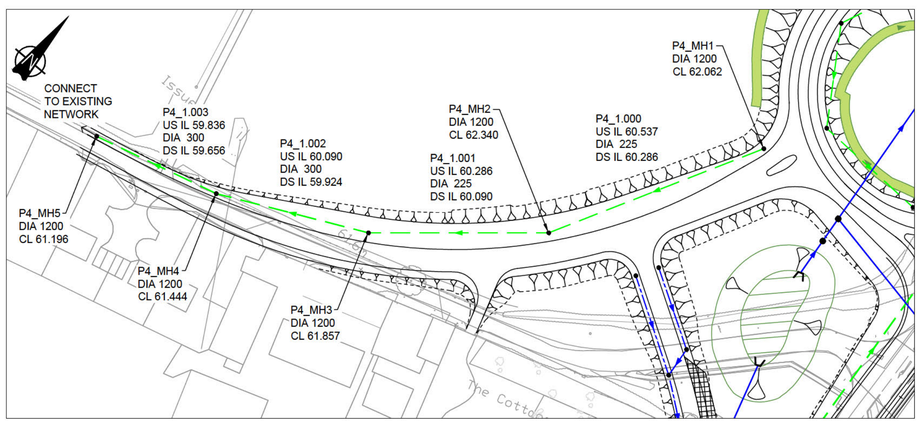
DETAIL 1



DETAIL 2

LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

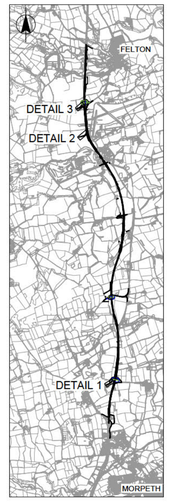


DETAIL 3

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m
SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT
SHEET 11 OF 13
REGULATION 5 (2) (o)

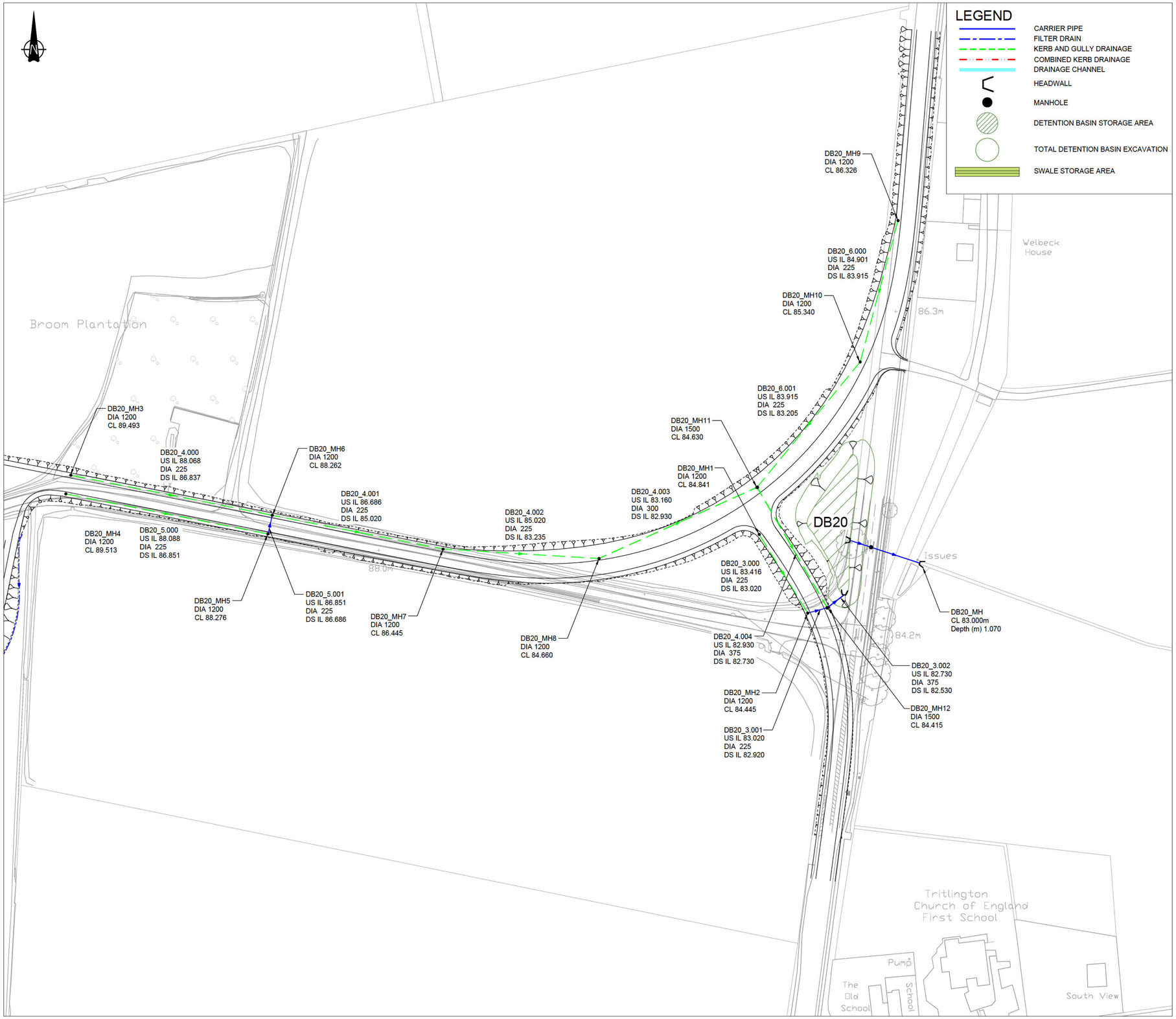
Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size	Date	Date	Date	Date
A1	18.10.18	19.10.18	25.10.18	25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0016
Revision: P05
PW Stg Code: 3

