

**SURFACE & FOUL WATER DRAINAGE STRATEGY**  
**UPON**  
**PROPOSED PADEL COURTS & OFFICE BUILDING**  
**HOLBEACH ROAD, SPALDING, LINCOLNSHIRE**  
**PROJECT NO: SW25-138**  
**DOCUMENT REF: SW25-138-REP-01A**



**FOR KIRK CONNECTED CONSTRUCTION LTD.**



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Revision	Date	Description		
-	Oct. '25	First Issue	Prepared	M. R. Barlow
			Approved	A. Wilson CEng MStructE

## 1 Introduction

Under the instruction of Kirk Connected Construction., the following drainage strategy report has been prepared for proposed padel courts & office building, Land off Holbeach Road, Spalding, Lincolnshire.

The object of this report is to clarify the design philosophy followed when preparing the proposed surface & foul water drainage arrangements for the site and to outline the proposed solution in sufficient detail for all relevant parties to be able to comment. This assessment also demonstrates that the proposals are within the guidance contained with the National Planning Policy Framework (NPPF).

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## 2 Site Information

### 2.1 Location & Description

The site is approximately 0.50 hectares in size and is located North of Holbeach Road, Spalding, with National Grid reference TF268241.



Figure 1: Site Location

## 2.2 Geology

A desktop study of the area has been undertaken using the British Geological Survey Maps.

The maps indicate the site to be underlain by a bedrock geology of Mudstone, overlain with superficial deposits of the of Clay & Silt. These ground conditions are in line with what we would expect to see in this area.

This information is based upon publicly available records from the BGS Mapping Geological survey records, as can be seen in the figure below.

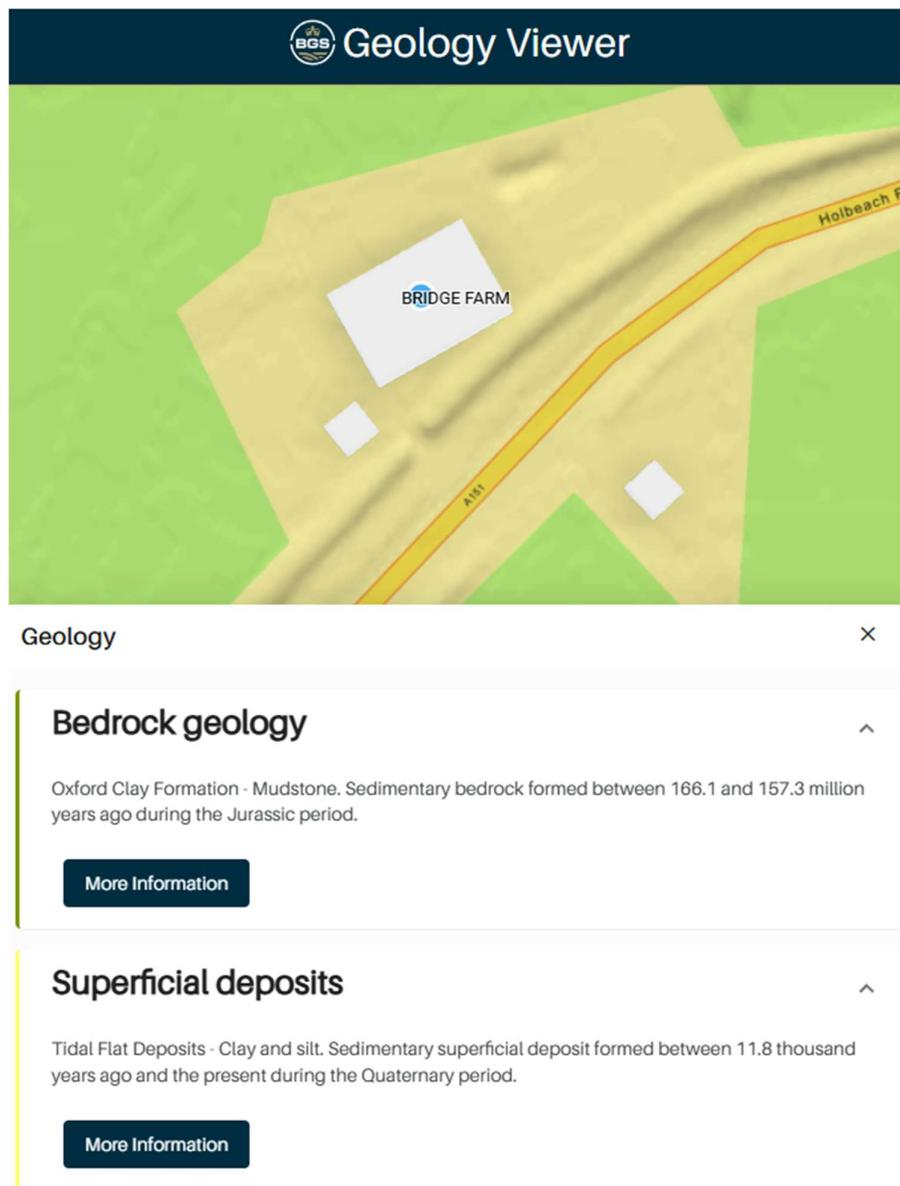


Figure 2: Data from BGS Geology Viewer

On top of the desktop study, we attended site on the 15<sup>th</sup> of October 2025 with the purpose to determine the ground conditions. 2 No. 1.1m deep Soakaway pits & 1 No. 2.2m deep trial pit were excavated by means of a mechanical excavator in different locations over the site.

All test holes had identical ground conditions of being light brown sandy silts, with the deeper hole getting slightly damper with depth but not wet. On top of this the deeper trial pit which got to 2.2m below existing ground level showed no signs of ground water ingress after 1 hour of being left open

### 2.3 Drainage

The current site consists of existing farmyard sheds as well as a concrete access road and pad.

It is believed that these roofs currently discharge into soakaways.

However, these buildings are to be demolished/converted and all the existing surface water drainage is to become redundant.

There are no known foul assets on the site.

There is a main South Holland IDB Drain to the Southern boundary of the site. The figure below shows the IDB map and location of the drain, as well as drain details.

