



Haigh Huddleston & Associates

Civil & Structural Engineering Consultants

Firth Buildings, 99 - 101 Leeds Road, Dewsbury, WF12 7BU

t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

FLOOD RISK ASSESSMENT

ON

**LAND TO THE SOUTH OF DONCASTER ROAD,
DARFIELD, BARNSELY**

FOR

**SAUL HOMES &
KEEPMOAT HOMES**

E20/7309/FR01D

Rev D – May 2026

JUNE 2024

M.Huddleston MEng.

1.0 INTRODUCTION

- 1.1 This report is commissioned to investigate and report on the Flood Risk for this site in accordance Planning Practise Guidance- Flood Risk and Coastal Change April 2022 and the proposals for drainage of this site when redeveloped as residential land. The report is based on information supplied by the client and from relevant authorities in both written and verbal format. Some of this information is in verbal form only. No liability can be accepted for information supplied by third parties which is subsequently found to be inaccurate or incorrect.

2.0 THE SITE

- 2.1 The site is located to the south of Doncaster Road, Darfield. It is situated around Ordnance Survey grid reference 440215,404985. A site location plan is included in Appendix A.
- 2.2 The site is irregularly shaped, with boundaries formed by watercourses to the west and south-west, Doncaster Road to the north and residential properties to the east. There is vehicular access from Doncaster Road along the northern boundary of the site and pedestrian access on the Southern boundary. The overall site area is approximately 17.55ha.
- 2.3 The site primarily consists of two grassed fields separated by an overgrown former quarry area and small overgrown embankment which is partially tree-lined. The north-western corner of the site is an area of short grass. An occasionally tarmacked access track between the two grassed fields is present at the southern tip of the northern field. Several overhead electric lines cross the site from north to south and west to east with supporting poles located within the fields on site. An oil pipeline crosses the north western corner of the site.
- 2.4 Tree growth is noted in the former quarry area and along the embankment separating the northern and southern fields. Further tree growth is noted at the north eastern corner of the northern field at the boundary of the site and Barnsley Road. There is a hedgerow to the northern boundary.

2.5 Overgrown watercourses extend along the western boundary of the southern area of the site. These are occasionally bridged to connect the footpath links between the fields.

2.6 The site slopes from north to south at a grade of approximately 1 in 20. A high point of approximately 67.2m AOD is located approximately half way along the northern boundary of the site and a low point of approximately 35.1m in the southeast corner.

3.0 PROPOSED DEVELOPMENT AND DRAINAGE CONSTRAINTS

3.1 The proposed planning application is for the detailed development of the northern portion (Area 1) and the outline for the southern portion (Area 2). The northern portion consists of 260 plots in total split between Saul Homes (93 plots) and Keepmoat Homes (167 plots). In addition to the plots there are the access roads and associated car parking areas. A sketch scheme for Area 2 is provided to enable an overall drainage design to be established. The proposed site layout is attached in the appendices.

SITE GEOLOGY

3.2 The site investigation report confirms the ground consists of three distinct areas. In the north of the site medium dense sands overlay a weak sandstone strata. Within the central area of the development there is a former sandpit which has been backfilled with landfill, primarily consisting of unconsolidated construction waste of between 6-9m in depth. The southern portion of the site a firm clay overlies a moderately weak mudstone strata.

3.3 Four soakaways have been undertaken in the northern area of the site within the sandstone strata. Within three of the tests the groundwater level increased during the test, only SAW 02 managed to provide a reasonable infiltration rate of 10^{-5} m/s. Therefore, considering the landfill area and the clay superficial deposits occupying the central and southern areas of the development site we would therefore conclude that soakaways would not be a suitable method of surface water drainage for the development.

EXISTING DRAINAGE

- 3.4 There are two existing open watercourses adjacent to the site. A watercourse serving the open agricultural land to the west of the site form the southern site boundary. A second watercourse runs adjacent to the eastern site boundary, this is culverted in sections through existing properties. Both watercourses join at the south eastern corner of the development and form a tributary to the River Dove to the south of the site.
- 3.5 There are no existing public foul or surface water sewers crossing the development land. The nearest public sewers are located in the development to the east of the site. These consist of both foul and surface water. A copy of the Yorkshire Water records for the site are in the appendices at the rear of the report.
- 3.6 Yorkshire Water has confirmed that there is no capacity within adjacent adopted surface water systems to service the site. They have recommended that surface water is discharged to the adjacent watercourse on the southern boundary of the site. This will require a right of discharge in perpetuity to the existing watercourse which will need to be agreed with the current landowner. Due to the site being an open field a greenfield discharge will need to be agreed with the LLFA.
- 3.7 Due to the slope of the land it's likely that a gravity connection for the surface water should be feasible. However further survey and re-engineering work in the vicinity of the diverted watercourse outfall is recommended to ensure that it is running freely and without obstruction to avoid any flooding to land south of the site.

4.0 FLOOD RISK

- 4.1 On reviewing the Environment Agency websites flood risk maps (Fig 1), the vast majority of the site currently falls within flood zone 1: which is designated as low probability of flooding from sea or rivers less than 0.1% (ie 1 in 1000 year) probability of flooding. Following the update of the EA flood maps in June 2025, the development proposals have been revised to bring the development, including the proposed detention basin, outside of Flood Zone 2 and Flood Zone 3. Only a short length of the final surface water sewer outfall to the existing watercourse encroaches on Flood Zone 2. However, widening works and the diversion of the existing watercourse lie partially within Flood Zone 3.

The hierarchy of flood zones are described as:

Flood Zone 1: Low Probability. Land assessed as having a less than 1 in 1000 chance of river and sea flooding in any year (<0.1%).

Flood Zone 2: Medium Probability. Land assessed as having between a 1 in 100 and 1 in 1000 chance of river flooding (1% 0.1%) and between a 1 in 200 and 1 in 1000 chance of sea flooding (0.5% 0.1%) in any year.

Flood Zone 3: High Probability. Land assessed as having a 1 in 100 or greater chance of river flooding (>1%) and 1 in 200 or greater chance of sea flooding (>0.5%) in any year.

The main development area of the site is therefore considered not to be at risk from fluvial flooding from rivers or sea for the 1 in 100 or 1 in 1000 year flood event. The proposed use of the site would be classified as More Vulnerable in Table 2: Flood Risk Vulnerability Classification in the Planning Practise Guidance- Flood Risk and Coastal Change April 2022. In accordance with that table the proposed development would be considered to be appropriate for the site.

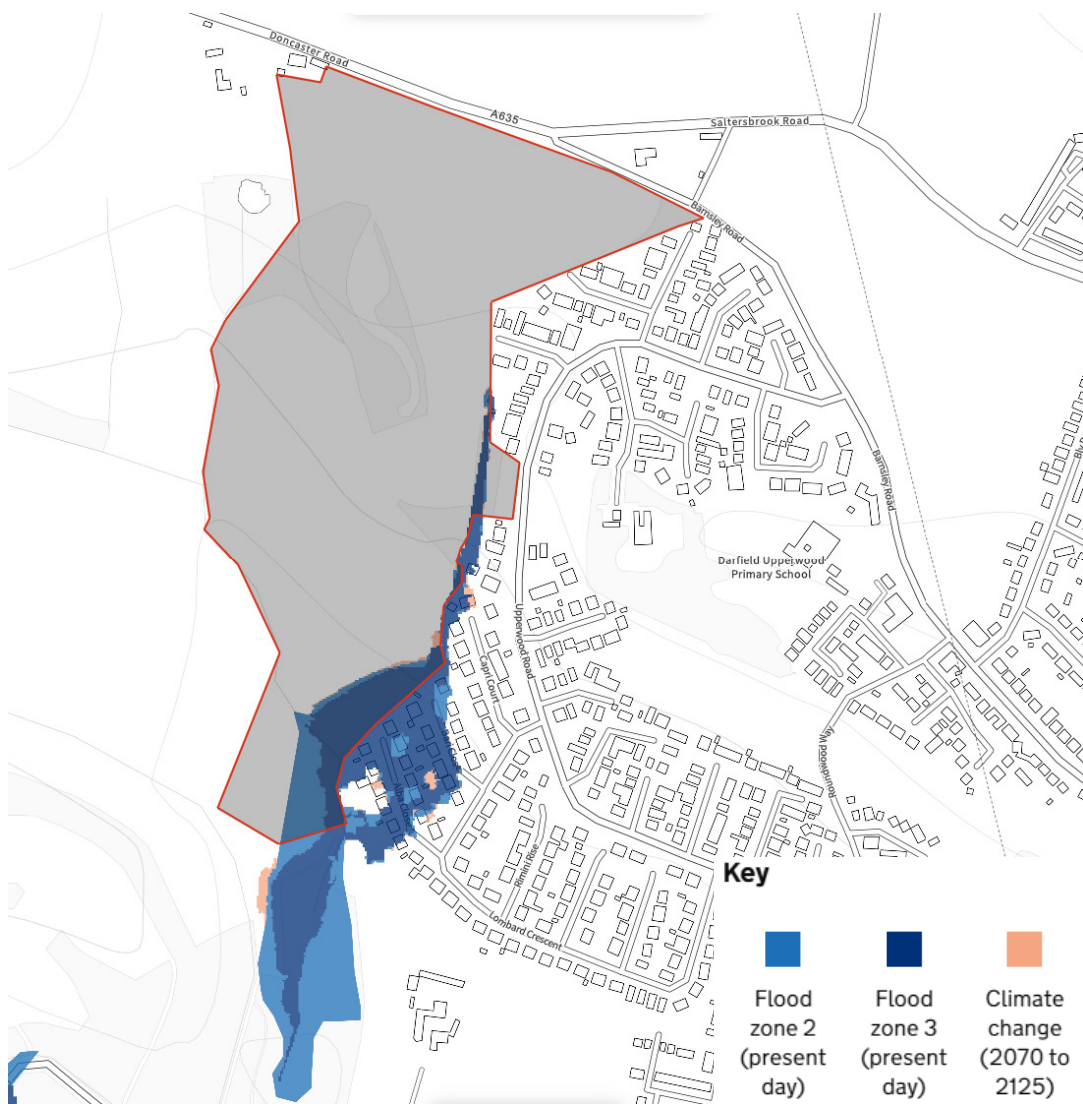


Fig 1 – Flood Risk Map for Planning (including climate change)

- 4.2 However, the depth of flooding from rivers and sea map indicates a less than 0.1% chance of this area being flooded up to 0.9m (Fig 2). The extent of flooding on the depth plan also does not match the outlines shown for Flood Zone 2.

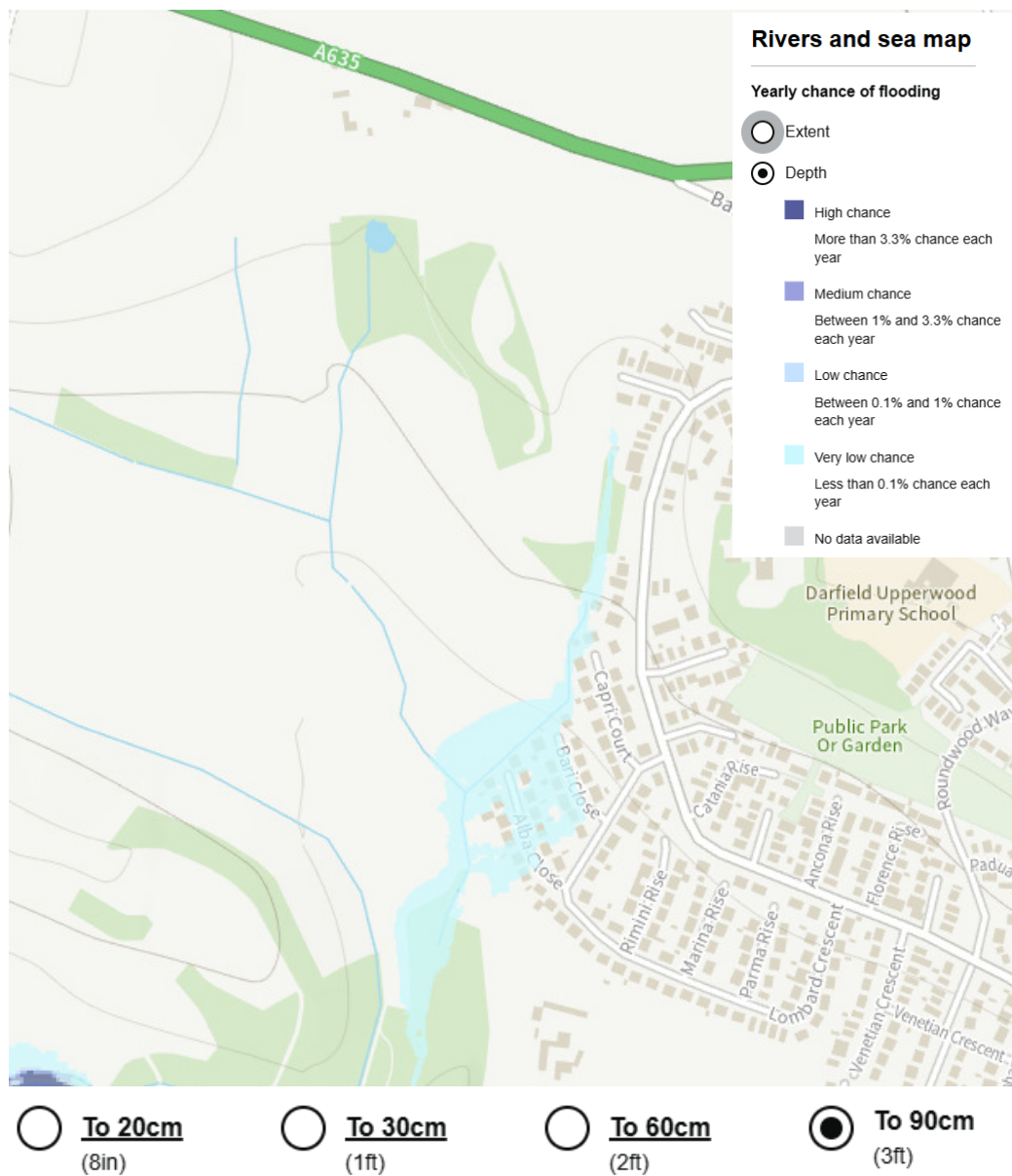


Fig 2 – Depth of Flooding from Rivers and Sea Map

- 4.3 The surface water flooding maps show some ingress into the site from the watercourses along the southern and eastern site boundaries. However, the watercourse on the eastern boundary is at a level approximately 1-1.5m below the adjacent on-site levels for Area 2 (Fig 3). In addition to this, the on-site levels are falling steeply from north to south, not towards the watercourse. This makes the indicated area of flooding unlikely as exceedance flow would fall southwards with the watercourse, not to the west. Anecdotally, water levels within this eastern watercourse have not burst their banks, which means it isn't likely the southern tip of Area 2 has been flooded. The existing EA flood maps are therefore not considered to be an accurate representation of the on-site circumstances.

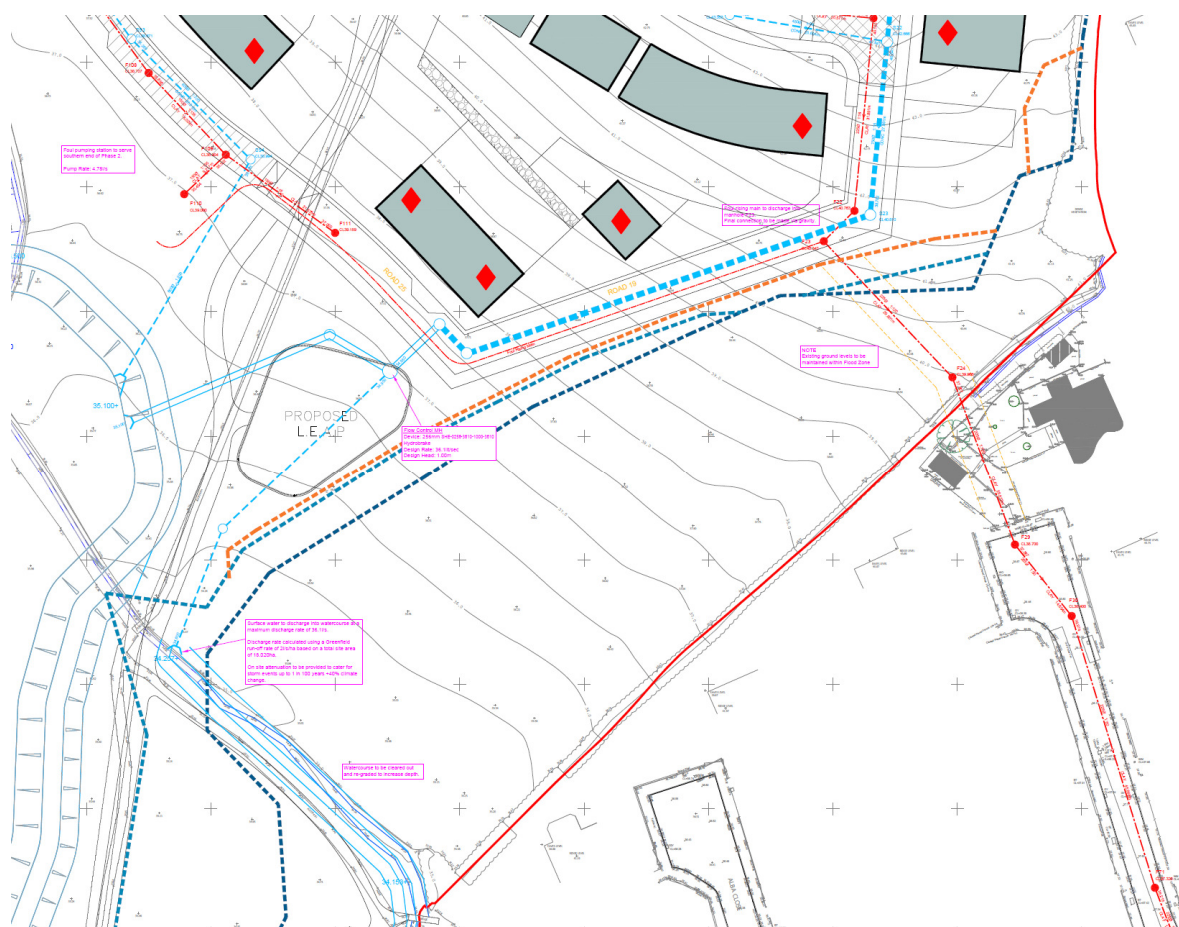


Fig 3 – Flood Zone Extents Adjacent Proposed Detention Basin

- 4.4 The proposed development and detention basin have been redesigned to lie entirely outside the newly defined Flood Zone 2 including climate change, and only a short length of the proposed final surface water sewer outfall is located within Flood Zone 2.
- 4.5 There will be marginal raising of ground levels to enable sufficient ground cover to the outfall sewer within Flood Zone 2. In addition to this, improvement works to the existing watercourse, and part of the watercourse diversion to the south of the proposed detention basin, will be within Flood Zone 3. A cut fill analysis of the proposed works within Flood Zone 3, along with the ground raising to the outfall sewer within Flood Zone 2 has been undertaken and results in a nett cut of approximately 66m³. This means the proposed works will result in an additional 66m³ of storage being provided within Flood Zone 2 and 3 as a result of the proposed works. The cut/fill plan demonstrating this is included within the appendices.

- 4.5 There will be marginal raising of ground levels to enable sufficient ground cover to the outfall sewer within Flood Zone 2. In addition to this, improvement works to the existing watercourse, and part of the watercourse diversion to the south of the proposed detention basin, will be within Flood Zone 3. A cut fill analysis of the proposed works within Flood Zone 3, along with the ground raising to the outfall sewer within Flood Zone 2 has been undertaken and results in a nett cut of approximately 66m³. This means the proposed works will result in an additional 66m³ of storage being provided within Flood Zone 2 and 3 as a result of the proposed works. The cut/fill plan demonstrating this is included within the appendices.

- 4.5 The site does not appear to fall within an area subject to flooding from reservoirs according to the EA maps. We consider the risk of such a source of flooding would be low. The site does not fall within a flood warning zone.
- 4.6 Due to the size of the development being in excess of 1Ha, it would be necessary to prepare a site-specific Flood Risk Assessment for the site.
- 4.7 There are a number of potential flooding mechanisms that the Planning Practise Guidance- Flood Risk and Coastal Change April 2022 now requires to be evaluated for each proposed development site. Each method of flooding requires an assessment to be made on its probability relative to the site development. The normal requirement of the document is for no flooding of properties for storms up to a 1% probability or a once in a 100 years storm. The risk assessment also includes for flooding both on site and off site, and the effects of the development on the downstream catchment or the flow regime of the watercourse. NPPG also requires that the effects of severe storms above the normal 1% probability are reviewed together with the effects of climatic change relating to the design life of the development.
- 4.8 It also requires that the effects of climate change are taken into account together with the impacts of extreme events and flood defence failures. Prior to this the Sequential Test, and where necessary, the Exception test as outlined in Planning Practise Guidance- Flood Risk and Coastal Change April 2022, must also be applied to each development site. These aspects are not covered in this report but the proposed site being in Flood Zone 1, would mean these requirements are already met and do not apply.