Millimetres 100 10 0
DO NOT SCALE

Security Class

WSP Project Number: 70038006

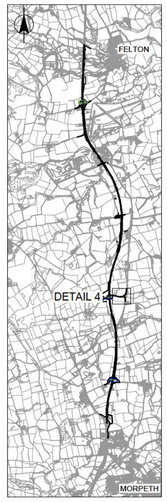


DETAIL 4

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m
SCALE 1:1000

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 12 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

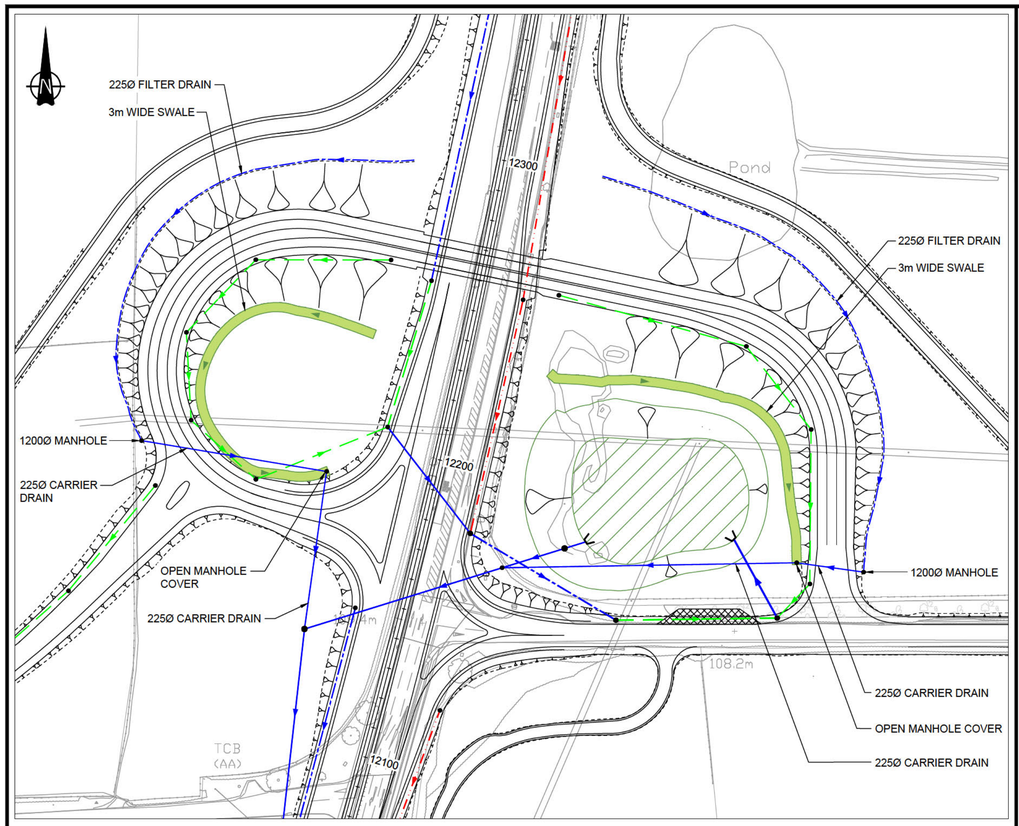
Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0017
Revision: P05
PW Stg Code: 3

