

Natural Resources Wales

**Stephenson Street Flood Defence
Scheme**

Drainage Strategy Report

274580-ARP-XX-XX-RP-CX-1000

P01 | 1 March 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 274580

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ARUP

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1 Introduction

Natural Resources Wales (NRW) have commissioned Ove Arup and Partners Ltd (Arup) to undertake the design of the flood alleviation scheme on the east bank of the River Usk in Newport. The project will manage flood risk to the residents, businesses and infrastructure of Spytty from the Stephenson Street Embankment in accordance with the Severn Estuary Strategy (i.e. hold the line with a standard of protection of 1:200 year tidal event with allowance for 50 years sea level rise).

The project comprises of the construction and enhancement of 1.7km of flood defences and a section of new highway between East Bank Road and Corporation Road. The main purpose for the new highway is to provide access to and from the adjacent industrial area via East Bank Road in the event that the proposed flood gates are closed on Corporation Road.

This report mainly details the surface water drainage strategy developed for the proposed highway works. The storm water strategy has been written to provide the principles of how the proposed highway works will be drained to meet the requirements of Schedule 3 of the Flood and Water Management Act. The storm drainage proposals outlines are currently being discussed with the Sustainable Drainage Systems (SuDS) Approving Body (SAB). The SAB for the scheme is Newport City Council (NCC). A Pre-SAB Application consultation meeting was held on 18/08/2020 where the principles were discussed and in-principally agreed with the SAB. A Pre-SAB application has been submitted and currently being reviewed by the SAB. A summary of the consultation meeting has been provided in Appendix G. For further information relating to the flood defence structures and accompanying Flood Consequence Assessment (FCA), refer to document ref 274580-ARP-XX-XX-RP-XX-0001

The proposed highway works and alterations to Stephenson's Street will be designed to an adoptable standard and offered to Newport City Council for adoption.

1.1 Site Location

The site is located on the east bank of the River Usk, Newport, with approximate OS grid reference ST326855. A location plan can be seen in on drawing 274580-ARP-XX-XX-DR-CX-1000 in Appendix D. The adjacent industrial areas are bound by the River Usk to the south west and a railway to the north east. The area is accessed from Stephenson Street and Corporation Road to the north and south east respectively via separate rail underpasses.

The proposed highway works, as shown on 274580-ARP-XX-XX-DR-CX-1000 in Appendix D, will provide a connection between East Bank Road and Corporation Road. The scheme is proposed to run adjacent to Hanson Aggregates and through land owned by Marshalls PLC. Local alterations are also proposed to Stephenson Street, near the eastern approach to the Newport Transporter Bridge. This is to enhance accessibility and to ensure that the flood protection measures are maintained across the existing carriageway.

The topography is predominantly flat within the vicinity of the proposed highway works with levels varying between 6.9m and 7.5m above ordnance datum AOD. Whilst the existing ground profile near the Stephenson Street works is at approximately 8.5m AOD. Mean Spring High Water (MHWS) within the adjacent River Usk is approximately 6.4m AOD.

2 Existing Drainage

Dŵr Cymru Welsh Water (DCWW) asset records show a 675mm diameter storm drainage sewer is present within East Bank Road and can be found in Appendix A. The records indicate that the head of the sewer is approximately 140m to the north east of the proposed highway works. The pipe falls in a south westerly direction ultimately discharging into a pond to the west of Hanson's compound. This area is densely vegetated and is designated as a Special Area of Conservation (SAC).

Highway gullies are present along East Bank Road. It is unknown if a separate highway network is present or if the gullies connect to the DCWW network. No highway record information has been made available. On the basis that no additional manhole covers have been identified on the topographical survey, it is assumed that the gullies connect to the DCWW surface water network.

An existing watercourse is present between the Marshalls site and the existing railway. Record information provided by Marshalls regarding the watercourse can be found in Appendix B. The records show the watercourse crosses the Marshall site in a southerly direction before being culverted under Corporation Road and outfalling to the River Usk.

An existing waterbody/pond is present to the south of the Marshalls site adjacent to the River Usk. Land registry records show the pond to be owned by Marshalls; however, no further details on the pond have been provided. Another waterbody or drainage ditch exists along the north eastern perimeter of the Wales Coastal Path.

A site visit was completed on 24/08/2020 to identify any outfalls however proved inconclusive.

No records of any positive drainage networks have been provided for the land at the location of the proposed highway works near East Bank Road. The area is currently owned and used by Marshalls for general storage of stockpiled materials. It is thought that the surface water runoff from area collects in several ill-defined ditches in the area and the adjacent waterbody/pond, however no outfalls have been identified. It is believed that the water infiltrates/percolates through the ground to the River Usk in combination with evaporation and evapotranspiration.

The DCWW asset records show an existing 375mm diameter DCWW combined sewer is present within Stephenson Street. The sewer falls in a westerly direction ultimately discharging into the River Usk adjacent to the Newport Transporter Bridge. Highway gullies are present on Stephenson Street in the location of the proposed works however no record information on highway drainage has been

made available. It is assumed that the highway gullies connect to the combined sewer due to it being the only identified network in the vicinity.

3 Proposed Storm Drainage

The following section outlines the surface water drainage strategy for the proposed circa 700m of proposed highway connecting East Bank Road and Corporation Road, as well as the alterations to Stephenson's Street.

The proposed storm water drainage strategy is currently being reviewed by the SAB and therefore is subject to change until the SAB Pre-Application has been approved. This will agree the principles of the proposed storm drainage strategy.

A SAB Pre-Application consultation was held with Newport City Council on 21/08/2020. The scheme was presented as discussed in line with the drainage principles outlined in this report and in-principally agreed with the SAB.

3.1 Proposed Drainage Catchments and Design Parameters

The proposed East Bank Road/Corporation Road highway works have been split into three proposed drainage catchments. This is to replicate the existing overland flow routes and based on the proposed highway levels and the outfall locations. Multiple catchments and outfall locations are required to limit the depth of the proposed drainage networks and to negate the need for excessively deep drainage due to the flat topography of the site. The proposed drainage catchments can be found on drawing 274580-ARP-XX-XX-DR-CX-1152 in Appendix D.

The highway alternations on Stephenson Street are contained within the same catchment as existing and therefore are not shown on the catchment drawing.

The proposed surface water drainage network will be designed to be flood free for the 1 in 30 year return period event including a 40% allowance for climate change in accordance with Sewers for Adoption 7th Edition (SFA7). Analysis of the network will be undertaken for the 1 in 100 year return period event + 40% and the volume of flooding (if any) will be provided. Minor flooding for events greater than the 30 year event + 40% are considered to be acceptable as outlined in SFA7 as the highway and surrounding areas are not considered to be vulnerable development. Exceedance flow routes and volumes will be provided at detailed design for the 1 in 100 year return period event plus a 40% allowance for climate change.

3.2 Schedule 3 of the Flood and Water Management Act

Schedule 3 of the Flood and Water Management Act 2010 has established SuDS Approving Bodies (SABs) in Local Authorities. Since the 7th January 2019, developments greater than 100m² or developments containing more than one building will be required consent for the surface water strategy through the SAB

application process. This application requires developers to utilise SuDS for their surface water management. The SAB for the scheme, Newport City Council, have confirmed that SAB approval will be required for the scheme with the following exemptions as they are not considered to change the characteristics of the drainage catchments or are assessed separately in the FCA:

- Flood Defence Structure; and
- New gravel paths introduced within the parks or along the flood defence structures.

Furvert detail of the above proposals will be included as part of the planning application.

The Welsh Governments national standard ‘*Statutory Standards for Sustainable Drainage Systems*’, outlines the requirements that should be considered for the design, construction, operation and maintenance of a compliant drainage system. Within the document, there are six standards which need to be achieved. These standards are as follows:

- S1. Runoff destination
- S2. Hydraulic control
- S3. Water quality
- S4. Amenity
- S5. Biodiversity
- S6. Construction, operation and maintenance

These standards form a set of principles which must be considered in the design of the SuDS features in order to obtain approval from the SAB. The following subsections consider how the proposed development will meet these requirements.

3.2.1 S1 – Surface Water Runoff Destination

The Welsh Governments SuDS Standard S1 provides a discharge hierarchy for surface water from developments as follows;

- Level 1: Surface water runoff is collected for use;
- Level 2: Surface water runoff is infiltrated to ground;
- Level 3: Surface water runoff is discharged to a surface water body;
- Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;
- Level 5: Surface water runoff is discharged to a combined sewer.

The aim of this is to encourage developments to use runoff as a resource and ensure that runoff is sustainably managed to avoid negative impacts from the development, such as increased flood risk.

Level 1 - Run off collected for reuse

There is currently no demand for the use of water on the scheme and therefore, the reuse of surface water is not considered to be appropriate discharge location for the surface water runoff. As such, collection for re-use is not considered further within this report.

Level 2 - Infiltration to the ground

Ground Investigation (GI) in the form of trial pits have been undertaken across the site to inform the design. The trial pits concluded that the ground conditions within the vicinity of the proposed highway generally comprise of a shallow depth of made ground, approximately 1m thick underlain by tidal flat deposits. Groundwater was encountered between 0.2-1m below ground level (BGL) and remained stable after 20 minutes. The GI information can be found in Appendix C.

The tidal flat deposits predominately comprise of clay and as such, are not considered to have sufficient infiltration potential for the discharge of surface water from the proposed highway. Infiltration as the primary discharge location of surface water is not considered further within this report.

Level 3 – Discharged to a Surface Water Body

East Bank Road

The proposed highway has been split into three proposed drainage catchments as defined in Section 3.1.

Catchment 1 - The nearest waterbody to Catchment 1 is an existing pond located adjacent to the Hanson Aggregates compound on the bank of the River Usk. The pond is located approximately 50m to the south of the proposed catchment. A direct connection to the pond would require a new sewer and headwall to be installed to the pond crossing land designated as a Special Area of Conservation (SAC). The associated construction works would likely require the removal of the vegetation and extensive works within a designated SAC.

Asset records from Dŵr Cymru Welsh Water (DCWW) show a surface water sewer currently running from under the proposed scheme and outfalling to the existing pond along the same route a proposed connection would take. As such it is proposed to connect indirectly to the pond via the DCWW network to avoid any loss of established vegetation and ecological value, sensitive in nature, which would be counterintuitive considering that increasing biodiversity is a factor considered in the WG Standards. This is discussed further under Level 4.

Catchment 2 – Catchment 2 is located in the centre of the scheme and at its nearest point is located adjacent to the River Usk. It is proposed to discharge the catchment directly to the river through the provision of a new outfall. The outfall connection was prioritised over forming a new connection to the adjacent existing pond, to minimise disturbing established vegetation and ecology surrounding the

pond. The purpose of the pond was also unknown which also contributed toward the decision of it not being considered as an outfall destination. It is proposed to outfall the catchment above Mean High Water Spring (MHWS) level of 6.42m AOD. This will negate the need for a Marine Licence to undertake the work.

Catchment 3 – Two waterbodies / watercourses are located adjacent to Catchment 3. An existing waterbody / pond is located to the south and a watercourse to the east. The discharge into the waterbody/pond to the south has been discounted due to the reasons described in Catchment 2 above. Records provided by Marshalls show the watercourse to run through the Marshalls site in a southerly direction before entering a culvert under the existing highway and discharging into the River Usk. It is proposed to discharge the surface water runoff from the catchment into the watercourse immediately upstream of the outfall, north and east of Corporation Road and the Marshalls' compound respectively. Consideration has been given to discharge Catchment 3 directly into the Usk via the proposed outfall for Catchment 2 however it would push the drainage network serving Catchment 2 deeper which would involve works below the MHWS level and extensive works within the marine environment designated as a SSSI. Lowering the outfall would also increase the maintenance requirements of the outfall as it would be more susceptible to the build-up of debris and mud from the surrounding tidal flat deposits.

Stephenson Street

The installation of a new outfall to a tributary to the River Usk adjacent to the Newport Transporter Bridge was initially considered for the Stephenson Street highway alterations. However, the installation of a new outfall at this location would involve extensive works within the riverbank designated as a SSSI. Additionally, it was considered that these works could be avoided by utilising the existing DCWW sewer outfall at this location. As the scheme is located immediately upstream of the existing outfall the provision of an additional outfall is not considered to provide any significant benefit. This is discussed further in Level 5.

Level 4 – Discharge to Surface Water Network

As discussed in Level 3, it is proposed to discharge Catchment 1 to the existing DCWW surface water network which runs under the proposed highway and into the pond adjacent to the River Usk. The DCWW asset records shown this pipe to be a 675mm diameter. Engagement with DCWW regarding the proposed connection has taken place and DCWW have agreed in principle a discharge to the surface water sewer with a maximum flow rate of 40 l/s. Correspondence can be found in Appendix E.

No further levels in the hierarchy of discharge were required to be considered for East Bank Road.

Level 5 – Discharge to a Combined Sewer

Stephenson Street

As discussed in Level 3, it is proposed to discharge the surface water runoff from the Stephenson Street highway alternations to the existing DCWW combined sewer. DCWW have agreed to the proposal in principle, subject to the confirmation of the existing gully connections and betterment of discharge due to the introduction of SuDS features. Correspondence can be seen in Appendix E.

As the works are immediately upstream of the DCWW combined outfall, this option was considered preferable to avoid the anticipated intrusive works required to construct a new outfall on the riverbank. The riverbank is densely vegetated and designated as a SSSI.

3.2.2 S2 – Hydraulic Control

The proposed scheme is located at the downstream end of the River Usk. At this location and further downstream, the River Usk is under tidal influence due to its proximity to the Severn Estuary. As the proposals are located along the riverbanks of the River Usk the development proposals are also located on the downstream end of any drainage catchments. As such, it is considered that hydraulic control of the surface water discharge is not required in accordance with the Statutory Standards G2.1 as the River Usk is not considered to be affected by either the discharge rate or volume. Additionally, unattenuated discharge from the scheme is not considered to pose any increase risk of flooding downstream, as the scheme lies at the bottom of the surrounding drainage catchments. This is with the exception of Catchment 1 as an agreed discharge rate has been agreed with DCWW. Therefore, hydraulic control will be provided for Catchment 1 prior to connection into the DCWW surface water network. The peak flow rate for the catchment will be restricted to 40 l/s as agreed in principle with DCWW. Attenuation will be provided upstream of the flow control to store the attenuated flow for storm event up to and including the 1 in 30 year storm event plus a 40% allowance for climate change. Catchment 2 is proposed to discharge directly to the River Usk. Catchment 3 is proposed to discharge into the River Usk via an existing watercourse approximately 100m upstream of the Usk.

For the highway alterations on Stephenson Street, no increase in impermeable area is proposed. The alternations are proposed to connect to the existing DCWW combined network mimicking the existing scenario. DCWW have in-principally agreed to the connection location however have requested for confirmation/evidence that the existing gullies are connected to the DCWW sewer. As such, the connection is subject to agreement with DCWW for which discussions/surveys are ongoing. As the works are immediately upstream of the outfall to the River Usk, it is considered that hydraulic control is not required for the same reasons outlined for the East Bank Road above. However, bioretention/raingardens are proposed for the highway alternations which will provide a level of natural hydraulic control for the scheme and betterment to the existing.

3.2.3 S3 – Water Quality

The Simple Index Approach (SIA) has been used to determine the pollution hazard index for the runoff and appropriate mitigation method through SuDS.

The proposed highway has been classified as a low trafficked road with less than 300 vehicle movements per day. The primary users of the highway will be vehicles accessing Hanson Aggregates and Marshalls at the western and eastern ends of the highway respectively. Both are only likely to use small section at the retrospective ends of the scheme, mimicking the existing scenario. The primary function of the highway is an emergency access route over the flood defences and does not form a convenient thoroughfare for any of the compounds.

As identified through the SIA, appropriate treatment for the scheme includes either a swale or a settlement pond as a minimum. The proposed treatment for each catchment is outlined below. SIA calculation can be found in Appendix F.

Catchment 1 – The treatment train will comprise of swales and an attenuation/settlement pond for a portion of the scheme and a settlement/attenuation pond for the remainder. Swales are proposed along the proposed highway where there is sufficient space to allow. Swales cannot be accommodated to the north of the Hansons' compound, as the highway corridor is constrained by the compound fence to the south, the proposed flood defence structure and existing electrical transfer substation to the north. The entire proposed Catchment 1 network will enter a settlement/attenuation pond prior to discharge into the DCWW surface water sewer.

Catchment 2 – The treatment train will comprise of both swales and a settlement pond. Swales will be present running parallel to the proposed highway throughout the catchment. The swales will discharge to a settlement basin located on the site side of the existing flood bund. A new overflow outfall will be provided through the flood bund to the River Usk with a tidal flap valve installed on the outlet.

Catchment 3 – This section of highway is constrained between the Marshalls site compound to the north and an existing pond to the south. This portion of highway forms the tie in of the scheme to Corporation Road and is approximately 0.1Ha. Due to the limited width available, there is insufficient space to incorporate SuDS features without the removal of significant established vegetation surrounding the existing pond. It is considered counterproductive to the amenity and biodiversity aspirations of the Statutory Standards to remove the established habitat and vegetation around the pond to replace it with new infrastructure. No SuDS are proposed for this catchment which is equivalent to 2% of the total drainage catchment areas however, it is noted that the treatment of the other catchments is over and above that required for the SIA.

It is proposed to treat the surface water runoff generated from the alterations to Stephenson's Street in bioretention features prior to discharge into the River Usk.

3.2.4 S4 Amenity

The primary function of the highway is to provide an emergency access route from the industrial areas on the river side of the proposed flood defences to the

defended side. The highway is part of the wider flood defence scheme on the east bank of the River Usk designed to provide protection for numerous existing industrial and residential areas for a 1 in 200 year annual probability tidal flood event with 50 years of sea level rise. As such the scheme will provide significant amenity benefits to the surrounding area.

Additionally, landscaping enhancements are planned for the adjacent costal path running to the south of the scheme to provide amenity value to the local area.

The highway itself will improve and provide safer pedestrian access between the industrial areas. The proposed SuDS features will improve the visual aesthetic of the existing scrubland and areas which currently are unused.

3.2.5 S5 Biodiversity

The introduction of SuDS features such as swales and settlement ponds will create green space and habitat for flora and fauna. Additionally, the landscaping enhancement for the flood defence scheme will provide additional green space enhancing the biodiversity of the scheme.

3.2.6 S6 Design of Drainage for Construction, Operation and Maintenance and Structural Integrity

Standard S6 requires that the proposed surface water drainage systems are designed such that they can be constructed, operated and maintained easily, safely and cost effectively for the whole design life of the systems. They should also aim to minimise the use of natural resources and embedded carbon.

These aspects will be considered through the design of the drainage system. A SuDS Management Plan will be developed to determine how the proposed SuDS features can be effectively and efficiently managed. Where possible natural resources will be utilised.

The SuDS management plan will be submitted as part of the full SAB application.

4 Conclusion

This report has been prepared to provide details of the surface water drainage strategy that has been prepared for the proposed highway works and alterations to Stephenson Street as part of an NRW flood defence scheme on the eastern banks of the River Usk. The approach detailed, outlines the principles which have been discussed and in principle agreed with the SAB at the pre-planning consultation meeting.

The Hierarchy of Discharge has been used to determine the most appropriate surface water discharge location for each of the drainage catchments. Catchment 1 is proposed to discharge to the existing DCWW surface water network at a restricted rate of 40l/s as agreed in principle with DCWW which ultimately discharges to a pond immediately downstream of the works. Catchment 2 is proposed to discharge directly to the River Usk via a new outfall above the

MHWS. Catchment 3 is proposed to discharge to the Usk via an existing watercourse and outfall located approximately 50m upstream of the Usk. The Stephenson Street alterations are proposed to reconnect to the existing DCWW combined sewer, subject to agreement with DCWW.

SuDS solutions in the form of swales, ponds and bioretention features will be utilised for the scheme in accordance with the water quality requirements of the Simple Index Approach. SuDS solutions are not considered to be feasible to the eastern highway tie in (Catchment 3) due to the existing constraints. Additionally, the introduction of SuDS would likely remove established habitat and vegetation around the existing pond which is considered counterproductive to the amenity and biodiversity of the aspirations of the Welsh Government Statutory Standards.

The scheme as a whole is considered to provide substantial flood protection to numerous industrial and residential sites of the east bank of the River Usk. The proposed surface water drainage strategy outlined has been considered in line with the Welsh Governments Statutory Standards for Sustainable Drainage S1-S6 which have been outlined in Section 3.