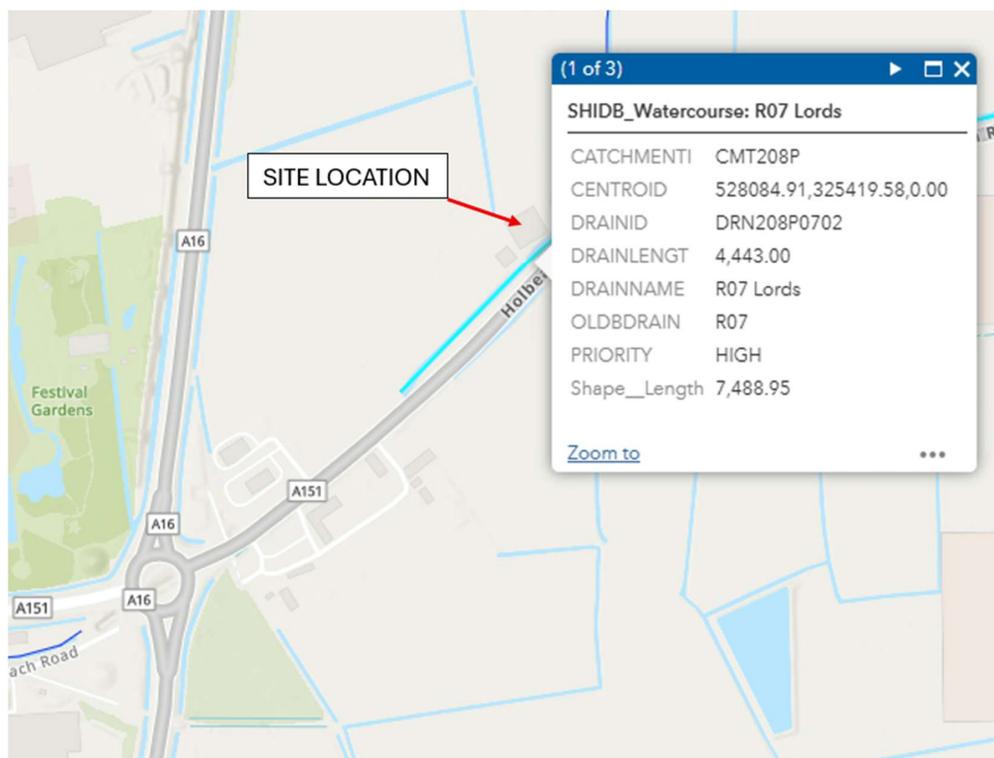


Figure 3: IDB Map image showing location and details of drain

## 2.4 Topography & Flood Routing

The topography of the site is relatively flat with site levels varying from 3.05m – 3.40m AOD. The topography and in-turn the existing flood routing generally falls outwards from the centre of the site both north and south.

An existing site & flood route arrangement showing topographical survey levels and flood routing arrows, ref. 'SW25-346-001' can be found within Appendix A.

## 3 Proposed Development

This drainage strategy is based upon a site layout prepared by J Knight Design.

The proposed development consists of a set of padel courts, as well as a converted office building. The padel courts come with an accompanying club house whilst the offices have a staff wellness shed to the north. Each comes with their own car parking areas.

## 4 Flood Risk

The site lies in Flood zone 3, therefore a site-specific flood risk assessment is necessary. A flood risk assessment has been undertaken by RM Associated dated October 2025, discussing the sites flood risk further.

The flood risk indicated FFL's to be a minimum of 300mm above existing site levels. It has been recommended that a minimum FFL for the office block will be 3.65m AOD. & the clubhouse FFL is to be a minimum of 3.72m AOD.

## 5 Surface Water Drainage Strategy

The proposed surface water drainage strategy arrangement for the site 'SW25-346-005A' can be found within Appendix B.

### 5.1 SuDS Considerations

#### 5.1.1 Hierarchy

The NPPF guidance advises that surface water discharge from proposed developments should aim to be as high up the following hierarchy as reasonably possible:

1. Into the ground (infiltration) – via soakaways or other infiltration device,
2. To a surface water body – i.e. a watercourse / Internal Drainage Board,
3. To a surface water sewer, highway drain, or another drainage system,
4. To a combined sewer.

#### 5.1.1.1 Infiltration

We visited site on the 15<sup>th</sup> of October 2025 to conduct infiltration testing, with the goal to prove a suitable infiltration rate for draining the surface water from the site. Two no. soakaway pits were excavated and filled with water over the day for testing, as well as one deeper trial pit with the purpose to gather a greater understanding of the ground strata as well as get an understanding on where groundwater may be. Infiltration rates are tabulated below:

<b>Infiltration Rates</b>	<b>SA01</b>	<b>SA02</b>
Test 1	$8.33 \times 10^{-6}$	$1.07 \times 10^{-5}$
Test 2	$9.29 \times 10^{-6}$	$1.00 \times 10^{-5}$

The testing results were positive, with a worst-case infiltration rate coming out as  $8.33 \times 10^{-6}$  m/s. Full infiltration calculations can be found within Appendix C.

Based on the above as well as the soil type and with not encountering ground water during our exploratory works, an infiltration-based strategy is suitable for the proposed site, achieving the highest level of the SuDS hierarchy.

#### 5.1.1.2 Watercourse

Surface water discharge from site via this method is not required.

#### 5.1.1.3 Surface Water Sewer

Surface water discharge from site via this method is not required.

#### 5.1.1.4 Combined Sewer

Surface water discharge from site via this method is not required.

#### 5.1.2 Source Control

It is proposed that all roof water is to enter several rainwater pipes and private laterals and subsequently combine and discharge into an infiltration basin biodiversity lagoon, which both provides source control through its planted and seeded base and sides as well as its strong capability of infiltrating the water to ground at source.

On top of this surface water run-off from the hardstanding road and car parking areas is to infiltrate to the ground at source through its construction being permeable, based on the infiltration rate found previously.

## 5.2 Proposals

The proposed roof areas of the office, club house and staff wellness shed are to be collected by a number of rain water pipes and private laterals to their perimeters, and eventually combine in a shared infiltration basin biodiversity lagoon, based on the worst case infiltration rate of  $8.33 \times 10^{-6}$  m/s and sized to be able to attenuate storms up to a 1:100 year + 40% CC event without flooding, including drain down checks for a 1:100 year + 40% CC storm followed by a 1:10 year storm 24 hours later.

The road and parking areas are to be constructed of a permeable surfacing type, based on the worst-case infiltration rate of  $8.33 \times 10^{-6}$  m/s calculated previously.

The proposed padel court areas are to have a permeable surfacing in a similar manner to the rest of the sites surfacing; however, it is to be detailed and designed at a later stage by a specialist, based upon the worst-case infiltration rate of  $8.33 \times 10^{-6}$  m/s.

Details of these arrangements can be found on drawings 'SW25-346-005A' within Appendix B and 'SW25-346-006A' within Appendix D.

## 5.3 Flood Exceedance

Proposed site levels have been designed to mimic the existing scenario where possible, with the proposed buildings being the highest points of the site, and for there to be a fall from the centre to both the Northern & Southern boundaries to tie into the existing levels. Proposed flood routing arrows can be found on drawings 'SW25-346-005' within Appendix D.

## 5.4 Hydraulic Modelling

The system serving the building's roof areas has been modelled using FEH-22 data in Causeway Flow+ and the calculation inputs and outputs are included within Appendix G at the end of this report.

These calculations demonstrate that the roof water will be safely conveyed and attenuated & infiltrated during storms up to and including the 1:100 year storm plus climate change allowance.

The calculations show the system has limited surcharging in the 1:2 year event, and that there is no flooding up to and including the 1:100 Year + CC event.