Millimetres 100 0 10
DO NOT SCALE
Security Class

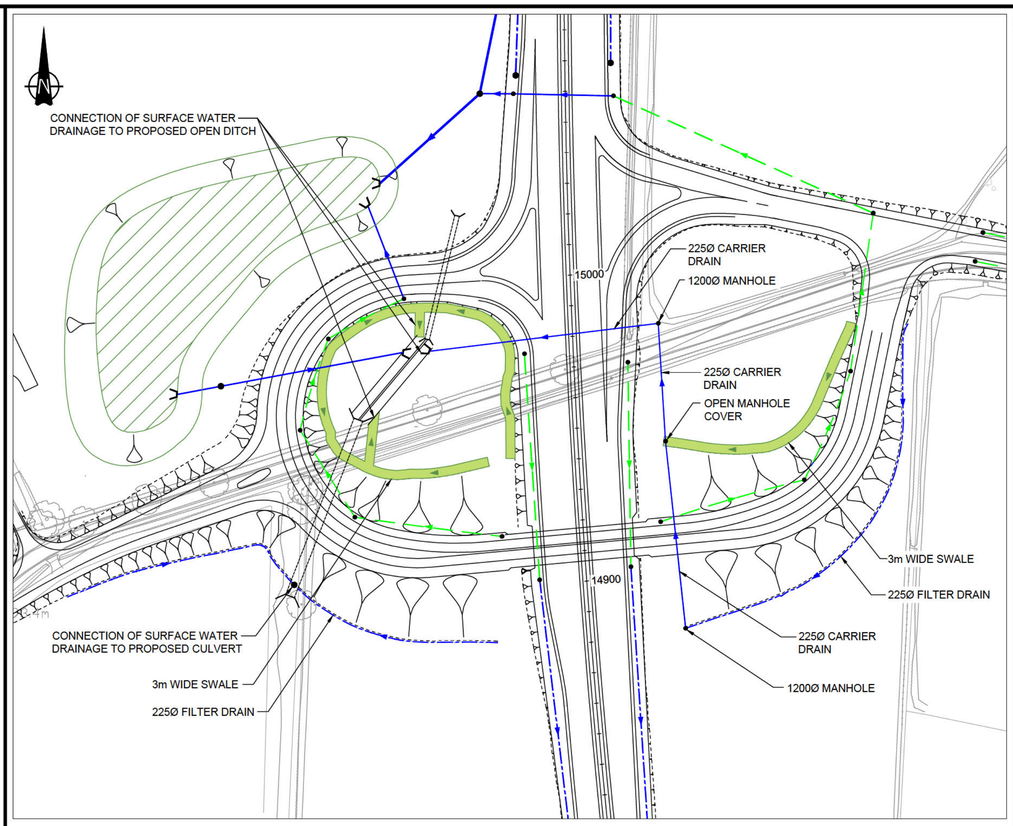
WSP Project Number: 70038006

DO NOT SCALE

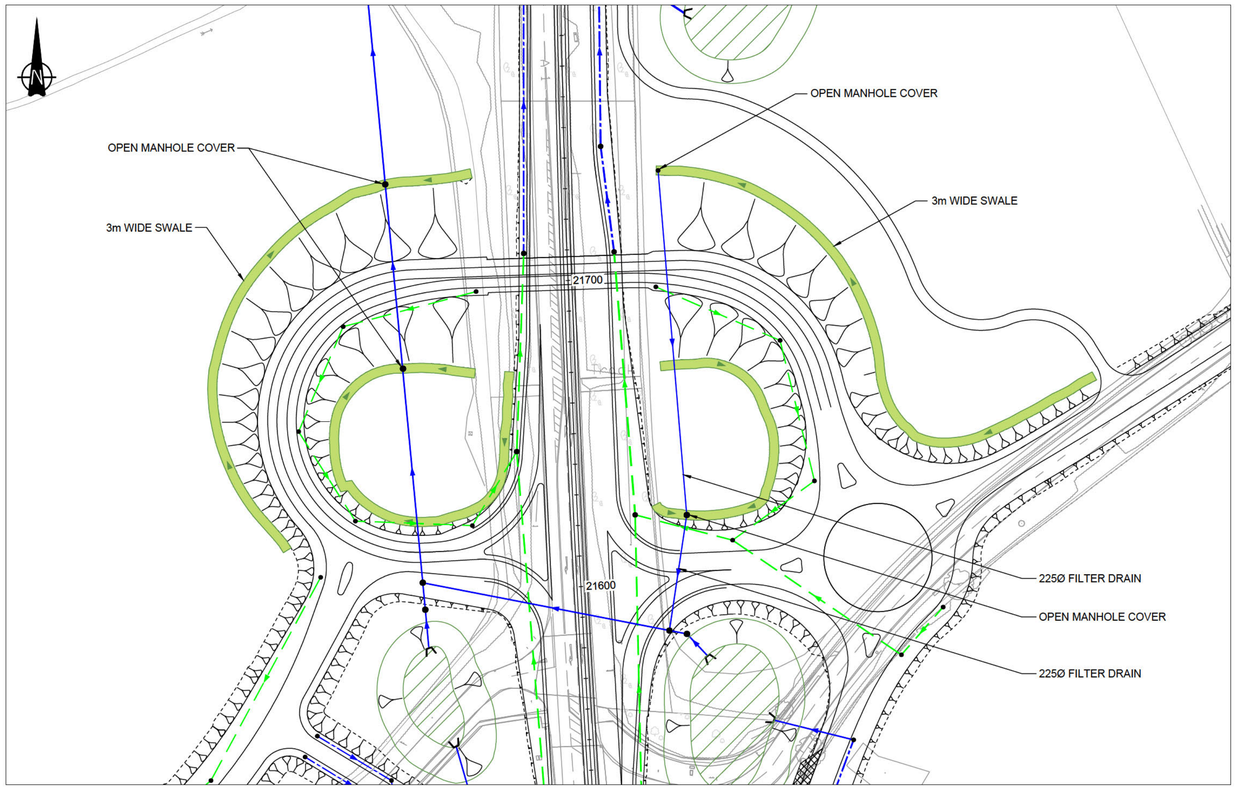
Millimetres 0 10 100



DETAIL 5 - HIGHLAWS JUNCTION



DETAIL 6 - FENROTHER JUNCTION

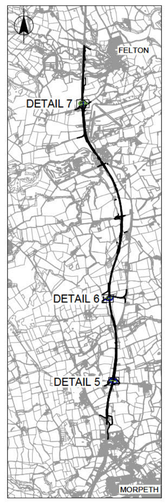


DETAIL 7 - WEST MOOR JUNCTION

NOTES

1. DRAWING TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT REFERENCE DRAWINGS.
3. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES. ALL LEVELS ARE IN METRES.
5. THE POSITION AND LEVELS OF ALL DRAINS ARE TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL DRAINAGE TO COMPLY WITH THE REQUIREMENTS OF DESIGN MANUAL FOR ROADS AND BRIDGES: VOLUMES 4 & 11.
7. COVER LEVELS OF THE MANHOLES ARE PROVISIONAL AND SUBJECT TO ADJUSTMENT TO SUIT THE FINISHED GROUND LEVELS.
8. ANY WORKS AFFECTING EXISTING WATERCOURSES REQUIRE ENVIRONMENT AGENCY AND / OR LOCAL AUTHORITY APPROVAL.
9. GULLY LOCATIONS OMITTED FOR CLARITY AND SUBJECT TO DETAILED DESIGN.
10. ALL ATTENUATION STRUCTURES ARE APPROXIMATE AND SUBJECT TO DETAILED DESIGN.
11. DITCHES ARE PROPOSED TO THE TOE OF EMBANKMENTS ON THE MAINLINE.