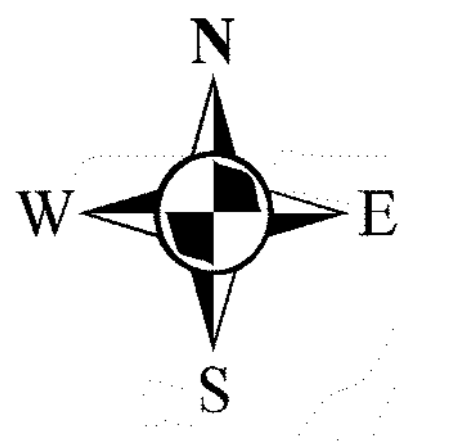
Appendix A

Statutory Records - Existing Utilities Drawing



Dŵr Cymru
Welsh Water

Stephenson Street, Newport



LEGEND (Representative of most common features)

- Waste network:**
- Foul chamber
 - Surface water chamber
 - Combined chamber
 - Combined sewer overflow
 - Special purpose chamber
 - + Treatment works
 - △ Pumping station
 - Outfall
 - Lamphole
 - Storm Overflow
 - Rising main
 - Gravity sewer
 - Private sewer
 - Private sewer subject to Sect. 104 adoption agreement
 - Private Sewer Transfer
 - Lateral Drain
 - Inspection Chamber
- NB:** Sewer symbol/colour indicates the type:
 RED - Combined
 GREEN - Surface Water
 BROWN - Foul
 Purple - Former S24 sewers (for indicative purposes only)

Notes:

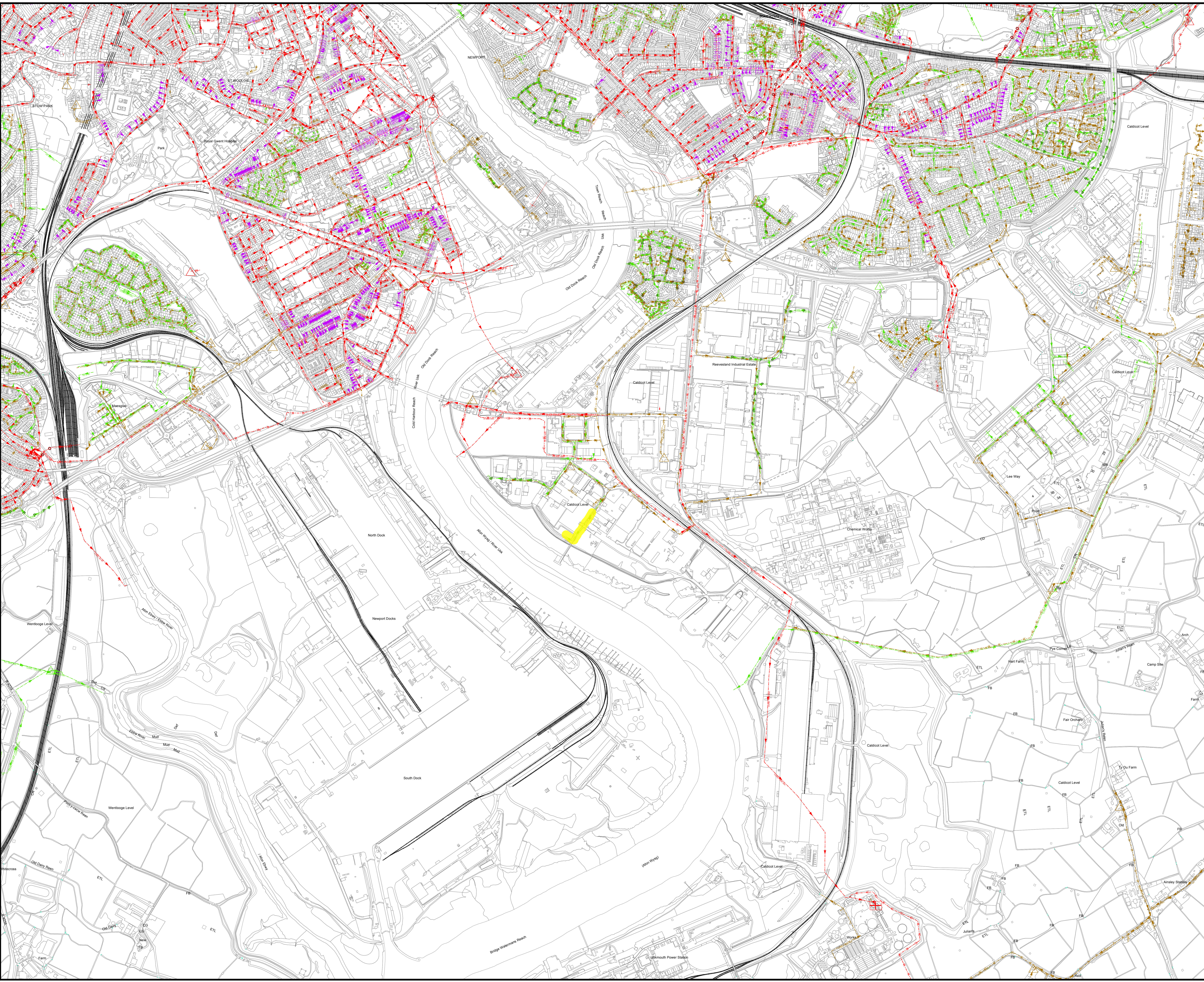
Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases, pipe material (other than Asbestos Cement or Pitch Fibre (PF)) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cymru/Dŵr Cymru (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and to warrant as to its correctness. It does not warrant the absence of excavations or other works made in the vicinity of the Company's apparatus. The users of locating apparatus before carrying out any excavations must verify on site. The information which is supplied by the Company is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal man and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position, and the Company does not warrant the accuracy of the information. The users of this information is entirely without prejudice to the provisions of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref: 332564,185790
 Map scale: 1:4950
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 Printed on: 01 May 2020



Appendix B

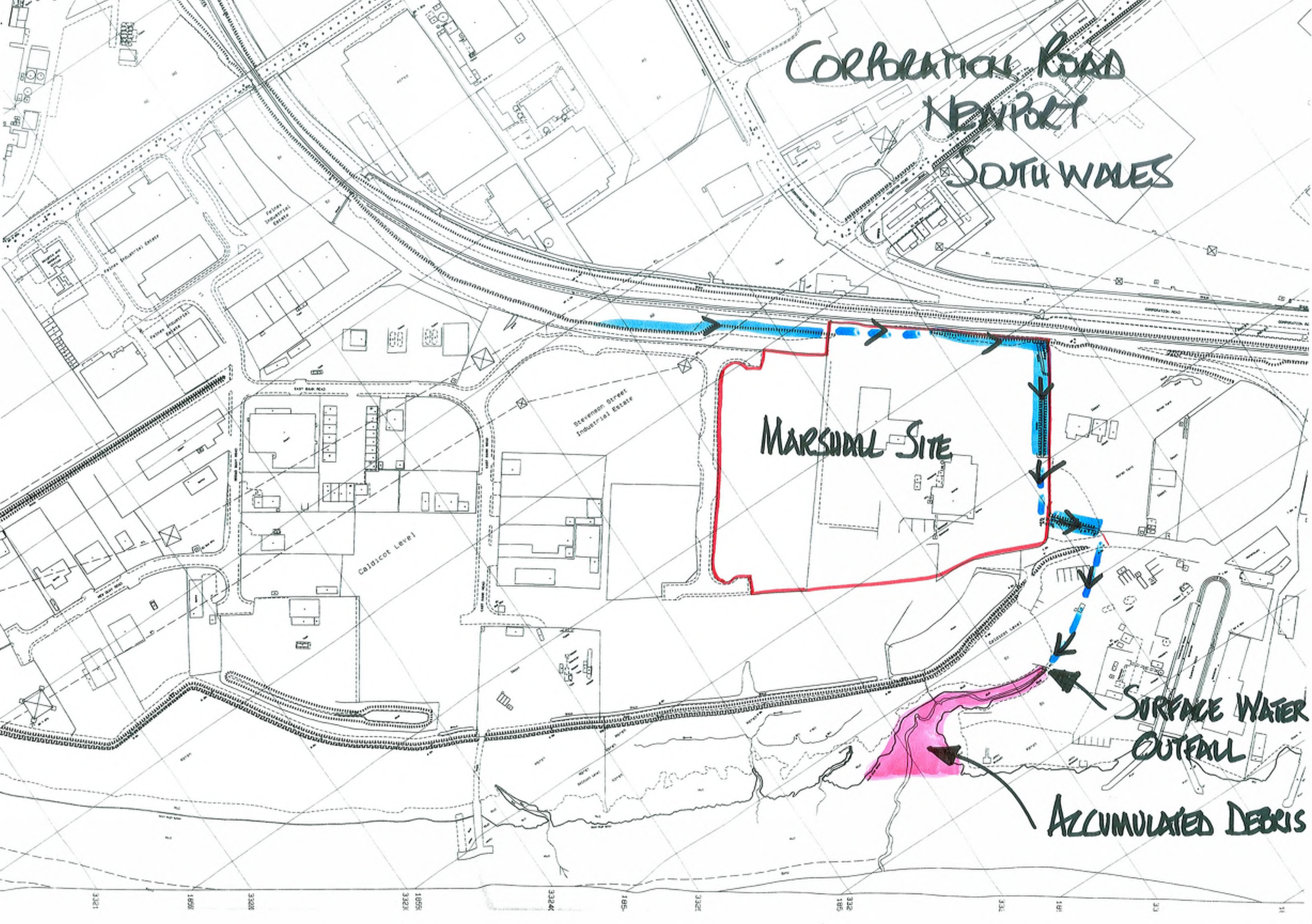
Marshalls' Drainage Records

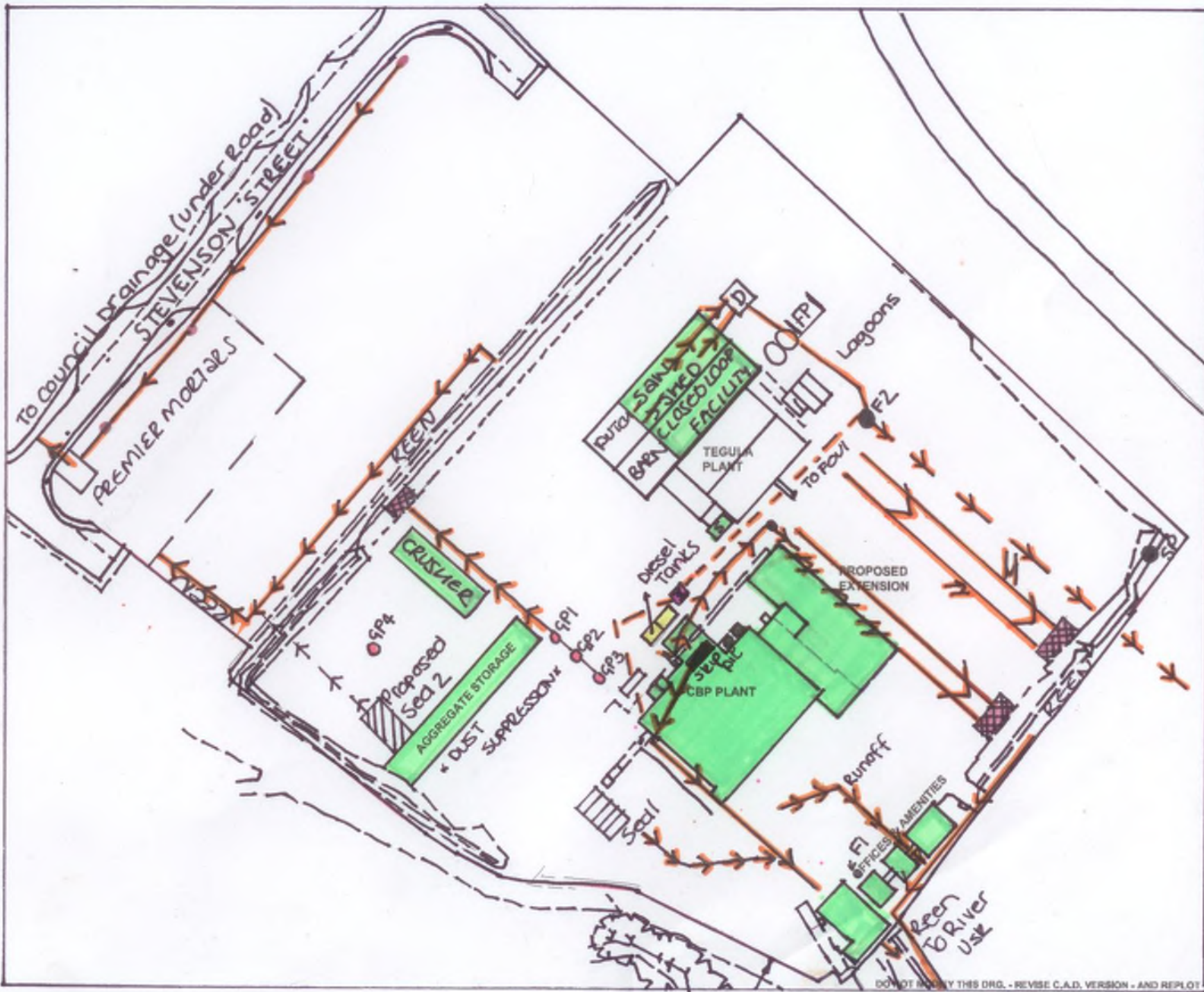
CORPORATION ROAD
NEWPORT
SOUTH WALES

MARSHALL SITE

SURFACE WATER
OUTFALL

ACCUMULATED DEBRIS





- | REV | DATE | DESCRIPTION |
|-----|------|-------------|
| 1 | 1/1 | |
- KEY**
- F1 - Cesspit 1/12
 - F2 - Consented Foul
 - I - Interceptor
 - Proposed Gully Pits
 - Sed 1 - Sediment Pit Agg Yard
 - Sed 2 - Proposed Sed Pit
 - SP - Sample Point
 - sibs
 - OO saw Filtration
 - Gully Pots
 - Covered Drain
 - Drains to Canal
 - Pit (Premier Mortars)
 - skip Pit

REV	DATE	DESCRIPTION

Marshall's

SITE PLAN

WORKS: **NEWPORT** I.G. REF: DATE ISSUED:

DRAWN BY: P.Jewell DATE: 1/1/2005 SCALE: 1:500

MARSHALLS MORD LTD
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DRG NO: REV: A BPC:

DO NOT REPLY THIS DRG. - REVISE C.A.D. VERSION - AND RE-PRINT

Appendix C

Ground Investigation Results



**Cyfoeth
Naturiol
Cymru**
**Natural
Resources
Wales**

Natural Resources Wales

**A112258-2 Stephenson Street
Option 2b Ground Investigation**

Ground Investigation Factual Report

April 2020



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Prepared by

Checked by

Approved By

A handwritten signature in blue ink, appearing to be 'SOF'.

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Senior Geo-Environmental Engineer

A handwritten signature in blue ink, appearing to be 'N. Bool'.

Nicholas Bool
Senior Geo-Environmental Engineer

Chris Pugh
Associate Director



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Appendix B – Exploratory Hole Logs, Photographic Plates and In-situ Test Results

Appendix C - Geotechnical Laboratory Results

Appendix D - Environmental Laboratory Results

Appendix E – Topographical Survey

Appendix F – CPT Interpretive Report



1 Introduction

1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) were commissioned by Natural Resources Wales to undertake an intrusive ground investigation at the Stephenson Street site, Newport. The ground investigation is split over three sites namely the Felnex industrial Estate (East Bank Road), Marshalls PLC (Corporation Road) and Nash Wall.

1.2 Brief

Arup have been commissioned by Natural Resources Wales (NRW) to undertake the detailed design of the Stephenson Street Flood Alleviation Scheme. The ground investigation was designed by Arup to inform the scheme design which includes flood retention walls and a series of road embankments. The scope of the ground investigation was as follows:

Felnex Industrial Estate (East Bank Road)

- 6 No. machine excavated trial pits to 3.00m bgl to investigate the shallow ground conditions.
- 4 no. CPT tests to maximum depths ranging from 6m bgl to 20m bgl.
- Geotechnical and Geo-environmental sampling from all locations.
- Topographic survey.

Marshalls PLC Land (Corporation Road Access)

- 4 no. machine dug trial pits to 3m bgl to investigate the shallow ground conditions.
- 1 no. CPT tests to a depth of 6m bgl.
- Geotechnical and Geo-environmental sampling from all locations.
- Topographic Survey.

Nash Wall

- Topographic Survey.

1.3 Report Scope

This report summarises the work undertaken and includes the following key elements;

- Full factual records of the site works carried out;



- Ground conditions encountered;
- Initial interpretation of CPT testing results.
- Geotechnical and environmental laboratory testing results.
- Topographic Survey report.

1.4 Limitations

This report has been prepared in accordance with the requirements of Natural Resources Wales and Arup. It is subject to the report conditions contained in Appendix A.

The information contained in this report is intended for the use of Natural Resources Wales and Arup. WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report.



2 Site Information

2.1 Location

The site is located south of central Newport centred approximately ST 32591 85552. The majority of the site is situated within an industrial and commercial district known as the Felnex Industrial Estate which is accessed off East Bank Road and consists of a number of commercial assets, areas of disused land and both public and unnamed roads.

South of the Felnex Industrial estate along the sites southern perimeter is an area of scrubland (approximately 90m x 250m) owned by Marshalls PLC. A third isolated site area is located around 1.8km south of the Felnex Industrial Estate at approximately ST 33481 84092.

A site location plan is presented as Figure 1.

2.2 Site description

The Felnex Industrial Estate which is accessed off East Bank Road consists of a number of commercial assets, areas of disused land and both public and unnamed roads. An area (approximately 200m x 100m) west of East Bank Road in the south west corner of the site is designated as a Site of Importance for Nature Conservation (SINC). The SINC area has a covering of fledgling and mature trees mixed with bramble and hedgerow. To the east of East Bank Road an unnamed road owned by Newport Council runs north east to south west adjacent to the to the western perimeter of the Marshalls site boundary. Although not currently thought to be officially owned or leased by Marshalls PLC or the opposite GD Environmental is gated and locked outside normal business hours and is used to store commercial skips, containers and stockpiles of concrete and other materials. At the southern extent of East Bank Road an unnamed gated access track runs north east then south to west adjacent to the western boundary of Hanson Concrete Facility. The track is thought to be an emergency access to the current flood defences situated along the River Usk to the south of the site. The 'Felnex site area' is generally flat (between 7.20m AOD and 7.70m AOD) and with the exception of the SINC area and emergency access track is covered by asphalt or concrete hard standing. Giving the commercial setting the roads in and around the Felnex site area are frequently visited by heavy goods vehicles and other plant.

An approximately rectangular area of scrubland (90m x 250m) spans the majority of the sites southern extent separating the site from the flood plains of the River Usk to the south. This area is owned by Marshalls PLC and is accessed via Corporation Road to the east. The scrubland is predominantly flat (ranging from 7.985m AOD to 7.673m AOD) with a covering of compacted engineered fill. The site has several stockpiles of aggregates and has areas designated for wooden pallet storage in the south east corner. Marshalls PLC land



contains a densely vegetated area in its south east corner (adjacent to the boundary line with Hanson's concrete facility to the east) with a mixture of mature, fledgling trees and bramble.

The Nash site area is located immediately east of a railway line used too by the neighbouring steelworks at approximately ST 33481 84092. The area is densely vegetated and is bounded by Uskmouth Power Station to the west and a water treatment facility to the west and south west.

The Corporation Road Site is situated along Corporation Road with exploratory hole locations on land owned by Marshalls Mono Ltd and Bird Port (Cargo Services). The Corporation Road Site is an industrial setting with heavy goods vehicles and heavy lifting equipment within close proximity. The exploratory holes are located on areas of hard standing and soft landscaping. The surrounding area is almost entirely industrial with neighbouring steel works, dockyard and cement works.

2.3 Geology

The site is covered by British Geological Survey (BGS) 1:50,000 (solid and drift) map number 249, Newport. According to the BGS map of the area, the site is underlain by Tidal Flat deposits overlying the Mercia Mudstone Group. The Tidal Flat deposits are described as a mixture of clay and silt deposited in shallow marine environments. The Mercia Mudstone Group is described as red mudstones and subordinate siltstones with halite bearing units in some basinal areas.



3 Site Investigation

The site investigation was undertaken between the 17th and 20th February 2019. Details of the fieldwork methods are given in the notes section at the end of this report.

3.1 Scope

The scope of the site investigation was modified from the initial scope and included the following:

- 10 no. Machine Excavated Trial Pits to a maximum depth of 3.00m bgl.
- 5 no. CPT tests to depths of 6m bgl to 20m bgl.
- Topographic survey of selected site areas.
- In-situ hand shear vane tests.
- UXO watching brief.
- Archaeology watching brief.
- On-site inspection and logging of samples.
- Chemical and geotechnical sampling in exploratory holes.
- Laboratory geotechnical and chemical testing of soils.

Figure 2 shows the layout of the exploratory holes advanced during the site investigation. Exploratory hole logs including photographic plates and in-situ test results are presented in Appendix B. Laboratory test results are presented in Appendix C (Geotechnical) and Appendix D (Environmental).

3.2 Changes to Scope

Due to various site constraints encountered during the ground investigation the locations of some of the exploratory holes need to be changed. Deviations from the original locations include:

- TP04, TP05 and TP06 were relocated west from a roadside verge into an unnamed road.
- The topographic surveys of the railway embankment and Nash area were not achievable due to access constraints.
- TP02 was moved approximately 10m north west to an area of wasteland due to encountering buried services associated with a nearby substation.
- TP03 was moved approximately 20m west from an access track to a disused area of Marshalls PLC land to preserve an access road.



- TP07 was relocated approximately 20m east due to dense vegetation within the southwest corner of Marshalls PLC land.
- TP09 was terminated at 1.40m bgl due to water ingress.
- TP01 was terminated at 1.20m due to encountering a buried concrete culvert.
- Inspection pits for CPT01, CPT02 and CPT03 were terminated shallower than proposed due to water ingress.



4 Ground Conditions Encountered

4.1 Strata encountered

The ground conditions over the entire site as proven during the current works are in general accordance with the published geological literature.

The general sequence of strata encountered beneath the site was as follows.

- Topsoil
- Made Ground.
- Tidal Flat Deposits.

A summary of depth/thickness of each stratum is provided in Table 1 and descriptions of each stratum are detailed in the subsequent sections. Exploratory hole logs are presented in Appendix B.

Table 1 - Summary of strata depths (m bgl) for all exploratory holes

Location	Topsoil (m)	Made Ground (m)	Tidal Flat Deposits (m)
TP01	0.1	0.1-1.20*	ne
TP02	ne	0.00-0.60	0.60-3.00*
TP03	0.1	0.10-0.50	0.50-3.40*
TP04	ne	0.00-1.00	1.00-3.00*
TP05	ne	0.00-1.20	1.20-3.40*
TP06	ne	0.00-1.10	1.10-3.00*
TP07	ne	0.0-2.00	2.00-3.00*
TP08	ne	0.00-1.10	1.10-3.40*
TP09	ne	0.00-1.00	1.00-1.40*
TP10	ne	0.00-0.60	0.60-3.30*
CPT01 (IP)	0.1	0.10-0.80*	ne
CPT02 (IP)	0.1	0.10-0.80*	ne
CPT03 (IP)	0.1	0.10-0.30*	ne
CPT03A (IP)	0.1	0.10-0.90*	ne
CPT04 (IP)	ne	0.00-1.20*	ne
CPT05 (IP)	ne	0.00-0.80*	ne

- Not Encountered

* – Base of Stratum not proven

(IP)-hand dug inspection pit. Interpretive analysis of CPT testing included within Appendix B.



4.1.1 Topsoil

Topsoil was encountered in TP01, CPT01, CPT02, CPT03 and CPT03A which were located on the existing emergency access road adjacent to Hanson Concrete Facility. This material generally comprised dark brown sandy gravelly silt with frequent rootlets.

4.1.2 Made Ground

Made Ground was encountered in all exploratory positions and was variable in composition but mainly consisted asphalt or concrete where hardstanding was present to depths or approximately 0.30m bgl. Below the hardstanding (where present) the material generally ranged from gravelly fine to coarse sand with bands of oversized cobble clasts above sandy gravelly clay. The lithologies of the gravel constituents included brick, concrete, bitumen, slag, clinker, sandstone with occasional metal fragments. The cobble clasts generally consisted of concrete or brick. Hydrocarbon odours were noted during the excavation of TP02.

4.1.3 Tidal Flat Deposits

Alluvium was encountered in all the exploratory positions where the base of the made ground was reached. The deposits generally consisted of a ‘crust’ of slightly sandy slightly gravelly clay which was firm or soft to firm in consistency over soft to very soft silty clay rich in organic material. The initial ‘crust’ was generally between 1.0m to 1.50m thick.

4.2 Groundwater

The groundwater strikes are summarised in Table 2 below.

Table 2 - Summary of groundwater strikes

Location	Strike (m bgl)	After 20 minutes (m bgl)
CPT01	0.60	0.60
CPT02	0.70	0.60
CPT03	0.2	GL
CPT03A	0.35	0.18
TP02	0.40	0.40
TP03	1.00	1.00
TP04	1.05	1.05
TP07	0.50	0.50
TP09	1.40	0.30
TP10	0.60	0.30



4.3 In Situ Testing

4.3.1 CPT Testing

5 no. Cone Penetrometer tests were undertaken using a tracked rig at the base of inspection pits to a maximum depth of 20m bgl. Results can be found in Appendix F.