4.9 The Planning Practise Guidance- Flood Risk and Coastal Change April 2022 requires that each flooding mechanism is addressed, and levels of risk evaluated. We consider there are three main risks of flooding to the site. The alternative mechanisms are not applicable to this site.

- Inundation from floodwaters leaving watercourses or rivers entering the site. This can include the effects on culverted watercourses and where the risk of blockage can occur and from breach scenarios.
- Rainwater falling on the site and not being able to leave the site at sufficient rate to prevent flooding on the site.
- Overland flows from adjacent land sites due to surcharging of sewerage systems or other watercourses.
- The impact of the developed site on the existing drainage systems and off-site surface water systems must also be assessed as part of this flood risk assessment.

5.0 DISCUSSION OF FLOOD RISKS

5.1 Flood Risk from Watercourses, River & Tidal

- 5.1.1 Only a short length of the proposed surface water outfall serving the development falls within the Flood Risk maps for Zone 2 as published by the Environment Agency. The site is therefore considered not to be at risk from fluvial flooding for the once in 100 year flood event.
- 5.1.2 As discussed in paragraph 4.5, there are widening and diversion works to the existing watercourse within Flood Zone 3. A cut/fill analysis has shown that the proposed works will result in an additional 66m³ of storage being provided within the Flood Zones as a result of the proposed works.
- 5.1.3 A detention basin to attenuate the surface water discharge from the site is proposed to be located to the south of the site. This will require the existing watercourse to be re-routed to the south of the detention basin. This would reduce the risk of flooding to the development area.
- 5.1.4 It is proposed to raise the southern corner of Area 2 by up to 3m to ensure a gravity outfall can be achieved to the watercourse, in conjunction with providing the attenuation within the new basin.
- 5.1.5 Given the above measures we would therefore consider the risk of flooding of the site from River and Sea is acceptable for this type of development on this site.

5.2 **Risk of Flooding from overland flows from adjacent land.**

- 5.2.1 The site lies on land sloping from north to south. Doncaster/Barnsley Road forms the northern site boundary this will provide a cut off drain to any surface water flows from the agricultural land to the north. In addition, the surface water flood maps indicate that this land lies within a separate catchment with flows being generated to the north.
- 5.2.2 To the east of the site there is residential development along with a watercourse abutting the site boundary. The watercourse lies within a relatively deep gully near the central portion of the site, this would be approximately 3m below the existing site levels. The remainder of the watercourse appears to be a combination of open and culverted sections as it passes through the rear gardens of the existing properties. Overland flood water associated with this system is shown on the Environment Agency Plans. This primarily affects Area 2 on site. Any future detailed planning application for this area should afford sufficient standoff from the boundary to enable slab levels can be elevated above existing ground levels. This would ensure that any new development could accommodate any overland flood route along the eastern boundary.
- 5.2.3 The land to the south is lower than the development site. The land to the west is agricultural land and falls at a similar rate to the development site. Therefore, flows will predominately be in a southern direction. In addition, there is a shallow watercourse abutting the site boundary providing a cut off drain to prevent surface water flows entering the development site.
- 5.2.4 We would, however, still recommend that an overland flood route is provided through the site to cater for extreme events and in addition to any blockage failure of new drainage systems on site.

5.3 **Risk of Flooding from Rainwater Falling on Site**

- 5.3.1 The risk of flooding from water falling on site and not being able to leave the site is relatively high. The impermeable area of the site will increase significantly due to the development, and this would increase the run off from the site. This would increase the flood risk to downstream properties unless attenuation measures and restriction of flows took place.

	Impermeable Area (ha)
Current Site	0 ha
Proposed Development	Area 1 4.50 ha Area 2 3.76 ha Total 8.25 ha

- 5.3.2 The normal hierarchy for surface water discharge in accordance with current planning and SUDS policies is as follows:
1. The use of infiltration systems such as Soakaways.
 2. Discharge to nearby rivers or watercourses with the use of attenuation.
 3. Discharge to existing public sewer network with the use of attenuation. Note Yorkshire Water have confirmed there is no available capacity for surface water within the existing sewers.
- 5.3.3 Infiltration testing was undertaken in four trial pits as part of the recent site investigation report, only one test proved successful. In addition, a large proportion of the site consists of made ground and/or clays over mudstone. Considering the above the use soakaways will not be a viable method of dealing with surface water discharge from the site.
- 5.3.4 Therefore the development should drain to the watercourse located to the southern boundary of the site. To avoid a requirement of a surface water pumping station the current design suggests raising the lower portion of Area 2 and diverting the existing watercourse around the proposed detention basin. Note any existing land drainage connections to the watercourse will need to be maintained. Following a site walkover, it is evident that the existing watercourse is currently poorly maintained especially as it travels further to the south of the site. Existing levels are preventing some overland flows from reaching the watercourse thus resulting in

shallow flooding across the land adjacent to the watercourse, in the location of the proposed basin. Some local re-engineering of the existing watercourse is likely to be required in the area of the proposed basin and where the diverted watercourse will re-connect.

5.3.5 The new connection from the development is to connect to the watercourse at the south of the site. Storm water attenuation systems should be utilised to ensure the flows from the site are reduced to agricultural run-off rates or as otherwise agreed with the Barnsley Land Drainage Authority.

5.3.6 Further to a review of the topographical survey it can be established that entire site (18.0 ha) falls to the adjacent watercourses. This would contribute to surface water runoff towards the southeast. A copy of the site survey is contained within the appendices.

5.3.7 A site greenfield area of 18.0 ha would equate to the following existing runoff rates.

Storm Event	Discharge Rate (l/s)
1 in 1 year	31.0
Q _{BAR}	36.1
1 in 30 year	63.4
1 in 100 year	75.0

5.3.8 There are no significant existing buildings or paved areas on site. In conjunction with infiltration systems not being suitable a greenfield discharge rate of 36.1l/s has been proposed for the development into the existing watercourse. Therefore, this has been considered as the design option for the treatment of the discharge of surface water and storage volumes calculated based upon this discharge rate. The above figure has been confirmed by Barnsley LLFA, a copy of the email is contained at the rear of the report.

5.3.9 With attenuation of flows there would have to be a storm-water storage facility. The use of above storage systems such as swales, detention basins or ponds, would provide the most sustainable urban drainage system and possibly the most economic but this would entail significant land up take and potentially large, commuted sums for future maintenance. With

the recent implementation of the Codes for Adoption by Yorkshire Water there is greater scope for a regulatory body to adopt and maintain the above ground storage facilities than previously.

- 5.3.10 Based on the current planning layout including both Area 1 & 2 there is 8.25ha of impermeable area from the plots and highway that will need to be catered for within the proposed attenuation system. Based on this criteria, the estimated volumes of storage required within the attenuation basin for the 2, 30 and 100 year storms are as follows. Note a 40% climate change uplift has been included within the 1 in the 100 year figures.

Return Period Storm	Volume of attenuation (m ³)
1 in 2 year event	1313 m ³
1 in 30 year event	2711 m ³
1 in 100 year event + 40% CC	5600 m ³

- 5.3.11 At present the basin is designed as an online feature, and therefore some sediment retention could be designed into the scheme to improve the water quality. Please note Yorkshire Water will require an easement and access for future maintenance.
- 5.3.12 The size of the storm water storage facilities would need to be determined accurately in the final detailed designs. These should be all in accordance with the current PPG. The volumes of storage can include flooding to roads and designated areas such as carpark areas or public open space for the 100 year storm with 40% allowance for climate change, but must ensure that no buildings are flooded.
- 5.3.13 The requirement for surface water attenuation and the expected shallow nature of the culverted watercourse will necessitate a length of offsite surface water sewer to enable a reconnection with the watercourse level at a suitable level. Easements will be required to the offsite pipework in addition to permission to connect with the current landowner. The position and levels of the attenuation has been considered to ensure that any failure or blockage of the outfall will result in above ground flooding to the fields to the east of the site and not affect any of the new or existing properties.

5.4 **Impact on Existing Drainage Systems.**

- 5.4.1 If the site is developed with attenuation systems and an agreed discharge rate of 36l/s reduced to agricultural rates of discharge, there should be no increase in the flood risk to properties off site or in the drainage networks downstream of the site. In real terms there would be slight reduction in flood risk to adjacent land due to the attenuation provided on site for the 1 in 100 year storms with the discharge rate cut to below the current estimated 1 in 1 year storm agricultural discharge rate.
- 5.4.2 In addition to the above, the diversion and clearing out works to the existing watercourses will provide an improvement to the existing system which is in a very dilapidated overgrown condition as well as providing additional storage volume within Flood Zone 2 and 3.
- 5.4.3 The maintenance of the onsite proposed SUDS basin would be carried out by Yorkshire Water as part of the Section 104 Agreement, put forward for adoption. The maintenance of any on or off site above ground storage systems will need to be resolved satisfactorily in perpetuity either with Yorkshire Water, a management company or Barnsley MBC. This may mean commuted sums being paid for such an agreement.
- 5.4.4 The developer will be responsible to maintain the drainage systems on site until final adoption by Yorkshire Water or similar body ensuring that they are working effectively in the intervening period between construction and adoption.

6.0 **FUTURE MAINTENANCE**

- 6.1 It is proposed for the adoptable drainage, and outfall to the attenuation basin to be adopted and maintained by Yorkshire Water or a similar approved regulatory body under a Section 104 Agreement. The maintenance of the attenuation basin should be in line with the SUDS manual. (CIRIA C753, 2015) as detailed in table 22.1 below.

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseedling or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

- 6.2 The developer will be responsible to maintain the drainage systems, on site until final adoption by the Water Authority ensuring that they are working effectively in the intervening period between construction and final adoption.
- 6.3 Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/ debris removal for large systems. Maintenance should be provided at regular intervals to ensure that the constructed system's are working adequately. If maintenance is not undertaken for long periods, deposits can become hard-packed and require considerable effort to remove.

7.0 CONCLUSIONS

- 7.1 The majority of the site to be developed currently falls within Flood Zone 1 as defined by the EA Flood maps, only a short section of the proposed surface water sewer to the existing watercourse is shown to be within Flood Zone 2. The area of the site to be developed is not at risk of flooding from river, the flood risk is considered to be acceptable for residential development.
- 7.2 The development of the site utilising infiltration techniques is not considered suitable. A surface water attenuation system should be designed to reduce the run-off from the site to an agricultural discharge rate of 36l/s, to ensure there is no increase in flood risk to the downstream catchment. A detention basin has been designed to accommodate the 1 in 100year event with a 40% climate change uplift, in addition a 10% urban creep has been included within the drainage design. Consent for the final outfall to the watercourse will require approval and further survey investigation on site.
- 7.3 The risk of overland flows entering the site is considered to be low due to the topography of the area around the site and the drainage systems to the previously developed areas to the north. Properties along the eastern and southern boundaries will require to be raised to ensure any overland surface water can be accommodated without causing risk to the new properties. The risk can be further minimised by providing a flood water route through the site to ensure flood water flows are directed away from the existing and proposed housing. We would recommend that the floor levels of the proposed houses should be a minimum of 300mm above the existing ground/road levels.



MARTIN HUDDLESTON. MEng
martin@haighhuddleston.co.uk

© Copyright: Haigh Huddleston & Associates

APPENDICES

- A LOCATION PLAN
- B PROPOSED PLANNING LAYOUT
- C TOPOGRAPHICAL SURVEY
- D YORKSHIRE WATER RECORDS & CORRESPONDENCE
- E BARNSELY LAND DRAINAGE CORRESPONDENCE
- F GREENFIELD DISCHARGE RATE CALCULATION
- G PROPOSED ENGINEERING FEASIBILITY PLAN
- H PRELIMINARY DRAINAGE CALCULATIONS
- J CUT/FILL PLAN

APPENDIX A
LOCATION PLAN



Haigh Huddleston & Associates

Civil Structural Engineering Consultants

t 01924 574074

e info@haighhuddleston.co.uk

Unit 4
Midgley Business
Park
Bar Lane
Midgley
WF4 4JJ

Client : SAUL HOMES

Job Title: DONCASTER RD, DARFIELD

Job Number : E20/7309

LOCATION PLAN

OS Grid Reference : SE 402051

Easting : 440277

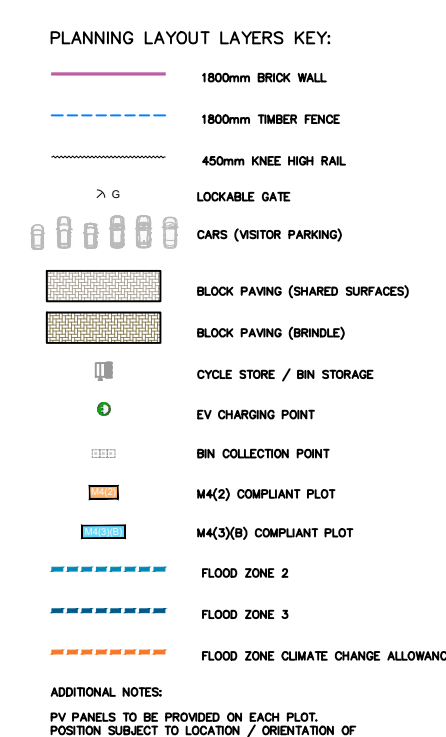
Northing : 405163

Topographical Survey carried out
using GPS.



APPENDIX B

PROPOSED PLANNING LAYOUT



J	15:56	PH 2 DEVELOPMENT AMENDED TO COMPLY WITH LATEST FLOOD MAPPING DATA	JP	VS
P	16:26	PH 2 RING BOUNDARY	JP	VS
P	09:03	PH 1 UPDATED IN LINE WITH LATEST LAYOUT	JP	VS
Q	10:20	RED LINE UPDATED TO SUIT LATEST BNG CALCULATIONS	JP	VS
N	05:02	PH 1 ACCESS REVISED	JP	VS
N	05:02	PH 1 LINE UPDATED TO SUIT LATEST MASTERPLAN	JP	VS
L	20:10	ATTENTION BASIN AND PH 2 MASTERPLAN	JP	VS
L	20:10	PH 1 LINE UPDATED TO SUIT LATEST ZONE	JP	VS
K	12:05	RED LINE BOUNDARY REVISED	JP	VS
J	08:10	PH 1 UPDATED IN LINE WITH LATEST LAYOUT	JP	VS
J	08:25	UPDATED TO SHOW LANDSCAPE MASTERPLAN LB DETAIL	JP	VS
J	18:05	PHASE 1 UPDATED IN LINE WITH LATEST PLANNING LAYOUT	JP	VS
J	18:05	PHASE 2 UPDATED IN LINE WITH LATEST PLANNING LAYOUT	JP	VS
G	07:05	PHASE 1 UPDATED IN LINE WITH LATEST PLANNING LAYOUT	JP	VS
F	24:23	SITE BOUNDARY UPDATED	JP	VS
E	20:35	SITE BOUNDARY UPDATED	JP	VS
E	20:35	PHASE 1 UPDATED IN LINE WITH LATEST PLANNING LAYOUT (REV-2)	JP	VS
E	20:35	PHASE 2 UPDATED IN LINE WITH LATEST PLANNING LAYOUT	JP	VS
B	24:23	PHASE 2 UPDATED IN LINE WITH REVISED SITE BOUNDARY	JP	LBVS
A	18:12	PHASE 1 UPDATED IN LINE WITH LATEST PLANNING LAYOUT	JP	VS

Rev	Date	Description	Drawn	Check
-----	------	-------------	-------	-------



CLIENT: KEEPMOAT & SAUL HOMES

PROJECT: DONCASTER ROAD, SCALE @ A0: 1:1000

DARFIELD
DRAWING: SITE LAYOUT PHASE 1 & 2
DRAWN: JP
DATE: JUN '24

CHECKED: VS DATE: JUN '24

JRP Associates
14 Mariner Court,
Calder Park, Wakefield, WF4 3FL

APPENDIX C
TOPOGRAPHICAL SURVEY



APPENDIX D
YORKSHIRE WATER RECORDS
& CORRESPONDENCE

Haigh Huddleston & Associates
99-103 Leeds Road
Dewsbury
West Yorkshire
WF12 7BU
accounts@haighhuddleston.co.uk

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482

Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

Your Ref:
Our Ref: Z005354

For telephone enquiries ring:
George Mullaney on 0345 120 8482

27th October 2023

Dear Ms Huddleston,

Doncaster Road, Darfield, Barnsley, S73 9RL. – Pre-planning Enquiry V295328

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

It is noted from correspondence on the previous Pre-planning enquiry under reference U012534 that the 375mm foul sewer in Lombard Crescent is some distance from the site and an alternate point of discharge is preferred.



The closest practicable point of discharge for foul will be the 225mm foul public sewer running along Upperwood Road, but at present it does not have adequate capacity available to accommodate the anticipated foul water discharge from the proposed site. Subject to the submission of a Formal Planning Application and robust build plan and start date, Yorkshire Water will carry out a feasibility study to determine suitable foul connection points, any available capacity in the public sewer network, together with timescales for any potential upgrading works required.

The cost for any feasibility/modelling/upgrade works will be at Yorkshire Waters cost up-front and recouped via the sites eventual infrastructure charges.

What are infrastructure charges?

We levy infrastructure charges for all newly connected properties that have not been connected to our water or sewer network before. The charges are calculated to recover the cost of reinforcing our existing water and sewer networks needed to serve new developments. The charges are set to recover the costs over the whole of the Yorkshire Water area to increase capacity.

For more information

<https://www.yorkshirewater.com/developers/developer-services-charges>

Please review section 4 (page 68) of our New Connection Charging Arrangements 2023/2024 for an explanation of our infrastructure charges

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2010. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

As the proposed site is currently undeveloped no surface water is known to have previously discharged to the public sewer network.

As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority/Internal Drainage Board* with a view to establishing a suitable watercourse for discharge.

It is understood that a watercourse is located to the west and south of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable). Please note Yorkshire Water cannot provide plans of culverted watercourses or highway drains. To obtain plans please contact the Lead Local Flood Authority for more details.

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply online or obtain an application form from our website (www.yorkshirewater.com/developers/sewerage/sewerage-connections/) or by telephoning 0345 120 84 82.

Under the provisions of section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer network) any items likely to cause damage to the public sewer network or interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes fat, oil, nappies, bandages, syringes, medicines, sanitary towels and incontinence pants. Contravention of the provisions of section 111 is a criminal offence.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for Code for Adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Code for Adoption, pursuant to an agreement under Section 104 of the Water Industry Act 1991. We are happy to offer pre-development technical advice on any prospective sites that you would like to put forward for adoption, prior to submission of your adoption application.

An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Sewer Adoption, Diversion and Requisition (telephone 0345 120 84 82) or email technical.sewerage@yorkshirewater.co.uk or visit - <https://www.yorkshirewater.com/developers/sewerage/sewer-adoptions/> for further information.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer

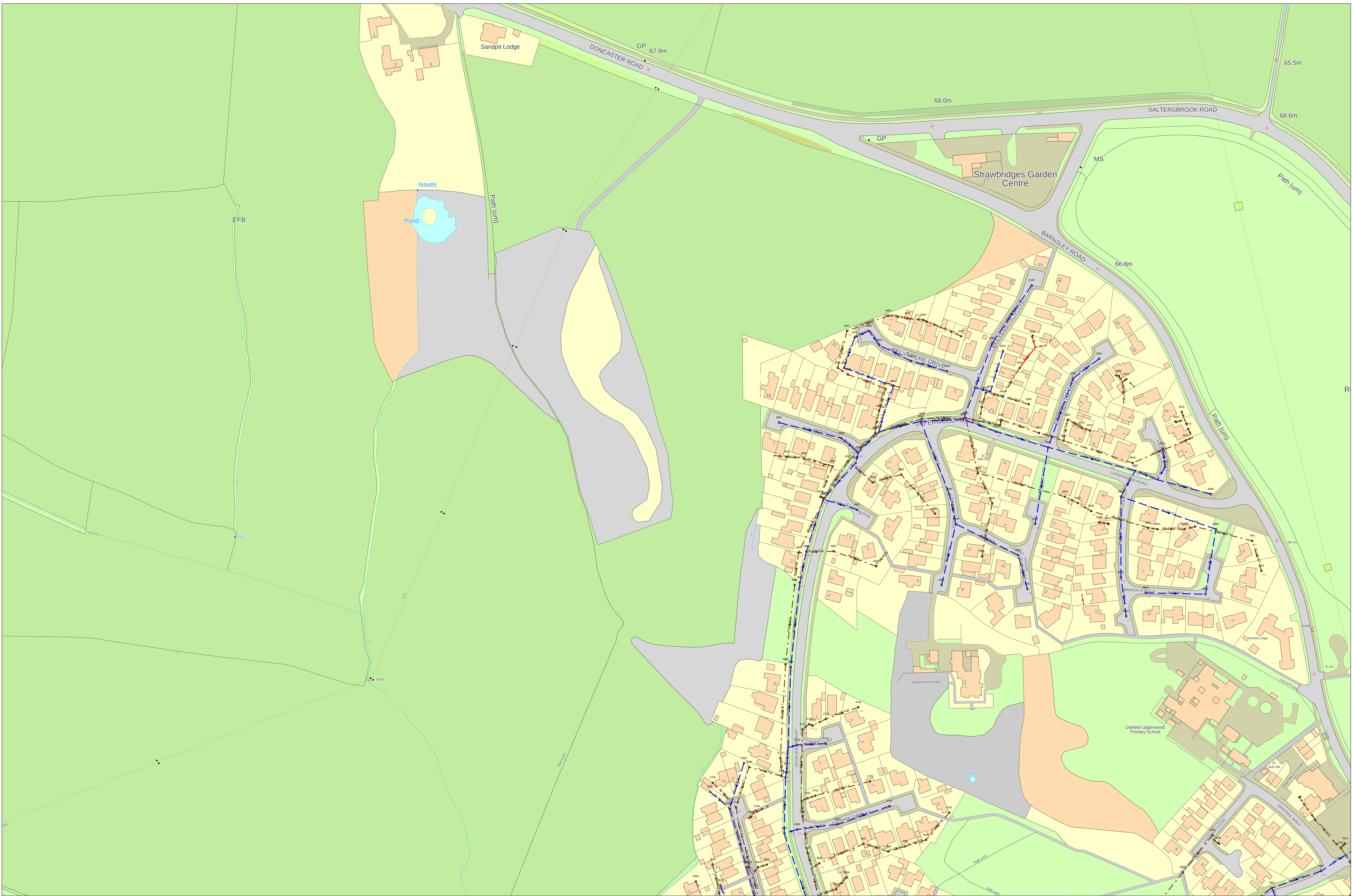


YorkshireWater

Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

George Mullaney
Development Services Technician



440195 : 404933	 Yorkshire Water PO Box 500, Hallifax Road, Bradford BD6 2LZ Contact Name : G Mullaney Contact Tel :	Map Name : SE3904NE	Title	Notes	Partial Key	
					Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
					Date Req : 27/10/2023, 16:11:28 Source : Sewer Network Enquiry	Date Gen : 27/10/2023, 16:15:20

APPENDIX E
BARNSLEY LAND DRIANGE
CORRESPONDENCE

From: [Atkins , Wayne \(SENIOR ENGINEER\)](#)
To: [Martin Huddleston](#); [Grayson , Ian \(SENIOR ENGINEER - ASSETS\)](#)
Cc: [Paul Justice MCIAT](#); [Joe Blankley](#); [Lewis Galtress](#)
Subject: RE: Development at Darfield - Saul Construction/Keepmoat
Date: 26 January 2024 07:56:21
Attachments: [image001.png](#)
[image002.png](#)

Morning Martin,

I confirm the discharge rate of 36l/s for the overall site is acceptable to BMBC as Lead Local Flood Authority.