DRAFT



KEY PLAN
(Scale 1:100,000)

0 50 100 m
SCALE 1:1000

LEGEND

- CARRIER PIPE
- FILTER DRAIN
- KERB AND GULLY DRAINAGE
- COMBINED KERB DRAINAGE
- DRAINAGE CHANNEL
- HEADWALL
- MANHOLE
- DETENTION BASIN STORAGE AREA
- TOTAL DETENTION BASIN EXCAVATION
- SWALE STORAGE AREA

Rev.	Date	Description	By	Eng' Ch'k	Disc' Ch'k	App'd
P05	20.05.19	AMENDED TITLE BOX	SVB	GP	RFS	SG
P04	02.04.19	SHEET BORDER UPDATED	MJC	GP	RFS	SG
P03	27.02.19	DESIGN FIX 3 FOR DCO - MINOR MODIFICATION	MJC	GP	RFS	SG
P02	30.01.19	DESIGN FIX 3 FOR DCO	MJC	GP	RFS	SG
P01	25.10.18	FIRST ISSUE	MJC	GP	RFS	SG

Suitability: DCO SUBMISSION
Status: S2

PINS Reference Number: TR010041

Client: highways england

Project Title: A1 in Northumberland: Morpeth to Felton Scheme

Drawing Title: DRAINAGE STRATEGY LAYOUT SHEET 13 OF 13 REGULATION 5 (2) (o)

Scale	Drawn	Eng. Check	Approved	Authorised
1:1000	MJC	GP	RFS	SG
Original Size: A1	Date: 18.10.18	Date: 19.10.18	Date: 25.10.18	Date: 25.10.18

Drawing Number: HE551459-WSP-HDG-M2F-DR-CD-0018
Revision: P05
PW Stg Code: 3

Security Class

WSP Project Number: 70038006

Appendix C – Relevant Correspondence

Appendix C – Relevant Correspondence

1.1 Northumberland County Council

1.1.1 19/2/18

From: James Hitching [mailto:james.hitching@northumberland.gov.uk]
Sent: 19 February 2018 17:20
To: Gilliland, Simon <Simon.Gilliland@wsp.com>
Cc: lucy.mo@environment-agency.gov.uk; Caroline.Maarouf@environment-agency.gov.uk; Johnson, Claire <Claire.Johnson@wsp.com>; Sharpe, Rob <Rob.Sharpe@wsp.com>; Thresh, Majlinda <Majlinda.Thresh@wsp.com>; Bedford, Lee <lee.bedford@wsp.com>; Macmillan, Nic <Nic.Macmillan@wsp.com>; Achampong, Henri <Henrietta.Achampong@wsp.com>
Subject: Re: A1 in Northumberland Drainage Strategy

Dear Simon

Thank you for your email and the draft surface water drainage strategy. I have read through the strategy and associated drawings and make the following comments:

It is acknowledged that this is a first draft and as such the strategy makes comments such as "appears to" and "needs to be investigated". When formally submitted, there can be no further unknowns and as such all investigations will need to have been carried out and the strategy amended accordingly. Many other factors still need to be examined and undertaken further, as such we await these details before making comment. The comment made now are partially informative acknowledging additional information is forthcoming.

Following the connectivity/outfall surveys further and complete information on the existing surface water catchments will need to be submitted. As present, areas and catchments have been used to ascertain impermeable areas; however, no background information to these areas has been produced.

Where groundwater levels are high, is it the intention to line the ponds?

Are ponds rather than basins going to be used in every instance within this scheme?

Access to each feature for ongoing maintenance will need to be presented.

Full design and associated drawings for each pond/basin/swale will need to be undertaken and presented.

The draft drainage strategy makes reference to the Q100 greenfield runoff rate and the associated attenuation required in a 1 in 100 year plus climate change event. The defra guidance document Sustainable Drainage Systems Non-statutory Technical Standards for

Sustainable Drainage Systems has been correctly reference and the surface water design will need to adhere with this document.

Guidance S2 of this documents reads "S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event".

At present the 1 in 1 year greenfield runoff rate has not been calculated and therefore it is unknown as to whether the system will be designed as so the system will discharge at these lower rates. This needs to be established within the drainage strategy.

Furthermore guidance S4 states "Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event".

The greenfield runoff volumes have not be calculated and/or presented within the drainage strategy. This is required when especially looking to discharge at the 1 in 100 year greenfield runoff rate. Long-term storage and interception storage may be required as part of the attenuation requirements by adopting this methodology and strategy to disposing surface water. All associated calculations will need to be presented within the drainage strategy.

The government guidance on climate change requires the +20% and +40% scenarios to be looked at and assessed. The impact of the +40% event needs to be looked at within every catchment. The impact on site and off site will need to be examined. Where possible every feature should accommodate the 40% climate change event. Where this is not possible, valid reasons will need to be given and these reasoning will need to be cross-referenced with the risk of flooding on and off-site, as described above.

What impact will the swales/basins/ponds and associated access have on existing features? For example pond P2a appears to overlap with an existing pond.

The impact of existing drainage will need to be looked at particularly where it is inadequate and where existing problems existing. We have alerted you to the issue with the existing holding tanks at Felton and the requirements and desire to improve these as part of this scheme.

With drawing HE 551459 Rev P01 "Offline in-cutting" it appears that the swales are located at a higher level than the road. In this instance how will the road be drained and how will the swales be effectively utilised?

Please get in touch if you want discuss any of the above in more detail.

Kind regards
James

James Hitching
Senior Sustainable Drainage Officer

Flood & Coastal Erosion Risk Management
Northumberland County Council
County Hall
Morpeth
NE61 2EF

[redacted]
Email – James.Hitching@northumberland.gov.uk

On 13 February 2018 at 17:05, Gilliland, Simon <Simon.Gilliland@wsp.com> wrote:

All,

Further to the meetings and correspondence with the wider WSP Water team on the A1 in Northumberland scheme please find attached our draft surface water drainage strategy for the Morpeth to Felton section of the scheme.

It may be helpful to have a phone conversation/ meeting to discuss this further once you've looked through.

As you'll see the drainage strategy has currently been developed based on Highways England's own climate change guidance.

The guidance received from HE (SES) is that all new schemes shall adopt the following approach to drainage design:

1. For all new schemes that do not involve adaptation of an existing drainage network: Full compliance with the requirements described in NPPF;

2. For all new schemes that involve adaptation of an existing drainage network: Compliance in accordance with HD33, (with the exception of Smart Motorways where IAN 161 shall apply);

3. In both 1 and 2, above, the design solution shall incorporate a 20% uplift in peak rainfall intensity. The proposal shall also sensitivity test the design with a 40% uplift in peak rainfall intensity. The difference between the 2 scenarios (Central and Upper) shall enable the end user to understand the range of impact between the climate change risk scenarios. In the light of this knowledge the Project Sponsor shall determine the appropriate course of action to be implemented;

4. For all schemes that use existing outfalls, the current discharge rates shall not be exceeded. The current discharge rates (no rates were historically pre-defined, or pre-agreed) shall be calculated using the current design methods available within DMRB 4.2.