5 Laboratory Testing

5.1 Geotechnical Testing

Geotechnical testing was scheduled by Arup and undertaken by GSTL Ltd, an approved supplier in accordance with the requirements of WYG quality system and are UKAS accredited for a range of geotechnical tests. The test procedures used in each case are given in Table 3. The results of the testing are presented in Appendix C.

Table 3 - Summary of Geotechnical Tests

Test	Standard (BS1377:1990) and Accreditation	No.
Moisture content	Part 2, Clause 3.2. UKAS	23
4 Point Liquid and Plastic Limits	Part 2, Clause 4.3 and 5.3. UKAS	13
Particle size distribution by wet sieving	Part 2, Clause 9.2. UKAS	21
Particle size distribution by wet sieve and pipette analysis	Part 2, Clause 9.4. UKAS	12
Acid soluble sulphate	BS 1377:1990-Part 3 : 5.2	11
Water soluble sulphate 2:1 extract	BS 1377:1990-Part 3 : 5.3	11
Sulphate content of groundwater	BS 1377:1990-Part 3 : 5.4	11
pH value of soil	BS 1377:1990-Part 3 : 9.5	11

5.2 Environmental Testing

The environmental chemistry was investigated by specialist chemical analysis of selected soil and groundwater samples scheduled by Arup and carried out by ALS Ltd, which is an approved supplier in accordance with the requirements of WYG quality system and is UKAS and MCERTS accredited for a range of chemical analyses. The tests undertaken are summarised in Table 4 below. The soil testing results are shown in Appendix D and the Arup suites are shown in Appendix E.

Soil Test Suite	No.
Suite E1 – Metals and pH	16
Suite E2 - Asbestos Screen	12
Suite E2b – Asbestos Quantification	1
Suite E3 – Speciated TPH	13
Suite E4 – Speciated PAH and BTEX	9
Suite E5 – VOC and SVOC	4
Suite E7 – Unspeciated TPH	5
Suite E9 – Hexavalent Chromium	6



Soil Test Suite	No.
Suite E16 – Loss on Ignition	6
Suite H – Waste Acceptance Criteria	9
Suite I - Leachability	13
Suite J – Leachability General	4



Notes

1. Standards

All excavation operations, sampling of soils, *in situ* testing and geotechnical laboratory testing have been carried out in accordance with the recommendations of the British Standards BS 5930(2015)⁽¹⁾, BS 1377 (1990)⁽²⁾ and BS10175 (2001)⁽³⁾.

Soil and rock descriptions follow the recommendations of BS 5930. Where descriptions or classifications are based on other documents (e.g. BS 8004 (1986) or CIRIA Project Report 11 (1993)), this is stated in the report text.

2. Site methods

Unless specifically stated otherwise, the following methods are used for exploratory holes.

- Machine excavated trial pits using plant operated machinery.
- Dynamic probes are usually heavy dynamic probes, using the same tracked Geotool used for window sampling.

3. Definitions and abbreviations

The following terms are used in the exploratory hole logs

Samples

U	Undisturbed 38mm dia. sample
ES	Environmental Sample
B	Bulk sample

In situ tests

C	Standard penetration test using cone (SPT)
N	SPT N value (blows/300mm)
HV	Hand shear vane – shear strength
RV	Hand shear vane – residual shear strength

Water strikes

▽	Level of water strike
▼	Water level rose to this level (see Remarks at foot of log for details)

Depth means depth below existing ground level unless otherwise specified. Values specified in soil descriptions given in the exploratory hole logs are depths unless otherwise specified.

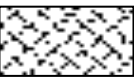
Log Legend



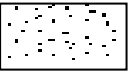
Arisings



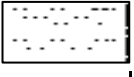
Bentonite



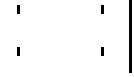
Made Ground



Gravel



Clay



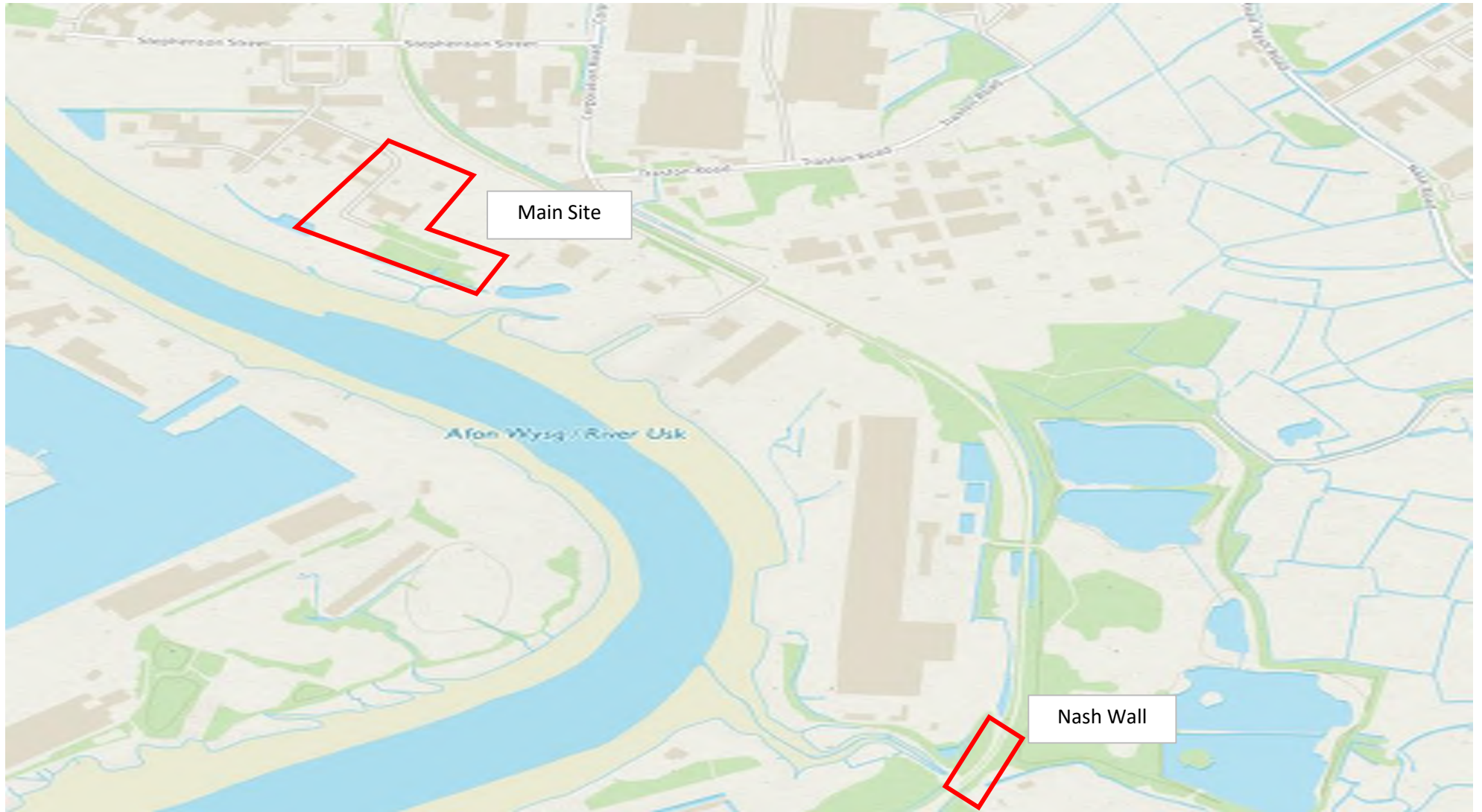
Silt



Figures



Figure 1 – Site Location Plan



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WYG Environment
 5th Floor, Longcross Court, 47 Newport Road, Cardiff
 Tel: 02920 829200
 Fax: 02920 455321
 Environmental Consultancy
 Ground Engineering Services



Project
Stephenson Street Option 2b GI

Client
 Natural Resources Wales

Drawing Title
Site Location Plan

Checked by
 SOF

Drawing No.
 Figure 1





Figure 2 – Site Investigation Layout Plan

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS



KEY:

-  TRIAL PIT LOCATIONS
-  CONE PENETRATION LOCATIONS

NOTE:
DRAWING IS MADE UP OF TWO SEPARATE TOPOGRAPHIC SURVEYS:
JOHN VINCENT SURVEYS, STEPHENSON STREET, NEWPORT SITE SURVEY DRAWING. DRAWING NO 16 / 20. DATED FEBRUARY 2020
& SURVEY SYSTEMS LTD TOPO SURVEY. REF: SSL:2680C:200:1:7 DATED MARCH 2012.



01	ADDITIONAL JVS TOPO ADDED	PP	SO	NB	06.04.20
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REV	DESCRIPTION	BY	CHK	APP	DATE
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Client:
NATURAL RESOURCES WALES

5th FLOOR
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47 NEWPORT ROAD
CARDIFF
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FAX: +44 (0)29 2045 5321
e-mail: cardiff@wyg.com



Project:
STEPHENSON STREET OPTION 2B GI

Drawing Title:
EXPLORATORY HOLE LOCATION PLAN

Scale @ A3	Drawn	Date	Checked	Date	Approved	Date
1:1250	CM	26.03.20	SO	26.03.20	NB	26.03.20
Project No.	Office	Type	Drawing No.	Revision		
A112258-2	CDF	N	02	01		



Appendices



Appendix A – Report Conditions



APPENDIX A - REPORT CONDITIONS GROUND INVESTIGATION

This report is produced solely for the benefit of Natural Resources Wales and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a visual site inspection, reference to accessible referenced historical records, information supplied by those parties referenced in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, perhaps in higher concentrations, elsewhere on the site cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question as such bodies often have unpublished, more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYG. In time improved practices or amended legislation may necessitate a re-assessment.

The assessment of ground conditions within this report is based upon the findings of the study undertaken. We have interpreted the ground conditions in between locations on the assumption that conditions do not vary significantly. However, no investigation can inspect each and every part of the site and therefore changes or variances in the physical and chemical site conditions as described in this report cannot be discounted.

The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists further extensive research will be required before the effects can be better determined.



Appendix B – Exploratory Hole Logs, Photographic Plates and In-situ Test Results



Project: **Stephenson Street Option 2b GI**

Location: **Newport**

Client: **Natural Resources Wales**

Location Details

Easting: 332471.95 Northing: 185708.72

Level: 7.52mAOD Depth: 0.80m

Logger: SOF Type: IP

Status

DRAFT

Pit Number

CPT01

Sheet 1 of 1

Pit Dimensions 	Hole Information Orientation: ° Shoring: None Stability: Stable Plant: Hand Tools		Groundwater Strike (m): 0.60 Rose To (m): 0.60 After (mins): 20 Remarks:				Scale: 1:10 Checked By: RS Approved By: NB Start Date: 17/02/2020 Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Soft brown gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of tile, plastic brick and clinker. (MADE GROUND)		0.40	7.12			0.00 - 0.30 0.00 - 0.70	ES2 B1	PID 0.00m, 0.0ppm
MADE GROUND: Soft brown gravelly slightly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of tile, plastic, brick and clinker. Cobbles are subangular of sandstone. (MADE GROUND)		0.40	7.12			0.40 - 0.70	ES1	PID 0.40m, 0.0ppm
EOH at 0.80m - Terminated upon refusal.		0.80	6.72					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Inspection pit hand dug to 0.80m bgl. 3. Inspection pit terminated at 0.70m bgl due to water ingress. 4. CPT testing undertaken between base of inspection pit and 16.81m bgl. 5. Inspection pit backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

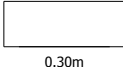


Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332457.21 Northing: 185686.41
 Level: 7.03mAOD Depth: 0.80m
 Logger: SOF Type: IP

Status
DRAFT

Pit Number
CPT02
 Sheet 1 of 1

Pit Dimensions 	Hole Information		Groundwater				Scale: 1:10
	Orientation: °	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: RS	
	Shoring: None	0.70	0.60	20		Approved By: NB	
	Stability: Stable					Start Date: 17/02/2020	
	Plant: Hand Tools					Finish Date: 17/02/2020	

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
Soft to firm dark brown gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of tile, plastic, brick and clinker. Cobbles are subangular of sandstone. (MADE GROUND)		0.30	6.73			0.40 - 1.70		
Soft to firm dark brown gravelly sandy CLAY. Gravel is subangular fine to coarse of tile, plastic, brick and clinker. Sand is fine to coarse. (MADE GROUND)		0.80	6.23			0.60 - 1.20 0.60 - 1.20	B2 ES1	PID 0.60m, 0.0ppm
EOH at 0.80m - Terminated due to water ingress.								

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Inspection pit hand dug to 0.80m bgl. 3. Inspection pit terminated at 0.80m bgl due to water ingress. 4. CPT testing undertaken between base of inspection pit and refusal. 5. Inspection pit backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2



Project: **Stephenson Street Option 2b GI**

Location: **Newport**

Client: **Natural Resources Wales**

Location Details

Easting: 332446.76 Northing: 185623.62

Level: 6.95mAOD Depth: 0.30m

Logger: SOF Type: IP

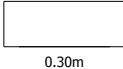
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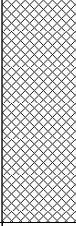

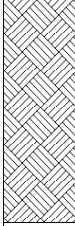
DRAFT

Pit Number

CPT03

Sheet 1 of 1

Pit Dimensions 	Hole Information			Groundwater			Scale: 1:10 Checked By: RS Approved By: NB Start Date: 17/02/2020 Finish Date: 17/02/2020
	Orientation: ° Shoring: None Stability: Stable Plant: Hand Tools	Strike (m)	Rose To (m)	After (mins)	Remarks		
	0.20	0.00	20	Steady ingress			

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
Soft dark brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse sandstone, brick concrete and clinker. (MADE GROUND)								
EOH at 0.30m - Terminated due to water ingress.		0.30	6.65					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Inspection pit terminated at 0.30m bgl due to water ingress.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

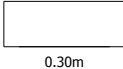


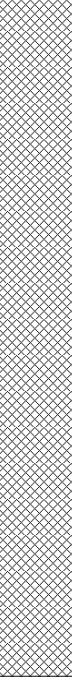


Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332445.76 Northing: 185624.62
 Level: 6.96mAOD Depth: 0.90m
 Logger: SOF Type: IP

Status
DRAFT

Pit Number
CPT03A
 Sheet 1 of 1

Hole Information		Groundwater			Scale: 1:10
Pit Dimensions 	Orientation: °	Strike (m)	Rose To (m)	After (mins)	Checked By: RS
	Shoring: None Stability: Stable Plant: Hand Tools	0.35	0.18	20	Approved By: NB Start Date: 17/02/2020 Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Soft dark brown gravelly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse sandstone, brick concrete and clinker. (MADE GROUND)						0.60 - 0.90	B1	PID 0.60m, 0.0ppm
EOH at 0.90m - Terminated due to water ingress.		0.90	6.06					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Inspection pit hand dug to 0.90m bgl. 3. Inspection pit terminated at 0.90m bgl due to water ingress. 4. CPT testing undertaken between base of inspection pit to 6.0m bgl. 5. Inspection pit backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

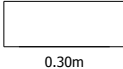


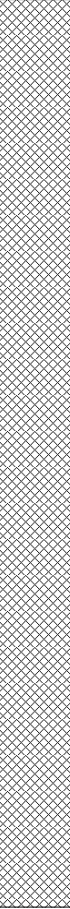

Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332567.70 Northing: 185580.57
 Level: 7.54mAOD Depth: 1.20m
 Logger: SOF Type: IP

Status
DRAFT

Pit Number
CPT04
 Sheet 1 of 1

Hole Information		Groundwater				Scale: 1:10
Pit Dimensions 	Orientation: °	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: RS
	Shoring: None Stability: Stable Plant: Hand Tools					Approved By: NB Start Date: 17/02/2020 Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Soft dark brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse sandstone, brick and concrete. (MADE GROUND)		1.20	6.34			0.00 - 0.80	B1	PID 0.00m, 0.0ppm
EOH at 1.20m - Target depth achieved.								

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Inspection pit hand dug to 1.20m bgl. 3. CPT testing undertaken between base of inspection pit and 6m bgl. 4. Inspection pit backfilled with arisings upon completion. 5. No groundwater encountered.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

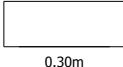


Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332697.68 Northing: 185642.26
 Level: 7.16mAOD Depth: 0.80m
 Logger: SOF Type: IP

Status
DRAFT

Pit Number
CPT05
 Sheet 1 of 1

Hole Information		Groundwater				Scale: 1:10
Pit Dimensions 	Orientation: °	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: RS
	Shoring: None Stability: Stable Plant: Hand Tools					Approved By: NB Start Date: 17/02/2020 Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
Asphalt. (MADE GROUND)		0.10	7.06					
Dark grey sandy slightly silty subrounded to subangular fine to coarse GRAVEL of mixed lithologies with low cobble content. Sand is fine to coarse. Cobbles are subangular of brick and concrete. (MADE GROUND)		0.60				0.60	ES1	PID 0.60m, 0.0ppm
EOH at 0.80m - Terminated due to obstruction (cobbles).		0.80	6.36					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Inspection pit hand dug to 0.80m bgl. 3. CPT testing undertaken between base of inspection pit and 6m bgl. 4. Inspection pit backfilled with arisings upon completion. 5. No groundwater encountered.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

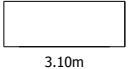


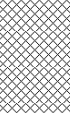

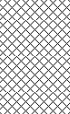
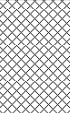
Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332417.28 Northing: 185575.91
 Level: 7.56mAOD Depth: 1.20m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP01
 Sheet 1 of 1

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions 	Orientation: 22°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: RS
	Shoring: None					Approved By: NB
	Stability: Very unstable below 0.40m bgl					Start Date: 18/02/2020
	Plant: 16 Ton Wheeled Excavator					Finish Date: 18/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown to light brown gravelly fine to coarse SAND with medium cobble content and rare boulders. Gravel is angular to subangular fine to coarse concrete, plastic, brick, iron fragments and timber. (MADE GROUND)		0.00 - 0.40	7.16			0.00 - 0.40	B1 ES1	
MADE GROUND: Dark brown gravelly slightly clayey fine to coarse SAND with high cobble and boulder content. Gravel is angular to subangular fine to coarse of brick, concrete, iron, steel and bitumen. Cobble are subangular brick and concrete. Boulders are tabular of concrete (>0.30m wide). (MADE GROUND)		0.60 - 1.10	6.76			0.60 - 1.10	ES2	PID 0.60m, 0.0ppm
MADE GROUND: Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine to medium of brick, concrete, iron, steel and bitumen. (MADE GROUND) <i>At 1.10m bgl crown of concrete culvert exposed (0.40m wide).</i>		0.80 - 1.20	6.36			0.80 - 1.20	B2	
EOH at 1.20m - Terminated due to encountering concrete culvert at 1.10m bgl.		1.20	6.36					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion. 3. Concrete culvert encountered at 1.10m bgl. 4. No Groundwater encountered.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

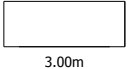









Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332501.04 Northing: 185641.96
 Level: 7.13mAOD Depth: 3.00m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP02
 Sheet 1 of 1

Hole Information		Groundwater			Scale:
Pit Dimensions 	Orientation: 312°	Strike (m)	Rose To (m)	After (mins)	1:25
	Shoring: None	0.40	0.40	20	Checked By: RS
	Stability: Stable	Remarks			Approved By: NB
	Plant: 16 Ton Wheeled Excavator	Seepage.			Start Date: 17/02/2020
					Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Concrete. (MADE GROUND)								
MADE GROUND: Light greenish blue mottled brown and orange gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded of fine to coarse of mixed lithologies including sandstone, limestone and concrete. (MADE GROUND)		0.30	6.83			0.30 - 0.50 0.30 - 0.50	B1 ES1	PID 0.30m, 0.8ppm
Soft to firm light brown to grey slightly peaty slightly sandy silty CLAY. Sand is fine to coarse. Peat is soft black pseudo fibrous. Rare pockets of soft black organic clay (<20mm). Sand is fine to coarse. (TIDAL FLAT DEPOSITS)		0.60	6.53			0.60 - 1.00 0.80 - 1.20	ES1 B2	HV 0.60m, (p)=47 kPa (r)= kPa PID 0.60m, 4.0ppm
Soft light grey mottled blue and black peaty silty CLAY. Peat is pseudo fibrous. Frequent pockets of semi decomposed roots (less than 3mm diameter). (TIDAL FLAT DEPOSITS)		1.90	5.23			1.50 1.90 - 2.10	ES7 B3	PID 1.50m, 0.2ppm HV 1.90m, (p)=21 kPa (r)= kPa
Very soft light bluish grey mottled blue and black slightly peaty clayey SILT. Peat is pseudo fibrous. Frequent pockets of semi decomposed roots (less than 3mm diameter). (TIDAL FLAT DEPOSITS)		2.50	4.63			2.50 2.50 - 3.00	ES8 B4	HV 2.50m, (p)=11 kPa (r)= kPa PID 2.50m, 0.0ppm
EOH at 3.00m - Target depth achieved.		3.00	4.13					HV 3.00m, (p)=6 kPa (r)= kPa

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

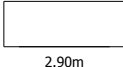


Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332611.52 Northing: 185543.14
 Level: 7.67mAOD Depth: 3.40m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP03
 Sheet 1 of 1

Pit Dimensions 	Hole Information Orientation: 268° Shoring: None Stability: Very Unstable below 0.50m bgl Plant: 16 Ton Wheeled Excavator		Groundwater Strike (m): 1.00 Rose To (m): 1.00 After (mins): 20			Remarks Seepage.	Scale: 1:25 Checked By: RS Approved By: NB Start Date: 17/02/2020 Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Dark grey to black gravelly clayey fine to coarse SAND with low cobble content. Gravel is subangular to subrounded of brick, clinker, concrete, sandstone and flint. Cobbles are subangular concrete and limestone. (MADE GROUND)						0.00 - 0.50	B1 ES1	PID 0.00m, 0.0ppm
Soft to firm light brown mottled orange slightly sandy silty CLAY. Rare shell fragments (less than 6mm diameter). Sand is fine to coarse. (TIDAL FLAT DEPOSITS)		0.50	7.17			0.00 - 0.50		PID 0.50m, 0.0ppm HV 0.60m, (p)=95 kPa (r)= kPa
Soft to firm dark bluish grey mottled orangish brown slightly sandy silty CLAY. Sand is fine. (TIDAL FLAT DEPOSITS)		1.50	6.17			1.00 - 1.50	B2	
Soft dark blue mottled orange slightly sandy CLAY with occasional fine shell fragments (less than 6mm diameter). (TIDAL FLAT DEPOSITS)		2.00	5.67			1.50 - 2.00	B3	HV 1.50m, (p)=45 kPa (r)= kPa
Soft dark blue mottled orange slightly sandy CLAY with occasional fine shell fragments (less than 6mm diameter). (TIDAL FLAT DEPOSITS)		2.40	5.27			2.00 - 2.50	B4	HV 2.00m, (p)=31 kPa (r)= kPa
Very soft light bluish grey slightly peaty silty CLAY. Peat is plastic black amorphous and pseudo fibrous. Rare pockets (less than 10mm) . (TIDAL FLAT DEPOSITS)		2.40	5.27			2.50 - 3.00	B5	HV 2.40m, (p)=10 kPa (r)= kPa
EOH at 3.40m - Target depth achieved.		3.40	4.27					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2



Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332716.31 Northing: 185673.75
 Level: 7.05mAOD Depth: 3.40m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP05
 Sheet 1 of 1

Pit Dimensions 	Hole Information Orientation: 34° Shoring: None Stability: Stable Plant: 16 Ton Wheeled Excavator		Groundwater Strike (m) Rose To (m) After (mins) Remarks				Scale: 1:25 Checked By: RS Approved By: NB Start Date: 19/02/2020 Finish Date: 19/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Asphalt. (MADE GROUND)		0.20	6.85					
MADE GROUND: Light grey gravelly sandy COBBLES of concrete and brick. (MADE GROUND)						0.50 - 1.00	ES4	PID 0.50m, 0.1ppm
						1.00 - 1.50	B1	PID 1.00m, 0.0ppm
						1.00 - 1.50	ES1	
Soft to firm orangish brown mottled bluish grey slightly peaty slightly sandy SILTY/CLAY. Peat is pseudo fibrous. Rare pockets of semi decomposed roots (less than 3mm diameter). Sand is fine to coarse. (TIDAL FLAT DEPOSITS)		1.20	5.85					HV 1.20m, (p)=60 kPa (r)= kPa
Very soft to soft light bluish grey slightly sandy silty CLAY. Sand is fine to coarse. (TIDAL FLAT DEPOSITS)		2.00	5.05			2.00 - 2.50	B2	PID 2.00m, 0.0ppm
								HV 2.50m, (p)=25 kPa (r)= kPa
								HV 2.80m, (p)=12 kPa (r)= kPa
						3.00 - 3.40	B3	PID 3.00m, 0.0ppm
EOH at 3.40m - Target depth achieved.		3.40	3.65					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2



Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332753.23 Northing: 185717.65
 Level: 7.06mAOD Depth: 3.00m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP06
 Sheet 1 of 1

Pit Dimensions 	Hole Information Orientation: 248° Shoring: None Stability: Stable Plant: 16 Ton Wheeled Excavator		Groundwater Strike (m) Rose To (m) After (mins) Remarks				Scale: 1:25 Checked By: RS Approved By: NB Start Date: 19/02/2020 Finish Date: 19/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Asphalt. (MADE GROUND)		0.05	7.01					
MADE GROUND: Concrete. (MADE GROUND)		0.35	6.71					
MADE GROUND: Dark grey sandy slightly clayey subangular fine to coarse GRAVEL of mixed lithologies (limestone, flint etc) with medium cobble content. Sand is fine to coarse. Cobbles are subangular concrete and sandstone. (MADE GROUND)		1.10	5.96			0.50 - 1.00 0.50 - 1.00	B1 ES2	PID 0.50m, 0.2ppm
Firm light brown mottled light blue and orange slightly sandy slightly silty CLAY. Rare pockets of plant remains and fine sand (20mm diameter). Sand is fine to coarse. (TIDAL FLAT DEPOSITS)		2.20	4.86			1.10 - 2.00 1.10 - 2.00	B2 ES5	PID 1.10m, 0.0ppm HV 1.50m, (p)=32 kPa (r)= kPa HV 1.80m, (p)=42 kPa (r)= kPa
Soft to firm light bluish grey slightly peaty silty CLAY. Peat pseudo fibrous. Rare pockets of semi decomposed roots (less than 3mm diameter). (TIDAL FLAT DEPOSITS) <i>From 2.50m bgl becoming very soft.</i>		3.00	4.06			2.20 - 3.00 2.20 - 3.00	B3 ES6	PID 2.20m, 0.0ppm HV 2.50m, (p)=15 kPa (r)= kPa HV 3.00m, (p)=12 kPa (r)= kPa
EOH at 3.00m - Target depth achieved.								

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

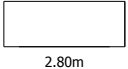





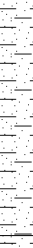

Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332598.86 Northing: 185495.14
 Level: 7.59mAOD Depth: 3.00m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP07
 Sheet 1 of 1

Hole Information		Groundwater			Scale:
Pit Dimensions 	Orientation: 331°	Strike (m)	Rose To (m)	After (mins)	1:25
	Shoring: None	0.50	0.50	0	Checked By: RS
	Stability: Very unstable below 0.50m bgl				Approved By: NB
	Plant: 16 Ton Wheeled Excavator				Start Date: 18/02/2020
					Finish Date: 18/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown gravelly fine to coarse SAND with high cobble content. Gravel is angular to subangular fine to coarse brick, tile, concrete and sandstone. (MADE GROUND)						0.50 0.50 - 1.00	EW6 ES1	PID 0.50m, 0.0ppm
MADE GROUND: Dark grey to black slightly gravelly slightly clayey fine to coarse SAND with a strong organic odour. Gravel is subangular to subrounded fine to medium glass, brick and sandstone. (MADE GROUND)		1.20	6.39			1.20 - 2.00	B1	HV 1.20m, (p)=46 kPa (r)= kPa
						1.50 - 1.90	ES5	PID 1.50m, 0.0ppm
Soft to firm dark brown slightly sandy slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of shell fragments. (TIDAL FLAT DEPOSITS)		2.00	5.59			2.00 - 2.80	B2	HV 2.20m, (p)=63 kPa (r)= kPa
Very soft bluish grey slightly peaty silty CLAY. Peat is pseudo fibrous. Rare pockets of semi decomposed roots (less than 3mm diameter). (TIDAL FLAT DEPOSITS)		2.80	4.79			2.80 - 3.00	B3	HV 2.80m, (p)=19 kPa (r)= kPa PID 2.80m, 0.0ppm
EOH at 3.00m - Target depth achieved.		3.00	4.59					

Observations / Remarks	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Project Number A112258-2

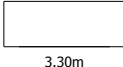


Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332650.03 Northing: 185509.03
 Level: 7.71mAOD Depth: 3.40m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP08
 Sheet 1 of 1

Pit Dimensions 	Hole Information Orientation: 90° Shoring: None Stability: Slightly unstable Plant: 16 Ton Wheeled Excavator		Groundwater Strike (m) Rose To (m) After (mins) Remarks				Scale: 1:25 Checked By: RS Approved By: NB Start Date: 18/02/2020 Finish Date: 18/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown locally mottled black and orange sandy subangular fine to coarse GRAVEL of brick, tile concrete and sandstone with medium cobble content. Cobbles are tabular of concrete. (MADE GROUND)						0.50 - 1.00 0.50 - 1.00	B3 ES1	PID 0.50m, 0.0ppm
Firm light brown mottled orange and locally light bluish grey slightly sandy silty CLAY. Frequent pockets of fine to medium sand (less than 20mm diameter). (TIDAL FLAT DEPOSITS)		1.10	6.61			1.00 - 1.50 1.20 - 2.00	ES2 B1	PID 1.00m, 0.0ppm HV 1.50m, (p)=46 kPa (r)= kPa HV 1.60m, (p)=22 kPa (r)= kPa
Very soft to soft light bluish grey slightly sandy silty CLAY. (TIDAL FLAT DEPOSITS)		1.55	6.16			2.00 - 3.00	B2	PID 2.00m, 0.0ppm HV 2.20m, (p)=20 kPa (r)= kPa
EOH at 3.40m - Target depth achieved.		3.40	4.31					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2




Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332710.91 Northing: 185451.30
 Level: 7.65mAOD Depth: 1.40m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP09
 Sheet 1 of 1

Pit Dimensions 	Hole Information			Groundwater			Scale: 1:25
	Orientation: 260° Shoring: None Stability: Unstable below 0.40m bgl Plant: 16 Ton Wheeled Excavator	Strike (m) 1.40	Rose To (m) 0.50	After (mins) 20	Remarks Fast ingress.	Checked By: RS	Approved By: NB

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown locally mottled black and orange gravelly fine to coarse SAND with medium cobble content. Gravel is angular to subangular fine to coarse brick, concrete and sandstone. (MADE GROUND)						0.00 - 0.40	ES1	PID 0.00m, 0.0ppm
MADE GROUND: Brown to grey and orange sandy subangular to subrounded fine GRAVEL of mixed lithologies. Sand is fine to coarse. (MADE GROUND)		0.50	7.15			0.60 - 1.00	ES2	
Firm dark brown locally mottled orangish brown, blue and pinkish brown slightly sandy CLAY. Frequent pockets of black amorphous peat. (TIDAL FLAT DEPOSITS)		1.00	6.65			1.00 - 1.40	B1	HV 1.00m, (p)=80 kPa (r)= kPa PID 1.00m, 0.0ppm
EOH at 1.40m - Terminated at 1.40m bgl due to rapid water ingress.		1.40	6.25					HV 1.40m, (p)=45 kPa (r)= kPa

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

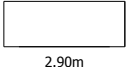


Project: **Stephenson Street Option 2b GI**
 Location: **Newport**
 Client: **Natural Resources Wales**

Location Details
 Easting: 332771.12 Northing: 185462.68
 Level: 7.98mAOD Depth: 3.30m
 Logger: SOF Type: TP

Status
DRAFT

Pit Number
TP10
 Sheet 1 of 1

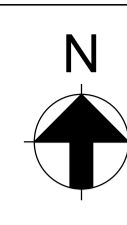
Hole Information		Groundwater				Scale: 1:25
Pit Dimensions 	Orientation: 348°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: RS
	Shoring: None	0.60	0.30	20		Approved By: NB
	Stability: Stable					Start Date: 17/02/2020
	Plant: 16 Ton Wheeled Excavator					Finish Date: 17/02/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
						Depth (m)	Ref	Tests / Results
MADE GROUND: Dark reddish brown gravelly fine to coarse SAND with medium cobble content. Gravel is subangular fine to coarse brick, limestone, tile, sandstone and concrete. (MADE GROUND)		0.30	7.68			0.00 - 0.30	ES1	PID 0.00m, 0.0ppm
MADE GROUND: Light brownish grey gravelly sandy COBBLES of brick and concrete. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick and concrete. (MADE GROUND)		0.40	7.58			0.40 - 0.60 0.40 - 0.60	B1 ES2	HV 0.40m, (p)=60 kPa (r)= kPa PID 0.40m, 0.0ppm
MADE GROUND: Firm dark brown mottled grey and orange slightly sandy silty CLAY. Sand is fine to coarse. (MADE GROUND)		0.60	7.38					
Firm light brown slightly sandy CLAY. Sand is fine to medium. (TIDAL FLAT DEPOSITS)						0.80 - 1.20	B2	
						1.40 - 1.60	ES3	PID 1.40m, 0.0ppm
		1.90	6.08					HV 1.90m, (p)=45 kPa (r)= kPa
Very soft to soft dark bluish grey peaty silty CLAY. Peat is pseudo fibrous. (TIDAL FLAT DEPOSITS)						2.50 - 3.00	B3	HV 2.50m, (p)=22 kPa (r)= kPa
EOH at 3.30m - Target depth achieved.		3.30	4.68					

Observations / Remarks 1. GPR and CAT and GENNY scan by Midland Survey Ltd. 2. Backfilled with arisings upon completion.	Longcross Court, Cardiff, CF24 0AD 029 2082 9200
	Project Number A112258-2

Appendix D

Proposed Drainage Drawings

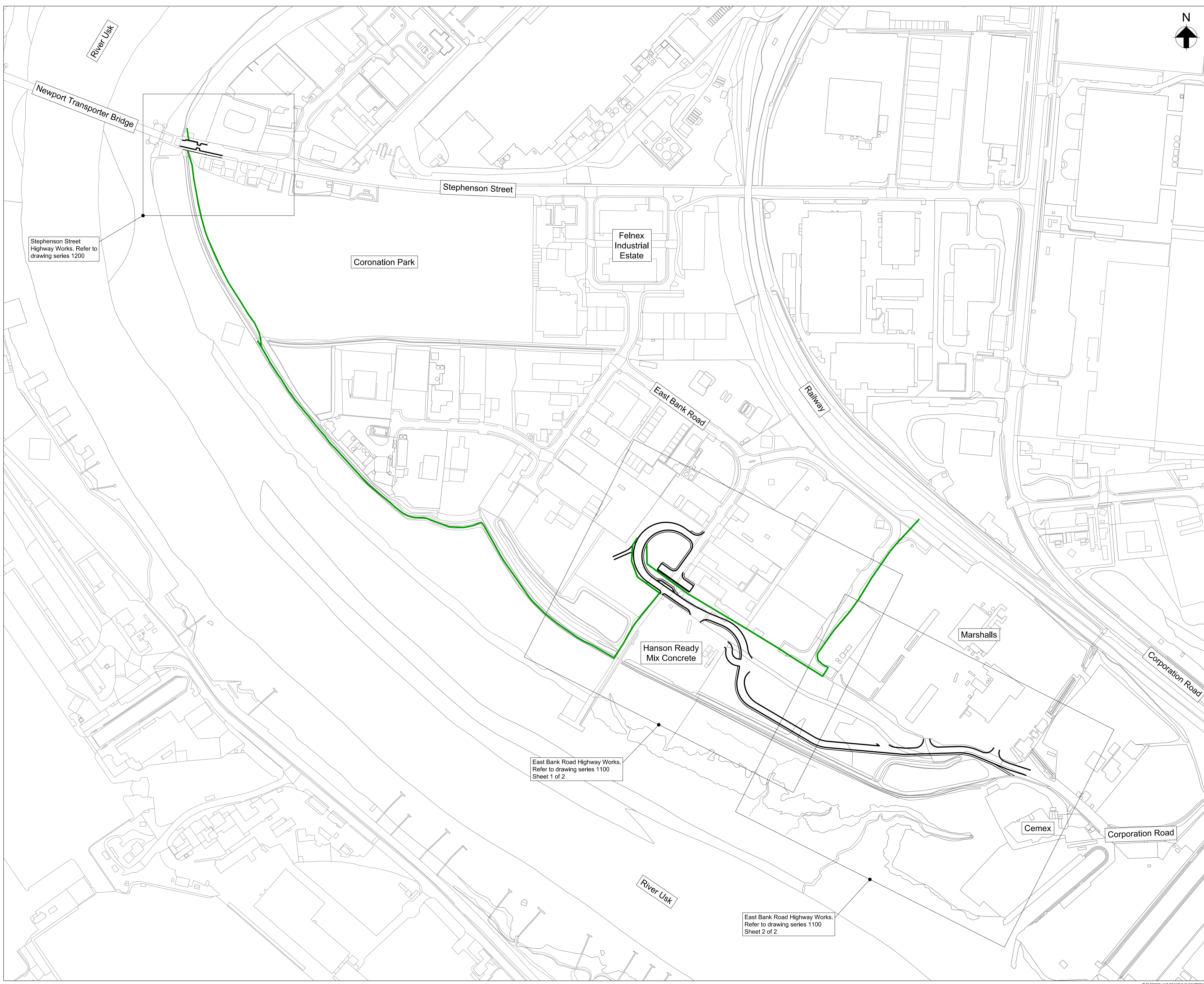


Legend



Proposed Flood Defence Structure Alignment - See drawing 274580-ARP-XX-XX-DR-CX-2000 for retaining wall alignment and associated details

Notes

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P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
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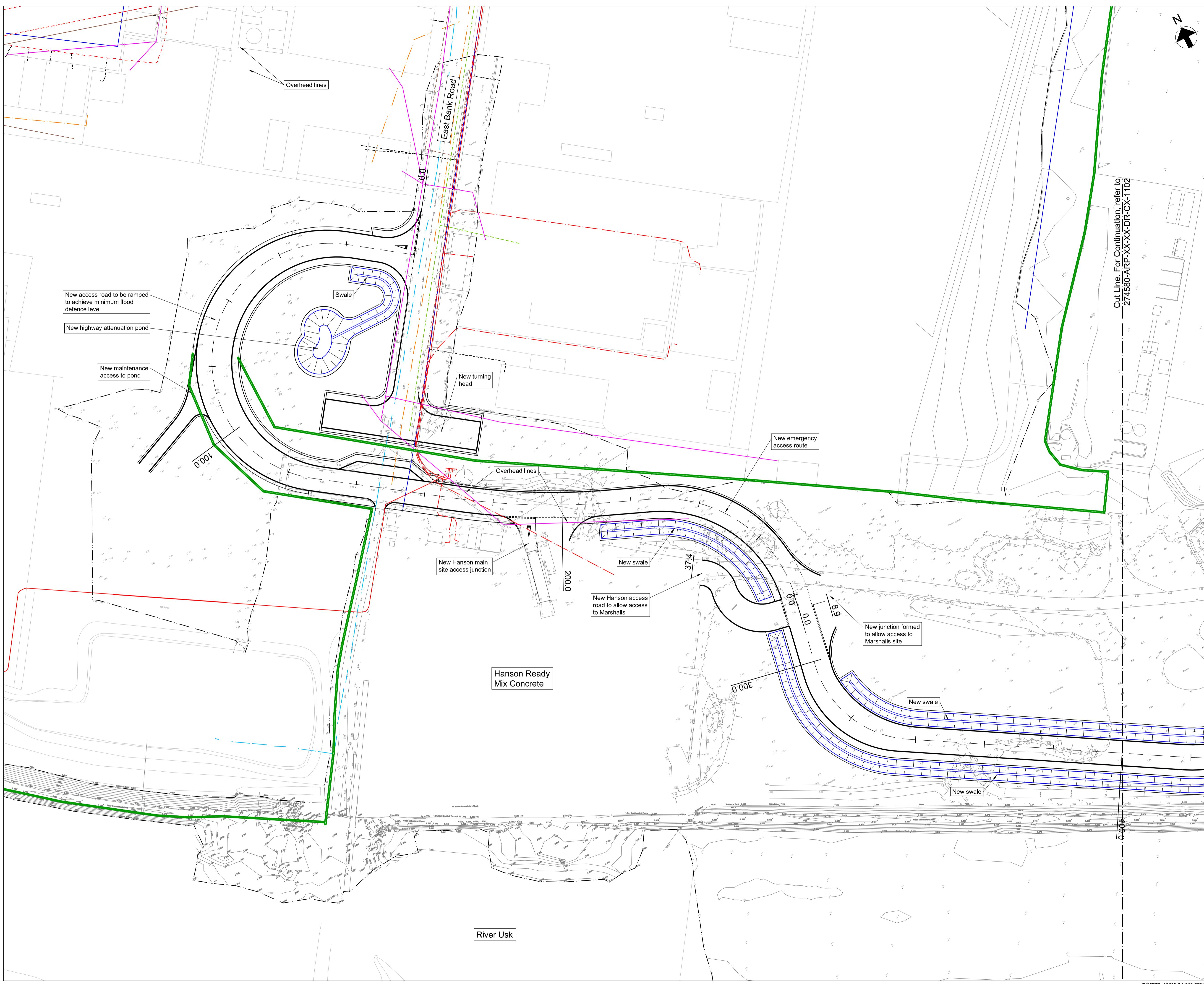
Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

Drawing Title:
HIGHWAY KEY PLAN

Subsidiary: S2 - FOR PLANNING	Subsidiary Code: S2
Internal Project Number: 274580	Scale: 1:2000
Drawing Number: 274580-ARP-XX-XX-DR-CX-1000	Rev. P01

- Legend**
- Topographical Survey Boundary
 - Flood Defence Structure. See drawing See drawing 274580-ARP-XX-XX-DR-CX-2000 for retaining wall alignment and associated details
 - Foul Drainage
 - Combined Drainage
 - Storm Drainage
 - Water Main
 - BT
 - Vodaphone
 - Virgin
 - Wales & West High Pressure Gas Main
 - Wales & West Intermediate Pressure Gas Main
 - Wales & West Low Pressure Gas Main
 - Wales & West Medium Pressure Gas Main
 - Western Power 11kV HV
 - Western Power 33kV HV
 - Western Power 132kV HV
 - Western Power LV
 - Western Power PL
 - Western Power Service Line

- Notes**
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 5. The positions of the existing services on this drawing have been interpreted from information received from the statutory local authorities.
 6. Contractor to identify any unknown services prior to commencement of works.
 7. Contractor to consult with appropriate statutory authorities prior to commencement of works on their assets.
 8. No easements are shown, to be confirmed by statutory undertaker.
 9. No utilities diversion are shown on this drawing. Refer to drawings 274580-ARP-XX-XX-DR-CX-1203 to 1208.
 10. No alterations to existing site premises shown at this stage. This is to be agreed with the land owners and/or tenants in subsequent design stage. Land owners and tenants have been consulted and have agreed in principle to the proposals shown. The crossing of private vehicles between the Hanson and Marshalls site assumes that no alterations or additional telemetry or signalling works are needed and the crossing of private vehicles is dealt with by other means between NRW and Hansons.