Consent for the watercourse diversion and installation of the headwall will be required under the Land Drainage Act, both Temporary and Permanent works consent will be required for each element. This will need to be applied for when the design is finalised.. Once the development is at that stage then an email should be sent to highwaydrainage@barnsley.gov.uk to request a Works in Watercourses consent pack which gives details of how to apply and relevant forms to be completed.

If you need anything else let me know.

Regards

Wayne Atkins F.I.H.E.
Senior Engineer, Highway Design
Strategic Transport
Growth and Sustainability
Barnsley Metropolitan Borough Council

E-mail: wayneatkins@barnsley.gov.uk
Mail : PO Box 601, Barnsley S70 9FA

From: Martin Huddleston <martin@haighhuddleston.co.uk>
Sent: Thursday, January 25, 2024 5:29 PM
To: Grayson , Ian (SENIOR ENGINEER - ASSETS) <iangrayson@barnsley.gov.uk>; Atkins , Wayne (SENIOR ENGINEER) <WayneAtkins@barnsley.gov.uk>
Cc: Paul Justice MCIAT <PJustice@saulhomes.co.uk>; Joe Blankley <Joseph.Blankley@keepmoat.com>; Lewis Galtress <Lewis.Galtress@keepmoat.com>
Subject: Development at Darfield - Saul Construction/Keepmoat

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Afternoon Ian, Wayne

Thanks for your time involved in attending site to review the proposed drainage arrangement and outfall for the above site

I've attached the current basin proposals would be acceptable in principle

The design details are based upon the 1 in 100yr return storm and 40% c/c.

The discharge rate has been calculated based upon a greenfield runoff rate of 2l/s/ha. Based upon a developable area of 18ha this provides a peak discharge rate of 36l/s for the overall site. This could be reduced if the phase 1 area is taken in isolation.

In relation to the diversion of the watercourse and construction of the outfall headwall are there any formal approvals required from Barnsley prior to any works commencing on site.

Should you have any queries please do not hesitate to contact me direct

Regards

Martin



Martin Huddleston
Haigh Huddleston & Associates
mobile 07745 877798
martin@haighhuddleston.co.uk

Unit 4, Midgley Business Park,
Midgley, Wakefield
West Yorkshire, WF4 4JJ
t 01924 574074
w www.haighhuddleston.co.uk

*** Barnsley Council Disclaimer: This email and any files attached are confidential for the use of the intended recipient. If you have received this email in error please notify the sender as soon as possible and delete the communication from your system without copying, disseminating or distributing the same in any way by any means. Any views or opinions expressed belong solely to the author and do not necessarily represent those of the council. In particular, the council will not accept liability for any defamatory statements made by email communications. Recipients are responsible for ensuring that all emails and files sent are checked for viruses. The council will not accept liability for damage caused by any virus transmitted by this email. No guarantees are offered on the security, content and accuracy of any emails and files received. Be aware that this email communication may be intercepted for regulatory, quality control, or crime detection purposes unless otherwise prohibited. The content of this email and any attachment may be stored for future reference. Link to privacy statement - <https://www.barnsley.gov.uk/services/information-and-privacy/your-privacy/>

APPENDIX F

GREENFIELD DISCHARGE RATE

Haigh Huddleston & Associates		Page 1
Firth Buildings 99-101 Leeds Road Dewsbury WF12 7BU		
Date 10/08/2018 11:25 File	Designed by j.mcbride Checked by	
Micro Drainage Source Control 2017.1		

IH 124 Mean Annual Flood

Input

Return Period (years)	2	Soil	0.300
Area (ha)	18.020	Urban	0.000
SAAR (mm)	689	Region Number	Region 3

Results l/s

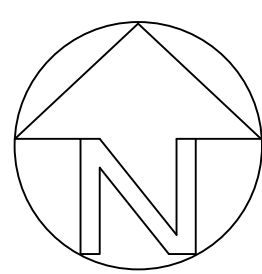
QBAR Rural	36.1
QBAR Urban	36.1
Q2 years	34.0
Q1 year	31.0
Q2 years	34.0
Q5 years	45.1
Q10 years	52.3
Q20 years	59.2
Q25 years	61.5
Q30 years	63.4
Q50 years	68.3
Q100 years	75.0
Q200 years	85.1
Q250 years	88.4
Q1000 years	109.6

Warning: It is unusual to use the IH124 method with an area < 50ha. The Interim Code of Practice recommends that the IH124 method is applied with 50ha and the resulting discharge is linearly interpolated for the required area. The ICP SUDS tab will do this automatically.

©1982-2017 XP Solutions

APPENDIX G

ENGINEERING FEASIBILITY PLAN



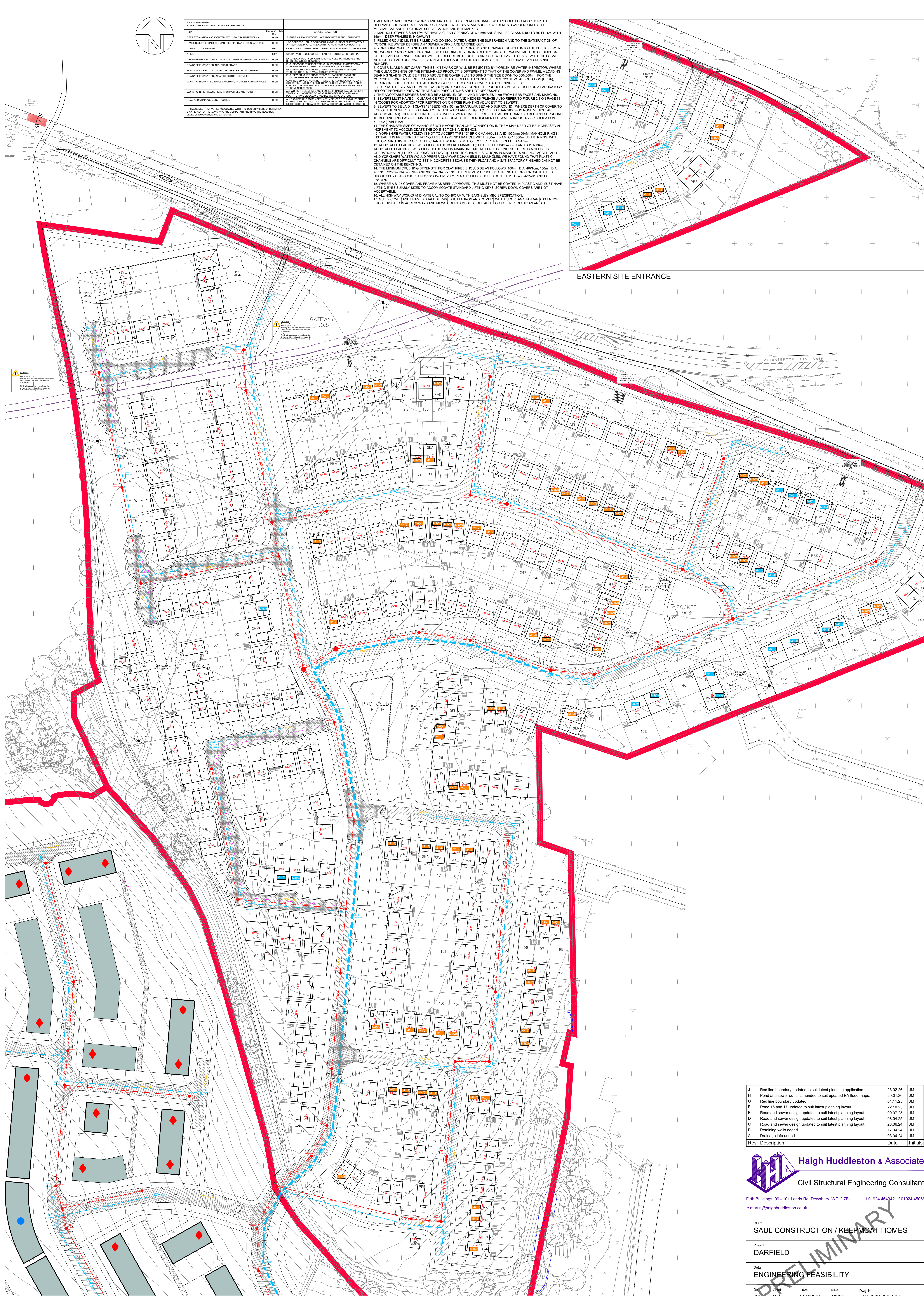
RISK ASSESSMENT		
SIGNIFICANT RISKS THAT CANNOT BE DESIGNED OUT		
RISK	LEVEL OF RISK	SUGGESTED ACTION
DEEP EXCAVATIONS ASSOCIATED WITH NEW DRAINAGE WORKS	HIGH	ENSURE ALL EXCAVATIONS HAVE ADEQUATE TRENCH SUPPORTS
HANDLING LARGE DIAMETER MANHOLE RINGS AND CIRCULAR PIPES	HIGH	USE CORRECT LIFTING EQUIPMENT AND TECHNIQUE TO PREVENT COLLAPSE
CONTACT WITH SEWERAGE	MED	OPERATIONAL TO USE CORRECT EAR PROTECTION/CORRECT PPE
NOISE	MED	OPERATIONAL TO USE CORRECT EAR PROTECTION/CORRECT PPE
DRAINAGE EXCAVATIONS ADJACENT EXISTING BOUNDARY STRUCTURES	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES
DRAINAGE EXCAVATIONS IN PUBLIC HIGHWAY	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES
MAINTAIN ACCESS TO ADJACENT PROPERTIES AND OCCUPANTS	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES
DRAINAGE EXCAVATIONS NEAR TO EXISTING SERVICES	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES
WORKING IN CONFINED SPACES, WORKING IN DRENDS AND MANHOLES	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES
WORKING IN HIGHWAYS / RISKS FROM VEHICLE AND PLANT	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES
ROAD AND DRAINAGE CONSTRUCTION	HIGH	ENSURE CORRECT PROTECTION OF EXISTING BOUNDARY STRUCTURES

IT IS ASSUMED THAT WORKS ASSOCIATED WITH THIS DESIGN WILL BE UNDERTAKEN BY A PERSON OR PERSONS WHO ARE COMPETENT AND HAVE THE REQUIRED LEVELS OF EXPERIENCE AND COMPETENCE.

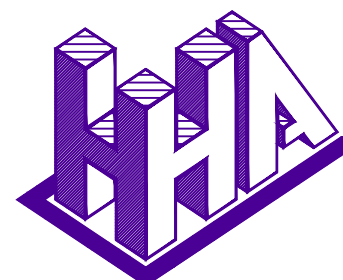
1. ALL ADAPTABLE SEWER WORKS AND MATERIAL TO BE IN ACCORDANCE WITH 'CODES FOR ADOPTION' THE RELEVANT BRITISH/EUROPEAN AND YORKSHIRE WATERS STANDARDS/REQUIREMENTS/ADDENDUM TO THE MECHANICAL AND ELECTRICAL SPECIFICATION AND KITEMARKED.
2. MANHOLE COVERS SHALL HAVE A CLEAR OPENING OF 600mm AND SHALL BE CLASS D400 TO BS EN 124 WITH 80mm DEEP FRAMES IN HIGHWAYS.
3. FILLED GROUND MUST BE FILLED AND CONSOLIDATED UNDER THE SUPERVISION AND TO THE SATISFACTION OF YORKSHIRE WATER BEFORE ANY SEWER WORKS ARE CARRIED OUT.
4. YORKSHIRE WATER IS NOT OBLIGED TO ACCEPT FILTER DRAIN AND DRAINAGE RUNOFF INTO THE PUBLIC SEWER NETWORK OR ADAPTABLE DRAINAGE SYSTEM DIRECTLY OR INDIRECTLY. AN ALTERNATIVE METHOD OF DISPOSAL OF THE LAND DRAINAGE RUNOFF WILL THEREFORE BE REQUIRED AND YOU WILL HAVE TO LIAISE WITH THE LOCAL AUTHORITY, LAND DRAINAGE SECTION WITH REGARD TO THE DISPOSAL OF THE FILTER DRAIN AND DRAINAGE RUNOFF.
5. COVER SLABS MUST CARRY THE BS KITEMARK OR WILL BE REJECTED BY YORKSHIRE WATER INSPECTOR. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOADING BEARING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO 600x600mm FOR THE YORKSHIRE WATER SPECIFIED COVER SIZE. PLEASE REFER TO CONCRETE PIPE SYSTEMS ASSOCIATION (CPSA) TECHNICAL BULLETIN ISSUED AUTUMN 2004 FOR KITEMARKED COVER SLAB OPENING SIZES.
6. SULPHATE RESISTANT CEMENT (C50/C55) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
7. THE ADAPTABLE SEWERS SHOULD HAVE A MINIMUM OF 1m AND MANHOLES 5m FROM KERB FACES AND MARGINS.
8. SEWERS MUST HAVE 5m CLEARANCE FROM TREES AND HEDGES (PLEASE ALSO REFER TO FIGURE 2.3 ON PAGE 33 'CODES FOR ADOPTION' FOR RESTRICTION ON TREE PLANTING ADJACENT TO SEWERS).
9. SEWERS TO BE LAID IN CLASS 'B' BEDDING (150mm GRANULAR BED AND SURROUND), WHERE DEPTH OF COVER TO TOP OF THE SEWER IS LESS THAN 1m IN HIGHWAYS AND VERGES OR LESS THAN 900mm IN HOME VEHICULAR ACCESS AREAS) THEN A CONCRETE SLAB OVER SEWER SHALL BE PROVIDED ABOVE GRANULAR BED AND SURROUND.
10. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENT OF WATER INDUSTRY SPECIFICATION K1002 (TABLE A2).
11. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
12. YORKSHIRE WATER POLICY IS NOT TO ACCEPT TYPE 'C' BRICK MANHOLES AND 1000mm DIAM. MANHOLE RINGS. INSTEAD IT IS PREFERRED THAT YOU USE A TYPE 'F' MANHOLE WITH 1000mm DIAM. RINGS, WITH THE OPENING SIGHTED OVER THE CHANNEL WHERE DEPTH OF COVER TO PIPE SOFFIT IS 1.15m.
13. ADAPTABLE PLASTIC SEWER PIPES TO BE Laid IN MAXIMUM 3 METRE LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS. PLASTIC CHANNELS IN MANHOLES ARE NOT ACCEPTABLE AND YORKSHIRE WATER WOULD PREFER CLAYWARE CHANNELS IN MANHOLES. WE HAVE FOUND THAT PLASTIC CHANNELS ARE DIRECTLY TO SET IN CONCRETE BECAUSE THEY FLAT AND A SATISFACTORY FINISH CANNOT BE OBTAINED ON THE BENCHING.
14. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m², 150mm DIA. 40kN/m², 225mm DIA. 45kN/m² AND 300mm DIA. 72kN/m². THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE: CLASS 120 TO EN 1916/BS EN1118/11202. PLASTIC PIPES SHOULD CONFORM TO BS 4-5-51 AND BS EN13476.
15. WHERE A 8/125 COVER AND FRAME HAS BEEN APPROVED, THIS MUST NOT BE COATED IN PLASTIC AND MUST HAVE LIFTING EYES SUABLY SIZED TO ACCOMMODATE STANDARD LIFTING KEYS. SCREW DOWN COVERS ARE NOT ACCEPTABLE.
16. ALL HIGHWAY WORKS AND MATERIAL TO CONFORM WITH BARNSLEY MBC SPECIFICATION.
17. GULLY COVER AND FRAMES SHALL BE D400 DUCTILE IRON AND COMPLY WITH EUROPEAN STANDARDS BS EN 124. THOSE SIGHTED IN ACCESSWAYS AND MOWS COURTS MUST BE SUITABLE FOR USE IN PEDESTRIAN AREAS.



EASTERN SITE ENTRANCE



Rev	Description	Date	Initials
J	Red line boundary updated to suit latest planning application.	23.02.26	JM
H	Pond and sewer outfall amended to suit updated EA flood maps.	29.01.26	JM
G	Red line boundary updated.	04.11.25	JM
F	Road 16 and 17 updated to suit latest planning layout.	22.10.25	JM
E	Road and sewer design updated to suit latest planning layout.	09.07.25	JM
D	Road and sewer design updated to suit latest planning layout.	08.04.25	JM
C	Road and sewer design updated to suit latest planning layout.	28.06.24	JM
B	Retaining walls added.	17.04.24	JM
A	Drainage info added.	03.04.24	JM



Haigh Huddleston & Associates

Civil Structural Engineering Consultants

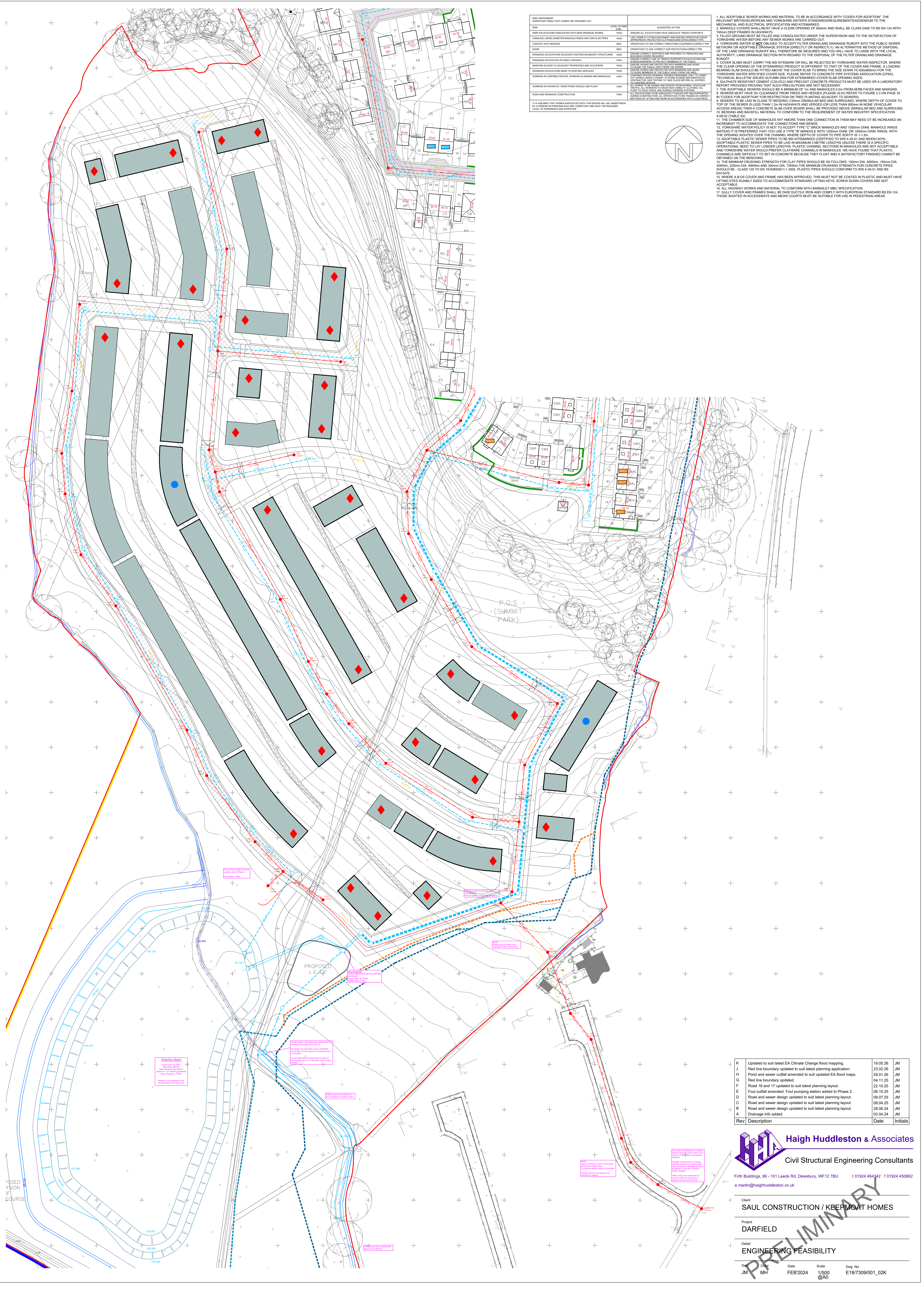
Firth Buildings, 99 - 101 Leeds Rd, Dewsbury, WF12 7BU | 01924 464342 | 01924 450662
e.martling@haighhuddleston.co.uk