5. All schemes shall be checked for a 1 in 100 year flooding compliance.

The storage volumes required in 1 in 100 year return period with 20% and the 40% climate change allowances are tabulated below.

Pond Ref.	100yr RP **20% CC** storage Volume (m3)	100yr RP **40% CC** storage Volume (m3)	Increase in Storage Volume required (%)
Swale 1	1700	2100	24
Swale 2	750	900	20
2a	550	625	14
4	1350	1650	22
6	2100	2550	21
7	1700	2100	24
7a	250	300	20
7b	200	225	13
9	900	1100	22
11	1500	1850	23
12	700	850	21
13	1350	1650	22
14	400	500	25
15	1950	2350	21
15a	500	600	20
17	1350	1650	22
17a	750	875	17
17b	850	1050	24
Local Network	200	225	13
18	1150	1400	22
19	1700	2100	24
Local Network	200	250	25
Local Network	200	250	25

Regards

Simon

Simon Gilliland *MEng CEng MICE*

Principal Engineer (Team Leader) – Flooding & Drainage North West

T +44 (0) 151 3318157

[redacted]

Exchange Station

Tithebarn Street

Liverpool

L2 2QP

wsp.com

Save Time Do It Online!
We have made a few key improvements to our site to make our services easy to access. Now you can do everything from paying your council tax, to reporting a faulty street light online. Go to: www.northumberland.gov.uk and click 'pay, apply or report' to access the relevant forms.

1.1.2 22/11/17

From: Ryan, Seamus
Sent: 22 November 2017 11:46
To: gary.mills@northumberland.gov.uk; david.brookes@northumberland.gov.uk; graham.fairs@northumberland.gov.uk
Cc: Thresh, Majlinda <Majlinda.Thresh@wsp.com>; Sharpe, Rob <Rob.Sharpe@wsp.com>; Harrison, Colin <Colin.Harrison@wsp.com>; Grymula, Jaroslaw <Jaroslaw.Grymula@wsp.com>; Stylianou, Constantina <Constantina.Stylianou@wsp.com>; Winnington, Max <Max.Winnington@wsp.com>; Johnson, Claire <Claire.Johnson@wsp.com>
Subject: FW: A1 M2F Drainage Strategy

Hi gents,

We are just following up on our email from 16th November as below.

The separation of the trunk road and local road network drainage systems forms an important part of our drainage strategy for the proposed A1 upgrade. We are currently working on the assumption that the two drainage systems will have separate attenuation (e.g. ponds), but that discharge to the local watercourse will be via a common outfall pipe and outfall structure. Flows from each pond element will need to be restricted to the allowable discharge rates, and this can be achieved by separate flow controls on each pond, or via a common control point if space is restricted.

Access for pond maintenance is being dealt with by our colleagues in the wsp Highways Section.

We would appreciate your comments on this, and for the chance to discuss if required.

Best regards,

Seamus Ryan

Seamus Ryan BSc CEng MIEI
Senior Engineer (Contract) – Flooding & Drainage

wsp
[redacted]

1st Floor, Exchange Station
Tithebarn Street, Liverpool
L2 2QP

From: Ryan, Seamus
Sent: 16 November 2017 10:25
To: 'gary.mills@northumberland.gov.uk' <gary.mills@northumberland.gov.uk>; 'david.brookes@northumberland.gov.uk' <david.brookes@northumberland.gov.uk>; 'graham.fairs@northumberland.gov.uk' <graham.fairs@northumberland.gov.uk>
Subject: A1 M2F Drainage Strategy
Hi gents,

I'm currently putting together the drainage strategy document for the proposed A1, Morpeth to Felton, upgrade. I have been provided with the broad strategy for dealing with surface water run-off from your Mr James Hitching.

The strategy, as set out by James, requires separation of the proposed trunk road drainage from the associated local road network drainage.

Currently, the strategy contains a number of elements, as follows:-

1. The actual highway drainage to remove the surface water from the carriageway
2. The potential treatment of the run-off
3. The potential attenuation requirements (e.g. ponds)
4. The potential flow control arrangements
5. The outfall requirements.

The strategy is to discharge to local watercourses via controlled pond attenuation.

The drainage may need to be separated where the proposed Highways England trunk highway impacts on the existing road network. This may then potentially involve separate attenuation ponds, controls, and/or discharge pipes and outfalls for both trunk and local networks. It would beneficial if the potential duplication of required assets could be reduced by, for example, allowing NCC ponds to discharge into HE ponds prior to outfall; or allowing a joint outfall pipe or outfall structure to be used.

Can you advise me if NCC have a current policy that covers this situation, or can you advise on how previous similar situations been dealt with? Basically, I need to know as part of the strategy, what is acceptable to NCC as separation of systems.

I would appreciate the opportunity to discuss this at a convenient time.