We have done an extra check on the drain down suitability of the infiltration basin, testing its capabilities of handling two consecutive design storms. Calculations prove that the infiltration basin can handle a 1:100 year + 40% CC event, followed 24hrs later by a 1:10 year storm event with no flooding, therefore we believe the drain down time is suitable for its application.

## 5.5 Management/Maintenance Strategy

The proposed system contains various assets which are all required to be in reasonable working order for the systems to function as a whole and operate as anticipated within the design models. These assets should generally be maintained in accordance with The SuDS Manual CIRIA C753 or manufacturer guidance.

The scope/nature of inspection and maintenance is such that various facilities and structures are inspected and maintained at yearly intervals, as well as after or during use and/or heavy storms, in order that they continue to perform effectively. The proposed surface water drainage system is to remain private and be the maintenance responsibility of the site owner.

### 5.5.1 Site Owner

The site owner will be responsible for the following assets:

- Gutters, downpipes and other building rainwater goods
- Underground pipe network and chambers
- Infiltration Basin – see maintenance requirement below
- Permeable Surfacing – see maintenance requirement below

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter, debris and trash	Monthly
	Cut grass – for landscaped areas 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
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	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 pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

Figure 4: Infiltration Basin Maintenance Requirements (The SuDS Manual C753)

Operation and maintenance requirements for pervious pavements		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Figure 5: Permeable Surfacing Maintenance Requirements (The SuDS Manual C753)

## 6 Foul Water Drainage Strategy

The proposed foul water drainage strategy arrangement is shown on drawing 'SW25-346-005A', included within Appendix B.

### 6.1 Proposals

Both the Office building & the Club House are shown to have several toilets and sinks to be collected. Each of these buildings will discharge their foul water to a private sewer network, which will run under the car park areas, where it will go through a treatment tank. From the tank this treated effluent will then run via a gravity sewer to the Southern boundary of the site and discharge into the South Holland IDB drain subject to consent being obtained from South Holland IDB before development.

Details of these arrangements can be found on drawings 'SW25-346-005A' within Appendix B and 'SW25-346-006A' within Appendix D.

## 6.2 Consultation

The following consents will need to be obtained prior to development:

- Works within 9m of a maintained watercourse subject to SHIDB consent under byelaw 3.
- Treated foul water discharge to watercourse subject to SHIDB consent under byelaw 3.
- Environmental Agency permit may be required for discharge of treated foul water to SHIDB watercourse.
- Further discussions to be had with SHIDB to determine drain max water levels local to proposed treated foul outfall levels, to ensure inverts are not submerged during any rainfall events.

## 6.3 Management/Maintenance Strategy

The proposed system contains various assets which all require to be in reasonable working order for the system to function as a whole and operate as anticipated.

The maintenance schedule for the foul water system, should as a minimum consist of annual inspections and 5 yearly rodding/jetting should no issue be encountered. The proposed foul water drainage system is to remain private and be the maintenance responsibility of the site owner.

### 6.3.1 Site Owner

The site owner will be responsible for the following assets:

- Underground pipe network and chambers
- Building soil and waste goods
- Foul water treatment plant and pump

## 7 Culverting Works

In the existing scenario, the site is entered by means of a brick built culverted bridge over the South Holland IDB drain. It is believed that this bridge is not suitably wide enough to act as the entrance for both the site and bridge manor house accessed by the same bridge. Drawings of the existing bridge culvert 'SW25-346-011' can be found within Appendix E. It was noted during our visit to site that the bottom of the dyke and the pipe was heavily silted, and the invert of the dyke bed could be lower than what has been recorded on the topo. Also, during our visit, it was noted that the water in the bottom of the dyke was visibly contaminated with a noticeable petro-chemical smell.

Initial discussions have been had with South Holland IDB where they agreed the entrance would be best to be replaced and that rather than a bridge culvert, a banked side sandbag culvert would be suitable, with an increased diameter pipe to reduce blockages and throttling in their system.

With this in mind we have put together proposals for the culverting works which can be seen on drawings 'SW25-346-015' in Appendix F. Our proposals indicate a widened entrance, with an enlarged 1050 dia. pipe upsized from the existing 750 dia. pipe. We have indicated a 1m verge between the road and the banking, with a maximum 1:3 slope down do the dyke bed. The pipe and bank are to be retained by the proposed sandbag structure.

## 8 Conclusion

In summary:

- A desk study & on-site investigations have been undertaken to assess the sites drainage.
- Existing site features, topography, drainage assets, etc. have been evaluated.
- Flood Risk has been reviewed and existing flood routing has been taken account of in the design.
- SuDS hierarchy has been explored;
- The first level of the SuDS hierarchy is to be used to discharge the surface water due to the high infiltration rate, therefore achieving the highest level of the SuDS hierarchy.
- Source control features have been reviewed; Both the infiltration basin and the permeable surfacing assist in source control.
- Hydraulic design undertaken using Causeway Flow+, modelling and attenuating surface water in a storm event up to a 1:100 Year + CC using FEH-22 data in which no flooding occurs, including a consecutive storm drain down check.
- Proposed flood exceedance routes have been at the forefront of design, and mimic the existing scenario where possible.
- Foul water network and discharge location demonstrated, foul to be treated and outfall into SHIDB drain subject to their consent.
- Bridge culvert to front of site to be replaced with wider entrance and larger pipe, subject to further discussions with SHIDB.
- Management and maintenance responsibilities explored for both the surface and foul water systems.

As illustrated by our design proposals on drawing 'SW25-346-005A' within Appendix B and the information outlined within this report, it is demonstrable that a viable and robust surface & foul water scheme that complies with the requirements of National Planning Guidance can be provided for the proposed residential development.

Under the proposals outlined within the report, all the drainage features will be either adopted, or be the responsibility of the site owner, and as such have suitable management and on-going maintenance.