Client
SAUL CONSTRUCTION / KEEPMOAT HOMES

Project
DARFIELD

Detail
ENGINEERING FEASIBILITY

Drawn: JM
Checked: MH
Date: FEB/2024
Scale: 1/500 @A0
Dwg No.: E18/7309/001_01J



RISK ASSESSMENT	LEVEL OF RISK	SUGGESTED ACTION
DEEP EXCAVATIONS ASSOCIATED WITH NEW DRAINAGE WORKS	HIGH	ENSURE ALL EXCAVATIONS HAVE ADEQUATE TRENCH SUPPORTS
MANHOLE LARGES QUANTITIES MANHOLE RINGS AND DISCREPANCY	HIGH	USE CORRECT LIFTING EQUIPMENT AND TENSILE CAPACITY RINGS
CONTACT WITH SERVICES	MED	OPERATOR TO USE CORRECT BREACHING EQUIPMENT TO CORRECT THE
DRAINAGE EXCAVATIONS ADJACENT EXISTING BOUNDARY STRUCTURES	HIGH	OPERATOR TO USE CORRECT DAM PROTECTION/CONNECT PIPE
DRAINAGE EXCAVATIONS PUBLIC HIGHWAY	HIGH	ENSURE CORRECT USE OF TRAFFIC/ROADWORKS TO PROTECT AND
MAINTAIN ACCESS TO ADJACENT PROPERTIES AND OCCUPANCIES	HIGH	ENSURE CORRECT USE OF TRAFFIC/ROADWORKS TO PROTECT AND
DRAINAGE EXCAVATIONS NEAR TO EXISTING SERVICES	HIGH	ENSURE CORRECT USE OF TRAFFIC/ROADWORKS TO PROTECT AND
WORKING IN CONFINED SPACES, WORKING IN DRENDS AND MANHOLES	HIGH	ENSURE CORRECT USE OF TRAFFIC/ROADWORKS TO PROTECT AND
ROAD AND DRAINAGE CONSTRUCTION	HIGH	ENSURE CORRECT USE OF TRAFFIC/ROADWORKS TO PROTECT AND

1. ALL ADAPTABLE SEWER WORKS AND MATERIAL TO BE IN ACCORDANCE WITH 'CODES FOR ADOPTION' THE RELEVANT BRITISH/EUROPEAN AND YORKSHIRE WATERS STANDARDS/REQUIREMENTS/ADDENDUM TO THE MECHANICAL AND ELECTRICAL SPECIFICATION AND KITEMARKED.
2. MANHOLE COVERS SHALL MUST HAVE A CLEAR OPENING OF 600mm AND SHALL BE CLASS D400 TO BS EN 124 WITH 150mm DEEP FRAMES IN HIGHWAYS.
3. FILLED GROUND MUST BE FILLED AND CONSOLIDATED UNDER THE SUPERVISION AND TO THE SATISFACTION OF YORKSHIRE WATER BEFORE ANY SEWER WORKS ARE CARRIED OUT.
4. YORKSHIRE WATER IS NOT OBLIGED TO ACCEPT FILTER DRAINLAND DRAINAGE RUNOFF INTO THE PUBLIC SEWER NETWORK OR ADAPTABLE DRAINAGE SYSTEM (DIRECTLY OR INDIRECTLY). AN ALTERNATIVE METHOD OF DISPOSAL OF THE LAND DRAINAGE RUNOFF MUST THEREFORE BE REQUIRED AND YOU WILL HAVE TO LIAISE WITH THE LOCAL AUTHORITY, LAND DRAINAGE SECTION WITH REGARD TO THE DISPOSAL OF THE FILTER DRAINLAND DRAINAGE RUNOFF.
5. COVER SLABS MUST CARRY THE KITEMARK OR WILL BE REJECTED BY YORKSHIRE WATER INSPECTOR. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOADING BEARING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO 600x600mm FOR THE YORKSHIRE WATER SPECIFIED COVER SIZE. PLEASE REFER TO CONCRETE PIPE SYSTEMS ASSOCIATION (CPSA) TECHNICAL BULLETIN ISSUED AUTUMN 2004 FOR KITEMARKED COVER SLAB OPENING SIZES.
6. SUSTAINABLE RESISTANT GROUND COVER AND PRECAST CONCRETE PRODUCTS MUST BE USED ON A LABORATORY REPORT PROVIDED PROVING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
7. THE ADAPTABLE SEWERS SHOULD BE A MINIMUM OF 1m AND MANHOLES 0.5m FROM KERB FACES AND MARGINS.
8. SEWERS MUST HAVE 5m CLEARANCE FROM TREES AND HEDGES PLEASE ALSO REFER TO FIGURE 2.3 ON PAGE 33 IN 'CODES FOR ADOPTION' FOR RESTRICTION ON TREE PLANTING ADJACENT TO SEWERS.
9. SEWERS TO BE LAID IN CLASS 'B' BEDDING (150mm GRANULAR BED AND SURROUND) WHERE DEPTH OF COVER TO TOP OF THE SEWER IS LESS THAN 1.5m IN HIGHWAYS AND VERTICES (UNLESS THAN 800mm IN NONE VEHICULAR ACCESS AREAS) THEN A CONCRETE SLAB OVER SEWER SHALL BE PROVIDED ABOVE GRANULAR BED AND SURROUND.
10. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENT OF WATER INDUSTRY SPECIFICATION 4-05-00 (TABLE A2).
11. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
12. YORKSHIRE WATER POLICY IS NOT TO ACCEPT TYPE 'C' BRICK MANHOLES AND 1000mm DIAM MANHOLE RINGS. INSTEAD IT IS PREFERRED THAT YOU USE A TYPE 'B' MANHOLE WITH 1200mm DIAM OR 1500mm DIAM RINGS. WITH THE OPENING SIGHTED OVER THE CHANNEL WHERE DEPTH OF COVER TO PIPE SOFFIT IS 1.5m.
13. ADAPTABLE PLASTIC SEWER PIPES TO BE BS1180 MARKED (CERTIFIED TO BS 4350:1 AND BS EN 13476). ADAPTABLE PLASTIC SEWER PIPES TO BE LAID IN MAXIMUM 3 METRE LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS. PLASTIC CHANNEL SECTIONS IN MANHOLES ARE NOT ACCEPTABLE AND YORKSHIRE WATER WOULD PREFER CLAYWARE CHANNELS IN MANHOLES. WE HAVE FOUND THAT PLASTIC CHANNELS ARE DIFFICULT TO SET IN CONCRETE BECAUSE THEY FLAT AND A SATISFACTORY FINISH CANNOT BE OBTAINED ON THE BENCHING.
14. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 1000mm DIA: 40kN/m², 1500mm DIA: 40kN/m², 2250mm DIA: 40kN/m² AND 3000mm DIA: 72kN/m². THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE: CLASS 150 TO EN 1916/BS EN 12062. PLASTIC PIPES SHOULD CONFORM TO BS 4350:1 AND BS EN 13476.
15. WHERE A 810mm COVER AND FRAME HAS BEEN APPROVED, THIS MUST NOT BE COATED IN PLASTIC AND MUST HAVE LIFTING EYES SUITABLY SIZED TO ACCOMMODATE STANDARD LIFTING KEYS. SCREW DOWN COVERS ARE NOT ACCEPTABLE.
16. ALL HIGHWAY WORKS AND MATERIAL TO CONFORM WITH BARNESLEY MBC SPECIFICATION.
17. GULLY COVER AND FRAMES SHALL BE D400 DUCTILE IRON AND COMPLY WITH EUROPEAN STANDARD BS EN 124. THOSE SIGHTED IN ACCESSWAYS AND NEW COURTS MUST BE SUITABLE FOR USE IN PEDESTRIAN AREAS.

K	Updated to suit latest EA Climate Change flood mapping.	19.05.26	JM
J	Red line boundary updated to suit latest planning application.	23.02.26	JM
H	Foul and sewer outfall amended to suit updated EA flood maps.	20.01.26	JM
G	Red line boundary updated.	04.11.25	JM
F	Road 16 and 17 updated to suit latest planning layout.	22.10.25	JM
E	Foul outfall amended. Foul pumping station added to Phase 2.	06.10.25	JM
D	Road and sewer design updated to suit latest planning layout.	09.07.25	JM
C	Road and sewer design updated to suit latest planning layout.	08.04.25	JM
B	Road and sewer design updated to suit latest planning layout.	28.06.24	JM
A	Drainage info added.	03.04.24	JM
Rev	Description	Date	Initials



Haigh Huddleston & Associates
Civil Structural Engineering Consultants

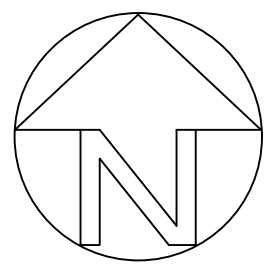
Firth Buildings, 99 - 101 Leeds Rd, Dewsbury, WF12 7BU | 01924 464342 | 01924 450662
e: martin@haighhuddleston.co.uk

Client
SAUL CONSTRUCTION / KEEPMOAT HOMES

Project
DARFIELD

Detail
ENGINEERING FEASIBILITY

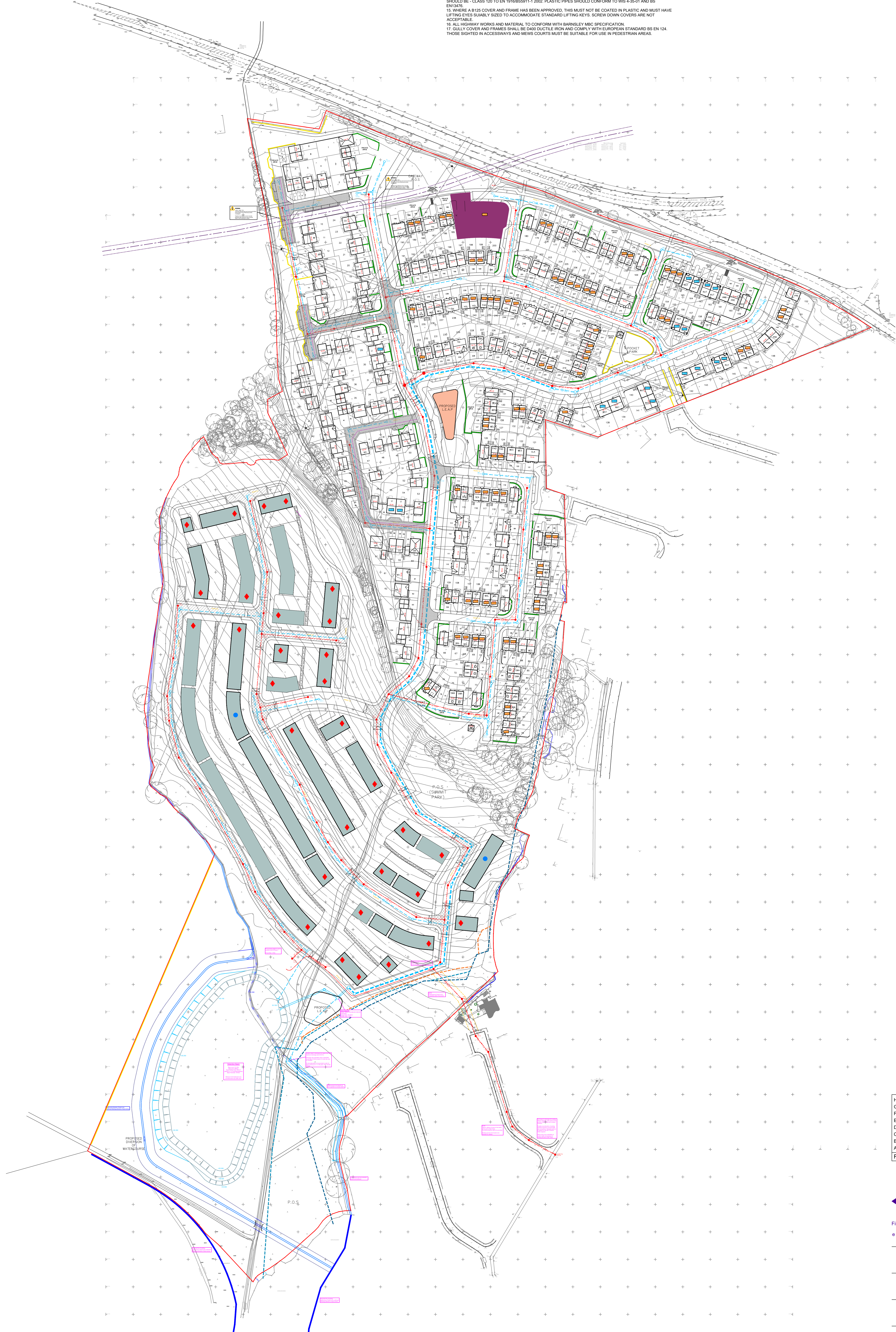
D:	JM	CH:	MH	Date:	FEB/2024	Scale:	1/500 @A0	Dwg No.:	E18/7309/001_02K
----	----	-----	----	-------	----------	--------	-----------	----------	------------------



RISK ASSESSMENT SIGNIFICANT RISKS THAT CANNOT BE DESIGNED OUT		
RISK	LEVEL OF RISK	SUGGESTED ACTION
DEEP EXCAVATIONS ASSOCIATED WITH NEW DRAINAGE WORKS	HIGH	ENSURE ALL EXCAVATIONS HAVE ADEQUATE TRENCH SUPPORTS
HANDLING LARGE DIAMETER MANHOLE RINGS AND CIRCULAR PIPES	HIGH	USE CORRECT LIFTING EQUIPMENT AND TECHNIQUES TO AVOID INJURY AND DAMAGE TO PIPES
CONTACT WITH SEWAGE	MED	OPERATIVES TO USE CORRECT EAR PROTECTION/CORRECT PPE
NOISE	MED	OPERATIVES TO USE CORRECT EAR PROTECTION/CORRECT PPE
DRAINAGE EXCAVATIONS ADJACENT EXISTING BOUNDARY STRUCTURES	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES
DRAINAGE EXCAVATION IN PUBLIC HIGHWAY	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES
MAINTAIN ACCESS TO ADJACENT PROPERTIES AND OCCUPANTS	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES
DRAINAGE EXCAVATION NEAR TO EXISTING SERVICES	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES
WORKING IN CONFINED SPACES, WORKING IN DRAINS AND MANHOLES	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES
WORKING IN HIGHWAYS / RISKS FROM VEHICLE AND PLANT	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES
ROAD AND DRAINAGE CONSTRUCTION	HIGH	ENSURE EXCAVATIONS ARE PROTECTED TO PREVENT COLLAPSE AND DAMAGE TO EXISTING STRUCTURES

IT IS ASSUMED THAT WORKS ASSOCIATED WITH THIS DESIGN WILL BE UNDERTAKEN BY A PERSON OR PERSONS WHO ARE COMPETENT AND HAVE THE REQUIRED LEVELS OF EXPERIENCE AND COMPETENCE.

1. ALL ADAPTABLE SEWER WORKS AND MATERIAL TO BE IN ACCORDANCE WITH "CODES FOR ADOPTION" THE RELEVANT BRITISH/EUROPEAN AND YORKSHIRE WATER'S STANDARDS/REQUIREMENTS/ADDENDUM TO THE MECHANICAL AND ELECTRICAL SPECIFICATION AND KITEMARKED.
2. MANHOLE COVERS SHALL HAVE A CLEAR OPENING OF 600mm AND SHALL BE CLASS D400 TO BS EN 124 WITH 50mm DEEP FRAMES IN HIGHWAYS.
3. FILLED GROUND MUST BE FILLED AND CONSOLIDATED UNDER THE SUPERVISION AND TO THE SATISFACTION OF YORKSHIRE WATER BEFORE ANY SEWER WORKS ARE CARRIED OUT.
4. YORKSHIRE WATER IS NOT OBLIGED TO ACCEPT FILTER DRAIN/LAND DRAINAGE RUNOFF INTO THE PUBLIC SEWER NETWORK OR ADAPTABLE DRAINAGE SYSTEM (DIRECTLY OR INDIRECTLY). AN ALTERNATIVE METHOD OF DISPOSAL OF THE LAND DRAINAGE RUNOFF WILL THEREFORE BE REQUIRED AND YOU WILL HAVE TO LIAISE WITH THE LOCAL AUTHORITY, LAND DRAINAGE SECTION WITH REGARD TO THE DISPOSAL OF THE FILTER DRAIN/LAND DRAINAGE RUNOFF.
5. COVER SLABS MUST CARRY THE BS KITEMARK OR WILL BE REJECTED BY YORKSHIRE WATER INSPECTOR. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOADING BEARING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO 600x600mm FOR THE YORKSHIRE WATER SPECIFIED COVER SIZE. PLEASE REFER TO CONCRETE PIPE SYSTEMS ASSOCIATION (CPSA), TECHNICAL BULLETIN ISSUED AUTUMN 2004 FOR KITEMARKED COVER SLAB OPENING SIZES.
6. SULPHATE RESISTANT CEMENT (SRCE) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
7. THE ADAPTABLE SEWERS SHOULD BE A MINIMUM OF 1m AND MANHOLES 0.7m FROM KERB FACES AND MARGINS.
8. SEWERS MUST HAVE 5m CLEARANCE FROM TREES AND HEDGES (PLEASE ALSO REFER TO FIGURE 2.3 ON PAGE 33 IN "CODES FOR ADOPTION" FOR RESTRICTION ON TREE PLANTING ADJACENT TO SEWERS).
9. SEWERS TO BE LAID IN CLASS "B" BEDDING (150mm GRANULAR BED AND SURROUND), WHERE DEPTH OF COVER TO TOP OF THE SEWER IS LESS THAN 1.2m IN HIGHWAYS AND VERGES OR LESS THAN 900mm IN NON VEHICULAR ACCESS AREAS) THEN A CONCRETE SLAB OVER SEWER SHALL BE PROVIDED ABOVE GRANULAR BED AND SURROUND.
10. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENT OF WATER INDUSTRY SPECIFICATION 400/2 (TABLE 4.2).
11. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND SEWERS.
12. YORKSHIRE WATER POLICY IS NOT TO ACCEPT TYPE "C" BRICK MANHOLES AND 1000mm DIAM. MANHOLE RINGS. INSTEAD IT IS PREFERRED THAT YOU USE A TYPE "F" MANHOLE WITH 1000mm DIAM. OR 1500mm DIAM. RINGS, WITH THE OPENING SIGHTED OVER THE CHANNEL WHERE DEPTH OF COVER TO PIPE SOFFIT IS 1.1.5m.
13. ADAPTABLE PLASTIC SEWER PIPES TO BE BS1 KITEMARKED (CERTIFIED TO WIS 4-35-01 AND BS EN 13476). ADAPTABLE PLASTIC SEWER PIPES TO BE LAID IN MAXIMUM 3 METRE LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS. PLASTIC CHANNEL SECTIONS IN MANHOLES ARE NOT ACCEPTABLE AND YORKSHIRE WATER WOULD PREFER CLAYWARE CHANNELS IN MANHOLES. WE HAVE FOUND THAT PLASTIC CHANNELS ARE DIFFICULT TO SET IN CONCRETE BECAUSE THEY FLOAT AND A SATISFACTORY FINISH CANNOT BE OBTAINED ON THE BENCHING.
14. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m², 150mm DIA. 40kN/m², 225mm DIA. 45kN/m² AND 300mm DIA. 72kN/m². THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE: CLASS 125 TO EN 1916/BS EN 12062. PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN 13476.
15. WHERE A B125 COVER AND FRAME HAS BEEN APPROVED, THIS MUST NOT BE COATED IN PLASTIC AND MUST HAVE LIFTING EYES SUABLY SIZED TO ACCOMMODATE STANDARD LIFTING KEYS. SCREW DOWN COVERS ARE NOT ACCEPTABLE.
16. ALL HIGHWAY WORKS AND MATERIAL TO CONFORM WITH BARNSLEY MBC SPECIFICATION.
17. GULLY COVER AND FRAMES SHALL BE D400 DUCTILE IRON AND COMPLY WITH EUROPEAN STANDARD BS EN 124. THOSE SIGHTED IN ACCESSWAYS AND MOWS COURTS MUST BE SUITABLE FOR USE IN PEDESTRIAN AREAS.