Many thanks for your help,
Seamus

Seamus Ryan BSc CEng MIEI
Senior Engineer (Contract) – Flooding & Drainage

wsp
[redacted]

1st Floor, Exchange Station
Tithebarn Street, Liverpool
L2 2QP

1.1.3 9/11/17

From: James Hitching [mailto:james.hitching@northumberland.gov.uk]
Sent: 09 November 2017 15:38
To: Ryan, Seamus <Seamus.Ryan@wsp.com>
Cc: Thresh, Majlinda <Majlinda.Thresh@wsp.com>; Bedford, Lee <lee.bedford@wsp.com>
Subject: Re: FW: A1 dualling scheme - flood risk and surface water comments

Dear Seamus

Unfortunately we do not have a document separating out drainage. Hopefully our Highways team can assist with anything specific with regards to this matter in the future.
Thanks
James

James Hitching
Senior Sustainable Drainage Officer
Flood & Coastal Erosion Risk Management
Northumberland County Council
County Hall
Morpeth
NE61 2EF
[redacted]
Email – James.Hitching@northumberland.gov.uk

On 6 November 2017 at 09:30, Ryan, Seamus <Seamus.Ryan@wsp.com> wrote:

Hi James,
Many thanks for your ongoing help with this development. I was just wondering if NCC have a policy with regard to the separation of the drainage, as outlined below. We understand that NCC adopted highways are to be drained separately, but we are trying to minimise the footprint required to achieve this.
Best regards,

Seamus Ryan BSc CEng MIEI

Senior Engineer (Contract) – Flooding & Drainage

1.1.4 1/11/17

From: James Hitching [mailto:james.hitching@northumberland.gov.uk]
Sent: 01 November 2017 10:13
To: Ryan, Seamus <Seamus.Ryan@wsp.com>
Cc: Bedford, Lee <lee.bedford@wsp.com>; Thresh, Majlinda <Majlinda.Thresh@wsp.com>; Ruth Bendell <ruth.bendell@northumberland.gov.uk>; Aaron McNeill <aaron.mcneill@northumberland.gov.uk>; Briggs, Ellie <Ellie.Briggs@wsp.com>
Subject: Re: A1 dualling scheme - flood risk and surface water comments

Hi Seamus

Thank you for your email. In answer to the points in your proposals:
1. Yes - Where the proposed highway is in greenfield areas, please do calculate run-off so it is restricted to greenfield run-off rates.

2. No - we ask that brownfield areas are calculated in accordance with the Defra document - non-technical standards for sustainable drainage systems. This outlines that for brownfield developments the allowable discharge rate should be akin to that of the greenfield runoff rate for the equivalent area. We would seek that this be achieved. If justification can be made for a higher rate it may be considered however, these developments must provide a minimum 50% improved situation on existing infrastructure for all events and provide evidence as to why the proposed discharge is the lowest feasible.
I hope that this clarifies our position on these aspects on the surface water disposal scheme.
Thanks
James

James Hitching
Senior Sustainable Drainage Officer
Flood & Coastal Erosion Risk Management
Northumberland County Council
County Hall
Morpeth
NE61 2EF

[redacted]
Email – James.Hitching@northumberland.gov.uk

On 27 October 2017 at 14:53, Ryan, Seamus <Seamus.Ryan@wsp.com> wrote:

Hi James,

With regard to your email below, can you please clarify the following in relation to run-off rates:-

Our proposal is:-1. Where the proposed highway is in greenfield areas, run-off will be restricted to greenfield run-off levels. 2. Where the proposed highway includes sections of existing carriageway, run-off will be restricted to existing, non-factored, levels for those sections. I.e. where there is existing hard-standing, climate change only will be added to the run-off calculation for attenuation.

Can you please advise if that is the correct interpretation.

Regards,

Seamus Ryan

1.1.5 24/10/17

From: James Hitching [mailto:james.hitching@northumberland.gov.uk]
Sent: 24 October 2017 17:06
To: Ryan, Seamus <Seamus.Ryan@wsp.com>; Bedford, Lee <lee.bedford@wsp.com>
Cc: Ruth Bendell <ruth.bendell@northumberland.gov.uk>; Aaron McNeill <aaron.mcneill@northumberland.gov.uk>; Briggs, Ellie <Ellie.Briggs@wsp.com>
Subject: A1 dualling scheme - flood risk and surface water comments

Dear Seamus and Lee,

Further to your respective emails and the technical meeting last Friday. I feel it is easier to send one email for which I hope encompasses the flood risk and surface water drainage issues around the A1 dualling scheme.

Flood Risk

We ask that particular care and attention be made to any works which are within the Cotting Burn catchment. Watercourse AF02 falls within this catchment. The Cotting Burn has caused flooding within Morpeth in the past and therefore we ask that where possible water is attenuated longer and that the allowable discharge rate is reduced to as small as possible. A similar approach should also be applied on the Benridge Burn which flows into the river Wansbeck. Again, flooding from this source through Morpeth has occurred recently (2008 and 2012).

We ask that a similar principle is applied to all watercourses that flow through Felton. Watercourses AF29 (Bradley Brook) through to AF34 (Back Burn) inclusive. Felton has experienced flooding on numerous occasions in recent memory. Furthermore, there are existing attenuation features at this section of the current A1. The local residents are very vocal and adamant that these features are not working as they should and are contributing to the flooding within Felton when it occurs.

With regards to any river crossing, our preferred solution is for a free standing bridge across the watercourse. If this cannot be achieved we ask for a box culvert, followed by a circular culvert with its diameter as large as possible. At locations where an existing bridge/culvert is in place we ask that the extension of this feature matches that there at present. At any location where this was to change, a watercourse assessment will need to be undertaken and appended to any formal documentation. This assessment will need to demonstrate that there is no increase in flood risk both upstream and downstream as a result of the works. We ask that all matters relating to culverts are undertaken using CIRIA - *Culvert Design Operation Guide*.

Flood risk assessments / watercourse assessments will be required for the crossings at Longdike Burn AF20, Earsdon Burn AF11 and the River Lyne AF06. There are flood outlines associated with these watercourses and dwellings/buildings within close proximity. Therefore it needs to be ensured that the proposed works will not detrimentally affect these features. Please contact the Environment Agency as to whether they have further information on these respective watercourses.

Where access tracks are required to access any new SuDS features, these shall not be raised within areas of floodplain, unless demonstrated and illustrated within the flood risk assessment.

Regarding the River Coquet, the crossing at this location and any works that are within 10 metres of this watercourse, please speak directly to the Environment Agency. The River Coquet is a designated Main River and therefore the Environment Agency are the statutory body who will respond specifically to this.

Surface Water

A drainage strategy will be required for this scheme.