Appendix A – Existing Site & Flood Layout 'SW25-346-001'



Appendix B – Proposed Drainage & Flood Layout ‘SW25-345-005A’

PLEASE REFER TO ARCHITECTS DRAWINGS FOR CONFIRMATION OF ALL WALL/SETTING OUT DIMENSIONS PRIOR TO COMMENCING OF WORKS

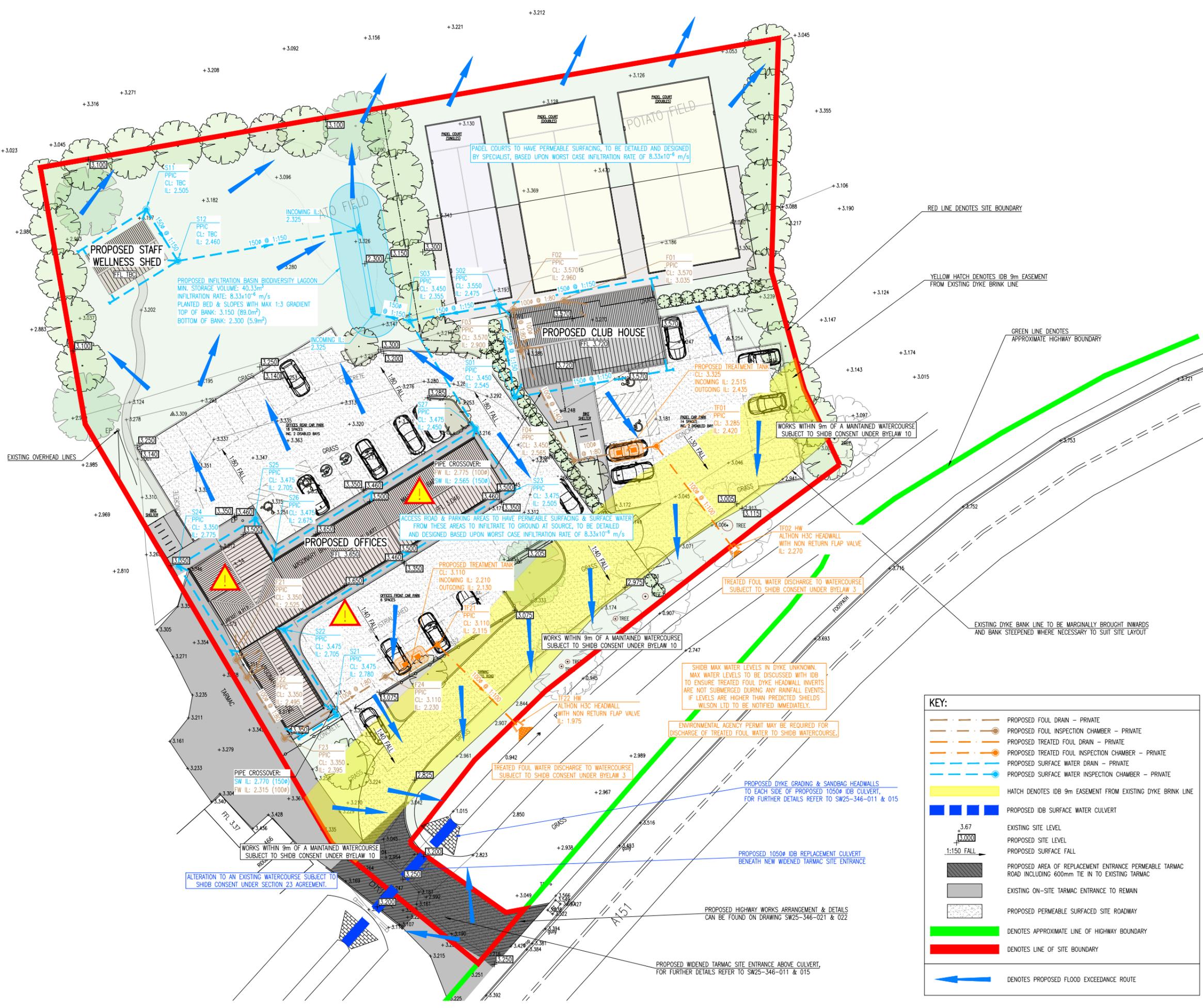
THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS & STRUCTURAL CALCULATIONS

GENERAL PRIVATE COMMERCIAL DRAINAGE NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT SHIELDS WILSON LTD. AND ARCHITECTS DRAWINGS AND PROJECT SPECIFICATIONS.
- ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT PARTS OF BS EN 752 'DRAINS AND SEWER SYSTEMS OUTSIDE BUILDINGS', THE CURRENT BUILDING REGULATIONS AND THE LOCAL AUTHORITY BUILDING CONTROL SPECIFICATIONS AND REQUIREMENTS.
- THE LOCATION, SIZE AND DEPTH OF ALL EXISTING DRAINS/SEWERS AND SERVICES SHALL BE ESTABLISHED AND CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS ON SITE. ANY DISCREPANCIES FROM THE INFORMATION INDICATED ON THESE DRAWINGS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEERS.
- ALL PIPES SHALL BE LAID WITH SOFFITS LEVEL UNLESS OTHERWISE STATED. ALL MANHOLE/INSPECTION CHAMBER INVERT LEVELS SHOWN ARE FOR THE OUTLET PIPE UNLESS OTHERWISE STATED. ALL PIPE RUNS SHALL BE LAID TO THE LEVELS INDICATED.
- ALL PRIVATE FOUL WATER PIPES & SWP'S CONNECTIONS TO BE 100mm UNLESS STATED OTHERWISE. WITH MINIMUM FALLS TO COMPLY WITH BUILDING REGULATIONS PART H.
- ALL PRIVATE SURFACE WATER PIPES, RWP CONNECTIONS, GULLY & LINEAR CHANNEL CONNECTIONS TO BE 150mm DIA UNLESS STATED OTHERWISE. WITH MINIMUM FALLS TO COMPLY WITH BUILDING REGULATIONS PART H.
- ALL RWP'S, SWP'S AND CONNECTIONS ARE SHOWN INDICATIVELY OR TO THE LATEST ARCHITECTS DRAWINGS. POSITION OF DOWN PIPES MUST BE CONFIRMED FROM ARCHITECTS DRAWING BEFORE LAYING UNDERGROUND PIPEWORK. ALL DOWN PIPES SHOULD BE PROVIDED WITH A RODDABLE ACCESS POINT ABOVE THE FFL.
- FOR FOUL WATER VENTING REQUIREMENTS REFER TO ARCHITECTS DRAWINGS.
- ALL INTERNAL POP-UPS WHICH DO NOT CONNECT TO A CHAMBER EXTERNALLY TO HAVE INTERNAL RODDABLE ACCESS POINT.
- ALL PRIVATE DRAINAGE LAD WITHIN 1m FROM TREE CANOPIES AND HEDGES TO HAVE CONCRETE BED AND SURROUND.
- FILLED GROUND OR SOFT SPOTS MUST BE EXCAVATED, BACKFILLED AND CONSOLIDATED BEFORE ANY DRAINAGE WORKS ARE CARRIED OUT.
- NO WATER SHOULD BE ALLOWED TO DISCHARGE FROM ANY PRIVATE AREAS ONTO THE ADJOINING HIGHWAYS. ALL PRIVATE GULLIES AND CHANNEL DRAINAGE POSITIONS SHOWN MAY VARY TO SUIT ON SITE WORKING CONDITIONS.
- DO NOT SHOW FROM THIS DRAWING.

NOTIFIABLE HAZARDS:

- EXISTING BUILDINGS TO BE DEMOLISHED/CONVERTED INTO OFFICE SPACE LIKELY TO INCLUDE ASBESTOS. FULL ASBESTOS R&D SURVEY REQUIRED.