Cut Line. For Continuation, refer to 274580-ARP-XX-XX-DR-CX-1102

P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
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Natural Resources Wales

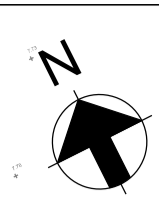
ARUP

Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

Drawing Title:
**EAST BANK ROAD
GENERAL ARRANGEMENT AND EXISTING UTILITIES PLAN
SHEET 1 OF 2**

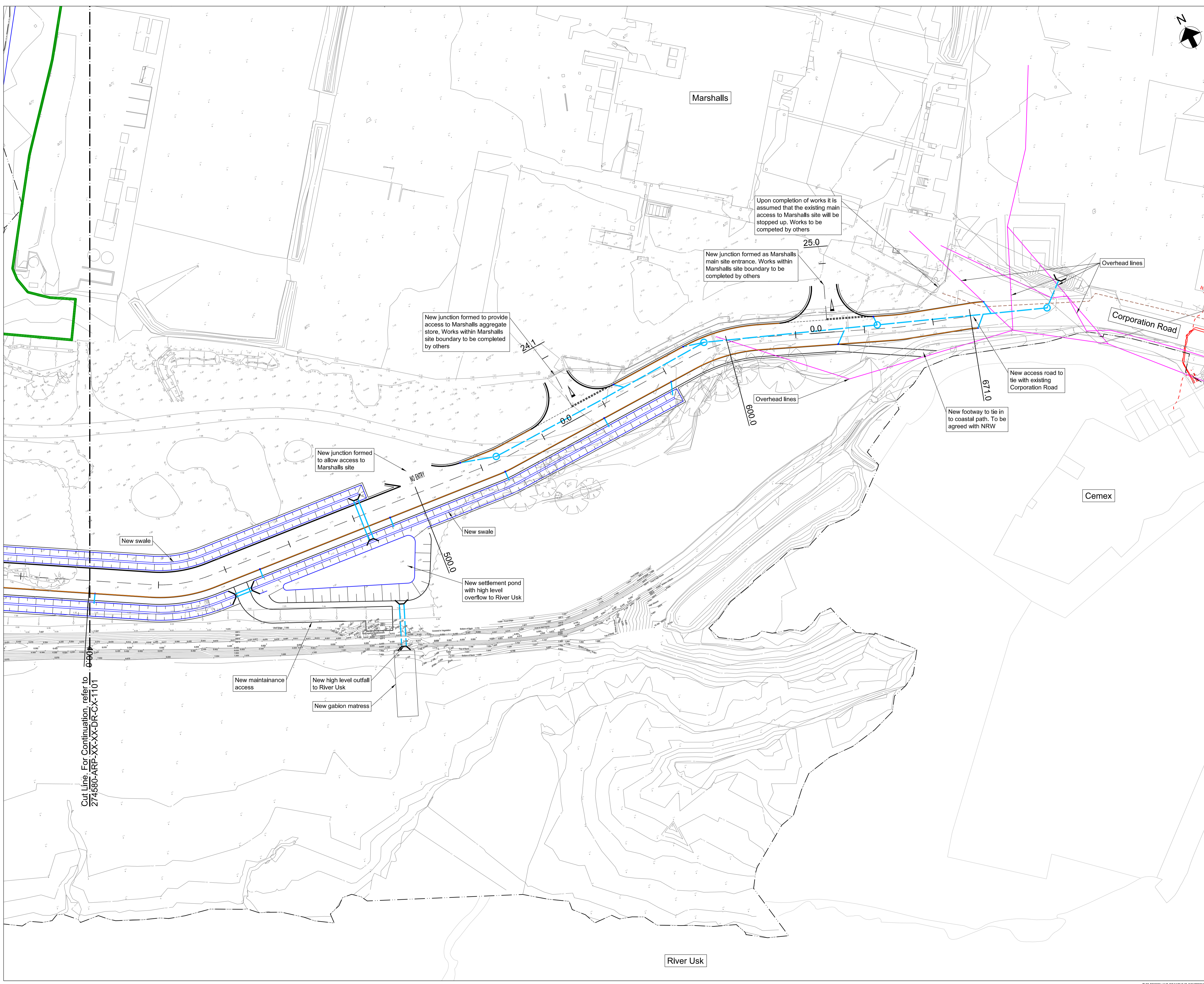
Subsidiary Code: S2 - FOR PLANNING	Subsidiary Code: S2
Internal Project Number: 274580	Scale: 1:500
Drawing Number: 274580-ARP-XX-XX-DR-CX-1101	Rev. P01

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- Legend**
- Topographical Survey Boundary
 - Flood Defence Structure. See drawing See drawing 274580-ARP-XX-XX-DR-CX-2000 for retaining wall alignment and associated details
 - Foul Drainage
 - Combined Drainage
 - Storm Drainage
 - Water Main
 - BT
 - Vodaphone
 - Virgin
 - Wales & West High Pressure Gas Main
 - Wales & West Intermediate Pressure Gas Main
 - Wales & West Low Pressure Gas Main
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 - Western Power 33kV HV
 - Western Power 132kV HV
 - Western Power LV
 - Western Power PL
 - Western Power Service Line

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Cut Line. For Continuation, refer to 274580-ARP-XX-XX-DR-CX-1101

P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
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Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

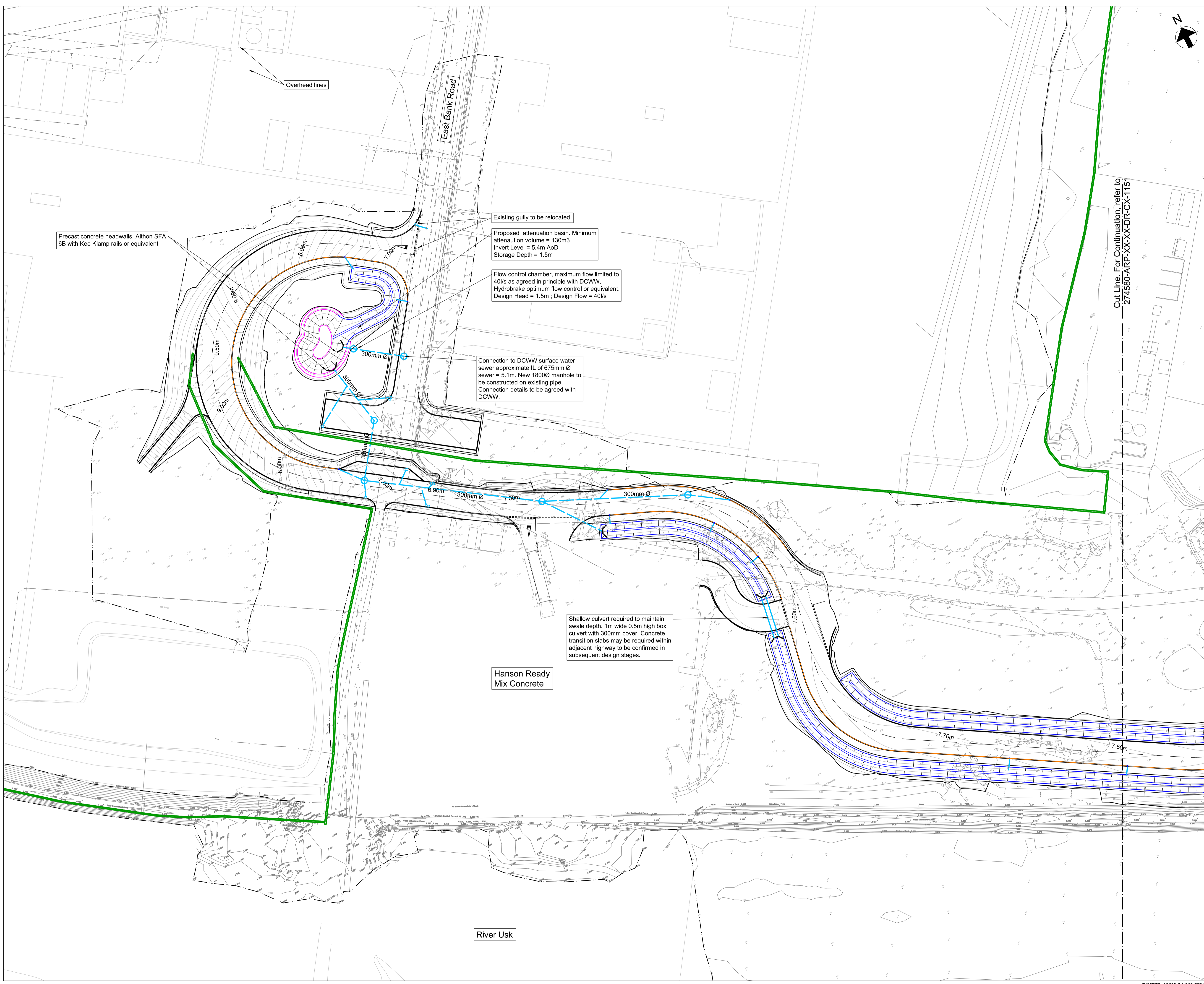
Drawing Title:
**EAST BANK ROAD
GENERAL ARRANGEMENT AND EXISTING UTILITIES PLAN
SHEET 2 OF 2**

Subsidiary Code: S2 - FOR PLANNING	Subsidiary Code: S2
Internal Project Number: 274580	Scale: 1:500
Drawing Number: 274580-ARP-XX-XX-DR-CX-1102	Rev. P01

Legend

- Topographical Survey Boundary
- Flood Defence Structure
- 7.00m Existing Contours
- Existing Utilities
- Proposed Storm Drainage
- Proposed Storm Manhole
- Proposed Storm Gully
- Proposed Storm Culvert
- Proposed Attenuation Pond
- Proposed Storm Headwall
- Proposed Swale
- Proposed Kerb Drainage ACO 305 or equivalent
- Proposed Kerb Drainage Outlet
- Reinforced grass, Geosynthetics Turfmesh 4 or equivalent

- Notes**
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 5. Refer to all other Engineering and Architects Drawings and notify the Civil Engineer of any discrepancies.
 6. This drawing is to be read with all other Engineers drawings and specifications.
 7. All manholes to be SFA Type 2, 1200mm diameter unless otherwise stated. Nominal 1.2m depth to pipe soffit unless stated otherwise.
 8. All grating and covers to be D400 unless otherwise stated.
 9. Concrete surround to be provided to all pipes where depth to soffit is less than 1.2m in trafficked areas.
 10. All storm pipes to be 150mm diameter respectively or unless otherwise stated.
 11. Proposals shown subject to SAB Approval therefore subject to change.
 12. All manhole pipe connections to be soffit to soffit.
 13. Refer to drawings 274580-ARP-XX-XX-DR-CX-1153 to 1154 for details and 274580-ARP-XX-XX-DR-CX-1152 for catchment extents.
 14. Details shown for the proposed highway and accompanying drainage infrastructure. No allowance shown for the proposed flood defence works.
 15. Narrow filter drainage for pavement layers required, however not shown. Narrow filter drains to be in accordance with SHW Highway Construction Details F20.
 16. All propriety products to be installed to manufacturers requirements.



Precast concrete headwalls. Althon SFA 6B with Kee Klamp rails or equivalent

Overhead lines

East Bank Road

Existing gully to be relocated.

Proposed attenuation basin. Minimum attenuation volume = 130m³
Invert Level = 5.4m Aod
Storage Depth = 1.5m

Flow control chamber, maximum flow limited to 40l/s as agreed in principle with DCWW. Hydrobrake optimum flow control or equivalent. Design Head = 1.5m ; Design Flow = 40l/s

Connection to DCWW surface water sewer approximate IL of 675mm Ø sewer = 5.1m. New 1800Ø manhole to be constructed on existing pipe. Connection details to be agreed with DCWW.

Shallow culvert required to maintain swale depth. 1m wide 0.5m high box culvert with 300mm cover. Concrete transition slabs may be required within adjacent highway to be confirmed in subsequent design stages.

Hanson Ready Mix Concrete

River Usk

Cut Line. For Continuation, refer to 274580-ARP-XX-XX-DR-CX-1151

P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
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**Cyfoeth
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Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

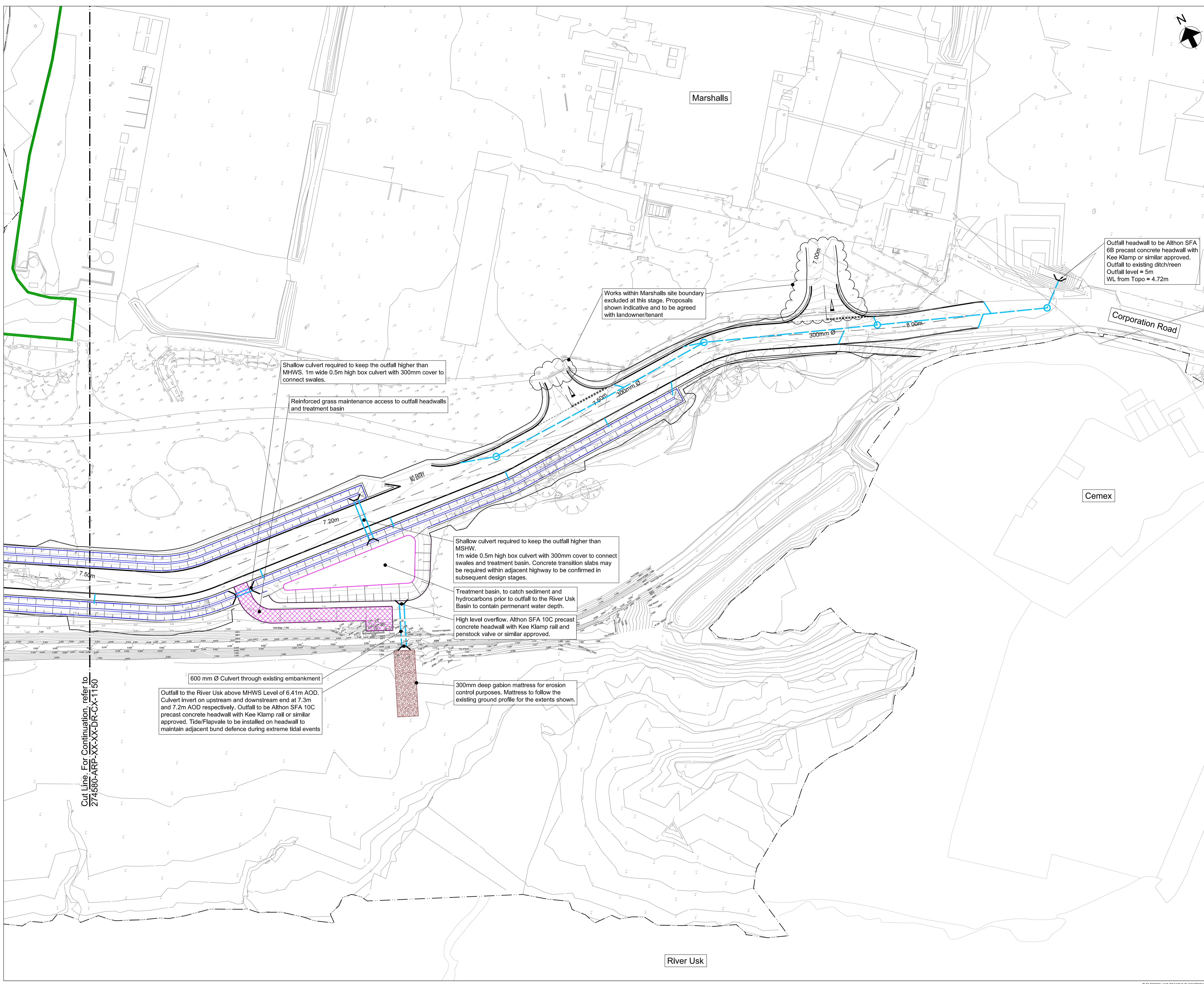
Drawing Title:
**EAST BANK ROAD
PROPOSED HIGHWAY DRAINAGE
SHEET 1 OF 2**

Subsidiary Code: S2 - FOR PLANNING	Subsidiary Code: S2
Internal Project Number: 274580	Scale: 1:500
Drawing Number: 274580-ARP-XX-XX-DR-CX-1150	Rev. P01

Legend

- Topographical Survey Boundary
- Flood Defence Structure
- 7.00m Contours
- Existing Utilities
- Proposed Storm Drainage
- Proposed Storm Manhole
- Proposed Storm Gully
- Proposed Storm Culvert
- Proposed Attenuation Pond
- Proposed Storm Headwall
- Proposed Swale
- Proposed Kerb Drainage ACO 305 or equivalent
- Proposed Kerb Drainage Outlet
- Reinforced grass, Geosynthetics Turfmesh 4 or equivalent

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 6. This drawing is to be read with all other Engineers drawings and specifications.
 7. All manholes to be SFA Type 2, 1200mm diameter unless otherwise stated. Nominal 1.2m depth to pipe soffit unless stated otherwise.
 8. All grating and covers to be D400 unless otherwise stated.
 9. Concrete surround to be provided to all pipes where depth to soffit is less than 1.2m in trafficked areas.
 10. All storm pipes to be 150mm diameter respectively or unless otherwise stated.
 11. Proposals shown subject to SAB Approval therefore subject to change.
 12. All manhole pipe connections to be soffit to soffit.
 13. Refer to drawings 274580-ARP-XX-XX-DR-CX-1153 to 1154 for details and 274580-ARP-XX-XX-DR-CX-1152 for catchment extents.
 14. Details shown for the proposed highway and accompanying drainage infrastructure. No allowance shown for the proposed flood defence works.
 15. Narrow filter drainage for pavement layers required, however not shown. Narrow filter drains to be in accordance with SHW Highway Construction Details F20.
 16. All proprietary products to be installed to manufacturers requirements.



Cut Line. For Continuation, refer to 274580-ARP-XX-XX-DR-CX-1150

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Natural Resources Wales

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Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

Drawing Title:
**EAST BANK ROAD
PROPOSED HIGHWAY DRAINAGE
SHEET 2 OF 2**

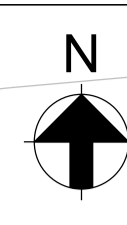
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S2 - FOR PLANNING

Internal Project Number:
274580

Scale:
1:500

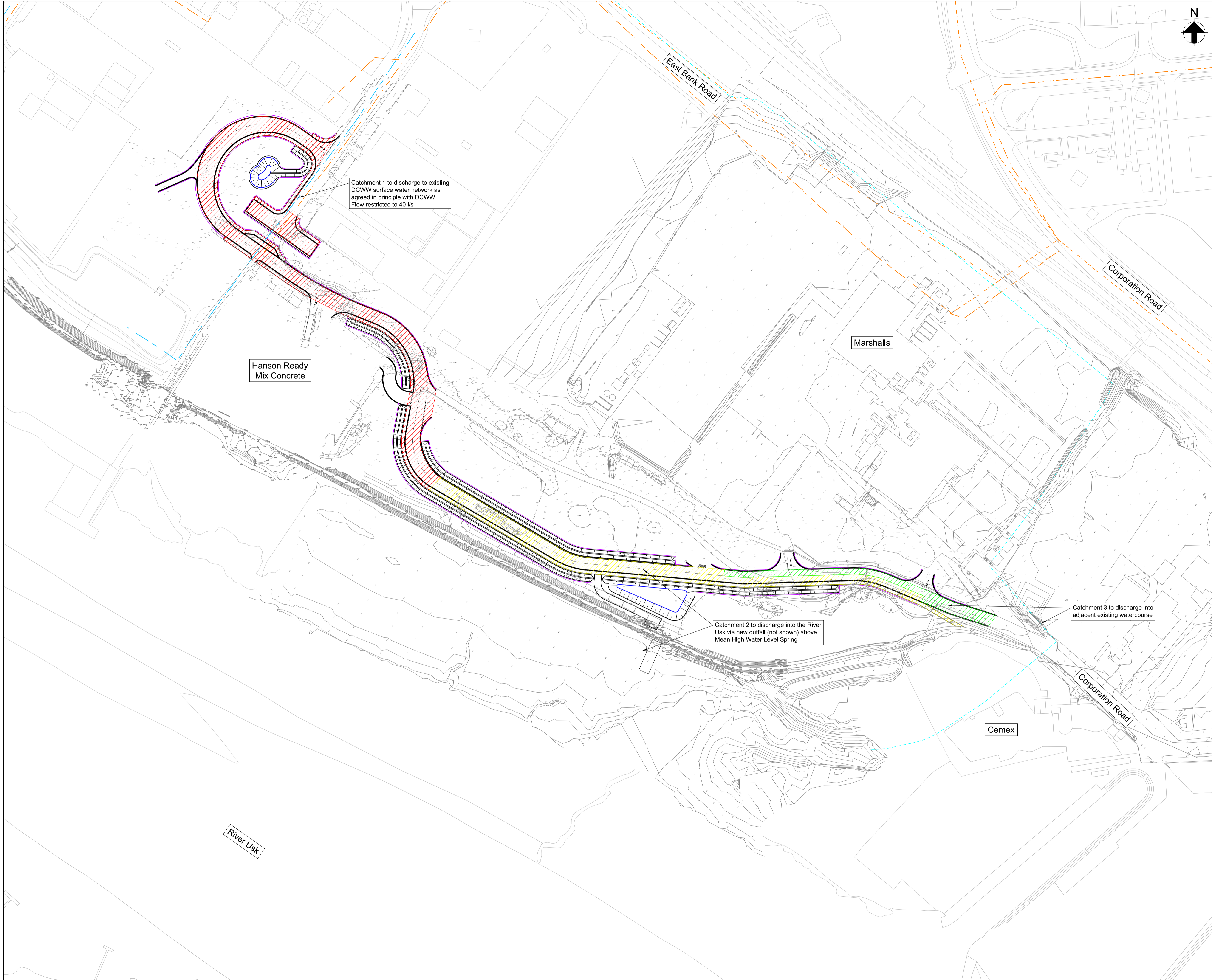
Rev.
P01

Drawing Number:
274580-ARP-XX-XX-DR-CX-1151



- Legend**
- Existing Storm Drainage
 - - - Existing Foul Drainage
 - - - Existing Watercourse
 - Proposed Storm Drainage Catchment 1
 - Proposed Storm Drainage Catchment 2
 - Proposed Storm Drainage Catchment 3

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 4. The positions of the existing services on this drawing have been traced from paper records received from the statutory authorities. Actual positions may vary from shown.
 5. Storm drainage catchments have been defined using the proposed highway levels.