H	Updated to suit latest EA Climate Change flood mapping.	19.05.26	JM
G	Red line boundary updated to suit latest planning application.	23.02.26	JM
F	Pond and sewer outfall amended to suit updated EA flood maps.	29.01.26	JM
E	Red line boundary updated.	04.11.25	JM
D	Road 16 and 17 updated to suit latest planning layout.	22.10.25	JM
C	Foul outfall amended. Foul pumping station added to Phase 2.	08.10.25	JM
B	Road and sewer design updated to suit latest planning layout.	09.07.25	JM
A	Road and sewer design updated to suit latest planning layout.	08.04.25	JM
Rev	Description	Date	Initials

Haigh Huddleston & Associates
Civil Structural Engineering Consultants

Firth Buildings, 99 - 101 Leeds Rd, Dewsbury, WF12 7BU | 01924 464342 | 01924 450662
e.martin@haighhuddleston.co.uk

Client
SAUL CONSTRUCTION / KEEPMOAT HOMES

Project
DARFIELD

Detail
ENGINEERING FEASIBILITY - FULL SITE

Drawn: JM
Checked: MH
Date: FEB'2024
Scale: 1/1000 @A0
Dwg No.: E18/7309/001_03H

APPENDIX H

PRELIMINARY DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
1	0.139	5.00	66.085	1500	440202.830	405258.642	1.785	64.300
127	0.012	5.00	65.336	1500	440182.788	405235.724	1.425	63.911
2	0.024	5.00	65.510	1200	440194.012	405236.657	4.010	61.500
3	0.137	5.00	65.324	1200	440195.807	405215.082	4.115	61.209
31	0.203	5.00	64.265	1500	440258.240	405173.425	1.615	62.650
4	0.090	5.00	64.840	1500	440206.154	405163.064	4.060	60.780
32	0.044	5.00	64.578	1500	440125.800	405244.862	1.425	63.153
37	0.075	5.00	64.961	1500	440153.345	405227.311	1.425	63.536
33	0.027	5.00	64.645	1200	440130.207	405222.708	3.720	60.925
34	0.108	5.00	64.000	1200	440138.929	405178.860	3.278	60.722
38	0.026	5.00	63.523	1200	440151.286	405116.734	1.425	62.098
35	0.012	5.00	63.768	1500	440147.466	405135.940	3.320	60.448
36	0.058	5.00	64.076	1500	440167.735	405139.972	3.722	60.354
5	0.068	5.00	64.650	1500	440209.110	405148.202	4.638	60.012
6	0.064	5.00	64.017	1500	440217.335	405106.852	4.146	59.871
39	0.093	5.00	65.362	1500	440479.861	405157.536	1.562	63.800
41	0.139	5.00	64.458	1200	440468.975	405142.147	1.780	62.678
49	0.134	5.00	65.516	1200	440325.575	405226.388	1.425	64.091
55	0.095	5.00	65.916	1200	440282.895	405233.605	1.425	64.491
50	0.068	5.00	65.710	1200	440300.971	405230.548	1.944	63.766
51	0.054	5.00	64.246	1500	440291.308	405173.406	1.843	62.403
52	0.240	5.00	63.886	1800	440308.336	405168.216	1.706	62.180
56	0.088	5.00	65.334	1200	440425.051	405189.269	1.425	63.909
57	0.110	5.00	65.887	1200	440404.509	405194.711	2.244	63.643
53	0.023	5.00	63.959	1500	440384.129	405139.989	2.318	61.641
54	0.064	5.00	63.484	1500	440401.182	405130.385	2.006	61.478
42	0.170	5.00	63.096	1800	440406.517	405117.088	1.737	61.359
43	0.061	5.00	62.679	1500	440376.373	405104.984	1.801	60.878
44	0.104	5.00	61.017	1800	440341.671	405091.071	1.913	59.104
45	0.160	5.00	60.638	1800	440326.576	405093.441	1.990	58.648
46	0.032	5.00	61.602	1800	440291.788	405106.367	3.060	58.542
47	0.112	5.00	62.478	1800	440265.497	405109.581	4.012	58.466
48	0.000	5.00	63.490	1800	440235.470	405103.609	5.111	58.379
7	0.026	5.00	63.718	1800	440221.546	405095.588	5.536	58.182
8	0.066	5.00	63.177	1800	440232.666	405076.284	5.059	58.118
9	0.053	5.00	61.999	1800	440242.043	405026.737	4.025	57.974
58	0.099	5.00	62.810	1200	440204.706	405069.310	1.425	61.385
59	0.193	5.00	62.400	1200	440176.572	405063.714	1.568	60.832
60	0.012	5.00	60.223	1200	440189.553	404998.455	1.537	58.686
61	0.115	5.00	60.155	1500	440193.130	404994.186	1.581	58.574
10	0.055	5.00	61.013	1800	440238.831	404990.256	3.222	57.791

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
11	0.108	5.00	60.269	1800	440236.219	404960.592	2.627	57.642
12	0.040	5.00	57.832	1800	440232.243	404915.438	2.079	55.753
13	0.114	5.00	56.499	1800	440230.056	404895.114	2.024	54.475
14	0.000	5.00	55.453	1800	440221.525	404880.985	2.010	53.443
62	0.154	5.00	61.089	1500	440274.673	405031.441	1.425	59.664
63	0.110	5.00	59.628	1200	440308.731	405028.442	1.838	57.790
64	0.075	5.00	58.527	1200	440305.673	404993.717	1.608	56.919
65	0.076	5.00	57.820	1500	440301.947	404951.400	1.684	56.136
66	0.100	5.00	57.536	1500	440299.461	404923.164	1.754	55.782
70	0.070	5.00	57.925	1200	440266.309	404924.407	1.525	56.400
67	0.101	5.00	57.535	1500	440284.545	404922.801	1.940	55.595
68	0.062	5.00	55.875	1500	440280.686	404878.981	1.909	53.966
71	0.059	5.00	54.744	1200	440277.432	404842.019	1.425	53.319
69	0.072	5.00	55.021	1800	440278.405	404853.071	2.038	52.983
26	0.000		55.430	1500	440262.153	404854.535	2.610	52.820
15	0.022	5.00	54.227	1800	440208.000	404869.110	2.088	52.139
16	0.040	5.00	53.048	1800	440200.127	404854.157	2.036	51.012
17	0.029	5.00	51.857	1800	440199.951	404836.859	1.998	49.859
18	0.101	5.00	50.419	1800	440209.235	404817.676	1.981	48.438
19	0.079	5.00	47.811	1800	440228.935	404784.606	2.123	45.688
20	0.075	5.00	46.210	1800	440266.797	404761.465	2.297	43.913
21	0.043	5.00	44.663	1800	440251.633	404732.710	2.050	42.613
27	0.144	5.00	50.714	1200	440155.001	404867.584	1.714	49.000
79	0.098	5.00	48.333	1200	440107.505	404869.719	1.425	46.908
28	0.053	5.00	48.148	1200	440110.073	404857.858	1.777	46.371
72	0.136	5.00	47.880	1200	440111.576	404850.472	1.603	46.277
73	0.110	5.00	45.888	1500	440138.674	404806.839	1.661	44.227
74	0.000		44.737	1500	440150.924	404779.988	1.720	43.017
75	0.082	5.00	44.466	1500	440159.315	404764.838	1.696	42.770
76	0.052	5.00	44.275	1500	440168.366	404751.051	1.741	42.534
77	0.123	5.00	43.973	1500	440184.251	404732.965	1.783	42.190
78	0.060	5.00	43.353	1500	440223.405	404707.543	1.747	41.606
22	0.071	5.00	42.666	1800	440248.732	404703.276	2.025	40.641
23	0.089	5.00	40.810	1800	440245.996	404675.520	2.178	38.632
24	0.056	5.00	39.327	1800	440224.636	404655.291	2.329	36.998
80	0.083	5.00	38.993	1200	440184.434	404650.481	1.425	37.568
25	0.000		38.515	1950	440201.041	404632.946	2.653	35.862
29	0.000		37.300	1950	440143.943	404578.872	1.942	35.358
81	0.100	5.00	52.928	1200	440102.807	405015.180	1.425	51.503
82	0.088	5.00	51.409	1200	440111.766	404977.638	1.450	49.959
83	0.077	5.00	50.606	1200	440115.380	404958.470	1.460	49.146
96	0.166	5.00	51.908	1200	440173.169	404911.597	1.425	50.483
97	0.000		48.952	1200	440111.729	404917.007	1.628	47.324
84	0.056	5.00	49.354	1200	440112.674	404927.735	2.165	47.189
85	0.150	5.00	46.447	1500	440053.533	404932.943	1.708	44.739
86	0.069	5.00	44.475	1500	440050.032	404893.187	1.731	42.744
87	0.000		43.408	1500	440046.532	404872.022	1.737	41.671
88	0.079	5.00	42.306	1500	440048.108	404850.255	1.726	40.580
89	0.085	5.00	41.106	1500	440053.981	404827.675	1.693	39.413
90	0.000		40.195	1500	440068.537	404804.935	1.682	38.513
91	0.076	5.00	38.495	1500	440102.303	404745.857	1.758	36.737
92	0.067	5.00	38.317	1500	440110.995	404726.185	1.909	36.408

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
93	0.000		38.671	1500	440127.211	404703.725	2.402	36.269
94	0.047	5.00	38.994	1500	440146.380	404684.406	2.861	36.133
95	0.000		37.300	1500	440111.956	404611.364	1.942	35.358
30	0.000	5.00	36.800	1800	440147.998	404565.910	1.558	35.242
125	0.000		36.800	1800	440153.563	404563.666	1.623	35.177
126			36.000	1200	440171.236	404556.542	0.910	35.090

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	23.687	0.600	64.300	63.770	0.530	44.7	225	5.20	50.0
2.000	127	2	11.263	0.600	63.911	63.770	0.141	80.0	225	5.13	50.0
1.001	2	3	21.650	0.600	61.500	61.284	0.216	100.0	225	5.48	50.0
1.002	3	4	53.037	0.600	61.209	60.855	0.354	150.0	300	6.17	50.0
3.000	31	4	53.107	0.600	62.650	62.296	0.354	150.0	300	5.69	50.0
1.003	4	5	15.153	0.600	60.780	60.162	0.618	24.5	375	6.24	50.0
4.000	32	33	22.588	0.600	63.153	63.002	0.151	150.0	225	5.35	50.0
5.000	37	33	23.591	0.600	63.536	63.002	0.534	44.2	225	5.20	50.0
4.001	33	34	44.707	0.600	60.925	60.722	0.203	220.0	300	6.06	50.0
4.002	34	35	43.761	0.600	60.722	60.523	0.199	220.0	300	6.75	50.0
6.000	38	35	19.582	0.600	62.098	61.967	0.131	150.0	225	5.31	50.0
4.003	35	36	20.666	0.600	60.448	60.354	0.094	220.0	375	7.03	50.0
4.004	36	5	42.186	0.600	60.354	60.162	0.192	220.0	375	7.61	50.0
1.004	5	6	42.160	0.600	60.012	59.871	0.141	300.0	525	8.16	50.0
1.005	6	7	12.025	0.600	59.871	59.831	0.040	300.0	525	8.31	50.0
7.000	39	41	18.850	0.600	63.800	62.753	1.047	18.0	225	5.10	50.0
7.001	41	42	67.298	0.600	62.678	61.509	1.169	57.6	300	5.64	50.0
8.000	49	50	24.953	0.600	64.091	63.841	0.250	100.0	225	5.32	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.962	78.0	18.8	1.560	1.515	0.139	0.0	75	1.623
2.000	1.463	58.2	1.6	1.200	1.515	0.012	0.0	26	0.647
1.001	1.307	52.0	23.7	3.785	3.815	0.175	0.0	107	1.279
1.002	1.281	90.6	42.3	3.815	3.685	0.312	0.0	144	1.259
3.000	1.281	90.6	27.5	1.315	2.244	0.203	0.0	113	1.129
1.003	3.672	405.5	82.0	3.685	4.113	0.605	0.0	114	2.903
4.000	1.065	42.3	6.0	1.200	1.418	0.044	0.0	57	0.755
5.000	1.973	78.4	10.2	1.200	1.418	0.075	0.0	54	1.365
4.001	1.056	74.6	19.8	3.420	2.978	0.146	0.0	105	0.896
4.002	1.056	74.6	34.4	2.978	2.945	0.254	0.0	143	1.036
6.000	1.065	42.3	3.5	1.200	1.576	0.026	0.0	44	0.647
4.003	1.217	134.4	39.6	2.945	3.347	0.292	0.0	139	1.063
4.004	1.217	134.4	47.4	3.347	4.113	0.350	0.0	153	1.115
1.004	1.288	278.8	138.6	4.113	3.621	1.023	0.0	262	1.286
1.005	1.288	278.8	147.3	3.621	3.362	1.087	0.0	271	1.305
7.000	3.098	123.2	12.6	1.337	1.480	0.093	0.0	48	2.002
7.001	2.076	146.7	31.4	1.480	1.287	0.232	0.0	94	1.665
8.000	1.307	52.0	18.2	1.200	1.644	0.134	0.0	92	1.195

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
9.000	55	50	18.333	0.600	64.491	63.841	0.650	28.2	225	5.12	50.0
8.001	50	51	57.953	0.600	63.766	62.478	1.288	45.0	300	5.73	50.0
8.002	51	52	17.801	0.600	62.403	62.255	0.148	120.0	375	5.91	50.0
8.003	52	53	80.879	0.600	62.180	61.641	0.539	150.0	450	6.72	50.0
10.000	56	57	21.251	0.600	63.909	63.643	0.266	80.0	225	5.24	50.0
10.001	57	53	58.394	0.600	63.643	61.866	1.777	32.9	225	5.67	50.0
8.004	53	54	19.571	0.600	61.641	61.478	0.163	120.0	450	6.90	50.0
8.005	54	42	14.327	0.600	61.478	61.359	0.119	120.0	450	7.03	50.0
7.002	42	43	32.483	0.600	61.359	60.953	0.406	80.0	450	7.26	50.0
7.003	43	44	37.387	0.600	60.878	59.179	1.699	22.0	525	7.39	50.0
7.004	44	45	15.280	0.600	59.104	58.798	0.306	50.0	600	7.47	50.0
7.005	45	46	37.112	0.600	58.648	58.542	0.106	350.0	750	7.88	50.0
7.006	46	47	26.487	0.600	58.542	58.466	0.076	350.0	750	8.18	50.0
7.007	47	48	30.615	0.600	58.466	58.379	0.087	350.0	750	8.52	50.0
7.008	48	7	16.069	0.600	58.379	58.332	0.047	341.9	750	8.70	50.0
1.006	7	8	22.278	0.600	58.182	58.118	0.064	350.0	900	8.92	50.0
1.007	8	9	50.427	0.600	58.118	57.974	0.144	350.0	900	9.43	49.2
1.008	9	10	36.622	0.600	57.974	57.791	0.183	200.0	900	9.70	48.5
11.000	58	59	28.685	0.600	61.385	60.907	0.478	60.0	225	5.28	50.0
11.001	59	60	66.538	0.600	60.832	58.686	2.146	31.0	300	5.67	50.0
11.002	60	61	5.569	0.600	58.686	58.649	0.037	150.0	300	5.75	50.0
11.003	61	10	45.870	0.600	58.574	58.316	0.258	177.8	375	6.31	50.0
1.009	10	11	29.779	0.600	57.791	57.642	0.149	200.0	900	9.93	47.9
1.010	11	12	45.329	0.600	57.642	55.753	1.889	24.0	750	10.06	47.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
9.000	2.473	98.3	12.9	1.200	1.644	0.095	0.0	55	1.727
8.001	2.350	166.1	40.3	1.644	1.468	0.297	0.0	100	1.945
8.002	1.653	182.5	47.6	1.468	1.256	0.351	0.0	130	1.397
8.003	1.657	263.6	80.1	1.256	1.868	0.591	0.0	169	1.459
10.000	1.463	58.2	11.9	1.200	2.019	0.088	0.0	69	1.157
10.001	2.290	91.0	26.8	2.019	1.868	0.198	0.0	83	1.994
8.004	1.855	294.9	110.0	1.868	1.556	0.812	0.0	190	1.726
8.005	1.855	294.9	118.7	1.556	1.287	0.876	0.0	198	1.758
7.002	2.274	361.7	173.2	1.287	1.276	1.278	0.0	219	2.251
7.003	4.790	1036.8	181.5	1.276	1.313	1.339	0.0	147	3.642
7.004	3.449	975.1	195.6	1.313	1.240	1.443	0.0	181	2.723
7.005	1.490	658.2	217.2	1.240	2.310	1.603	0.0	296	1.343
7.006	1.490	658.2	221.6	2.310	3.262	1.635	0.0	298	1.349
7.007	1.490	658.2	236.8	3.262	4.361	1.747	0.0	310	1.374
7.008	1.507	666.0	236.8	4.361	4.636	1.747	0.0	308	1.385
1.006	1.669	1061.6	387.6	4.636	4.159	2.860	0.0	375	1.544
1.007	1.669	1061.6	390.5	4.159	3.125	2.926	0.0	377	1.547
1.008	2.212	1407.0	391.4	3.125	2.322	2.979	0.0	323	1.909
11.000	1.691	67.2	13.4	1.200	1.268	0.099	0.0	68	1.329
11.001	2.834	200.3	39.6	1.268	1.237	0.292	0.0	90	2.221
11.002	1.281	90.6	41.2	1.237	1.206	0.304	0.0	142	1.253
11.003	1.355	149.7	56.8	1.206	2.322	0.419	0.0	160	1.266
1.009	2.212	1407.0	448.2	2.322	1.727	3.453	0.0	348	1.977
1.010	5.725	2529.4	459.0	1.877	1.329	3.561	0.0	214	4.405

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.011	12	13	20.441	0.600	55.753	54.475	1.278	16.0	750	10.11	47.4
1.012	13	14	16.505	0.600	54.475	53.443	1.032	16.0	750	10.15	47.3
1.013	14	15	17.998	0.600	53.443	52.139	1.304	13.8	750	10.19	47.2
12.000	62	63	34.190	0.600	59.664	57.865	1.799	19.0	225	5.19	50.0
12.001	63	64	34.859	0.600	57.790	56.919	0.871	40.0	300	5.42	50.0
12.002	64	65	42.481	0.600	56.919	56.211	0.708	60.0	300	5.77	50.0
12.003	65	66	28.345	0.600	56.136	55.782	0.354	80.0	375	6.00	50.0
12.004	66	67	14.920	0.600	55.782	55.595	0.187	80.0	375	6.13	50.0
13.000	70	67	18.307	0.600	56.400	55.745	0.655	27.9	225	5.12	50.0
12.005	67	68	43.990	0.600	55.595	53.966	1.629	27.0	375	6.34	50.0
12.006	68	69	26.010	0.600	53.966	53.058	0.908	28.6	375	6.46	50.0
14.000	71	69	11.095	0.600	53.319	53.208	0.111	100.0	225	5.14	50.0
12.007	69	26	16.318	0.600	52.983	52.820	0.163	100.0	450	6.60	50.0
12.008	26	15	56.080	0.600	52.820	52.439	0.381	147.2	450	7.16	50.0
1.014	15	16	16.899	0.600	52.139	51.012	1.127	15.0	750	10.23	47.1
1.015	16	17	17.299	0.600	51.012	49.859	1.153	15.0	750	10.27	47.0
1.016	17	18	21.312	0.600	49.859	48.438	1.421	15.0	750	10.31	46.9
1.017	18	19	38.493	0.600	48.438	45.688	2.750	14.0	750	10.40	46.7
1.018	19	20	44.374	0.600	45.688	43.913	1.775	25.0	750	10.53	46.4
1.019	20	21	32.508	0.600	43.913	42.613	1.300	25.0	750	10.63	46.2
1.020	21	22	29.577	0.600	42.613	40.641	1.972	15.0	750	10.70	46.0
15.000	27	28	45.969	0.600	49.000	46.446	2.554	18.0	225	5.25	50.0
16.000	79	28	12.136	0.600	46.908	46.446	0.462	26.3	225	5.08	50.0
15.001	28	72	7.537	0.600	46.371	46.277	0.094	80.0	300	5.32	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.011	7.015	3099.2	462.9	1.329	1.274	3.601	0.0	194	5.118
1.012	7.015	3099.2	476.6	1.274	1.260	3.715	0.0	197	5.159
1.013	7.554	3337.2	475.6	1.260	1.338	3.715	0.0	189	5.444
12.000	3.015	119.9	20.9	1.200	1.538	0.154	0.0	63	2.270
12.001	2.493	176.2	35.8	1.538	1.308	0.264	0.0	91	1.967
12.002	2.033	143.7	45.9	1.308	1.309	0.339	0.0	116	1.815
12.003	2.027	223.9	56.2	1.309	1.379	0.415	0.0	128	1.699
12.004	2.027	223.9	69.8	1.379	1.565	0.515	0.0	143	1.797
13.000	2.484	98.8	9.5	1.300	1.565	0.070	0.0	47	1.587
12.005	3.498	386.4	93.0	1.565	1.534	0.686	0.0	125	2.900
12.006	3.396	375.1	101.4	1.534	1.588	0.748	0.0	133	2.905
14.000	1.307	52.0	8.0	1.200	1.588	0.059	0.0	59	0.952
12.007	2.033	323.3	119.1	1.588	2.160	0.879	0.0	189	1.884
12.008	1.673	266.1	119.1	2.160	1.338	0.879	0.0	210	1.628
1.014	7.246	3201.0	589.8	1.338	1.286	4.616	0.0	216	5.595
1.015	7.246	3201.0	593.6	1.286	1.248	4.656	0.0	216	5.605
1.016	7.246	3201.0	595.8	1.248	1.231	4.685	0.0	217	5.615
1.017	7.500	3313.6	606.0	1.231	1.373	4.786	0.0	215	5.782
1.018	5.609	2478.2	611.8	1.373	1.547	4.865	0.0	252	4.691
1.019	5.609	2478.2	618.2	1.547	1.300	4.940	0.0	254	4.704
1.020	7.246	3201.0	621.4	1.300	1.275	4.983	0.0	222	5.683
15.000	3.098	123.2	19.5	1.489	1.477	0.144	0.0	60	2.279
16.000	2.563	101.9	13.3	1.200	1.477	0.098	0.0	55	1.790
15.001	1.759	124.3	40.0	1.477	1.303	0.295	0.0	117	1.574