**KEY:**

- PROPOSED FOUL DRAIN - PRIVATE
- PROPOSED FOUL INSPECTION CHAMBER - PRIVATE
- PROPOSED TREATED FOUL DRAIN - PRIVATE
- PROPOSED TREATED FOUL INSPECTION CHAMBER - PRIVATE
- PROPOSED SURFACE WATER DRAIN - PRIVATE
- PROPOSED SURFACE WATER INSPECTION CHAMBER - PRIVATE
- HATCH DENOTES IDB 9m EASEMENT FROM EXISTING DYKE BRINK LINE
- PROPOSED IDB SURFACE WATER CULVERT
- EXISTING SITE LEVEL
- PROPOSED SITE LEVEL
- PROPOSED AREA FALL
- PROPOSED AREA OF REPLACEMENT ENTRANCE PERMEABLE TARMAC ROAD INCLUDING 600mm TIE IN TO EXISTING TARMAC
- EXISTING ON-SITE TARMAC ENTRANCE TO REMAIN
- PROPOSED PERMEABLE SURFACED SITE ROADWAY
- DENOTES APPROXIMATE LINE OF HIGHWAY BOUNDARY
- DENOTES LINE OF SITE BOUNDARY
- DENOTES PROPOSED FLOOD EXCEEDANCE ROUTE

REV.	DESCRIPTION	DRN.	APP.	DATE
A	REVISION - UPDATES TO FFL'S TO SUIT FRA.	MRB	MP	28.10.25
-	FIRST ISSUE - FOR INFORMATION.	MRB	APM	24.10.25

**SHIELDS WILSON**  
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 STRUCTURAL AND CIVIL ENGINEERING

STATUS	FOR INFORMATION
CLIENT	KIRK CONNECTED CONSTRUCTION LTD.
PROJECT	PROPOSED PADEL COURTS & OFFICE BUILDING HOLBEACH ROAD, SPALDING, LINCOLNSHIRE
TITLE	PROPOSED DRAINAGE STRATEGY & FLOOD EXCEEDANCE ARRANGEMENT

DATE	OCT. '25	SCALE	0A1 1:200	DRAWING NO.	SW25-346-005	REV.	A
DRAWN	MRB						

Appendix C – Infiltration Calculations SA01 & SA02

**PADEL COURTS & OFFICE, HOLBEACH ROAD, SPALDING**

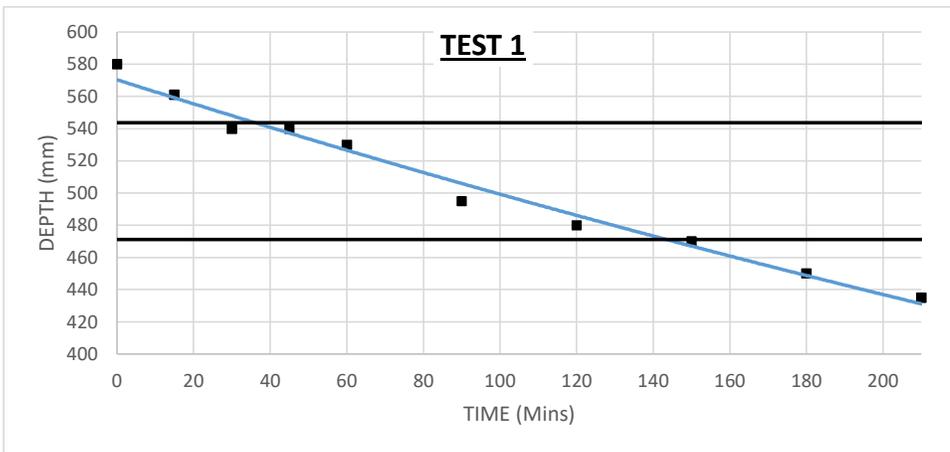
SA01	TEST 1	TEST 2
TIME (Mins)	DEPTH mm (d)	DEPTH mm (d)
0	580	590
15	561	565
30	540	555
45	540	540
60	530	530
90	495	510
120	480	485
150	470	465
180	450	450
210	435	422

**INFILTRATION TEST - HOLE SA01**

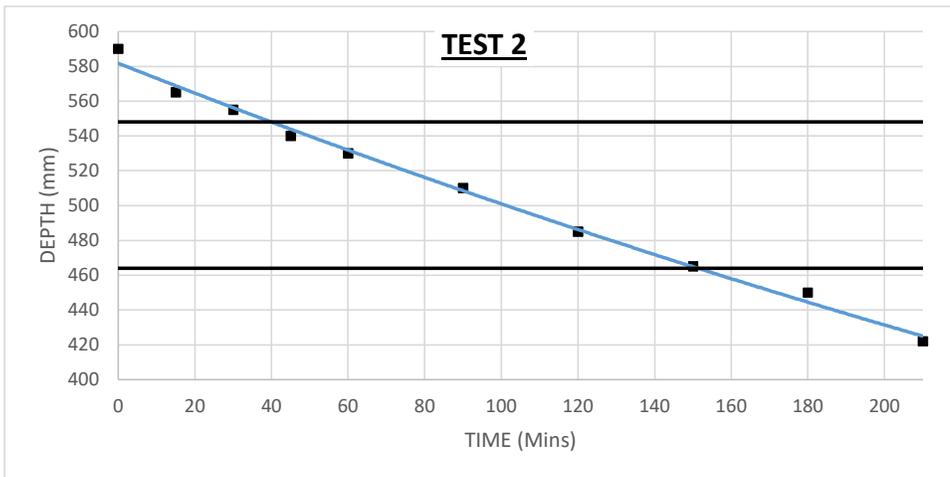
**PROJECT NO.** 25-346

**SITE VISIT:** 15/10/2025

TRIAL PIT DIMENSIONS (m)	
A [L]	1.30
B [W]	0.70
C [D]	1.10



SOIL INFILTRATION RATE, f	
TEST 1	
8.33018E-06 m/s	
0.029988636 m/h	



SOIL INFILTRATION RATE, f	
TEST 2	
9.2952E-06 m/s	
0.033462717 m/h	

**PADEL COURTS & OFFICE, HOLBEACH ROAD, SPALDING**

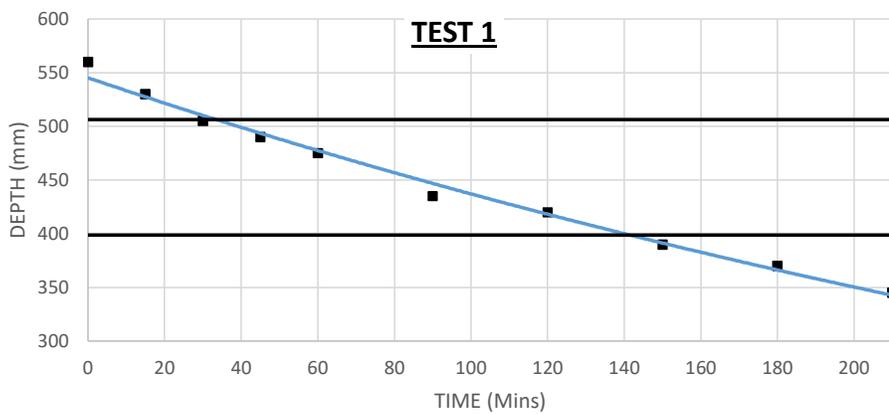
SA02	TEST 1	TEST 2
TIME (Mins)	DEPTH mm (d)	DEPTH mm (d)
0	560	565
15	530	545
30	505	530
45	490	520
60	475	510
90	435	475
120	420	450
150	390	429
180	370	409
210	345	385