Catchment 1 to discharge to existing DCWW surface water network as agreed in principle with DCWW. Flow restricted to 40 l/s

Hanson Ready Mix Concrete

Marshalls

Catchment 2 to discharge into the River Usk via new outfall (not shown) above Mean High Water Level Spring

Catchment 3 to discharge into adjacent existing watercourse

Cemex

River Usk

P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
Rev.	Description	Drawn	Chkd.	Appd.	Issue Date



Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

Drawing Title:
EAST BANK ROAD
PROPOSED DRAINAGE CATCHMENTS

Subsidiary: S2 - FOR PLANNING	Subsidiary Code: S2
Internal Project Number: 274580	Scale: 1:1000
Drawing Number: 274580-ARP-XX-DR-CX-1152	Rev. P01

FIGURE B.12
TYPICAL MANHOLE DETAIL - TYPE 2
Maximum depth from cover level to soffit of pipe 3.0 m

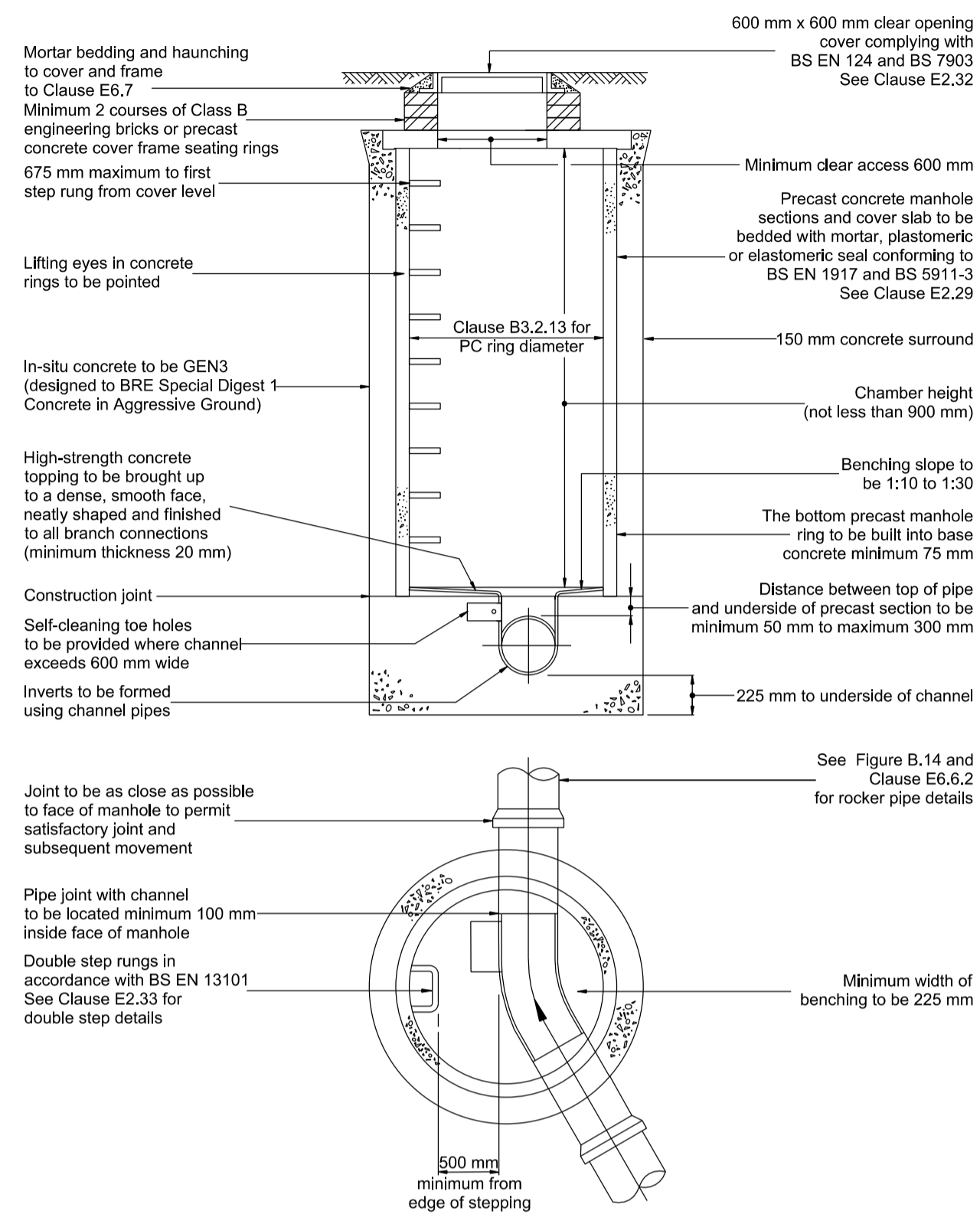


FIGURE B.10
TYPICAL MANHOLE DETAIL - TYPE 1B
Depth from cover level to soffit of pipe 3 m to 6 m

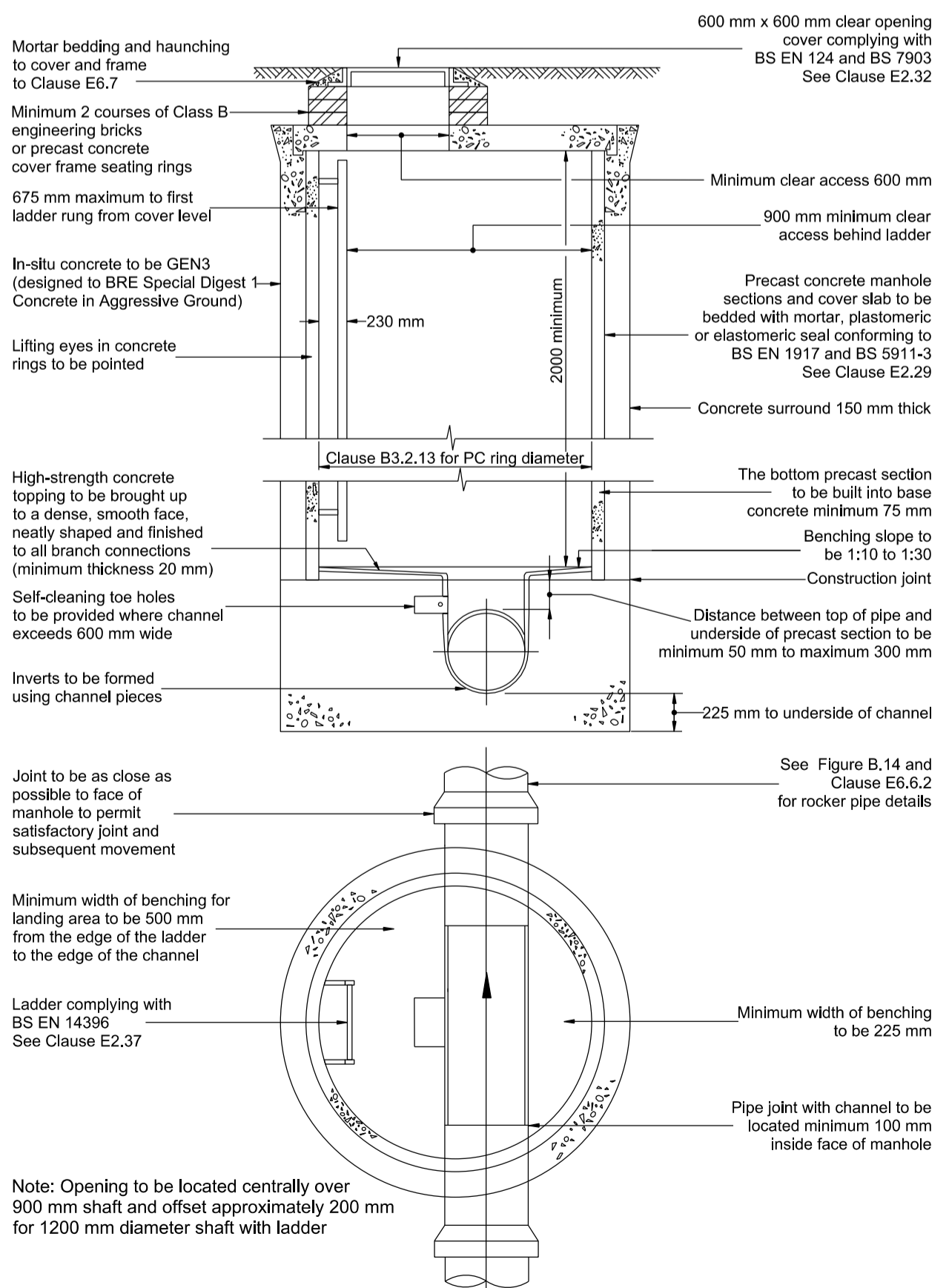


FIGURE B.26
JOINTS FOR CONCRETE ENCASED PIPES

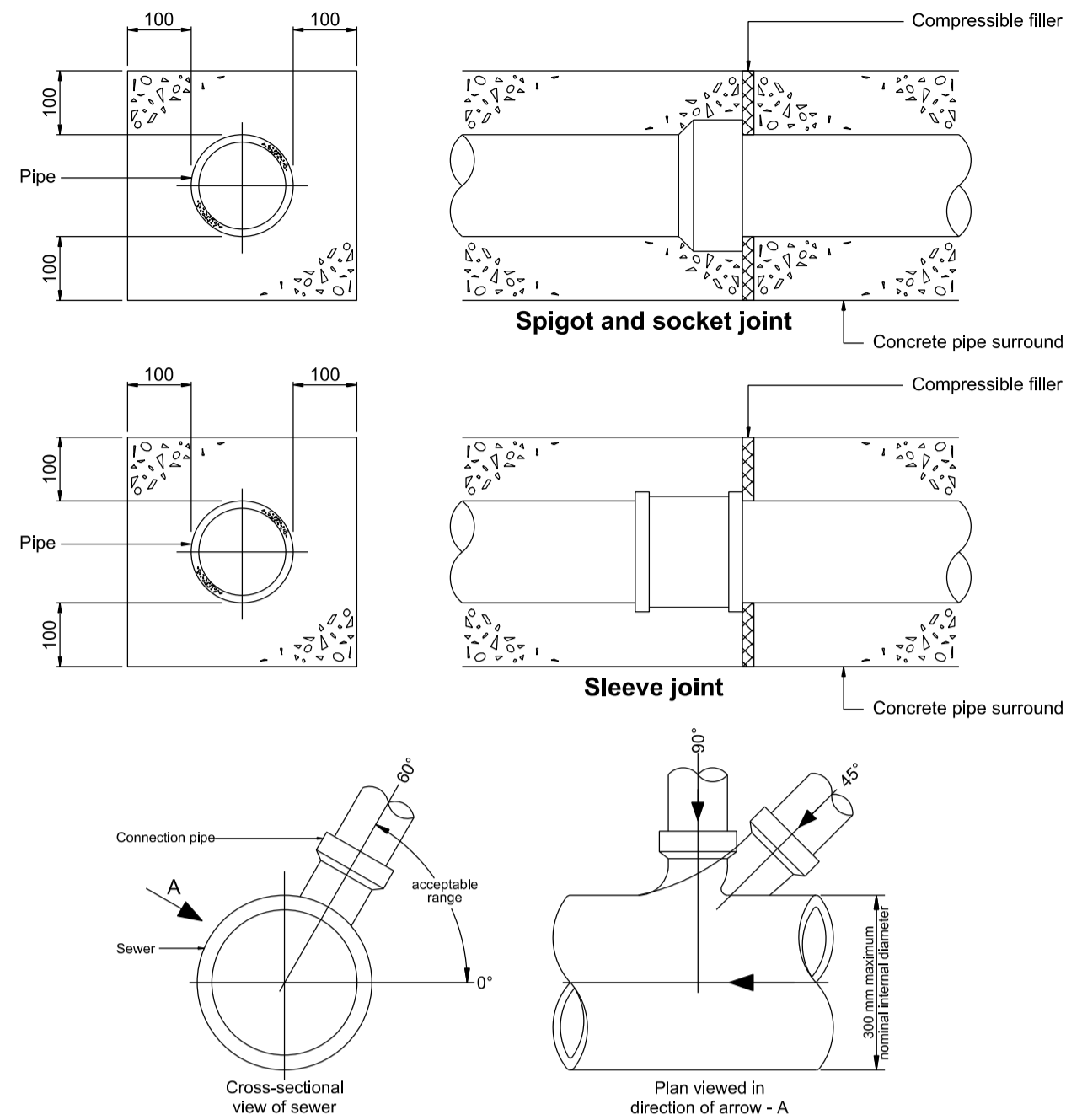
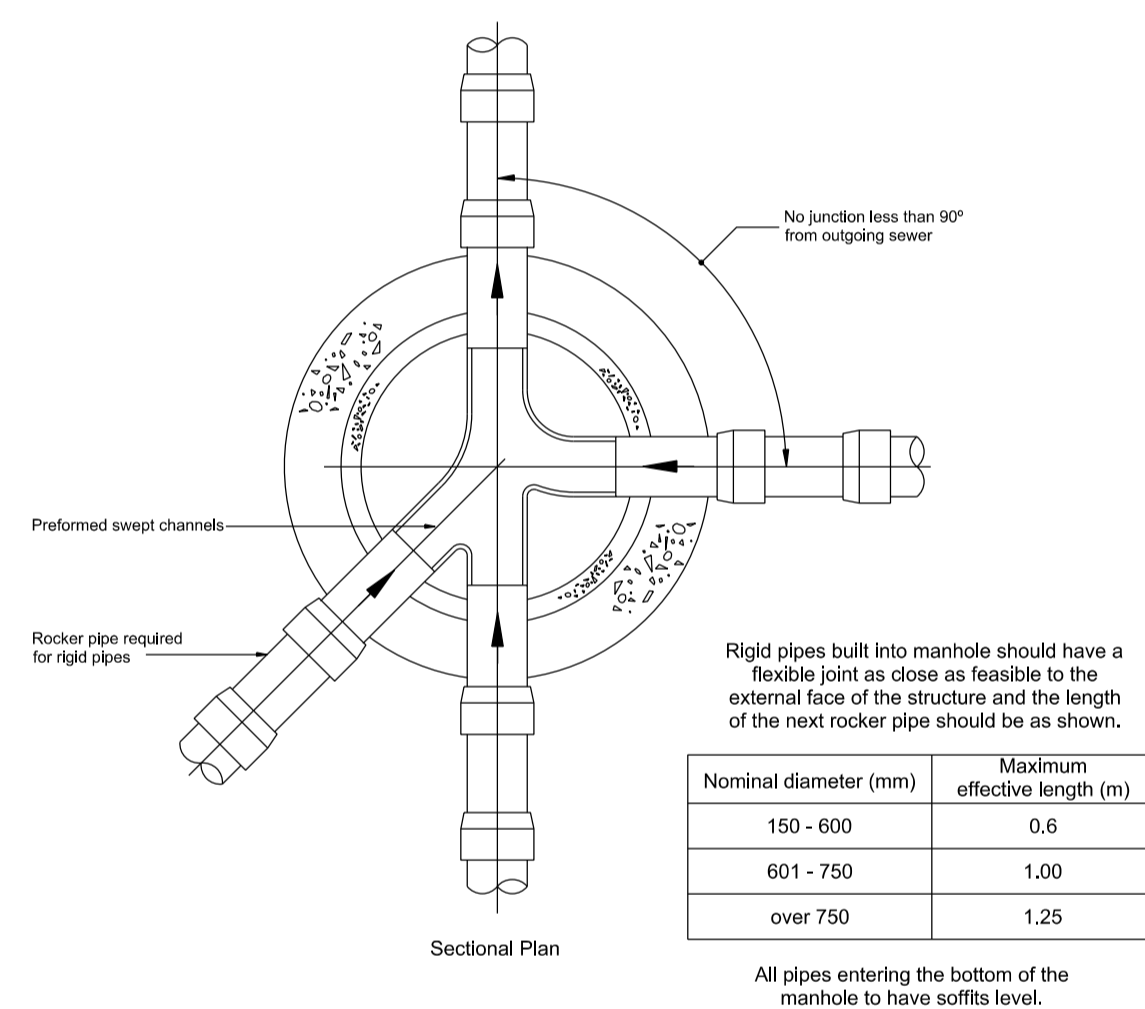
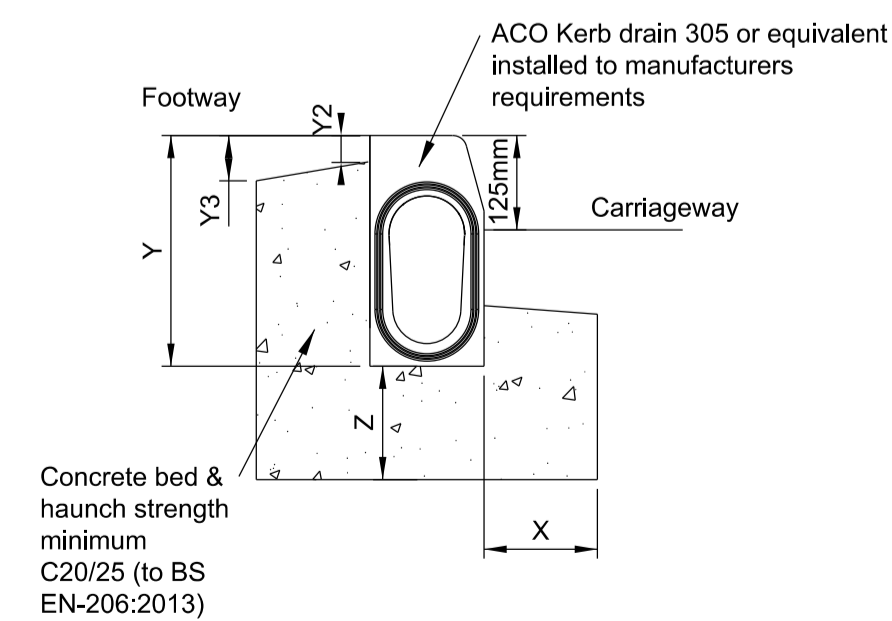


FIGURE B.14
TYPICAL ARRANGEMENT OF PIPE JUNCTIONS WITHIN MANHOLES



Load Class	A 15	B 125	C 250	D 400**
Minimum Dimensions (mm)	X 150	Y 150	Z 150	150
Maximum Dimensions (mm)	**Y2 35	**Y3 60	60	60
	Y4	No front haunch	Max 100	

** Where regular HGV impacts are anticipated (e.g. roundabouts), We recommend that the concrete backing is laid to the top of the ACO KerbDrain unit (i.e. Y2 = 0, Y3 = 0).



Pipe Dia.	Width Bc		Y		L	Z
	Max.	Min.	Y1 (Unifrom soil)	Y2 (Rock) *		
100	550	450	100	200	25	100
150	600	490	100	200	25	100
225	700	580	150	200	25	100
300	750	680	150	200	25	100
375	1050	950	150	200	25	100
450	1150	1030	150	200	25	150
525	1200	1120	150	200	30	150
600	1350	1240	150	200	30	150
675	1450	1330	150	200	30	225
750	1500	1400	150	200	30	225
825	1600	1490	150	225	30	225
900	2100	1900	150	225	30	225
975	2150	1950	175	250	30	300
1050	2250	2050	175	275	30	300
1200	2500	2250	200	300	30	300
OVER 1200	Outside Dia. + 1000	Outside Dia. + 800	DIA/6	DIA/4	54	400

Table B - Trench widths and other dimensions
* See Note 2

Pipe Bedding Details

Pipe Dia. (mm)	Aggregate Size	
	Graded (mm)	or single sized (mm)
100	-	10
150	14 - 5	10 Or 14
225-300	14 - 5 Or 20 - 5	10, 14 Or 20
375-525	14 - 5 Or 20 - 5	10, 14 Or 20
EXCEEDING 525	14 - 5 Or 20 - 5 Or 40 - 5	10, 14, 20 Or 40

Table A - Granular pipe bedding material Type 'A'

Table of Dimensions

Letter	Pipe Sizes	Dimension (mm)	
L	100 - 450	25	
	525 - 900	30	
Y*	Y1	100 - 150	100
		225 - 900	150
	Y2	100 - 750	200
		825 - 900	225
Z	100 - 375	100	
	450 - 600	150	
	675 - 900	225	

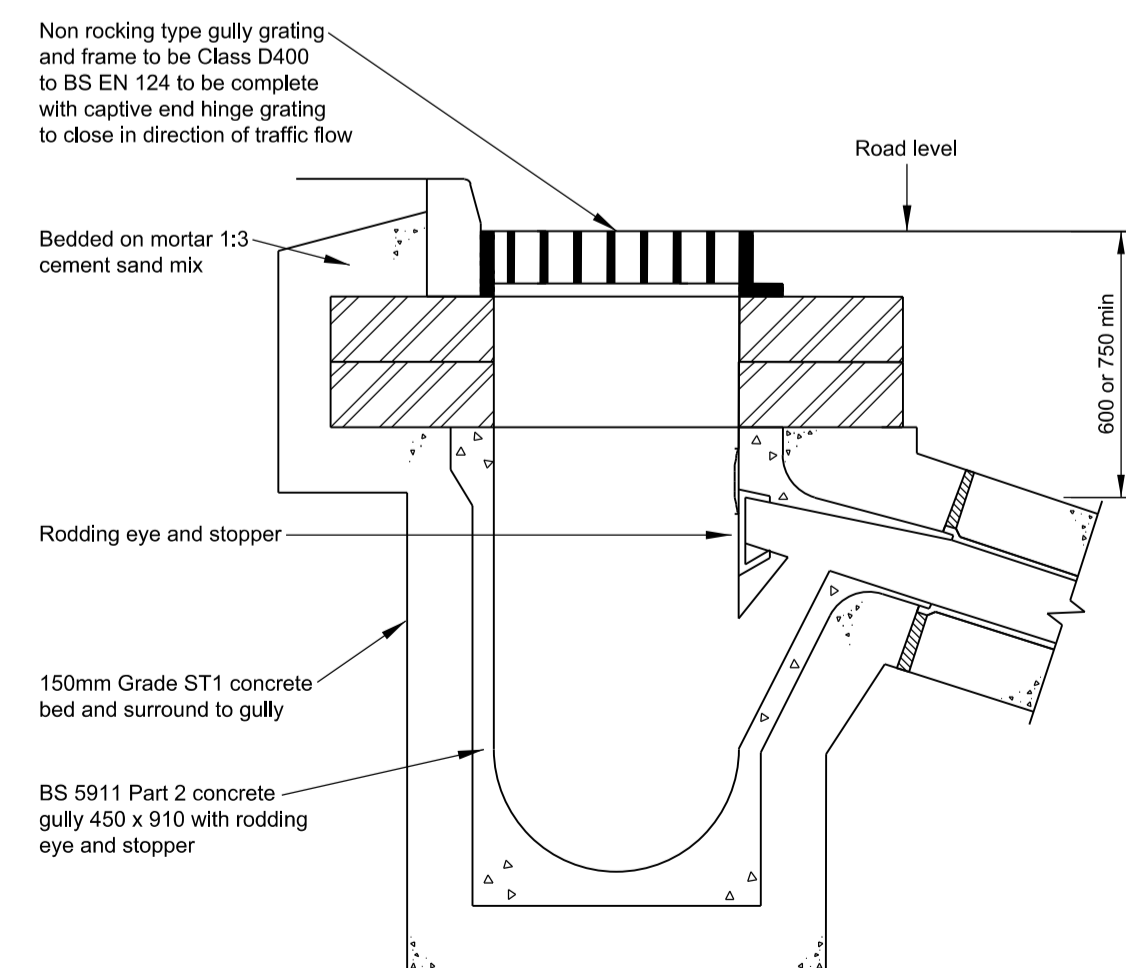
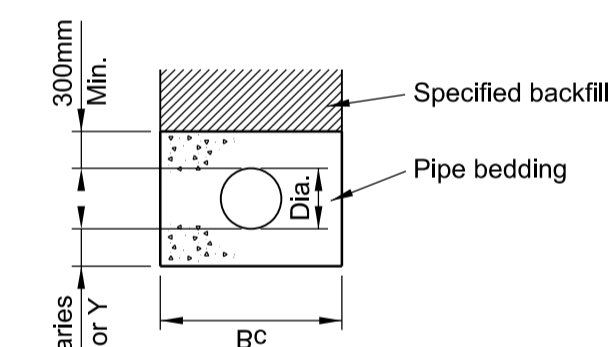
* Y1 - Unifrom Soil
* Y2 - Rock

Notes:

- All excavation in excess of Bc shall be backfilled with concrete Mix ST2.
- Dimension Y2 shall be increased at a rate of 40mm per additional 1000mm cover to pipe in excess of 5000mm.