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
15.002	72	73	51.363	0.600	46.277	44.302	1.975	26.0	300	5.60	50.0
15.003	73	74	29.513	0.600	44.227	43.092	1.135	26.0	375	5.73	50.0
15.004	74	75	17.319	0.600	43.017	42.770	0.247	70.0	450	5.85	50.0
15.005	75	76	16.492	0.600	42.770	42.534	0.236	70.0	450	5.96	50.0
15.006	76	77	24.071	0.600	42.534	42.190	0.344	70.0	450	6.13	50.0
15.007	77	78	46.683	0.600	42.190	41.606	0.584	80.0	450	6.47	50.0
15.008	78	22	25.684	0.600	41.606	40.941	0.665	38.6	450	6.60	50.0
1.021	22	23	27.891	0.600	40.641	38.782	1.859	15.0	750	10.76	45.9
1.022	23	24	29.419	0.600	38.632	36.998	1.634	18.0	900	10.83	45.7
1.023	24	25	32.497	0.600	36.998	36.012	0.986	33.0	900	10.93	45.5
17.000	80	25	24.151	0.600	37.568	36.687	0.881	27.4	225	5.16	50.0
1.024	25	29	78.640	0.600	35.862	35.600	0.262	300.0	1050	11.59	44.0
18.000	81	82	38.596	0.600	51.503	49.959	1.544	25.0	225	5.24	50.0
18.001	82	83	19.506	0.600	49.959	49.146	0.813	24.0	225	5.37	50.0
18.002	83	84	30.854	0.600	49.146	47.264	1.882	16.4	225	5.52	50.0
19.000	96	97	61.678	0.600	50.483	47.399	3.084	20.0	225	5.35	50.0
19.001	97	84	10.770	0.600	47.324	47.189	0.135	80.0	300	5.45	50.0
18.003	84	85	59.370	0.600	47.189	44.814	2.375	25.0	300	5.84	50.0
18.004	85	86	39.910	0.600	44.739	42.744	1.995	20.0	375	6.00	50.0
18.005	86	87	21.452	0.600	42.744	41.671	1.073	20.0	375	6.09	50.0
18.006	87	88	21.824	0.600	41.671	40.580	1.091	20.0	375	6.18	50.0
18.007	88	89	23.331	0.600	40.580	39.413	1.167	20.0	375	6.27	50.0
18.008	89	90	27.000	0.600	39.413	38.513	0.900	30.0	375	6.41	50.0
18.009	90	91	68.047	0.600	38.513	36.812	1.701	40.0	375	6.80	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
15.002	3.095	218.8	58.4	1.303	1.286	0.431	0.0	105	2.631
15.003	3.565	393.8	73.3	1.286	1.270	0.541	0.0	109	2.751
15.004	2.432	386.8	73.3	1.270	1.246	0.541	0.0	132	1.892
15.005	2.432	386.8	84.4	1.246	1.291	0.623	0.0	142	1.962
15.006	2.432	386.8	91.5	1.291	1.333	0.675	0.0	148	2.006
15.007	2.274	361.7	108.1	1.333	1.297	0.798	0.0	168	1.998
15.008	3.279	521.5	116.3	1.297	1.275	0.858	0.0	144	2.663
1.021	7.246	3201.0	734.9	1.275	1.278	5.912	0.0	243	5.945
1.022	7.402	4709.2	743.5	1.278	1.429	6.001	0.0	239	5.484
1.023	5.467	3478.0	746.7	1.429	1.603	6.057	0.0	281	4.406
17.000	2.508	99.7	11.2	1.200	1.603	0.083	0.0	51	1.671
1.024	1.984	1718.0	732.9	1.603	0.650	6.140	0.0	478	1.909
18.000	2.627	104.5	13.6	1.200	1.225	0.100	0.0	54	1.818
18.001	2.682	106.6	25.5	1.225	1.235	0.188	0.0	74	2.206
18.002	3.247	129.1	35.9	1.235	1.865	0.265	0.0	81	2.798
19.000	2.939	116.8	22.5	1.200	1.328	0.166	0.0	66	2.279
19.001	1.759	124.3	22.5	1.328	1.865	0.166	0.0	86	1.344
18.003	3.157	223.1	66.0	1.865	1.333	0.487	0.0	112	2.763
18.004	4.067	449.2	86.3	1.333	1.356	0.637	0.0	111	3.172
18.005	4.067	449.2	95.7	1.356	1.362	0.706	0.0	117	3.258
18.006	4.067	449.2	95.7	1.362	1.351	0.706	0.0	117	3.258
18.007	4.067	449.2	106.4	1.351	1.318	0.785	0.0	123	3.352
18.008	3.318	366.5	117.9	1.318	1.307	0.870	0.0	146	2.972
18.009	2.872	317.2	117.9	1.307	1.308	0.870	0.0	158	2.666

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
18.010	91	92	21.507	0.600	36.737	36.558	0.179	120.0	450	7.00	50.0
18.011	92	93	27.702	0.600	36.408	36.269	0.139	200.0	600	7.27	50.0
18.012	93	94	27.215	0.600	36.269	36.133	0.136	200.0	600	7.53	50.0
18.013	94	95	80.747	0.600	36.133	35.729	0.404	200.0	600	8.31	50.0
27.000	30	125	6.000	0.600	35.242	35.230	0.012	500.0	900	5.07	50.0
27.001	125	126	19.055	0.600	35.177	35.090	0.087	220.0	300	5.37	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
18.010	1.855	294.9	128.2	1.308	1.309	0.946	0.0	207	1.791
18.011	1.718	485.8	137.3	1.309	1.802	1.013	0.0	217	1.486
18.012	1.718	485.8	137.3	1.802	2.261	1.013	0.0	217	1.486
18.013	1.718	485.8	143.7	2.261	0.971	1.060	0.0	222	1.504
27.000	1.394	886.9	0.0	0.658	0.670	0.000	0.0	0	0.000
27.001	1.056	74.6	0.0	1.323	0.610	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	23.687	44.7	225	Circular_Default Sewer Type	66.085	64.300	1.560	65.510	63.770	1.515
2.000	11.263	80.0	225	Circular_Default Sewer Type	65.336	63.911	1.200	65.510	63.770	1.515
1.001	21.650	100.0	225	Circular_Default Sewer Type	65.510	61.500	3.785	65.324	61.284	3.815
1.002	53.037	150.0	300	Circular_Default Sewer Type	65.324	61.209	3.815	64.840	60.855	3.685
3.000	53.107	150.0	300	Circular_Default Sewer Type	64.265	62.650	1.315	64.840	62.296	2.244
1.003	15.153	24.5	375	Circular_Default Sewer Type	64.840	60.780	3.685	64.650	60.162	4.113
4.000	22.588	150.0	225	Circular_Default Sewer Type	64.578	63.153	1.200	64.645	63.002	1.418
5.000	23.591	44.2	225	Circular_Default Sewer Type	64.961	63.536	1.200	64.645	63.002	1.418
4.001	44.707	220.0	300	Circular_Default Sewer Type	64.645	60.925	3.420	64.000	60.722	2.978
4.002	43.761	220.0	300	Circular_Default Sewer Type	64.000	60.722	2.978	63.768	60.523	2.945
6.000	19.582	150.0	225	Circular_Default Sewer Type	63.523	62.098	1.200	63.768	61.967	1.576
4.003	20.666	220.0	375	Circular_Default Sewer Type	63.768	60.448	2.945	64.076	60.354	3.347
4.004	42.186	220.0	375	Circular_Default Sewer Type	64.076	60.354	3.347	64.650	60.162	4.113
1.004	42.160	300.0	525	Circular_Default Sewer Type	64.650	60.012	4.113	64.017	59.871	3.621

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1500	Manhole	Adoptable	2	1200	Manhole	Adoptable
2.000	127	1500	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1500	Manhole	Adoptable
3.000	31	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
1.003	4	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
4.000	32	1500	Manhole	Adoptable	33	1200	Manhole	Adoptable
5.000	37	1500	Manhole	Adoptable	33	1200	Manhole	Adoptable
4.001	33	1200	Manhole	Adoptable	34	1200	Manhole	Adoptable
4.002	34	1200	Manhole	Adoptable	35	1500	Manhole	Adoptable
6.000	38	1200	Manhole	Adoptable	35	1500	Manhole	Adoptable
4.003	35	1500	Manhole	Adoptable	36	1500	Manhole	Adoptable
4.004	36	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
1.004	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.005	12.025	300.0	525	Circular_Default Sewer Type	64.017	59.871	3.621	63.718	59.831	3.362
7.000	18.850	18.0	225	Circular_Default Sewer Type	65.362	63.800	1.337	64.458	62.753	1.480
7.001	67.298	57.6	300	Circular_Default Sewer Type	64.458	62.678	1.480	63.096	61.509	1.287
8.000	24.953	100.0	225	Circular_Default Sewer Type	65.516	64.091	1.200	65.710	63.841	1.644
9.000	18.333	28.2	225	Circular_Default Sewer Type	65.916	64.491	1.200	65.710	63.841	1.644
8.001	57.953	45.0	300	Circular_Default Sewer Type	65.710	63.766	1.644	64.246	62.478	1.468
8.002	17.801	120.0	375	Circular_Default Sewer Type	64.246	62.403	1.468	63.886	62.255	1.256
8.003	80.879	150.0	450	Circular_Default Sewer Type	63.886	62.180	1.256	63.959	61.641	1.868
10.000	21.251	80.0	225	Circular_Default Sewer Type	65.334	63.909	1.200	65.887	63.643	2.019
10.001	58.394	32.9	225	Circular_Default Sewer Type	65.887	63.643	2.019	63.959	61.866	1.868
8.004	19.571	120.0	450	Circular_Default Sewer Type	63.959	61.641	1.868	63.484	61.478	1.556
8.005	14.327	120.0	450	Circular_Default Sewer Type	63.484	61.478	1.556	63.096	61.359	1.287
7.002	32.483	80.0	450	Circular_Default Sewer Type	63.096	61.359	1.287	62.679	60.953	1.276
7.003	37.387	22.0	525	Circular_Default Sewer Type	62.679	60.878	1.276	61.017	59.179	1.313
7.004	15.280	50.0	600	Circular_Default Sewer Type	61.017	59.104	1.313	60.638	58.798	1.240
7.005	37.112	350.0	750	Circular_Default Sewer Type	60.638	58.648	1.240	61.602	58.542	2.310
7.006	26.487	350.0	750	Circular_Default Sewer Type	61.602	58.542	2.310	62.478	58.466	3.262
7.007	30.615	350.0	750	Circular_Default Sewer Type	62.478	58.466	3.262	63.490	58.379	4.361
7.008	16.069	341.9	750	Circular_Default Sewer Type	63.490	58.379	4.361	63.718	58.332	4.636
1.006	22.278	350.0	900	Circular_Default Sewer Type	63.718	58.182	4.636	63.177	58.118	4.159
1.007	50.427	350.0	900	Circular_Default Sewer Type	63.177	58.118	4.159	61.999	57.974	3.125
1.008	36.622	200.0	900	Circular_Default Sewer Type	61.999	57.974	3.125	61.013	57.791	2.322
11.000	28.685	60.0	225	Circular_Default Sewer Type	62.810	61.385	1.200	62.400	60.907	1.268
11.001	66.538	31.0	300	Circular_Default Sewer Type	62.400	60.832	1.268	60.223	58.686	1.237
11.002	5.569	150.0	300	Circular_Default Sewer Type	60.223	58.686	1.237	60.155	58.649	1.206

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.005	6	1500	Manhole	Adoptable	7	1800	Manhole	Adoptable
7.000	39	1500	Manhole	Adoptable	41	1200	Manhole	Adoptable
7.001	41	1200	Manhole	Adoptable	42	1800	Manhole	Adoptable
8.000	49	1200	Manhole	Adoptable	50	1200	Manhole	Adoptable
9.000	55	1200	Manhole	Adoptable	50	1200	Manhole	Adoptable
8.001	50	1200	Manhole	Adoptable	51	1500	Manhole	Adoptable
8.002	51	1500	Manhole	Adoptable	52	1800	Manhole	Adoptable
8.003	52	1800	Manhole	Adoptable	53	1500	Manhole	Adoptable
10.000	56	1200	Manhole	Adoptable	57	1200	Manhole	Adoptable
10.001	57	1200	Manhole	Adoptable	53	1500	Manhole	Adoptable
8.004	53	1500	Manhole	Adoptable	54	1500	Manhole	Adoptable
8.005	54	1500	Manhole	Adoptable	42	1800	Manhole	Adoptable
7.002	42	1800	Manhole	Adoptable	43	1500	Manhole	Adoptable
7.003	43	1500	Manhole	Adoptable	44	1800	Manhole	Adoptable
7.004	44	1800	Manhole	Adoptable	45	1800	Manhole	Adoptable
7.005	45	1800	Manhole	Adoptable	46	1800	Manhole	Adoptable
7.006	46	1800	Manhole	Adoptable	47	1800	Manhole	Adoptable
7.007	47	1800	Manhole	Adoptable	48	1800	Manhole	Adoptable
7.008	48	1800	Manhole	Adoptable	7	1800	Manhole	Adoptable
1.006	7	1800	Manhole	Adoptable	8	1800	Manhole	Adoptable
1.007	8	1800	Manhole	Adoptable	9	1800	Manhole	Adoptable
1.008	9	1800	Manhole	Adoptable	10	1800	Manhole	Adoptable
11.000	58	1200	Manhole	Adoptable	59	1200	Manhole	Adoptable
11.001	59	1200	Manhole	Adoptable	60	1200	Manhole	Adoptable
11.002	60	1200	Manhole	Adoptable	61	1500	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
11.003	45.870	177.8	375	Circular_Default Sewer Type	60.155	58.574	1.206	61.013	58.316	2.322
1.009	29.779	200.0	900	Circular_Default Sewer Type	61.013	57.791	2.322	60.269	57.642	1.727
1.010	45.329	24.0	750	Circular_Default Sewer Type	60.269	57.642	1.877	57.832	55.753	1.329
1.011	20.441	16.0	750	Circular_Default Sewer Type	57.832	55.753	1.329	56.499	54.475	1.274
1.012	16.505	16.0	750	Circular_Default Sewer Type	56.499	54.475	1.274	55.453	53.443	1.260
1.013	17.998	13.8	750	Circular_Default Sewer Type	55.453	53.443	1.260	54.227	52.139	1.338
12.000	34.190	19.0	225	Circular_Default Sewer Type	61.089	59.664	1.200	59.628	57.865	1.538
12.001	34.859	40.0	300	Circular_Default Sewer Type	59.628	57.790	1.538	58.527	56.919	1.308
12.002	42.481	60.0	300	Circular_Default Sewer Type	58.527	56.919	1.308	57.820	56.211	1.309
12.003	28.345	80.0	375	Circular_Default Sewer Type	57.820	56.136	1.309	57.536	55.782	1.379
12.004	14.920	80.0	375	Circular_Default Sewer Type	57.536	55.782	1.379	57.535	55.595	1.565
13.000	18.307	27.9	225	Circular_Default Sewer Type	57.925	56.400	1.300	57.535	55.745	1.565
12.005	43.990	27.0	375	Circular_Default Sewer Type	57.535	55.595	1.565	55.875	53.966	1.534
12.006	26.010	28.6	375	Circular_Default Sewer Type	55.875	53.966	1.534	55.021	53.058	1.588
14.000	11.095	100.0	225	Circular_Default Sewer Type	54.744	53.319	1.200	55.021	53.208	1.588
12.007	16.318	100.0	450	Circular_Default Sewer Type	55.021	52.983	1.588	55.430	52.820	2.160
12.008	56.080	147.2	450	Circular_Default Sewer Type	55.430	52.820	2.160	54.227	52.439	1.338
1.014	16.899	15.0	750	Circular_Default Sewer Type	54.227	52.139	1.338	53.048	51.012	1.286
1.015	17.299	15.0	750	Circular_Default Sewer Type	53.048	51.012	1.286	51.857	49.859	1.248
1.016	21.312	15.0	750	Circular_Default Sewer Type	51.857	49.859	1.248	50.419	48.438	1.231
1.017	38.493	14.0	750	Circular_Default Sewer Type	50.419	48.438	1.231	47.811	45.688	1.373
1.018	44.374	25.0	750	Circular_Default Sewer Type	47.811	45.688	1.373	46.210	43.913	1.547
1.019	32.508	25.0	750	Circular_Default Sewer Type	46.210	43.913	1.547	44.663	42.613	1.300
1.020	29.577	15.0	750	Circular_Default Sewer Type	44.663	42.613	1.300	42.666	40.641	1.275
15.000	45.969	18.0	225	Circular_Default Sewer Type	50.714	49.000	1.489	48.148	46.446	1.477

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
11.003	61	1500	Manhole	Adoptable	10	1800	Manhole	Adoptable
1.009	10	1800	Manhole	Adoptable	11	1800	Manhole	Adoptable
1.010	11	1800	Manhole	Adoptable	12	1800	Manhole	Adoptable
1.011	12	1800	Manhole	Adoptable	13	1800	Manhole	Adoptable
1.012	13	1800	Manhole	Adoptable	14	1800	Manhole	Adoptable
1.013	14	1800	Manhole	Adoptable	15	1800	Manhole	Adoptable
12.000	62	1500	Manhole	Adoptable	63	1200	Manhole	Adoptable
12.001	63	1200	Manhole	Adoptable	64	1200	Manhole	Adoptable
12.002	64	1200	Manhole	Adoptable	65	1500	Manhole	Adoptable
12.003	65	1500	Manhole	Adoptable	66	1500	Manhole	Adoptable
12.004	66	1500	Manhole	Adoptable	67	1500	Manhole	Adoptable
13.000	70	1200	Manhole	Adoptable	67	1500	Manhole	Adoptable
12.005	67	1500	Manhole	Adoptable	68	1500	Manhole	Adoptable
12.006	68	1500	Manhole	Adoptable	69	1800	Manhole	Adoptable
14.000	71	1200	Manhole	Adoptable	69	1800	Manhole	Adoptable
12.007	69	1800	Manhole	Adoptable	26	1500	Manhole	Adoptable
12.008	26	1500	Manhole	Adoptable	15	1800	Manhole	Adoptable
1.014	15	1800	Manhole	Adoptable	16	1800	Manhole	Adoptable
1.015	16	1800	Manhole	Adoptable	17	1800	Manhole	Adoptable
1.016	17	1800	Manhole	Adoptable	18	1800	Manhole	Adoptable
1.017	18	1800	Manhole	Adoptable	19	1800	Manhole	Adoptable
1.018	19	1800	Manhole	Adoptable	20	1800	Manhole	Adoptable
1.019	20	1800	Manhole	Adoptable	21	1800	Manhole	Adoptable
1.020	21	1800	Manhole	Adoptable	22	1800	Manhole	Adoptable
15.000	27	1200	Manhole	Adoptable	28	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
16.000	12.136	26.3	225	Circular_Default Sewer Type	48.333	46.908	1.200	48.148	46.446	1.477
15.001	7.537	80.0	300	Circular_Default Sewer Type	48.148	46.371	1.477	47.880	46.277	1.303
15.002	51.363	26.0	300	Circular_Default Sewer Type	47.880	46.277	1.303	45.888	44.302	1.286
15.003	29.513	26.0	375	Circular_Default Sewer Type	45.888	44.227	1.286	44.737	43.092	1.270
15.004	17.319	70.0	450	Circular_Default Sewer Type	44.737	43.017	1.270	44.466	42.770	1.246
15.005	16.492	70.0	450	Circular_Default Sewer Type	44.466	42.770	1.246	44.275	42.534	1.291
15.006	24.071	70.0	450	Circular_Default Sewer Type	44.275	42.534	1.291	43.973	42.190	1.333
15.007	46.683	80.0	450	Circular_Default Sewer Type	43.973	42.190	1.333	43.353	41.606	1.297
15.008	25.684	38.6	450	Circular_Default Sewer Type	43.353	41.606	1.297	42.666	40.941	1.275
1.021	27.891	15.0	750	Circular_Default Sewer Type	42.666	40.641	1.275	40.810	38.782	1.278
1.022	29.419	18.0	900	Circular_Default Sewer Type	40.810	38.632	1.278	39.327	36.998	1.429
1.023	32.497	33.0	900	Circular_Default Sewer Type	39.327	36.998	1.429	38.515	36.012	1.603
17.000	24.151	27.4	225	Circular_Default Sewer Type	38.993	37.568	1.200	38.515	36.687	1.603
1.024	78.640	300.0	1050	Circular_Default Sewer Type	38.515	35.862	1.603	37.300	35.600	0.650
18.000	38.596	25.0	225	Circular_Default Sewer Type	52.928	51.503	1.200	51.409	49.959	1.225
18.001	19.506	24.0	225	Circular_Default Sewer Type	51.409	49.959	1.225	50.606	49.146	1.235
18.002	30.854	16.4	225	Circular_Default Sewer Type	50.606	49.146	1.235	49.354	47.264	1.865
19.000	61.678	20.0	225	Circular_Default Sewer Type	51.908	50.483	1.200	48.952	47.399	1.328
19.001	10.770	80.0	300	Circular_Default Sewer Type	48.952	47.324	1.328	49.354	47.189	1.865
18.003	59.370	25.0	300	Circular_Default Sewer Type	49.354	47.189	1.865	46.447	44.814	1.333
18.004	39.910	20.0	375	Circular_Default Sewer Type	46.447	44.739	1.333	44.475	42.744	1.356
18.005	21.452	20.0	375	Circular_Default Sewer Type	44.475	42.744	1.356	43.408	41.671	1.362
18.006	21.824	20.0	375	Circular_Default Sewer Type	43.408	41.671	1.362	42.306	40.580	1.351
18.007	23.331	20.0	375	Circular_Default Sewer Type	42.306	40.580	1.351	41.106	39.413	1.318
18.008	27.000	30.0	375	Circular_Default Sewer Type	41.106	39.413	1.318	40.195	38.513	1.307