We ask that the surface water is kept in its original existing catchments. As such a plan looking at the existing catchments (and sub-catchments) needs to be devised and submitted. Information from FEH and LiDAR is available and can be used within this assessment. Surface water for the new highway needs to be kept to this catchment, additional plans demonstrating this will need to be submitted.

Please adhere to the DEFRA non-statutory guidance for sustainable drainage with regards to the surface water drainage scheme. This outlines restricted discharge rates and attenuation volumes that we will require. In summary we ask that the allowable discharge rate is restricted to the existing greenfield runoff rate and that attenuation is provided for the 1 in 100 year plus climate change event. In this instance we will not be requiring an additional allowance for urban creep. Associated calculations will be required for all drainage networks and catchments for this scheme.

SuDS measures need to be included within the drainage scheme. All these features need to be demonstrated on a plan drawing. We ask that all SuDS features are designed in accordance with CIRIA C753 *SuDS Manual*. Health and safety for these features need to adhere to CIRIA RP992 *Health and safety principles for SuDS*.

We have no preference to ponds or basins; however, please be aware of nearby airfields for which preclude the use of ponds and longstanding open water. Additional mitigation may be required at these locations.

All SuDS features need to be located outside of flood zones 2 and 3.

In addition to the DEFRA non-statutory guidance for sustainable drainage, please refer to the LASOO document - *non-statutory guidance for sustainable drainage practice guide.*

Further additional comments

It is NCC's desire to separate the drainage from any new highways that would be adopted by NCC and not the Highways Agency. Therefore within any design, please can the drainage for these sections of highway be distinguished and designed on a separate network accordingly. Where this is not possible, please liaise with NCC Highways, where we can provide further comments.

A drainage survey of the detrunked section of the A1 will need to be undertaken and submitted to NCC.

I hope this addresses all of your preliminary questions, if you do have anything additional then please get in touch.
Kind regards
James

James Hitching
Senior Sustainable Drainage Officer
Flood & Coastal Erosion Risk Management
Northumberland County Council
County Hall
Morpeth
NE61 2EF

[redacted]
Email – James.Hitching@northumberland.gov.uk

1.2 Highways England SES

Mon 22/01/2018 13:52
Bailey, Andy <Andrew.Bailey@highwaysengland.co.uk>
RE: A1 MtF Drainage Strategy
To: Sharpe, Rob <Rob.Sharpe@wsp.com>
Good afternoon Rob,

First and foremost, there is no requirement for SES to be involved - except in the case of 'Departures from Standard' and where a 'clarification of the requirements' outlined in our standards is required. DMRB 4.2: HD 49 & HD 50 (currently) set out the basic requirements for a Designer to comply with the requisite (published) standards and the need for the Designer to self-certify the design as complying with the standards. In this context, it would be meaningless for SES Drainage Specialist to even attempt to comment on a design as it would go against our published policy.

However, there are emerging issues in relation to Climate Change (CC) that may not have been fully incorporated in the current version of our published standards. As such, I consider that it would be useful if I reproduced some of the instructions we gave to our consultants commissioned with the task of updating the Drainage Documents contained within DMRD Vol 4.2, with particular reference to HD33 and HD45.The instruction is as follows:

When it comes to Design of Road Drainage HE advise that designers would normally be expected to adopt the following approach:

- All edge drain details for collection of run off and carrier pipes/conduits for conveyance of that run off shall be designed based on the 'rainfall' experienced by the road catchment. River levels and sea levels are not part of this design consideration. However, all drainage design shall incorporate appropriate discharge controls to comply with the national requirements.

Highways England fully recognise the design standards described in the National Planning Policy Framework (NPPF) for climate change adaptation. NPPF provides the controls we need to ensure the SRN drainage network can be designed, constructed and operated in a safe way, and in order to meet our legal obligation not to increase the risk of flooding. All new schemes shall adopt the following approach to drainage design:

1. For all new schemes that do not involve adaptation of an existing drainage network: Full compliance with the requirements described in NPPF;

2. For all new schemes that involve adaptation of an existing drainage network: Compliance in accordance with HD33, (with the exception of Smart Motorways where IAN 161 shall apply);

3. In both 1 and 2, above, the design solution shall incorporate a 20% uplift in peak rainfall intensity. The proposal shall also sensitivity test the design with a 40% uplift in peak rainfall intensity. The difference between the 2 scenarios (Central and Upper) shall enable the end user to understand the range of impact between the

climate change risk scenarios. In the light of this knowledge the Project Sponsor shall determine the appropriate course of action to be implemented;

4. For all schemes that use existing outfalls, the current discharge rates shall not be exceeded. The current discharge rates (no rates were historically pre-defined, or pre-agreed) shall be calculated using the current design methods available within DMRB 4.2.

5. All schemes shall be checked for a 1 in 100 year flooding compliance.

Where rivers and the sea have the potential to influence a highway design the regional effects of climate change must again be taken into account. In this case the impact of climate change on river flows and sea level rise must be taken into account as part of a flood risk assessment. Our HD45 publication, which covers flood risk assessment, signposts the end-user back to Volume 4.2 (HA107) for Culvert design. However, the end user should be aware of, and implement, the most up-to-date climate change guidance to assess risk and design culverts in accordance with the new regional variations defined in NPPF, and to use the higher risk levels when doing so.