Legend

- Concrete mix ST4
- Granular pipe bedding material Type 'A'
- Selected excavated material (Refer to specification)



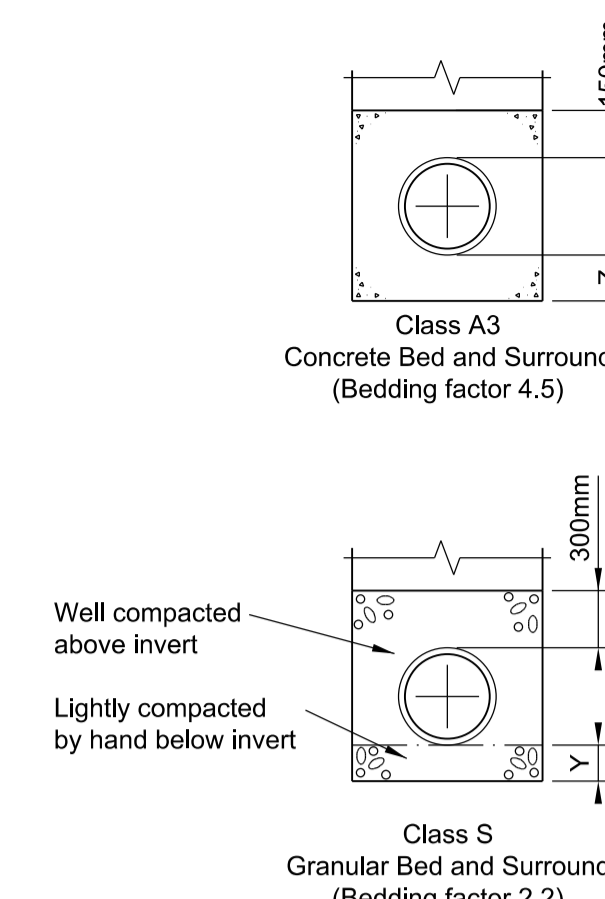
Detail of Road Gully

Notes:-

- Detail shown using pre-cast concrete gully. The following alternatives may be used:
(i) clayware
(ii) cast in situ using plastic or re-usable former and mix ST4 concrete using a minimum thickness 150 bed and backfill. Finish shall be Class F2 to Clause 17.06.
- Where constructed on trafficked roads, brickwork to be laid on polyester resin mortar.
- Where cover to branch pipes is less than 1.2M, Class Z bedding and surround material is to be used.
- The minimum depth from the top of the grating to the top of the gully outlet is to be 750 when the connecting pipe is under a carriageway or a hard shoulder and 600 elsewhere.

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- Figures taken from Sewers for Adoption 7th Edition.
- Drainage design and construction is in accordance with Sewers for Adoption 7th Edition and the requirements of the statutory undertaker.
- All proprietary products to be installed to manufacturers requirements.
- Proposals shown subject to SAB Approval therefore subject to change.
- All covers to be class D400 in accordance with EN 124. Covers within the highway to have high friction surfacing.



Rev.	Description	Drawn	Chkd.	Appd.	Issue Date
P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21

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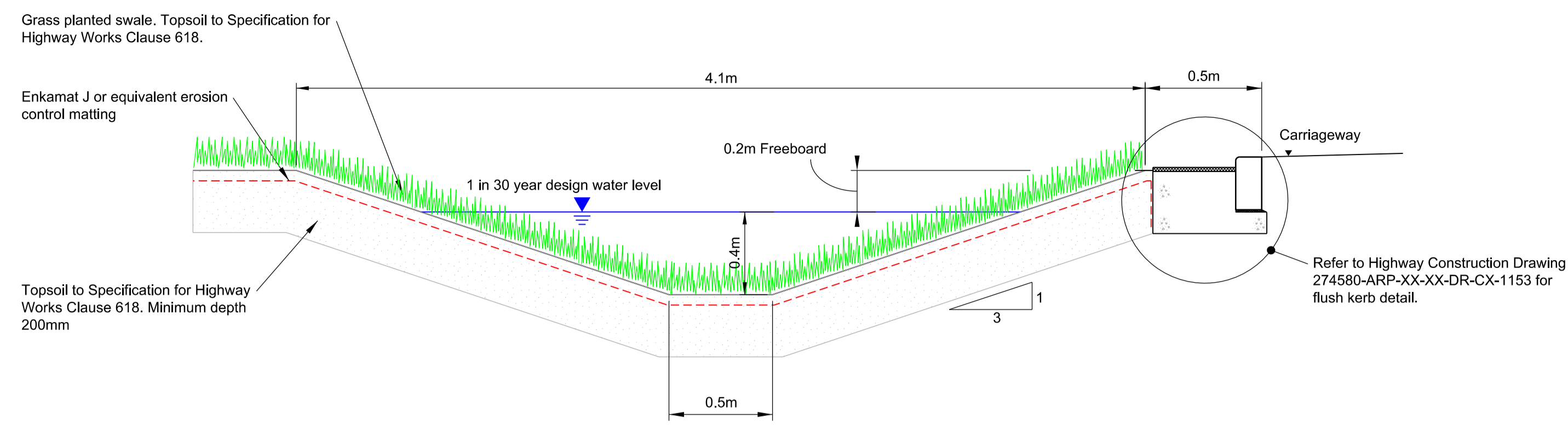
Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

Drawing Title:
EAST BANK ROAD PROPOSED DRAINAGE DETAILS SHEET 1 OF 2

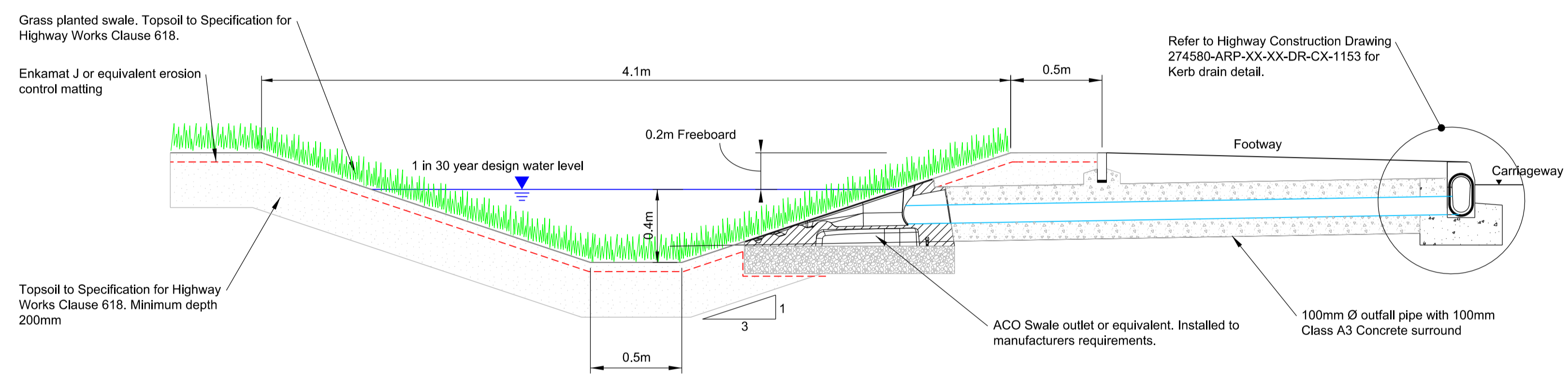
Subsidiary	Subsidiary Code
S2 - FOR PLANNING	S2

Internal Project Number	Scale	Rev.
274580	1:1000	P01

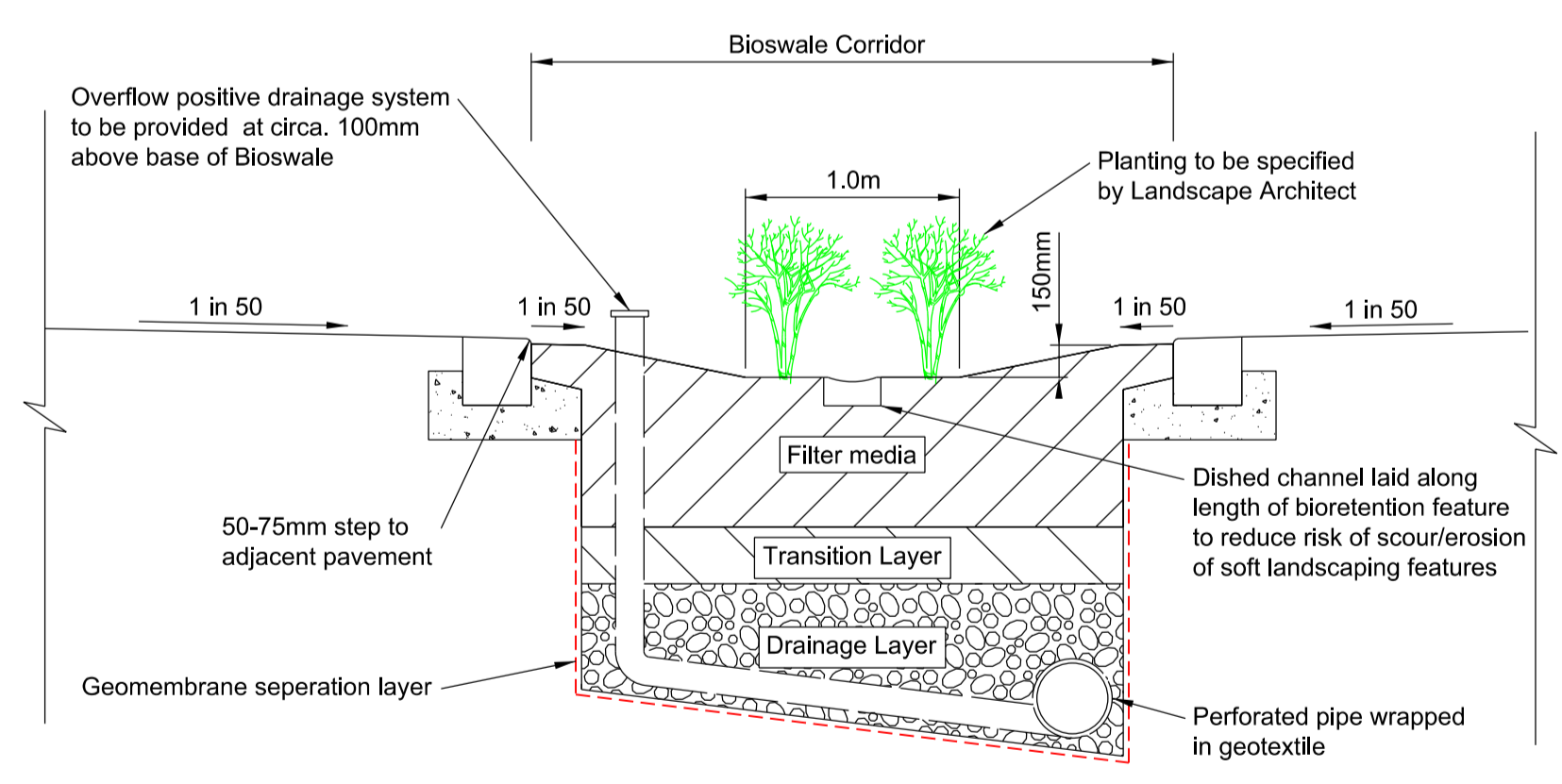
Drawing Number:
274580-ARP-XX-XX-DR-CX-1153



Typical Swale Section Adjacent to Highway



Typical Swale Section Adjacent to Footway



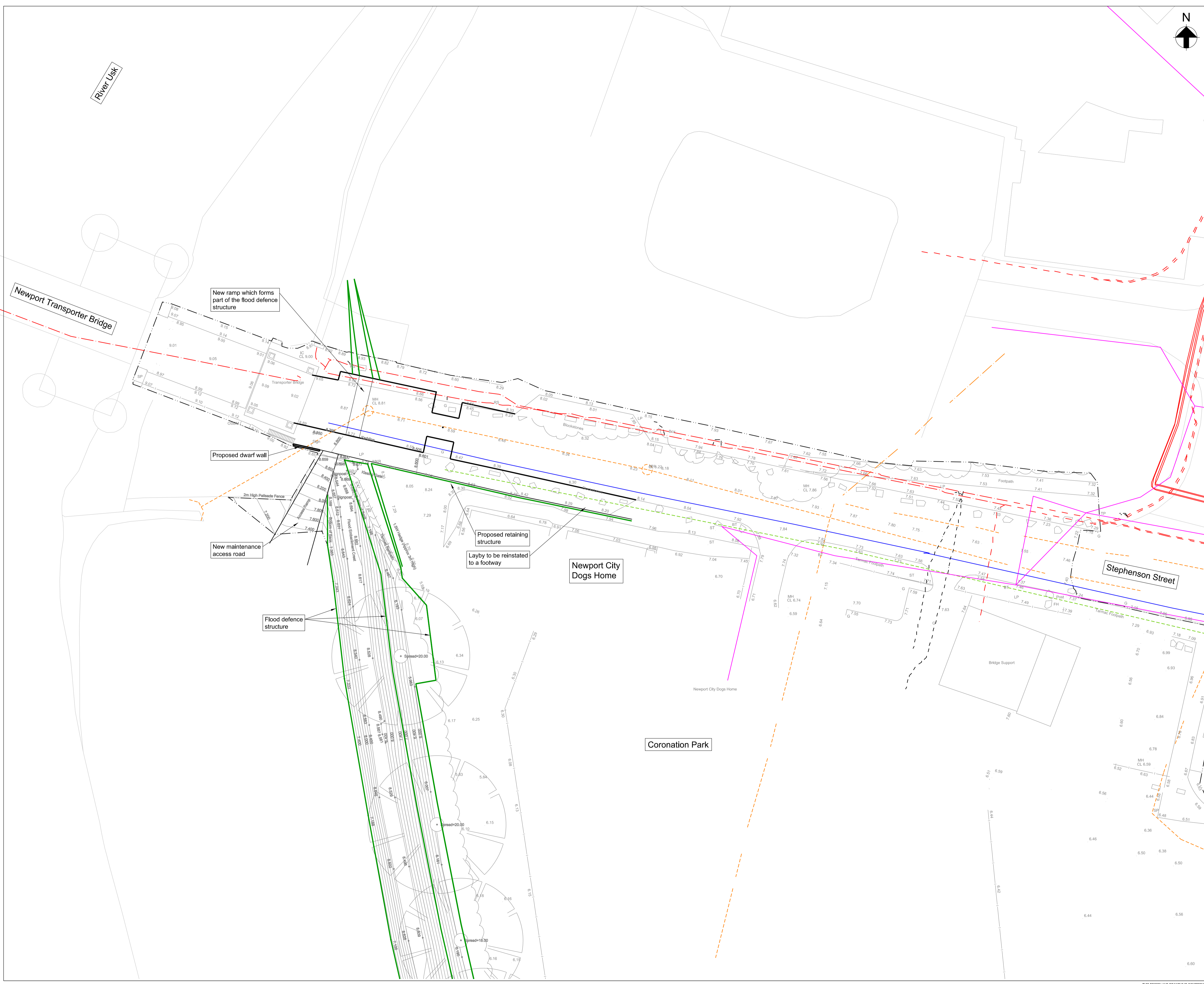
Typical Bioretention Feature with low planting

- Notes
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 4. Figures taken from Sewers for Adoption 7th Edition.
 5. Drainage design and construction is in accordance with Sewers for Adoption 7th Edition and the requirements of the statutory undertaker.
 6. All proprietary products to be installed to manufacturers requirements.
 7. Proposals shown subject to SAB Approval therefore subject to change.

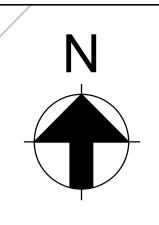
P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
Rev.	Description	Draught	Chkd.	Appd.	Issue Date
Project Name: STEPHENSON STREET FLOOD DEFENCE SCHEME					
Drawing Title: EAST BANK ROAD PROPOSED DRAINAGE DETAILS SHEET 2 OF 2					
Suitability Code: S2 - FOR PLANNING				Suitability Code: S2	
Internal Project Number: 274580		Scale: 1:1000		Rev. P01	
Drawing Number: 274580-ARP-XX-XX-DR-CX-1154					

- Legend**
- Topographical Survey Boundary
 - Flood Defence Structure. See drawing See drawing 274580-ARP-XX-XX-DR-CX-2000 for retaining wall alignment and associated details
 - Foul Drainage
 - - - Combined Drainage
 - Storm Drainage
 - Water Main
 - BT
 - Vodaphone
 - Virgin
 - Wales & West High Pressure Gas Main
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 - Wales & West Low Pressure Gas Main
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 - Western Power 11kV HV
 - Western Power 33kV HV
 - Western Power 132kV HV
 - Western Power LV
 - Western Power PL
 - Western Power Service Line

- Notes**
1. Do not scale from this drawing
 2. All dimensions are in metres unless noted otherwise.
 3. The details shown on this drawing are based on a RIBA Stage 3 design for approval produced for a detailed planning application. The highway design shown is for adoption by Newport City Council and subject to design approval. The details will need to be reviewed and revised during subsequent design stages.
 4. The topographical survey details shown within the topographical survey boundary has been provided by Natural Resources Wales (NRW) on 05/08/2020 from a survey completed by John Vincent Surveys LTD in July 2020. The survey information outside the boundary is a combination of surveys received from NRW as part of the original tender. No responsibility can be given for the accuracy of these surveys.
 5. The positions of the existing services on this drawing have been interpreted from information received from the statutory local authorities.
 6. Contractor to identify any unknown services prior to commencement of works.
 7. Contractor to consult with appropriate statutory authorities prior to commencement of works on their assets.
 8. No easements are shown, to be confirmed by statutory undertaker.
 9. No utilities diversion are shown on this drawing. Refer to drawings 274580-ARP-XX-XX-DR-CX-1203 to 1208.
 10. No alterations to existing site premises shown at this stage. This is to be agreed with the land owners and/or tenants in subsequent design stage. Land owners and tenants have been consulted and have agreed in principle to the proposals shown. The crossing of private vehicles between the Hanson and Marshalls site assumes that no alterations or additional telemetry or signalling works are needed and the crossing of private vehicles is dealt with by other means between NRW and Hansons.

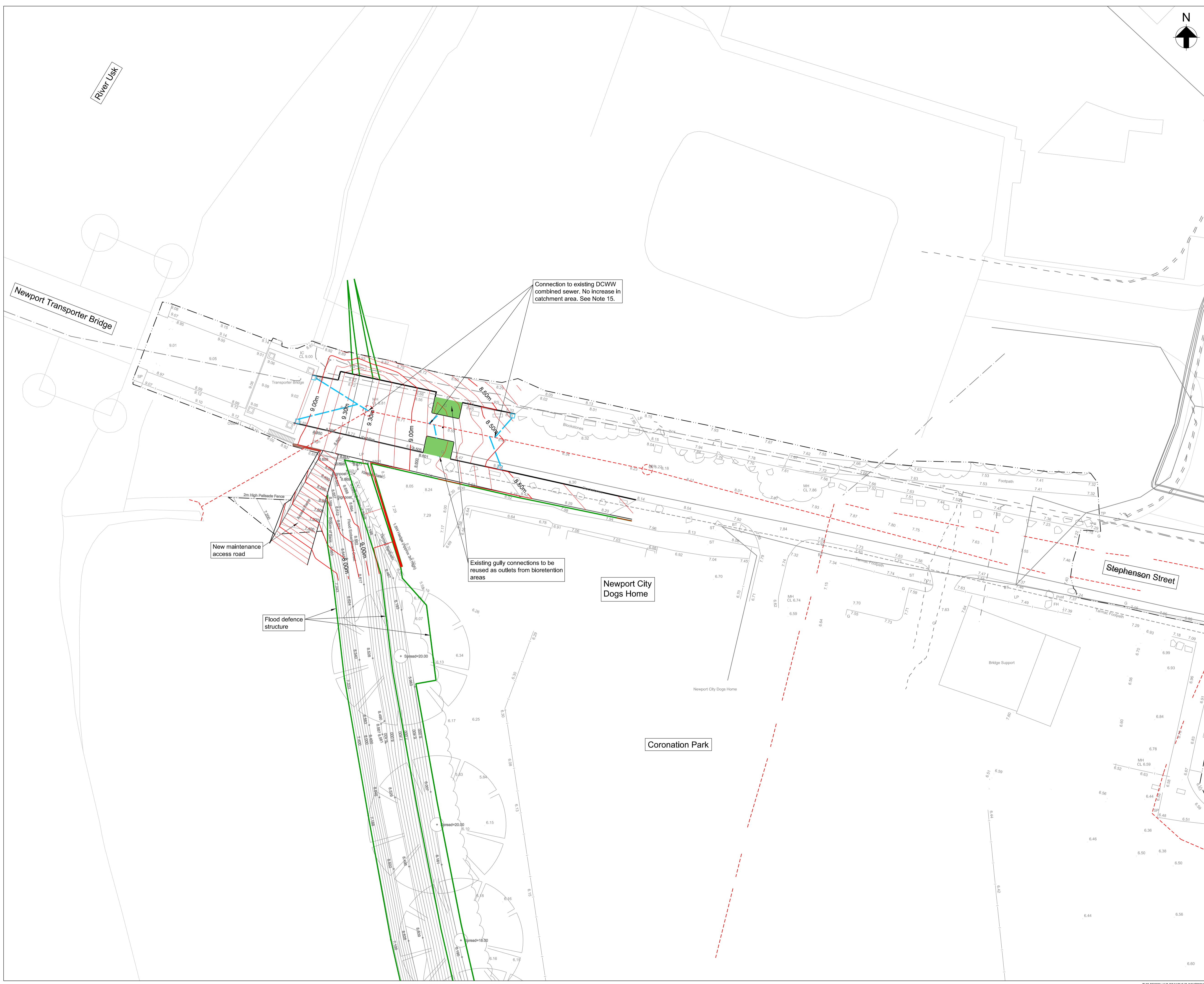


P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
Rev.	Description	Drawn	Chkd.	Appd.	Issue Date
Project Name: STEPHENSON STREET FLOOD DEFENCE SCHEME					
Drawing Title: STEPHENSON STREET GENERAL ARRANGEMENT AND EXISTING UTILITIES PLAN					
Suitability: S2 - FOR PLANNING		Suitability Code: S2			
Internal Project Number: 274580		Scale: 1:250		Rev. P01	
Drawing Number: 274580-ARP-XX-XX-DR-CX-1201					



- Legend**
- Topographical Survey Boundary
 - Proposed Dwarf Wall
 - Flood Defence Structure
 - 7.00m Proposed Contours
 - Existing Utilities
 - Proposed Storm Drainage
 - Proposed Storm Manhole
 - Proposed Storm Gully
 - Proposed Storm Headwall
 - Existing DCWW Combined Sewer
 - Bioretention areas

- Notes**
1. Do not scale from this drawing
 2. All dimensions are in metres unless noted otherwise.
 3. The details shown on this drawing are based on a RIBA Stage 3 design for approval produced for a detailed planning application. The highway design shown is for adoption by Newport City Council and subject to design approval. The details will need to be reviewed and revised during subsequent design stages.
 4. The topographical survey details shown within the topographical survey boundary has been provided by Natural Resources Wales (NRW) on 05/08/2020 from a survey completed by John Vincent Surveys LTD in July 2020. The survey information outside the boundary is a combination of surveys received from NRW as part of the original tender. No responsibility can be given for the accuracy of these surveys.
 5. Refer to all other Engineering and Architects Drawings and notify the Civil Engineer of any discrepancies.
 6. This drawing is to be read with all other Engineers drawings and specifications.
 7. All manholes to be SFA Type 2, 1200mm diameter unless otherwise stated. Nominal 1.2m depth to pipe soffit unless stated otherwise.
 8. All grating and covers to be D400 unless otherwise stated.
 9. Concrete surround to be provided to all pipes where depth to soffit is less than 1.2m in trafficked areas.
 10. All storm pipes to be 150mm diameter respectively or unless otherwise stated.
 11. Proposals shown subject to SAB Approval therefore subject to change.
 12. All manhole pipe connections to be soffit to soffit.
 13. Refer to drawings 274580-ARP-XX-DR-CX-1153 to 1154 for details.
 14. Details shown for the proposed highway and accompanying drainage infrastructure. No allowance shown for the proposed flood defence works.
 15. Existing highway drainage assumed to connect into existing DCWW combined sewer. Proposed connections to DCWW combined sewer. Proposed connections to DCWW combined sewer to mimic existing scenario, to be agreed with DCWW. If not a new connection into the River Usk will be required at the same location as the combined sewer outfall.