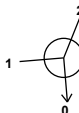
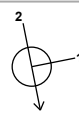
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
16.000	79	1200	Manhole	Adoptable	28	1200	Manhole	Adoptable
15.001	28	1200	Manhole	Adoptable	72	1200	Manhole	Adoptable
15.002	72	1200	Manhole	Adoptable	73	1500	Manhole	Adoptable
15.003	73	1500	Manhole	Adoptable	74	1500	Manhole	Adoptable
15.004	74	1500	Manhole	Adoptable	75	1500	Manhole	Adoptable
15.005	75	1500	Manhole	Adoptable	76	1500	Manhole	Adoptable
15.006	76	1500	Manhole	Adoptable	77	1500	Manhole	Adoptable
15.007	77	1500	Manhole	Adoptable	78	1500	Manhole	Adoptable
15.008	78	1500	Manhole	Adoptable	22	1800	Manhole	Adoptable
1.021	22	1800	Manhole	Adoptable	23	1800	Manhole	Adoptable
1.022	23	1800	Manhole	Adoptable	24	1800	Manhole	Adoptable
1.023	24	1800	Manhole	Adoptable	25	1950	Manhole	Adoptable
17.000	80	1200	Manhole	Adoptable	25	1950	Manhole	Adoptable
1.024	25	1950	Manhole	Adoptable	29	1950	Manhole	Adoptable
18.000	81	1200	Manhole	Adoptable	82	1200	Manhole	Adoptable
18.001	82	1200	Manhole	Adoptable	83	1200	Manhole	Adoptable
18.002	83	1200	Manhole	Adoptable	84	1200	Manhole	Adoptable
19.000	96	1200	Manhole	Adoptable	97	1200	Manhole	Adoptable
19.001	97	1200	Manhole	Adoptable	84	1200	Manhole	Adoptable
18.003	84	1200	Manhole	Adoptable	85	1500	Manhole	Adoptable
18.004	85	1500	Manhole	Adoptable	86	1500	Manhole	Adoptable
18.005	86	1500	Manhole	Adoptable	87	1500	Manhole	Adoptable
18.006	87	1500	Manhole	Adoptable	88	1500	Manhole	Adoptable
18.007	88	1500	Manhole	Adoptable	89	1500	Manhole	Adoptable
18.008	89	1500	Manhole	Adoptable	90	1500	Manhole	Adoptable

Pipeline Schedule

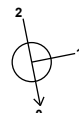
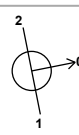
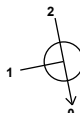
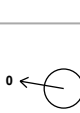
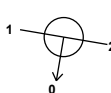
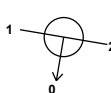
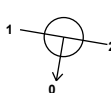
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
18.009	68.047	40.0	375	Circular_Default Sewer Type	40.195	38.513	1.307	38.495	36.812	1.308
18.010	21.507	120.0	450	Circular_Default Sewer Type	38.495	36.737	1.308	38.317	36.558	1.309
18.011	27.702	200.0	600	Circular_Default Sewer Type	38.317	36.408	1.309	38.671	36.269	1.802
18.012	27.215	200.0	600	Circular_Default Sewer Type	38.671	36.269	1.802	38.994	36.133	2.261
18.013	80.747	200.0	600	Circular_Default Sewer Type	38.994	36.133	2.261	37.300	35.729	0.971
27.000	6.000	500.0	900	Circular_Default Sewer Type	36.800	35.242	0.658	36.800	35.230	0.670
27.001	19.055	220.0	300	Circular_Default Sewer Type	36.800	35.177	1.323	36.000	35.090	0.610

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
18.009	90	1500	Manhole	Adoptable	91	1500	Manhole	Adoptable
18.010	91	1500	Manhole	Adoptable	92	1500	Manhole	Adoptable
18.011	92	1500	Manhole	Adoptable	93	1500	Manhole	Adoptable
18.012	93	1500	Manhole	Adoptable	94	1500	Manhole	Adoptable
18.013	94	1500	Manhole	Adoptable	95	1500	Manhole	Adoptable
27.000	30	1800	Manhole	Adoptable	125	1800	Manhole	Adoptable
27.001	125	1800	Manhole	Adoptable	126	1200	Manhole	Adoptable

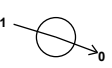
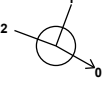
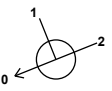
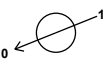
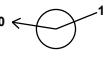
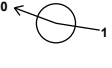
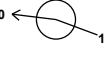
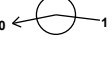
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	440202.830	405258.642	66.085	1.785	1500		0	1.000	64.300	225
127	440182.788	405235.724	65.336	1.425	1500		0	2.000	63.911	225
2	440194.012	405236.657	65.510	4.010	1200		1	2.000	63.770	225
							2	1.000	63.770	225
							0	1.001	61.500	225
3	440195.807	405215.082	65.324	4.115	1200		1	1.001	61.284	225
							0	1.002	61.209	300
31	440258.240	405173.425	64.265	1.615	1500		0	3.000	62.650	300
4	440206.154	405163.064	64.840	4.060	1500		1	3.000	62.296	300
							2	1.002	60.855	300
							0	1.003	60.780	375
32	440125.800	405244.862	64.578	1.425	1500		0	4.000	63.153	225

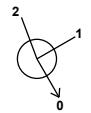
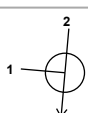
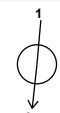
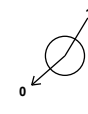
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
37	440153.345	405227.311	64.961	1.425	1500		0	5.000	63.536	225
33	440130.207	405222.708	64.645	3.720	1200		1 2 0	5.000 4.000	63.002	225
34	440138.929	405178.860	64.000	3.278	1200		1 0	4.001 4.002	60.925	300
38	440151.286	405116.734	63.523	1.425	1200		0	4.001	60.722	300
35	440147.466	405135.940	63.768	3.320	1500		1 2 0	6.000 4.002	62.098	225
36	440167.735	405139.972	64.076	3.722	1500		1 0	6.000 4.003	61.967	300
5	440209.110	405148.202	64.650	4.638	1500		1 2 0	4.003 4.004	60.523	375
6	440217.335	405106.852	64.017	4.146	1500		1 0	4.003 4.004	60.448	375
39	440479.861	405157.536	65.362	1.562	1500		0	4.004	60.354	375
41	440468.975	405142.147	64.458	1.780	1200		1 0	4.004 1.003	60.162	375
49	440325.575	405226.388	65.516	1.425	1200		1 0	1.003 1.004	60.162	525
55	440282.895	405233.605	65.916	1.425	1200		0	1.004 1.005	60.012	525
50	440300.971	405230.548	65.710	1.944	1200		0	1.005	59.871	525
							0	7.000	63.800	225
							1 0	7.000 7.001	62.753	225
							0	7.001	62.678	300
							0	8.000	64.091	225
							0	9.000	64.491	225
							1 2 0	9.000 8.000	63.841	225
							1 2 0	8.000 8.001	63.841	225
							1 2 0	8.001	63.766	300

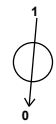
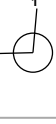
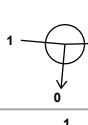
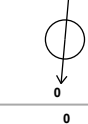
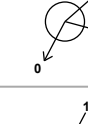
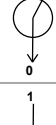
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
51	440291.308	405173.406	64.246	1.843	1500	 1	8.001	62.478	300
						0	8.002	62.403	375
52	440308.336	405168.216	63.886	1.706	1800	 1	8.002	62.255	375
						0	8.003	62.180	450
56	440425.051	405189.269	65.334	1.425	1200	 0			
						0	10.000	63.909	225
57	440404.509	405194.711	65.887	2.244	1200	 1	10.000	63.643	225
						0	10.001	63.643	225
53	440384.129	405139.989	63.959	2.318	1500	 1 2	10.001	61.866	225
						2	8.003	61.641	450
						0	8.004	61.641	450
54	440401.182	405130.385	63.484	2.006	1500	 1	8.004	61.478	450
						0	8.005	61.478	450
42	440406.517	405117.088	63.096	1.737	1800	 1 2	8.005	61.359	450
						2	7.001	61.509	300
						0	7.002	61.359	450
43	440376.373	405104.984	62.679	1.801	1500	 1	7.002	60.953	450
						0	7.003	60.878	525
44	440341.671	405091.071	61.017	1.913	1800	 1	7.003	59.179	525
						0	7.004	59.104	600
45	440326.576	405093.441	60.638	1.990	1800	 1	7.004	58.798	600
						0	7.005	58.648	750
46	440291.788	405106.367	61.602	3.060	1800	 1	7.005	58.542	750
						0	7.006	58.542	750
47	440265.497	405109.581	62.478	4.012	1800	 1	7.006	58.466	750
						0	7.007	58.466	750
48	440235.470	405103.609	63.490	5.111	1800	 1	7.007	58.379	750
						0	7.008	58.379	750

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
7	440221.546	405095.588	63.718	5.536	1800		1	7.008	58.332	750
							2	1.005	59.831	525
							0	1.006	58.182	900
8	440232.666	405076.284	63.177	5.059	1800		1	1.006	58.118	900
							0	1.007	58.118	900
9	440242.043	405026.737	61.999	4.025	1800		1	1.007	57.974	900
							0	1.008	57.974	900
58	440204.706	405069.310	62.810	1.425	1200					
							0	11.000	61.385	225
59	440176.572	405063.714	62.400	1.568	1200		1	11.000	60.907	225
							0	11.001	60.832	300
60	440189.553	404998.455	60.223	1.537	1200		1	11.001	58.686	300
							0	11.002	58.686	300
61	440193.130	404994.186	60.155	1.581	1500		1	11.002	58.649	300
							0	11.003	58.574	375
10	440238.831	404990.256	61.013	3.222	1800		1	11.003	58.316	375
							2	1.008	57.791	900
11	440236.219	404960.592	60.269	2.627	1800		0	1.009	57.791	900
							1	1.009	57.642	900
12	440232.243	404915.438	57.832	2.079	1800		1	1.010	57.642	750
							0	1.010	55.753	750
13	440230.056	404895.114	56.499	2.024	1800		1	1.011	54.475	750
							0	1.012	54.475	750
14	440221.525	404880.985	55.453	2.010	1800		1	1.012	53.443	750
							0	1.013	53.443	750
62	440274.673	405031.441	61.089	1.425	1500					
							0	12.000	59.664	225

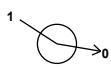
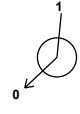
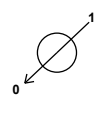
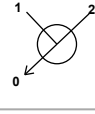
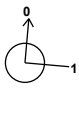
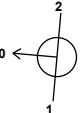
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
63	440308.731	405028.442	59.628	1.838	1200		1	12.000	57.865	225
64	440305.673	404993.717	58.527	1.608	1200		0	12.001	57.790	300
							1	12.001	56.919	300
65	440301.947	404951.400	57.820	1.684	1500		0	12.002	56.919	300
							1	12.002	56.211	300
66	440299.461	404923.164	57.536	1.754	1500		0	12.003	56.136	375
							1	12.003	55.782	375
70	440266.309	404924.407	57.925	1.525	1200		0	12.004	55.782	375
							0	13.000	56.400	225
67	440284.545	404922.801	57.535	1.940	1500		1	13.000	55.745	225
							2	12.004	55.595	375
68	440280.686	404878.981	55.875	1.909	1500		0	12.005	55.595	375
							1	12.005	53.966	375
71	440277.432	404842.019	54.744	1.425	1200		0	12.006	53.966	375
							0	14.000	53.319	225
69	440278.405	404853.071	55.021	2.038	1800		1	14.000	53.208	225
							2	12.006	53.058	375
26	440262.153	404854.535	55.430	2.610	1500		0	12.007	52.983	450
							1	12.007	52.820	450
15	440208.000	404869.110	54.227	2.088	1800		0	12.008	52.820	450
							1	12.008	52.439	450
16	440200.127	404854.157	53.048	2.036	1800		2	1.013	52.139	750
							0	1.014	52.139	750
17	440199.951	404836.859	51.857	1.998	1800		0	1.014	51.012	750
							1	1.014	51.012	750
17	440199.951	404836.859	51.857	1.998	1800		0	1.015	51.012	750
							1	1.015	49.859	750
17	440199.951	404836.859	51.857	1.998	1800		0	1.016	49.859	750
							0	1.016	49.859	750

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
18	440209.235	404817.676	50.419	1.981	1800	1 0	1	1.016	48.438	750
						0	0	1.017	48.438	750
19	440228.935	404784.606	47.811	2.123	1800	1 0	1	1.017	45.688	750
						0	0	1.018	45.688	750
20	440266.797	404761.465	46.210	2.297	1800	1 0	1	1.018	43.913	750
						0	0	1.019	43.913	750
21	440251.633	404732.710	44.663	2.050	1800	1 0	1	1.019	42.613	750
						0	0	1.020	42.613	750
27	440155.001	404867.584	50.714	1.714	1200	0				
						0	0	15.000	49.000	225
79	440107.505	404869.719	48.333	1.425	1200	0				
						0	0	16.000	46.908	225
28	440110.073	404857.858	48.148	1.777	1200	1 2 0	1	16.000	46.446	225
						2	2	15.000	46.446	225
						0	0	15.001	46.371	300
72	440111.576	404850.472	47.880	1.603	1200	1 0	1	15.001	46.277	300
						0	0	15.002	46.277	300
73	440138.674	404806.839	45.888	1.661	1500	1 0	1	15.002	44.302	300
						0	0	15.003	44.227	375
74	440150.924	404779.988	44.737	1.720	1500	1 0	1	15.003	43.092	375
						0	0	15.004	43.017	450
75	440159.315	404764.838	44.466	1.696	1500	1 0	1	15.004	42.770	450
						0	0	15.005	42.770	450
76	440168.366	404751.051	44.275	1.741	1500	1 0	1	15.005	42.534	450
						0	0	15.006	42.534	450
77	440184.251	404732.965	43.973	1.783	1500	1 0	1	15.006	42.190	450
						0	0	15.007	42.190	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
78	440223.405	404707.543	43.353	1.747	1500		1	15.007	41.606	450
							0	15.008	41.606	450
22	440248.732	404703.276	42.666	2.025	1800		1	15.008	40.941	450
							2	1.020	40.641	750
							0	1.021	40.641	750
23	440245.996	404675.520	40.810	2.178	1800		1	1.021	38.782	750
							0	1.022	38.632	900
24	440224.636	404655.291	39.327	2.329	1800		1	1.022	36.998	900
							0	1.023	36.998	900
80	440184.434	404650.481	38.993	1.425	1200		0	17.000	37.568	225
25	440201.041	404632.946	38.515	2.653	1950		1	17.000	36.687	225
							2	1.023	36.012	900
							0	1.024	35.862	1050
29	440143.943	404578.872	37.300	1.942	1950		1	1.024	35.600	1050
81	440102.807	405015.180	52.928	1.425	1200		0	18.000	51.503	225
82	440111.766	404977.638	51.409	1.450	1200		1	18.000	49.959	225
							0	18.001	49.959	225
83	440115.380	404958.470	50.606	1.460	1200		1	18.001	49.146	225
							0	18.002	49.146	225
96	440173.169	404911.597	51.908	1.425	1200		0	19.000	50.483	225
97	440111.729	404917.007	48.952	1.628	1200		1	19.000	47.399	225
							0	19.001	47.324	300
84	440112.674	404927.735	49.354	2.165	1200		1	19.001	47.189	300
							2	18.002	47.264	225
							0	18.003	47.189	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
85	440053.533	404932.943	46.447	1.708	1500	 1	18.003	44.814	300
86	440050.032	404893.187	44.475	1.731	1500	 1	18.004	44.739	375
87	440046.532	404872.022	43.408	1.737	1500	 1	18.005	42.744	375
88	440048.108	404850.255	42.306	1.726	1500	 1	18.006	41.671	375
89	440053.981	404827.675	41.106	1.693	1500	 1	18.007	40.580	375
90	440068.537	404804.935	40.195	1.682	1500	 1	18.008	39.413	375
91	440102.303	404745.857	38.495	1.758	1500	 1	18.009	38.513	375
92	440110.995	404726.185	38.317	1.909	1500	 1	18.010	36.737	450
93	440127.211	404703.725	38.671	2.402	1500	 1	18.011	36.558	450
94	440146.380	404684.406	38.994	2.861	1500	 1	18.012	36.408	600
95	440111.956	404611.364	37.300	1.942	1500	 1	18.013	36.269	600
30	440147.998	404565.910	36.800	1.558	1800	 1	18.012	36.269	600
125	440153.563	404563.666	36.800	1.623	1800	 1	18.013	36.133	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						 1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600
						1	18.013	35.729	600

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
126	440171.236	404556.542	36.000	0.910	1200	1 	27.001	35.090	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	19.000	Starting Level (m)	
Ratio-R	0.400	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Detailed		

Storm Durations

15	60	180	360	600	960	2160	4320	7200
30	120	240	480	720	1440	2880	5760	8640

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 125 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	35.177	Product Number	CTL-SHE-0256-3610-1000-3610
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	36.1	Min Node Diameter (mm)	1800

Node 30 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	58.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	35.242	Main Channel Slope (1:X)	500.0
Safety Factor	2.0	Time to half empty (mins)	165	Main Channel n	0.030