Note on Peak Rainfall Intensity allowances: The working assumption is that all new road infrastructure shall have a design lifetime of 60 years. Under the climate change scenarios for peak rainfall intensity described in NPPF Table 2 the design lifetime of new road infrastructure now places them in the "2080s" banding (Note that NPPF Table 2 brackets the "2080s" peak rainfall intensity scenarios over the 2070 to 2115 period). NPPF text on peak rainfall intensity simply states the need to "understand the range of impact" and refers to the Central and Upper values across all of England that will facilitate this understanding. NPPF Table 2 then defines the "2080s" Central and Upper Peak Rainfall Intensity values as 20% and 40%, respectively. It is in this context that HE requirements are defined. You will note that for completely new road drainage designs our requirements are in full accordance with NPPF, whilst ensuring due diligence is exercised when "understanding" and evaluating the potential effects of a changing climate.
It should first be noted that the HD33 guidance on climate change deals with 'drainage design' only. When it comes to the effects of climate change on 'flood risk assessment' HD33 should simply sign-post the end-user to HD 45. In this way there is a clear distinction between the effects of changing climate on drainage design, as a consequence of changing 'rainfall intensity', and on flood risk assessment, as a consequence of changing 'river level & sea level rise'. Values are defined for both parameters in the National Planning Policy Framework.

Finally I can confirm that all Drainage Designs shall be undertaken in accordance with HE standards and in consultation with the Local Authorities that are responsible for the side roads.

As it is already covered under HD 49&50, I do not see the need for the Design or Strategy to be reviewed by SES. The exception here is that all 'Departures from Standards' will need to be 'reviewed and approved' by the relevant SES Specialist.

I hope you find the above helpful in undertaking your design task and help you further define and evidence any further / remaining query you may have.

Regards

Andy Bailey (FIHE) – Senior Drainage Engineer
Highways England | Woodlands | Manton Lane | Bedford | MK41 7LW
Tel: +44 (0) 300 4704755 | **Mobile**: + 44 (0) 7803 202104
Web: http://www.highways.gov.uk
GTN: 0300 470 4755

From: Sharpe, Rob [mailto:Rob.Sharpe@wsp.com]
Sent: 22 January 2018 13:02
To: Bailey, Andy
Subject: A1 MtF Drainage Strategy
Importance: High

Hi Andy,

I was given your name by Nanette Hoyle who advised that we run the Drainage Strategy past you.

I have two queries on our methodology that I hope you can help with.

Climate Change
In line with HA 33/16 we have allowed a 20% increase in rainfall for both the 1 in 5 year (drainage asset capacity – no flooding) and the 1 in 100 year (off road storage). The local highways authority (Northumberland County Council) have requested that we increase the climate change allowance to 40%. Is this in your view acceptable?

Storage provision
We have based the storage volumes (prior to discharging into the local watercourses) on the greenfield runoff rates. For the 1 in 100 year plus climate change event we have restricted the flows to the Q100 figure (based on Qbar, Greenfield Runoff Rates - Institute of Hydrology Report 124 FSR 3-parameter equation). Is this the approach that you would advise?

Will you call me so that we can talk these over, prior to completing the strategy?

Regards

Rob Sharpe ***BEng (Hons) CEng C.WEM MCIWEM***
Principal Engineer

wsp

T +44 (0) 1513 318218
[redacted]

1st Floor Station House, Exchange Station
Tithebarn Street, Liverpool
L2 2QP

wsp.com

1.3 Highways England Project Manager

From: Bevan, Tsuwun [mailto:Tsuwun.Bevan@highwaysengland.co.uk]
Sent: 22 May 2018 18:22
To: Morrow, David <David.Morrow@wsp.com>; Achampong, Henri <Henrietta.Achampong@wsp.com>; Muscatelli, Dino <Dino.Muscatelli@wsp.com>; Johnson, Claire <Claire.Johnson@wsp.com>
Cc: Finnigan, James <James.Finnigan@highwaysengland.co.uk>; Mahoney, Joanna <Joanna.Mahoney@highwaysengland.co.uk>; Albone, Sarah <Sarah.Albone@highwaysengland.co.uk>
Subject: A1iN - Decisions

All,

Following Project Committee today, I can confirm the following:

Traffic speed at roadworks – agreed with request not to implement 60mph through roadworks; agreed there was a strong safety case for 40mph on the online widening sections. But to be prepared for push-back from Customer Focus. As an aside, I have queried with Safe Roads whether they want to see the TN.

20% v 40% uplift to 4 nr ponds/swales – agreed not to apply uplift of 40%, e.g. to retain 20% uplift. Can we pick this up with NCC at the next working group meeting - unless you think a separate, specific meeting would be better? I'm meeting with NCC on 5/6 in the morning mainly to provide NoE update ahead of SRG in the afternoon but will give them the heads up

Appetite to re-build/update the traffic model for BH/weekend traffic – no decision, but little appetite to do this so seems unlikely. There is a meeting with DfT tomorrow so hoping for some clarity.

Early works strategy – we need to work up the strategy for regional committee; **Dave** – can discuss to see what this looks like; I'm thinking we need to cover things like if scheme is pulled, what are the mitigation etc. I think we've already done a lot of this

VM Workshop – the one scheduled for 7 June is to be cancelled. Likely to be re-scheduled for Aug, possibly Sept and likely to be more of a Benefits Realisation workshop than VM workshop.

Any questions, let me know

Tsuwun Bevan CEng MICE
Senior Project Manager, Regional Investment Programme (RIP) North
Highways England | Lateral | 8 City Walk | Leeds | LS11 9AT
Mob: [redacted]
Web: http://www.highways.gov.uk

Regional Investment Programme - *recognised as the best infrastructure team nationally by creating a place where people can thrive*

Highways England Company Limited | General enquiries: 0300 123 5000 |National Traffic Operations Centre, 3 Ridgeway, Quinton Business Park, Birmingham B32 1AF | *https://www.gov.uk/government/organisations/highways-england* | *info@highwaysengland.co.uk*

Registered in England and Wales no 9346363 | Registered Office: Bridge House, 1 Walnut Tree Close, Guildford, Surrey GU1 4LZ

This document is also available on our website at **www.gov.uk /highways**

If you have any enquiries about this document A1inNorthumberland@highwaysengland.co.uk or call **0300 470 4580***.

*Calls to 03 numbers cost no more than a national rate call to an 01 or 02 number and must count towards any inclusive minutes in the same way as 01 and 02 calls.
These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone. Calls may be recorded or monitored.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363