**INFILTRATION TEST - HOLE SA02**

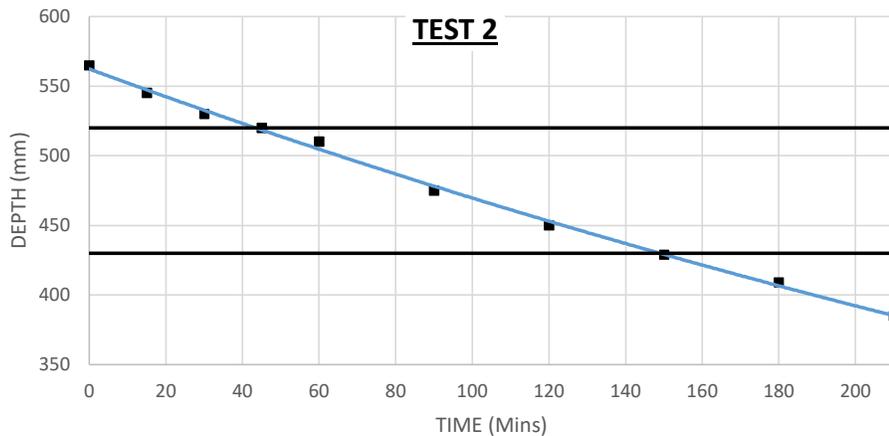
**PROJECT NO.** 25-346

**SITE VISIT:** 15/10/2025

TRIAL PIT DIMENSIONS (m)	
A [L]	1.20
B [W]	0.65
C [D]	1.10



SOIL INFILTRATION RATE, f
TEST 1
1.07871E-05 m/s
0.038833677 m/h

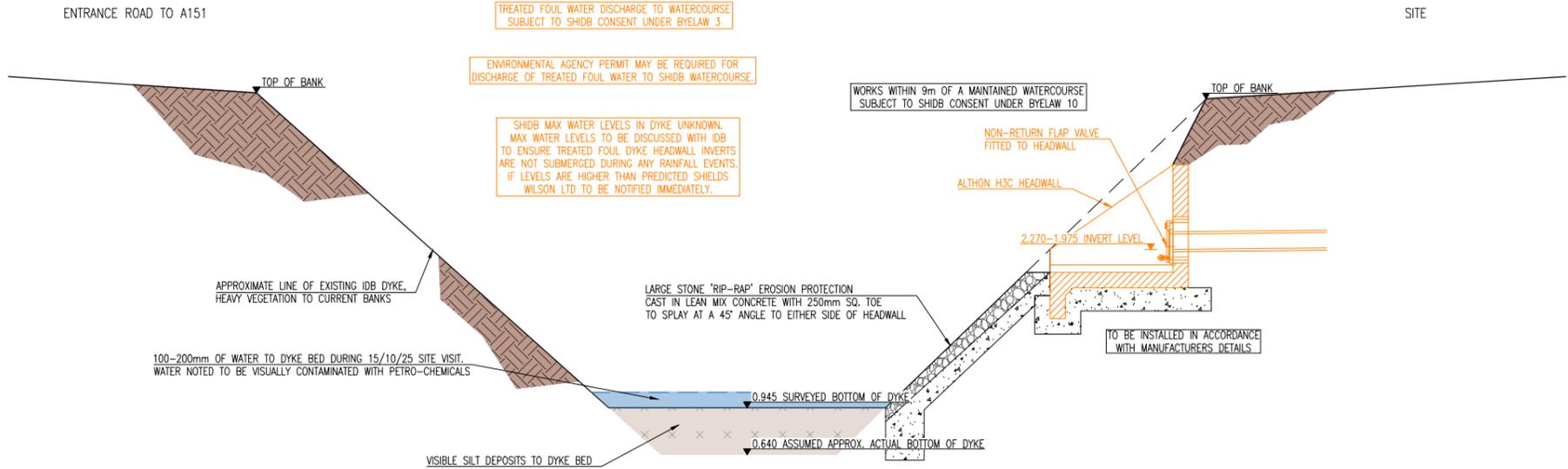


SOIL INFILTRATION RATE, f
TEST 2
1.00116E-05 m/s
0.036041586 m/h

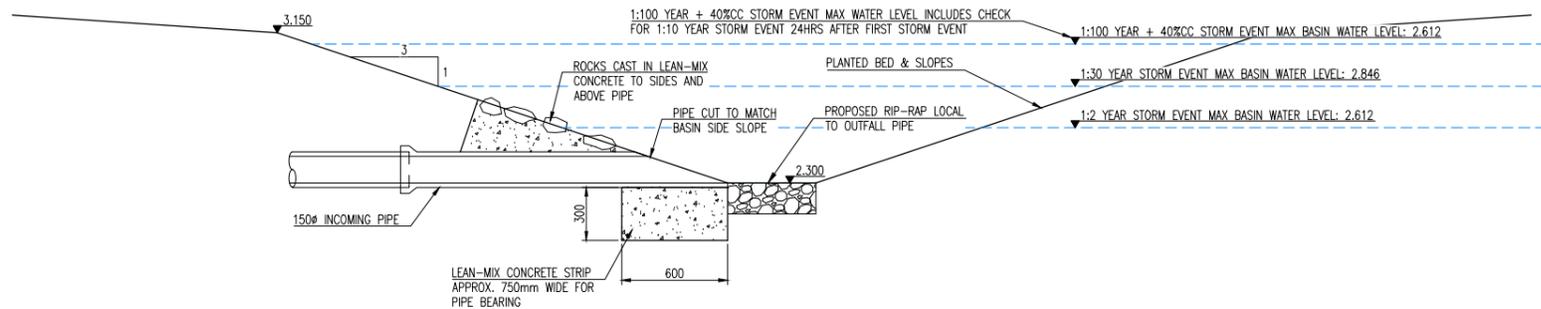
Appendix D – Proposed Basin & Dyke Sections & Details ‘SW25-346-006A’