Inlets

95	29
----	----

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	6687.0	0.0	1.500	8273.0	0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	64.608	0.308	82.6	1.0247	0.0000	SURCHARGED
15 minute winter	127	12	64.003	0.092	7.1	0.1788	0.0000	OK
15 minute winter	2	12	64.012	2.512	97.9	3.1428	0.0000	SURCHARGED
15 minute winter	3	12	63.165	1.956	163.7	3.5140	0.0000	SURCHARGED
15 minute winter	31	11	63.132	0.482	120.5	2.0615	0.0000	SURCHARGED
15 minute winter	4	11	61.919	1.139	320.8	2.5173	0.0000	SURCHARGED
15 minute winter	32	10	63.286	0.133	26.1	0.3163	0.0000	OK
15 minute winter	37	10	63.664	0.128	44.6	0.3614	0.0000	OK
15 minute winter	33	12	62.889	1.964	85.3	2.5058	0.0000	SURCHARGED
15 minute winter	34	12	62.647	1.925	138.3	3.4452	0.0000	SURCHARGED
15 minute winter	38	10	62.195	0.097	15.4	0.1449	0.0000	OK
15 minute winter	35	12	61.925	1.477	153.0	2.7161	0.0000	SURCHARGED
15 minute winter	36	12	61.753	1.399	180.1	2.9075	0.0000	SURCHARGED
15 minute winter	5	11	61.321	1.309	528.8	2.6963	0.0000	SURCHARGED
15 minute winter	6	11	60.665	0.794	561.3	1.6488	0.0000	SURCHARGED
15 minute winter	39	11	63.931	0.131	55.3	0.3865	0.0000	OK
15 minute winter	41	12	63.585	0.907	135.8	2.4417	0.0000	SURCHARGED
15 minute winter	49	12	65.441	1.350	79.6	4.0662	0.0000	FLOOD RISK
15 minute winter	55	12	65.193	0.702	56.5	1.7286	0.0000	SURCHARGED
15 minute winter	50	12	65.031	1.265	153.7	2.3159	0.0000	SURCHARGED
15 minute winter	51	11	64.054	1.651	174.1	3.8857	0.0000	FLOOD RISK
15 minute winter	52	11	63.886	1.706	284.0	9.1407	4.1977	FLOOD
15 minute winter	56	12	65.334	1.425	52.3	3.3716	0.2417	FLOOD
15 minute winter	57	12	65.205	1.562	96.0	3.2969	0.0000	SURCHARGED
15 minute winter	53	12	63.374	1.733	343.8	3.4067	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	77.5	2.105	0.994	0.9421	
15 minute winter	127	2.000	2	9.6	0.964	0.165	0.3104	
15 minute winter	2	1.001	3	91.5	2.300	1.760	0.8610	
15 minute winter	3	1.002	4	158.8	2.256	1.754	3.7348	
15 minute winter	31	3.000	4	113.2	1.616	1.251	3.5836	
15 minute winter	4	1.003	5	315.9	2.864	0.779	1.6713	
15 minute winter	32	4.000	33	25.4	1.091	0.601	0.5287	
15 minute winter	37	5.000	33	43.9	1.961	0.559	0.5277	
15 minute winter	33	4.001	34	77.9	1.106	1.044	3.1482	
15 minute winter	34	4.002	35	131.5	1.867	1.762	3.0816	
15 minute winter	38	6.000	35	15.1	0.957	0.356	0.3089	
15 minute winter	35	4.003	36	153.1	1.389	1.139	2.2794	
15 minute winter	36	4.004	5	183.3	1.662	1.363	4.6530	
15 minute winter	5	1.004	6	531.6	2.461	1.907	9.1079	
15 minute winter	6	1.005	7	562.4	2.604	2.018	2.5515	
15 minute winter	39	7.000	41	53.2	2.508	0.432	0.6001	
15 minute winter	41	7.001	42	119.2	1.814	0.812	4.7391	
15 minute winter	49	8.000	50	63.7	1.603	1.226	0.9924	
15 minute winter	55	9.000	50	52.1	2.098	0.530	0.7291	
15 minute winter	50	8.001	51	144.0	2.436	0.867	4.0810	
15 minute winter	51	8.002	52	159.3	1.603	0.873	1.9634	
15 minute winter	52	8.003	53	249.9	1.577	0.948	12.8147	
15 minute winter	56	10.000	57	39.8	1.270	0.684	0.8452	
15 minute winter	57	10.001	53	86.7	2.358	0.953	2.3224	
15 minute winter	53	8.004	54	348.0	2.197	1.180	3.1009	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	54	12	63.040	1.562	372.3	3.7555	0.0000	SURCHARGED
15 minute winter	42	12	62.710	1.351	578.6	6.0820	0.0000	SURCHARGED
15 minute winter	43	12	61.271	0.393	602.8	0.9609	0.0000	OK
15 minute winter	44	12	60.466	1.362	649.5	4.9458	0.0000	SURCHARGED
15 minute winter	45	12	60.195	1.547	722.2	6.4264	0.0000	SURCHARGED
15 minute winter	46	12	60.002	1.460	736.2	4.0206	0.0000	SURCHARGED
15 minute winter	47	12	59.837	1.371	787.9	4.2537	0.0000	SURCHARGED
15 minute winter	48	12	59.631	1.252	787.5	3.1876	0.0000	SURCHARGED
15 minute winter	7	12	59.485	1.303	1361.9	3.4373	0.0000	SURCHARGED
15 minute winter	8	12	59.266	1.148	1392.8	3.2218	0.0000	SURCHARGED
15 minute winter	9	12	58.910	0.936	1417.7	2.6296	0.0000	SURCHARGED
15 minute winter	58	10	61.558	0.173	58.8	0.4359	0.0000	OK
15 minute winter	59	11	61.077	0.245	172.2	0.8812	0.0000	OK
15 minute winter	60	11	59.651	0.965	173.0	1.2414	0.0000	SURCHARGED
15 minute winter	61	11	59.366	0.792	234.3	2.5508	0.0000	SURCHARGED
15 minute winter	10	12	58.608	0.817	1670.8	2.3582	0.0000	OK
15 minute winter	11	12	58.160	0.518	1721.2	1.7436	0.0000	OK
15 minute winter	12	12	56.267	0.514	1739.2	1.5069	0.0000	OK
15 minute winter	13	12	55.037	0.562	1791.1	2.0614	0.0000	OK
15 minute winter	14	12	53.957	0.514	1790.6	1.3069	0.0000	OK
15 minute winter	62	11	59.826	0.162	91.4	0.6354	0.0000	OK
15 minute winter	63	12	58.886	1.096	154.3	2.5522	0.0000	SURCHARGED
15 minute winter	64	12	58.340	1.421	173.1	2.9326	0.0000	FLOOD RISK
15 minute winter	65	12	57.290	1.154	204.1	3.0817	0.0000	SURCHARGED
15 minute winter	66	12	56.943	1.161	245.2	3.3738	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	54	8.005	42	375.3	2.369	1.272	2.2700	
15 minute winter	42	7.002	43	572.6	3.614	1.583	5.0947	
15 minute winter	43	7.003	44	601.1	3.889	0.580	7.2801	
15 minute winter	44	7.004	45	647.8	2.422	0.664	4.3040	
15 minute winter	45	7.005	46	721.3	1.639	1.096	16.3338	
15 minute winter	46	7.006	47	735.8	1.672	1.118	11.6575	
15 minute winter	47	7.007	48	787.5	1.789	1.197	13.4743	
15 minute winter	48	7.008	7	790.4	1.796	1.187	7.0723	
15 minute winter	7	1.006	8	1362.1	2.149	1.283	14.1192	
15 minute winter	8	1.007	9	1393.0	2.198	1.312	31.9593	
15 minute winter	9	1.008	10	1417.5	2.252	1.007	22.6799	
15 minute winter	58	11.000	59	57.5	1.832	0.855	0.9142	
15 minute winter	59	11.001	60	165.9	2.414	0.828	4.3941	
15 minute winter	60	11.002	61	170.0	2.414	1.877	0.3922	
15 minute winter	61	11.003	10	232.0	2.104	1.549	4.9449	
15 minute winter	10	1.009	11	1671.0	3.333	1.188	14.6272	
15 minute winter	11	1.010	12	1720.6	5.336	0.680	14.6476	
15 minute winter	12	1.011	13	1738.1	5.165	0.561	6.9054	
15 minute winter	13	1.012	14	1790.6	5.317	0.578	5.5704	
15 minute winter	14	1.013	15	1789.2	4.829	0.536	6.6563	
15 minute winter	62	12.000	63	88.9	3.072	0.742	1.2021	
15 minute winter	63	12.001	64	131.3	2.109	0.745	2.4547	
15 minute winter	64	12.002	65	160.0	2.321	1.113	2.9915	
15 minute winter	65	12.003	66	193.3	1.784	0.863	3.1264	
15 minute winter	66	12.004	67	237.0	2.208	1.058	1.6456	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	70	12	56.699	0.299	41.6	0.6136	0.0000	SURCHARGED
15 minute winter	67	12	56.612	1.017	324.8	2.8549	0.0000	SURCHARGED
15 minute winter	68	12	55.308	1.342	344.5	3.2438	0.0000	SURCHARGED
15 minute winter	71	12	54.339	1.020	35.1	1.9991	0.0000	SURCHARGED
15 minute winter	69	12	54.294	1.311	403.0	4.2608	0.0000	SURCHARGED
15 minute winter	26	12	53.872	1.052	402.8	1.8584	0.0000	SURCHARGED
15 minute winter	15	12	52.816	0.677	2202.5	1.8651	0.0000	OK
15 minute winter	16	12	51.684	0.672	2216.4	1.9735	0.0000	OK
15 minute winter	17	12	50.488	0.629	2223.4	1.7826	0.0000	OK
15 minute winter	18	13	49.057	0.619	2267.3	2.2075	0.0000	OK
15 minute winter	19	13	47.258	1.570	2274.5	5.1625	0.0000	SURCHARGED
15 minute winter	20	14	45.158	1.245	2295.2	3.9810	0.0000	SURCHARGED
15 minute winter	21	14	43.475	0.862	2280.9	2.5545	0.0000	SURCHARGED
15 minute winter	27	10	49.136	0.136	85.5	0.3834	0.0000	OK
15 minute winter	79	12	47.336	0.428	58.2	1.0728	0.0000	SURCHARGED
15 minute winter	28	11	47.173	0.802	166.1	1.3848	0.0000	SURCHARGED
15 minute winter	72	11	46.910	0.633	233.1	1.7909	0.0000	SURCHARGED
15 minute winter	73	12	44.506	0.279	282.5	0.8626	0.0000	OK
15 minute winter	74	12	43.753	0.736	279.3	1.2996	0.0000	SURCHARGED
15 minute winter	75	12	43.543	0.773	318.0	2.1125	0.0000	SURCHARGED
15 minute winter	76	12	43.275	0.741	343.9	1.7531	0.0000	SURCHARGED
15 minute winter	77	13	42.964	0.774	406.2	2.4371	0.0000	SURCHARGED
15 minute winter	78	13	42.329	0.723	434.7	1.7745	0.0000	SURCHARGED
15 minute winter	22	14	41.852	1.211	2627.8	3.9297	0.0000	SURCHARGED
15 minute winter	23	13	39.729	1.097	2651.0	3.6882	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	70	13.000	67	41.0	2.115	0.415	0.7281	
15 minute winter	67	12.005	68	312.1	3.289	0.808	4.8520	
15 minute winter	68	12.006	69	340.4	3.086	0.908	2.8688	
15 minute winter	71	14.000	69	29.4	1.057	0.565	0.4413	
15 minute winter	69	12.007	26	402.8	2.543	1.246	2.5855	
15 minute winter	26	12.008	15	403.0	2.544	1.515	8.7555	
15 minute winter	15	1.014	16	2197.8	5.315	0.687	7.0490	
15 minute winter	16	1.015	17	2209.9	5.499	0.690	7.0071	
15 minute winter	17	1.016	18	2220.3	6.202	0.694	8.2822	
15 minute winter	18	1.017	19	2247.5	5.869	0.678	15.9560	
15 minute winter	19	1.018	20	2269.6	5.157	0.916	19.5299	
15 minute winter	20	1.019	21	2266.2	5.405	0.914	14.3074	
15 minute winter	21	1.020	22	2254.9	5.834	0.704	13.0175	
15 minute winter	27	15.000	28	84.9	2.350	0.689	1.4926	
15 minute winter	79	16.000	28	53.1	1.703	0.521	0.4827	
15 minute winter	28	15.001	72	152.5	2.166	1.226	0.5308	
15 minute winter	72	15.002	73	221.5	3.424	1.012	3.6169	
15 minute winter	73	15.003	74	279.3	3.326	0.709	2.9252	
15 minute winter	74	15.004	75	279.0	1.879	0.721	2.7441	
15 minute winter	75	15.005	76	319.7	2.033	0.827	2.6130	
15 minute winter	76	15.006	77	345.8	2.183	0.894	3.8139	
15 minute winter	77	15.007	78	406.2	2.583	1.123	7.3966	
15 minute winter	78	15.008	22	434.9	3.337	0.834	4.0695	
15 minute winter	22	1.021	23	2629.7	6.890	0.822	12.2754	
15 minute winter	23	1.022	24	2656.6	4.883	0.564	18.6450	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.63%

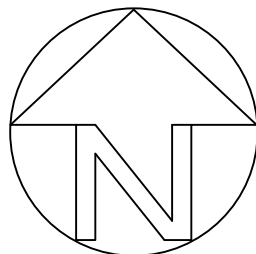
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	24	13	38.791	1.793	2672.7	5.4256	0.0000	SURCHARGED
15 minute winter	80	13	37.832	0.264	49.3	0.6058	0.0000	SURCHARGED
15 minute winter	25	13	37.773	1.911	2700.7	5.7071	0.0000	SURCHARGED
15 minute winter	29	14	36.906	1.548	2698.7	4.6223	0.0000	OK
15 minute winter	81	11	51.626	0.123	59.4	0.3115	0.0000	OK
15 minute winter	82	12	50.848	0.889	111.2	2.0853	0.0000	SURCHARGED
15 minute winter	83	12	50.130	0.984	140.6	2.1505	0.0000	SURCHARGED
15 minute winter	96	10	50.639	0.156	98.5	0.5395	0.0000	OK
15 minute winter	97	12	48.135	0.811	97.5	0.9174	0.0000	SURCHARGED
15 minute winter	84	12	48.037	0.848	238.4	1.3983	0.0000	SURCHARGED
15 minute winter	85	12	45.004	0.265	314.6	0.9338	0.0000	OK
15 minute winter	86	12	43.755	1.011	349.5	2.5921	0.0000	SURCHARGED
15 minute winter	87	12	42.947	1.276	337.9	2.2549	0.0000	SURCHARGED
15 minute winter	88	12	42.142	1.562	376.8	4.1895	0.0000	FLOOD RISK
15 minute winter	89	11	41.106	1.693	397.4	4.6913	5.6033	FLOOD
15 minute winter	90	11	39.960	1.447	359.7	2.5575	0.0000	FLOOD RISK
15 minute winter	91	11	37.473	0.736	399.6	1.9379	0.0000	SURCHARGED
15 minute winter	92	11	36.956	0.548	437.0	1.3524	0.0000	OK
15 minute winter	93	12	36.792	0.523	434.8	0.9236	0.0000	OK
15 minute winter	94	12	36.618	0.485	456.7	1.0164	0.0000	OK
720 minute winter	95	705	35.963	0.605	50.0	1.0696	0.0000	OK
720 minute winter	30	720	35.963	0.721	188.6	1.8356	0.0000	OK
960 minute winter	125	915	35.976	0.799	119.2	2.0341	0.0000	SURCHARGED
15 minute summer	126	1	35.090	0.000	36.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	24	1.023	25	2674.4	4.220	0.769	20.5957	
15 minute winter	80	17.000	25	49.4	2.361	0.496	0.9605	
15 minute winter	25	1.024	29	2698.7	3.129	1.571	67.8377	
15 minute winter	29	Flow through Pond	30	3196.3	0.302	0.008	1895.6165	
15 minute winter	81	18.000	82	58.9	1.878	0.564	1.1955	
15 minute winter	82	18.001	83	97.6	2.553	0.915	0.7758	
15 minute winter	83	18.002	84	124.6	3.477	0.965	1.2271	
15 minute winter	96	19.000	97	97.5	3.061	0.835	2.1316	
15 minute winter	97	19.001	84	83.2	1.287	0.669	0.7584	
15 minute winter	84	18.003	85	234.6	3.660	1.051	4.1800	
15 minute winter	85	18.004	86	311.0	3.769	0.692	3.8623	
15 minute winter	86	18.005	87	337.9	3.841	0.752	2.3661	
15 minute winter	87	18.006	88	332.7	3.574	0.741	2.4071	
15 minute winter	88	18.007	89	358.0	3.305	0.797	2.5733	
15 minute winter	89	18.008	90	359.7	3.262	0.982	2.9780	
15 minute winter	90	18.009	91	359.9	3.264	1.135	7.5054	
15 minute winter	91	18.010	92	399.5	2.521	1.354	3.3562	
15 minute winter	92	18.011	93	434.8	1.654	0.895	7.3336	
15 minute winter	93	18.012	94	430.4	1.752	0.886	6.8657	
15 minute winter	94	18.013	95	453.6	1.950	0.934	18.8180	
720 minute winter	95	Flow through Pond	30	188.6	0.047	0.000	4669.3364	
720 minute winter	30	27.000	125	37.8	0.518	0.043	3.2935	
960 minute winter	125	Hydro-Brake®	126	36.1				1989.9

APPENDIX J
CUT/FILL PLAN



RISK ASSESSMENT: SIGNIFICANT RISKS THAT CANNOT BE DESIGNED OUT		
RISK	LEVEL OF RISK (JH00)	SUGGESTED ACTION
DEEP EXCAVATIONS ASSOCIATED WITH NEW DRAINAGE WORKS	HIGH	ENSURE ALL EXCAVATIONS HAVE ADEQUATE TRENCH SUPPORTS
HANDLING LARGE DIAMETER MANHOLE RINGS AND CIRCULAR PIPES	HIGH	USE CORRECT LIFTING EQUIPMENT AND ENSURE OPERATIVES WEAR APPROPRIATE PROTECTIVE CLOTHING AND HATS/CORRECT PPE
CONTACT WITH SEWAGE	MED	OPERATIVES TO USE CORRECT BREATHING EQUIPMENT/CORRECT PPE
NOISE	MED	OPERATIVES TO USE CORRECT EAR PROTECTION/CORRECT PPE
DRAINAGE EXCAVATIONS ADJACENT EXISTING BOUNDARY STRUCTURES	HIGH	ENSURE CORRECT SUPPORTS ARE PROVIDED TO TRENCHES AND BUILDINGS WHERE REQUIRED
DRAINAGE EXCAVATION IN PUBLIC HIGHWAY	HIGH	ENSURE CORRECT USE OF TRENCH SUPPORTS IN EXCAVATION AND SCREEN BARRIERS TO PROTECT MEMBERS OF THE PUBLIC
MAINTAIN ACCESS TO ADJACENT PROPERTIES AND OCCUPIERS	HIGH	ENSURE WORKS ARE PROTECTED WITH BARRIERS AND SIGNS TO GUIDE THE PUBLIC AWAY FROM THE WORKS
DRAINAGE EXCAVATIONS NEAR TO EXISTING SERVICES	HIGH	ENSURE WORKS ARE PROTECTED WITH BARRIERS AND SIGNS TO GUIDE MEMBERS OF THE PUBLIC AWAY FROM THE AREA
WORKING IN CONFINED SPACES, WORKING IN DRAINS AND MANHOLES	HIGH	CONFINED SPACES WORKING TRAINED PERSONNEL ONLY TO CARRY OUT WORKS UNDER A PERMIT TO WORK SCHEME IMPLEMENTED BY CONTRACTOR. GAS TESTING TO TAKE PLACE BEFORE ALL ENTRIES TO CONFINED SPACES
WORKING IN HIGHWAYS / RISKS FROM VEHICLE AND PLANT	HIGH	ALL WORKERS TO WEAR HIGH VISIBILITY CLOTHING. ALL PLANT TO HAVE VISUAL AND AUDIBLE WARNING SYSTEMS
ROAD AND DRAINAGE CONSTRUCTION	HIGH	ALL EXCAVATIONS TO BE ADEQUATELY FENCED OFF AND SUPPORTED DURING CONSTRUCTION. ALL OPERATIVES TO BE TRAINED IN CORRECT METHODS OF LIFTING AND WORK IN ACCORDANCE WITH LOLER REGS
IT IS ASSUMED THAT WORKS ASSOCIATED WITH THIS DESIGN WILL BE UNDERTAKEN BY A PERSON OR PERSONS WHO ARE COMPETANT AND HAVE THE REQUIRED LEVEL OF EXPERIENCE AND EXPERTISE		



ON-SITE CUT/FILL CALCULATIONS

RE-GRADING OF WATERCOURSE AND CONSTRUCTION OF PROPOSED HEADWALL WITHIN FLOOD ZONE:

GROSS	CUT 134.7m³	FILL 19.1m³
NETT	115.6m³	

DIVERSION OF WATERCOURSE WITHIN FLOOD ZONE:

GROSS	CUT 42.5m³	FILL 92.4m³
NETT		49.9m³

OVERALL CUT/FILL CALCULATIONS

GROSS	CUT 177.2m³	FILL 111.5m³
NETT	65.7m³	

TOTAL VOLUME REDUCTION IN FLOOD ZONE: 65.7m³

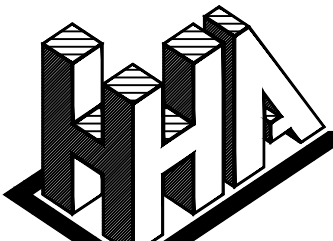
CUT Depth Bands

- Band 1 -0.00 - -0.10
- Band 2 -0.10 - -0.20
- Band 3 -0.20 - -0.30
- Band 4 -0.30 - -0.40
- Band 5 -0.40 - -0.50
- Band 6 -0.50 - -1.00
- Band 7 -1.00 - -2.00
- Band 8 -2.00 - -5.00
- Band 9 -5.00 - -10.00
- Band 10 -10.00 -

FILL Depth Bands

- Band 1 0.00 - 0.10
- Band 2 0.10 - 0.20
- Band 3 0.20 - 0.30
- Band 4 0.30 - 0.40
- Band 5 0.40 - 0.50
- Band 6 0.50 - 1.00
- Band 7 1.00 - 2.00
- Band 8 2.00 - 5.00
- Band 9 5.00 - 10.00
- Band 10 10.00 -

Rev	Description	Date	Initials



Haigh Huddleston & Associates
Civil Structural Engineering Consultants

Firth Buildings, 99 - 101 Leeds Rd, Dewsbury, WF12 7BU t 01924 464342 f 01924 450662
e martin@haighhuddleston.co.uk

Client		SAUL CONSTRUCTION / KEEP MOAT HOMES		
Project		DARFIELD		
Detail		FLOOD ZONE OUT AND FILL		
Dwn	Chkd	Date	Scale	Dwg No.
JM	MH	APR'2026	1/250 @A1	E18/7309/033_02