Connection to existing DCWW combined sewer. No increase in catchment area. See Note 15.

New maintenance access road

Existing gully connections to be reused as outlets from bioretention areas

Newport City Dogs Home

Coronation Park

Stephenson Street

P01	ISSUED FOR PLANNING	CB	SW	SW	24 / 02 / 21
Rev.	Description	Drawn	Chkd.	Appd.	Issue Date

Cyfoeth Naturiol Cymru
Natural Resources Wales

ARUP

Project Name:
STEPHENSON STREET FLOOD DEFENCE SCHEME

Drawing Title:
STEPHENSON STREET PROPOSED HIGHWAY DRAINAGE

Subsidiary:
S2 - FOR PLANNING

Subsidiary Code:
S2

Internal Project Number:
274580

Scale:
1:250

Rev.
P01

Drawing Number:
274580-ARP-XX-DR-CX-1230

Appendix E

DCWW Correspondence

David Owen (J)

Subject: FW: [External] RE: Sewer location survey - East Bank Road

From: MacMillan Jake <Jake.MacMillan@dwrwymru.com>
Sent: 03 September 2020 14:34
To: David Owen (J) <David-J.Owen@arup.com>
Cc: Jamie Lancaster <Jamie.Lancaster@arup.com>; Sion Williams <sion.williams@arup.com>
Subject: [External] RE: Sewer location survey - East Bank Road [Filed 03 Sep 2020 14:35]

Hi David,

Thanks for this, in that case I can confirm we have no objections in principle to allow a connection into this surface water sewer, at a reduced rate of 40 l/s.

Many thanks,



Jake MacMillan
Development Control Officer | Developer Services
Dŵr Cymru Welsh Water



T: 0800 917 2652 | E: 45xxx | M: 075557860559



A: PO Box 3146, Cardiff, CF30 0EH



W: dwrwymru.com



E: developer.services@dwrwymru.com

From: David Owen (J) <David-J.Owen@arup.com>
Sent: 03 September 2020 14:30
To: MacMillan Jake <Jake.MacMillan@dwrwymru.com>
Cc: Jamie Lancaster <Jamie.Lancaster@arup.com>; Sion Williams <sion.williams@arup.com>
Subject: RE: Sewer location survey - East Bank Road

***** External Mail *****

Hi Jake,

Thank you for the confirmation. We can accommodate the reduced rate of 40l/s so will ensure this is incorporated into our design.

Many thanks,
David

David Owen
Engineer | Infrastructure West

Arup
4 Pierhead Street, Capital Waterside, Cardiff CF10 4QP United Kingdom
d: +44 29 2026 6665
www.arup.com

From: MacMillan Jake <Jake.MacMillan@dwrcymru.com>
Sent: 03 September 2020 09:54
To: David Owen (J) <David-J.Owen@arup.com>
Cc: Jamie Lancaster <Jamie.Lancaster@arup.com>; Sion Williams <sion.williams@arup.com>
Subject: [External] RE: Sewer location survey - East Bank Road

Hi David,

Thanks for providing the plan for your proposed works, all proposals and hierarchy considerations seem well justified.

As previously mentioned we can accept in principle a connection to the surface water sewer. We previously discussed the potential of reducing the flow rate, have you had a chance to explore this? We would be looking at reducing this to 40 l/s, is this a figure you can achieve?

Many thanks,



Jake MacMillan

Development Control Officer | Developer Services
Dŵr Cymru Welsh Water



T: 0800 917 2652 | E: 45xxx | M: 075557860559

A: PO Box 3146, Cardiff, CF30 0EH



W: dwrcymru.com

E: developer.services@dwrcymru.com

David Owen (J)

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: 04 December 2020 09:47
To: David Owen (J)
Cc: Sion Williams; Jamie Lancaster
Subject: [External] RE: Stephenson Street Flood Alleviation Scheme - Newport [Filed 08 Dec 2020 13:42]

Hi David,

Thank you for consulting us on this one.

I can confirm we have no objections in principle to your proposal, which appears to essentially be rerouting of gullies which already connect to our sewer and shortly outfall into the Usk. This is on the basis that these gullies do connect, can you investigate this and provide evidence of this? Can you also confirm from your calculations what the betterment will be after the introduction of rain gardens?

In order to make a new connection you'll need to complete an NCS application, info of which can be found [here](#).

I'm on annual leave next week, however if there's anything urgent please forward your query to developer.services@dwrcymru.com.

Best regards,



Jake MacMillan

Development Control Officer | Developer Services
Dŵr Cymru Welsh Water



T: 0800 917 2652 | E: 45xxx | M: 07557860559



A: PO Box 3146, Cardiff, CF30 0EH



W: dwrcymru.com



E: developer.services@dwrcymru.com

From: David Owen (J) <David-J.Owen@arup.com>
Sent: 30 November 2020 12:16
To: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Cc: Sion Williams <sion.williams@arup.com>; Jamie.Lancaster <Jamie.Lancaster@arup.com>
Subject: Stephenson Street Flood Alleviation Scheme - Newport

***** External Mail *****

Hi Jake,

I hope you are well.

You may recall I contacted yourself regarding a proposed scheme on East Bank Road, Newport. The scheme comprised of a section on new highway forming an emergency access route for a flood defence scheme on behalf of NRW.

Away from the access route, we are also proposing to introduce a raised table within the existing highway adjacent to the Newport Transporter Bridge on Stephenson Street. The primary purpose of the table is to raise the road level circa 300mm and to also enhance the appearance of the highway at this location. Please refer to the attached for location and proposed GA.

Due to the introduction of the table, the existing drainage will require modification. There are existing gullies in the highway at this location which we believe connect to a 375mm DCWW combined sewer shortly before outfalling to the USK as this is the only nearby drainage identified. We are not currently proposing any increase in impermeable area, only modification to suit the amended levels. Two small raingardens are proposed for SuDS treatment which are likely to provide betterment in terms of runoff rate and volume to the existing scenario.

Would it be possible for you to advise if you are happy in principle with the modifications connecting into the DCWW combined sewer to facilitate the raised table? Please let me know if your want to discuss on the phone or require any further information.

Many thanks,
David

David Owen
Engineer | Infrastructure West

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Appendix F

Simple Index Calculations

**SIMPLE INDEX APPROACH:
SUMMARY TABLE**



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SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)					
Pollution Hazard Level Low					
Pollution Hazard Indices TSS 0.5 Metals 0.4 Hydrocarbons 0.4					
SuDS components proposed					
Component 1 Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events			
Component 2 None					
Component 3 None					
SuDS Pollution Mitigation Indices TSS 0.5 Metals 0.5 Hydrocarbons 0.6					
Groundwater protection type None					
Groundwater protection Pollution Mitigation Indices TSS 0 Metals 0 Hydrocarbons 0					
Combined Pollution Mitigation Indices TSS 0.5 Metals 0.5 Hydrocarbons 0.6		Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		
Acceptability of Pollution Mitigation TSS Sufficient Metals Sufficient Hydrocarbons Sufficient					

**SIMPLE INDEX APPROACH:
SUMMARY TABLE**



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SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)	Pollution Hazard Level Low Pollution Hazard Indices TSS 0.5 Metals 0.4 Hydrocarbons 0.4				
SuDS components proposed	Component 1 Swale Component 2 None Component 3 None	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
SuDS Pollution Mitigation Indices TSS 0.5 Metals 0.6 Hydrocarbons 0.6					
Groundwater protection type None Groundwater protection Pollution Mitigation Indices TSS 0 Metals 0 Hydrocarbons 0					
Combined Pollution Mitigation Indices TSS 0.5 Metals 0.6 Hydrocarbons 0.6 Acceptability of Pollution Mitigation TSS Sufficient Metals Sufficient Hydrocarbons Sufficient	Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			

Appendix G

SABs Newport Council Pre-application Correspondence

David Owen (J)

From: David Owen (J)
Sent: 21 August 2020 12:13
To: NCC - Sab
Cc: Sion Williams; Jamie Lancaster
Subject: Stephenson Street Pre SAB meeting 21/08/2020 [Filed 04 Sep 2020 15:32]
Attachments: Stephenson Street SAB pre app meeting slides 2020-08-21.pdf

Hi Steven and Chris,

Thank you for your time and input into the Stephenson Street SAB pre app meeting this morning.

Please find attached a copy of the sides from the presentation for your reference. I have outlined a brief summary of the meeting below. If you have any further comments to add please let me know.

Present Arup : Siôn Williams, David Owen
Present Newport SAB: Chris, Steven Jones.
Date 21/08/2020 at 10am.

Meeting summary.

- The aim of the meeting was to discuss the drainage principles which would be taken forward to form the drainage strategy and SAB pre application for the scheme.
- The Flood Alleviation scheme was presented and explained. Particular focus on the proposed adoptable highway scheme for which the drainage requires SAB approval.
- The drainage principles were discussed in the context of the Welsh Governments Statutory Standards S1 to S6 as per the attached presentation.
- Other considerations were discussed comprising of the raised table at the transporter bridge and the landscaping enhancements for the scheme.
- The principles of the scheme were considered to be acceptable by the SAB and will be developed into a drainage strategy and SAB pre application.
- Submission of the SABS pre application strategy is anticipated to take place within the next few weeks.

Regards,
David

David Owen
Engineer | Infrastructure West

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-----Original Appointment-----

From: David Owen (J)
Sent: 18 August 2020 14:26
To: NCC - Sab
Cc: Sion Williams
Subject: My Council Services - A new mail

When: 21 August 2020 10:00-11:00 (UTC+00:00) Dublin, Edinburgh, Lisbon, London.
Where: Microsoft Teams Meeting; Conference ID: 732 620 823;

Hi Chris,

Updated meeting invite for Friday at 10am.

Thanks
David

[Join Microsoft Teams Meeting](#)

Join from a video system

Dial: teams@vmr.arup.com

Video Conference ID: 129 909 959 3#

Join by phone (audio only)

+44 20 3321 5205 United Kingdom, London

Phone Conference ID: 732 620 823 #

[Local numbers](#) | [Alternate VC dialing instructions](#) | [Reset PIN](#) | [Meeting options](#)

From: NCC - Sab <Sab@newport.gov.uk>
Sent: 13 August 2020 10:47
To: David Owen (J) <David-J.Owen@arup.com>
Cc: Sion Williams <sion.williams@arup.com>; NCC - Sab <Sab@newport.gov.uk>
Subject: [External] RE: My Council Services - A new mail

Hi David,

Teams is good, if you could send the SAB a meeting request/appointment that would be great.

Catch you Tuesday.

Kind regards

Chris

From: David Owen (J) <David-J.Owen@arup.com>
Sent: 13 August 2020 10:44
To: NCC - Sab <Sab@newport.gov.uk>
Cc: Sion Williams <sion.williams@arup.com>
Subject: RE: My Council Services - A new mail

Hi Chris,

2pm would be great thanks. Shall we meet over MS teams? I can set up the meeting if you would like?

Thanks
David

David Owen
Engineer | Infrastructure West

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From: NCC - Sab <Sab@newport.gov.uk>
Sent: 13 August 2020 10:18
To: David Owen (J) <David-J.Owen@arup.com>
Cc: NCC - Sab <Sab@newport.gov.uk>
Subject: [External] RE: My Council Services - A new mail

Good morning David,

Would 2pm be ok?

Kind regards

Chris

From: David Owen (J) <David-J.Owen@arup.com>
Sent: 12 August 2020 09:51
To: NCC - Sab <Sab@newport.gov.uk>
Subject: RE: My Council Services - A new mail

Hi Chris,

Any chance we could do PM on that day please? as I'm due to have my internet upgraded in the morning and don't want to risk not being available if it is not a quick transition!

Regards,
David

David Owen
Engineer | Infrastructure West

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4 Pierhead Street, Capital Waterside, Cardiff CF10 4QP United Kingdom
d: +44 29 2026 6665
www.arup.com

From: NCC - Sab <Sab@newport.gov.uk>
Sent: 07 August 2020 09:49
To: David Owen (J) <David-J.Owen@arup.com>; NCC - Sab <Sab@newport.gov.uk>
Subject: [External] FW: My Council Services - A new mail

Good morning,

Would the 18th August at 10:30 be ok for the Pre – Application advice meeting?

Many thanks

Chris
Assistant Engineer

From: NCC - Sab <Sab@newport.gov.uk>
Sent: 04 August 2020 13:40
To: david-j.owen@arup.com
Cc: NCC - Sab <Sab@newport.gov.uk>
Subject: RE: My Council Services - A new mail

Good afternoon,

Many thanks for requesting a Pre Application advice meeting.

My colleague Steven Jones is off on annual leave until Thursday but I will speak to him upon his return to check his availability and send an appointment through for one of your preferred dates.

Many thanks

Chris
Assistant Engineer

From: DoNotReply@newport.gov.uk <DoNotReply@newport.gov.uk>
Sent: 04 August 2020 10:54
To: NCC - Sab <Sab@newport.gov.uk>
Subject: My Council Services - A new mail



Hello Service Area,

A customer has requested a VAT receipt.

01252 6691915
SuDs - Pre Application Advice Meeting

01252 6691915

- **Name** - David Owen
- **Company name** - Arup
- **Address** - [Ove Arup & Partners, 4 Pierhead Street, Cardiff, CF10 4QP, UK](#)
- **Contact number** - 02920266665
- **Email address** - david-j.owen@arup.com
- **Development size** - Site less than 0.49 hectares - 1 hour meeting only
- **Planning application reference (if applicable)** -
- **Description of proposed development** - The scheme consists of a section of new highway between East Bank Road and Corporation Road within the industrial estate on the east bank of the Usk in Newport. The proposed highway is part of a flood alleviation scheme for NRW. The proposed highway is approximately 660m long and replaces the existing highway in places. It is proposed to offer the highway to Newport Council for adoption. Correspondence on the scheme has been made with Newport SAB for which they have confirmed the scheme requires SAB approval for the surface water strategy.
- **Additional information box if required** -
- **1st available date** - 13-08-2020
- **2nd available date** - 14-08-2020
- **3rd available date** - 18-08-2020
- **Select amount for payment** -

No	Product	Price	Quantity	Description	Reference	Total	Tax
	1 hour advice - site area						
1	not exceeding 0.49 hectares (1 Item)	150		1 Advice Fee		125	25
						Total Tax	25
						Grand total	150

- **Do you require a full VAT receipt? (This will be emailed to you separately if required)** - Yes
- **First name** - Christine
- **Surname** - Luker
- **House name or number** - 4
- **Street** - Pierhead Street
- **Town / City** - Cardiff
- **Postcode** - CF10 4QP
- **Email address for receipt** - david-j.owen@arup.com

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Pan fyddwch yn anfon e-bost at Gyngor Dinas Casnewydd, rydych yn cydsynio i'r Cyngor fonitro a darllen unrhyw e-byst o'r fath at ddibenion cydymffurfio â diogelwch ac â deddfwriaeth. I weld yr ymwadiad llawn ewch i <http://www.newport.gov.uk/ymwadiad>

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Pan fyddwch yn anfon e-bost at Gyngor Dinas Casnewydd, rydych yn cydsynio i'r Cyngor fonitro a darllen unrhyw e-byst o'r fath at ddibenion cydymffurfio â diogelwch ac â deddfwriaeth. I weld yr ymwadiad llawn ewch i <http://www.newport.gov.uk/ymwadiad>

Mae'r Cyngor yn croesawu gohebiaeth yn Gymraeg, Saesneg neu yn y ddwy iaith. Byddwn yn cyfathrebu â chi yn ôl eich dewis. Ni fydd gohebu yn Gymraeg yn arwain at oedi.

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Mae'r e-bost hwn yn cynnwys gwybodaeth y bwriedir ar gyfer y derbynnydd yn unig a gall fod yn gyfrinachol, yn destun ragorfraint gyfreithiol neu broffesiynol, neu fel arall wedi'i diogelu rhag cael ei rhyddhau. Os nad chi yw derbynnydd bwriadedig y neges hon, a fyddech cystal â rhoi gwybod i'r anfonwr ar unwaith a pheidio â datgelu, dosbarthu neu gopïo'r e-bost i unrhyw barti arall. Mae'r e-bost hon ac unrhyw ffeiliau atodedig yn eiddo i Gyngor Dinas Casnewydd.

Pan fyddwch yn anfon e-bost at Gyngor Dinas Casnewydd, rydych yn cydsynio i'r Cyngor fonitro a darllen unrhyw e-byst o'r fath at ddibenion cydymffurfio â diogelwch ac â deddfwriaeth. I weld yr ymwadiad llawn ewch i

<http://www.newport.gov.uk/ymwadiad>

Stephenson Street Flood Alleviation Scheme

SAB Pre Application Meeting 21/08/2020

David Owen
Sion Williams

ARUP

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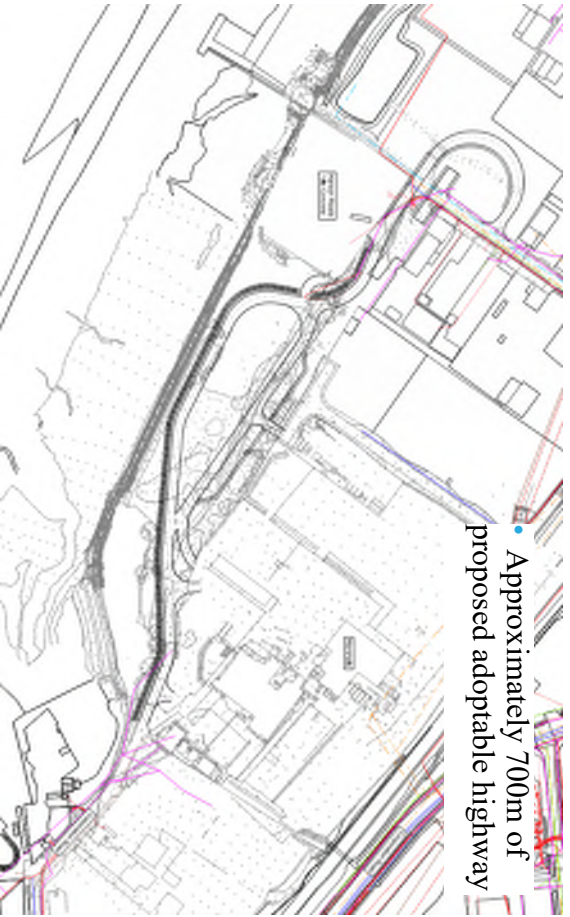
- ### Objectives
- Present the scheme
 - Discuss the drainage principles which will form drainage strategy and SABS Pre Application
 - Discuss the SAB Process

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Proposed Highway

- Approximately 700m of proposed adoptable highway

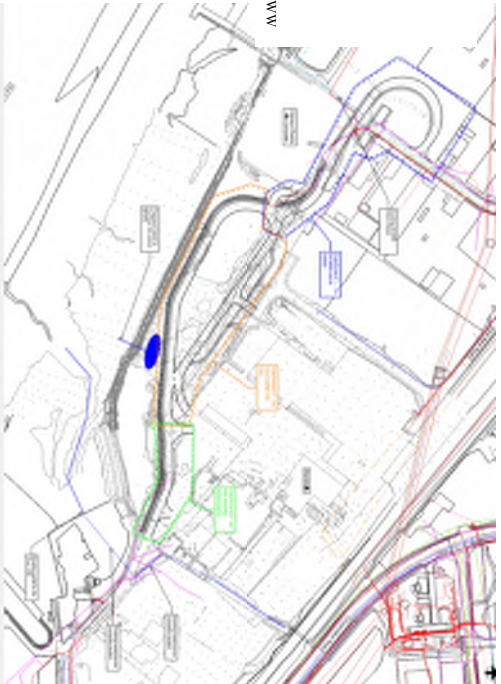


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S1 – Runoff Destination

- Rainwater Harvesting
- Infiltration
 - Tidal Flat Deposits
 - Made ground
- Waterbody/Watercourse
- Surface Water Network
 - Recent engagement with DCWW



ARUP

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S2 – Hydraulic Control

- Surface water designed to be flood free for storm events up to and including 1:30 year return period event.
- In principle the destination for runoff if the River Usk. The River Usk at this location it under tidal influence and therefore consider to be unaffected by discharge rate or volume.
- Climate change allowance
- In accordance with Standard G2.1 attenuation is not considered to be required for the scheme
 - Discussions ongoing with DCWW regarding discharge restrictions into their network.
- Interception provided through SUDS solutions



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S3 – Water Quality

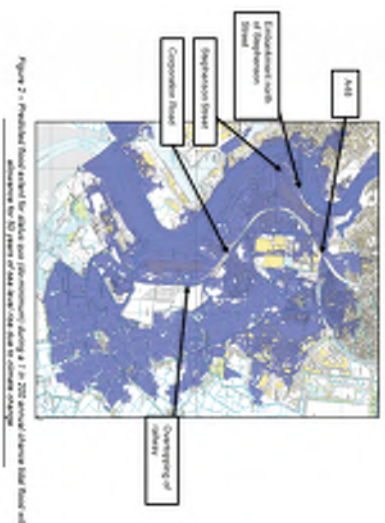
- Low frequency estate road assumed to be less than 300 vehicle movements per day.
- Highway primarily used to transport aggregate between Hanson's and Marshall's.
- Simple index approach for water quality design as per Table G3.1
- Sufficient treatment train examples:
 - Swale and/or
 - Pond/forebay and/or
 - Bioretention

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S4 – Amenity

- Flood alleviation scheme to provide protection for up to surrounding industrial and residential areas.
- SuDS features will enhance the surrounding existing scrubland area
- Increased provision of pedestrian routes
- Improved access for local highway users
- Landscaping enhancements



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S5 – Bio diversity

- Introduction of SuDS features
- Landscaping enhancements as part of the Flood Alleviation Scheme this will provide habitat generation
- Added amenity to local area



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S6 – Design and Maintenance

- Highway and Highway drainage and SuDS to be offered for adoption to Newport City Council / SAB
- Drainage Aims;
 - Features located at the surface and accessible from the highway where possible
 - Design and access considered for all drainage elements

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Other Considerations

- Severance of overland flow routes due to flood defence structures.
- Transporter Bridge raised table. No change proposed to the existing drainage principles. No space available to introduce SuDS features due to land ownership and topography. It is considered that the overall scheme meets the requirements of the WG standards regardless of this element.

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Other Considerations

- Landscaping enhancements as part of the scheme are not considered to change the existing drainage catchments or hydrology. Only permeable surfaces are proposed and no drainage is proposed.



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Next Steps

- Agreement of Principles
- Further development of drainage strategy
- Pre SABS application
- Planning Application
- Full SABS application to be developed alongside S38/S278 agreements (where required).

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