PLEASE REFER TO ARCHITECTS DRAWINGS FOR  
CONFIRMATION OF ALL WALL/SETTING OUT  
DIMENSIONS PRIOR TO COMMENCING OF WORKS

THIS DRAWING MUST BE READ IN CONJUNCTION  
WITH ALL RELEVANT DRAWINGS & STRUCTURAL  
CALCULATIONS



TYPICAL SECTION THROUGH PROPOSED  
TREATED FOUL OUTFALL INTO SHIDB WATERCOURSE  
SCALE 1:20



TYPICAL SECTION THROUGH PROPOSED INFILTRATION BASIN BIODIVERSITY LAGOON  
SCALE 1:20

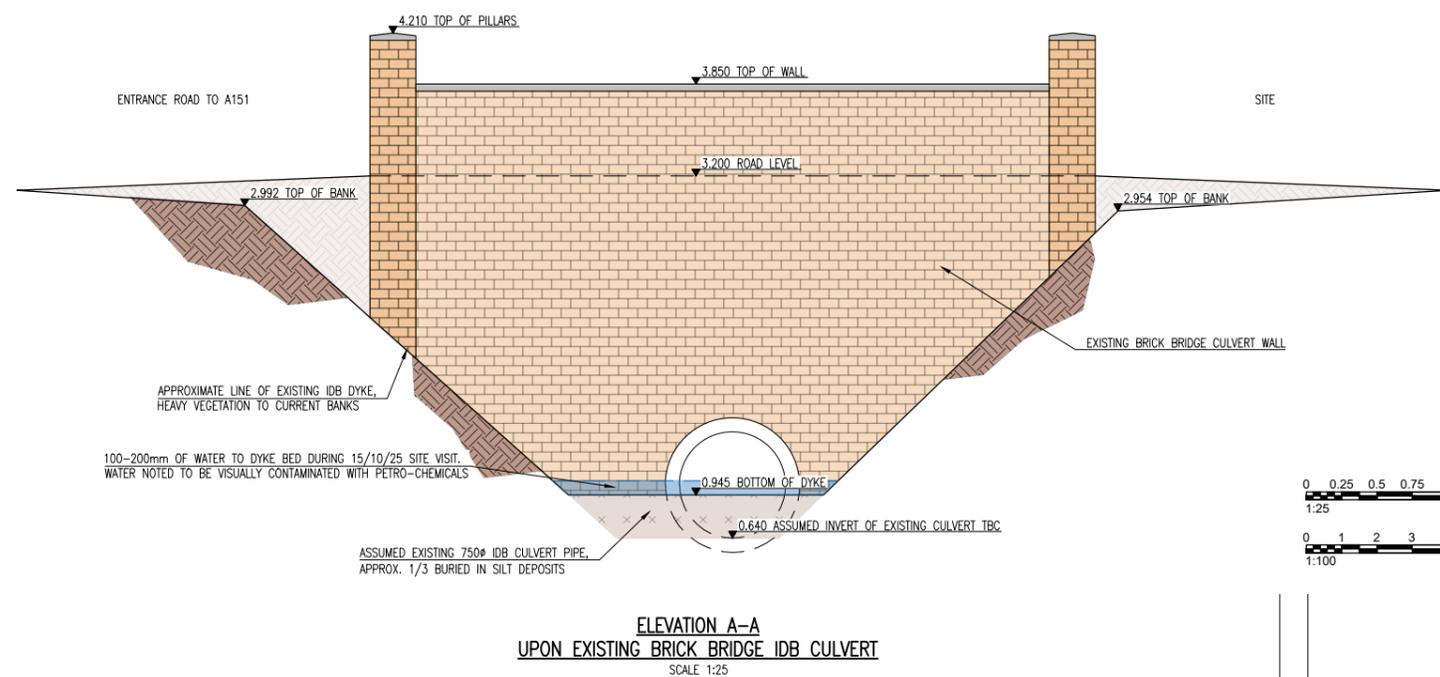
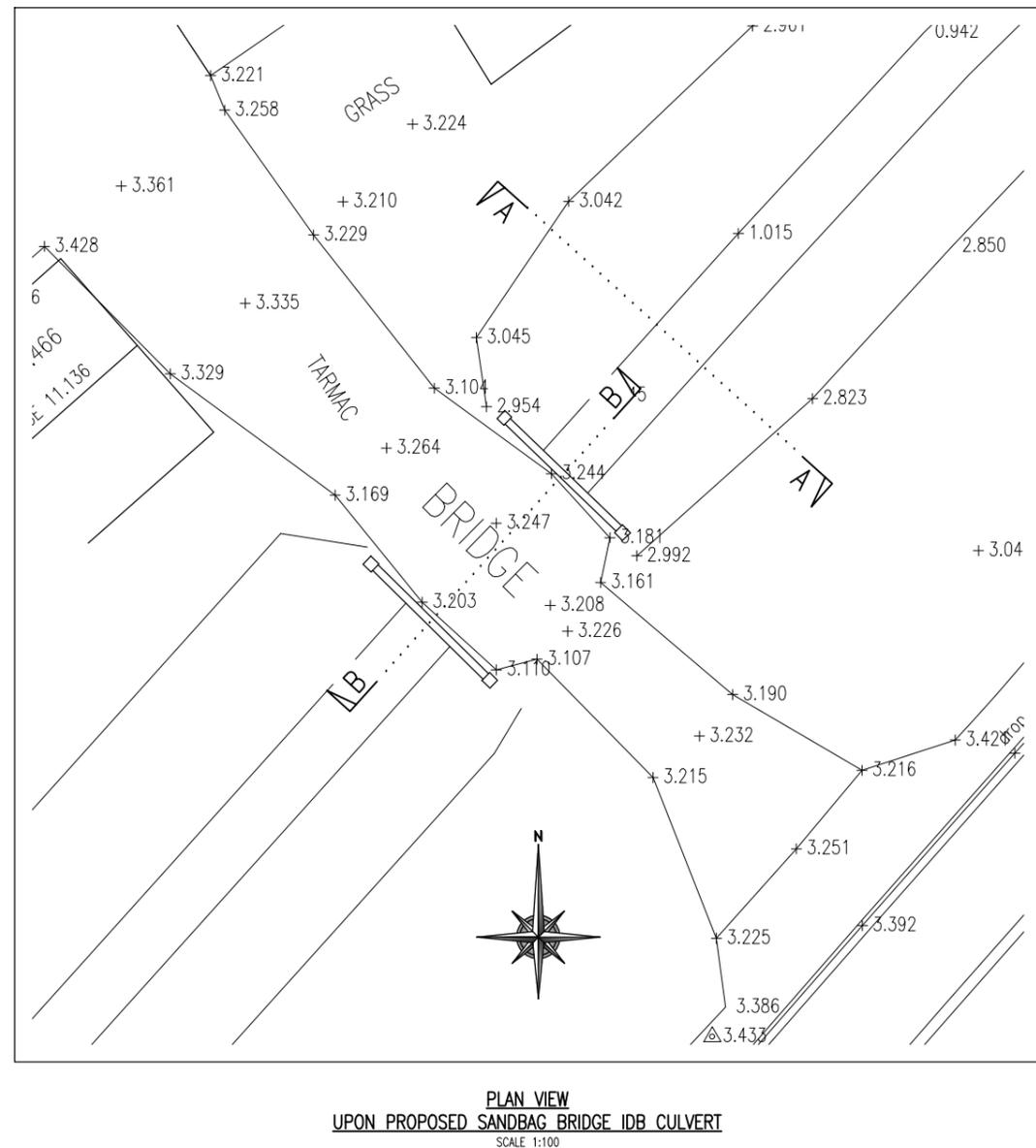
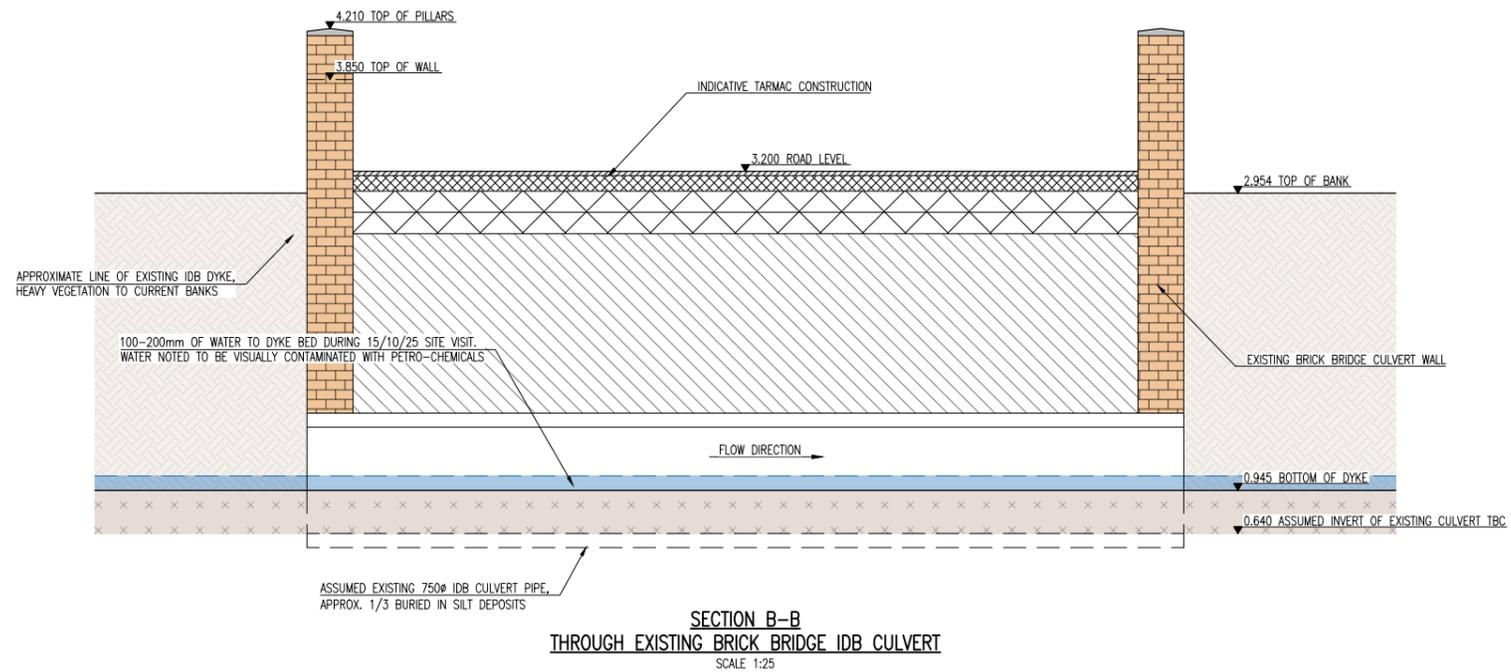


REV.	DESCRIPTION	DRN.	APP.	DATE
A	REVISION - HEADWALL TYPE AMENDED & FLAP VALVE ADDED.	MRB	MP	28.10.25
-	FIRST ISSUE - FOR INFORMATION.	MRB	APW	24.10.25

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STATUS	FOR INFORMATION				
CLIENT	KIRK CONNECTED CONSTRUCTION LTD.				
PROJECT	PROPOSED PADEL COURTS & OFFICE BUILDING HOLBEACH ROAD, SPALDING, LINCOLNSHIRE				
TITLE	PROPOSED BASIN & DYKE DRAINAGE SECTIONS & DETAILS				
DATE	OCT. '25	SCALE	A1 1:20	DRAWING NO.	REV.
DRAWN	MRB			SW25-346-006	A

Appendix E – Existing Bridge Culvert Arrangement ‘SW25-346-011’



REV.	DESCRIPTION	MRB	APW	DATE
-	FIRST ISSUE - FOR INFORMATION			24.10.25

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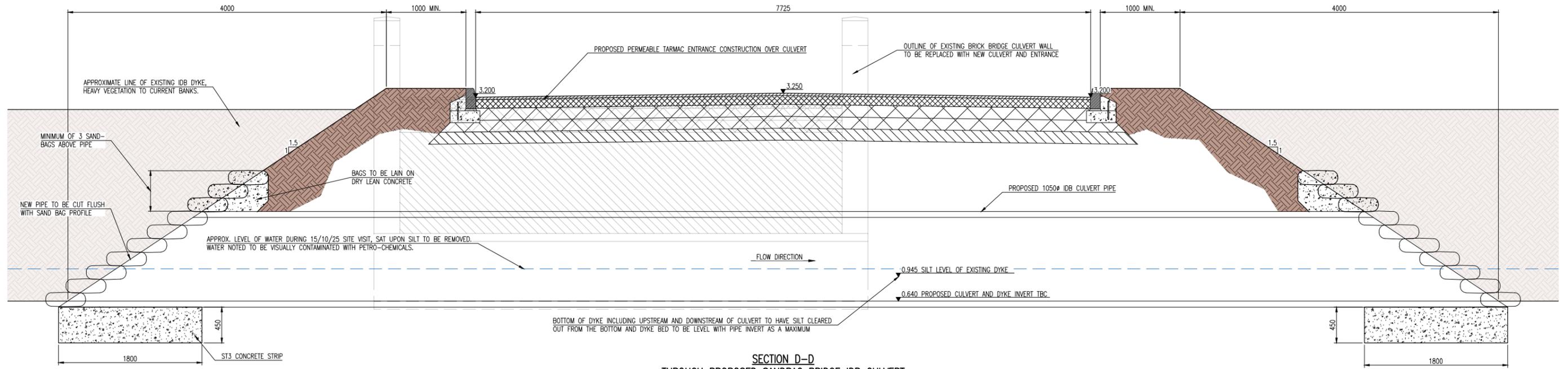
TITLE EXISTING BRIDGE CULVERT ARRANGEMENT

DATE	OCT. '25	SCALE 0A1	DRAWING NO.	REV.
DRAWN	MRB	1:100 1:25	SW25-346-010	-

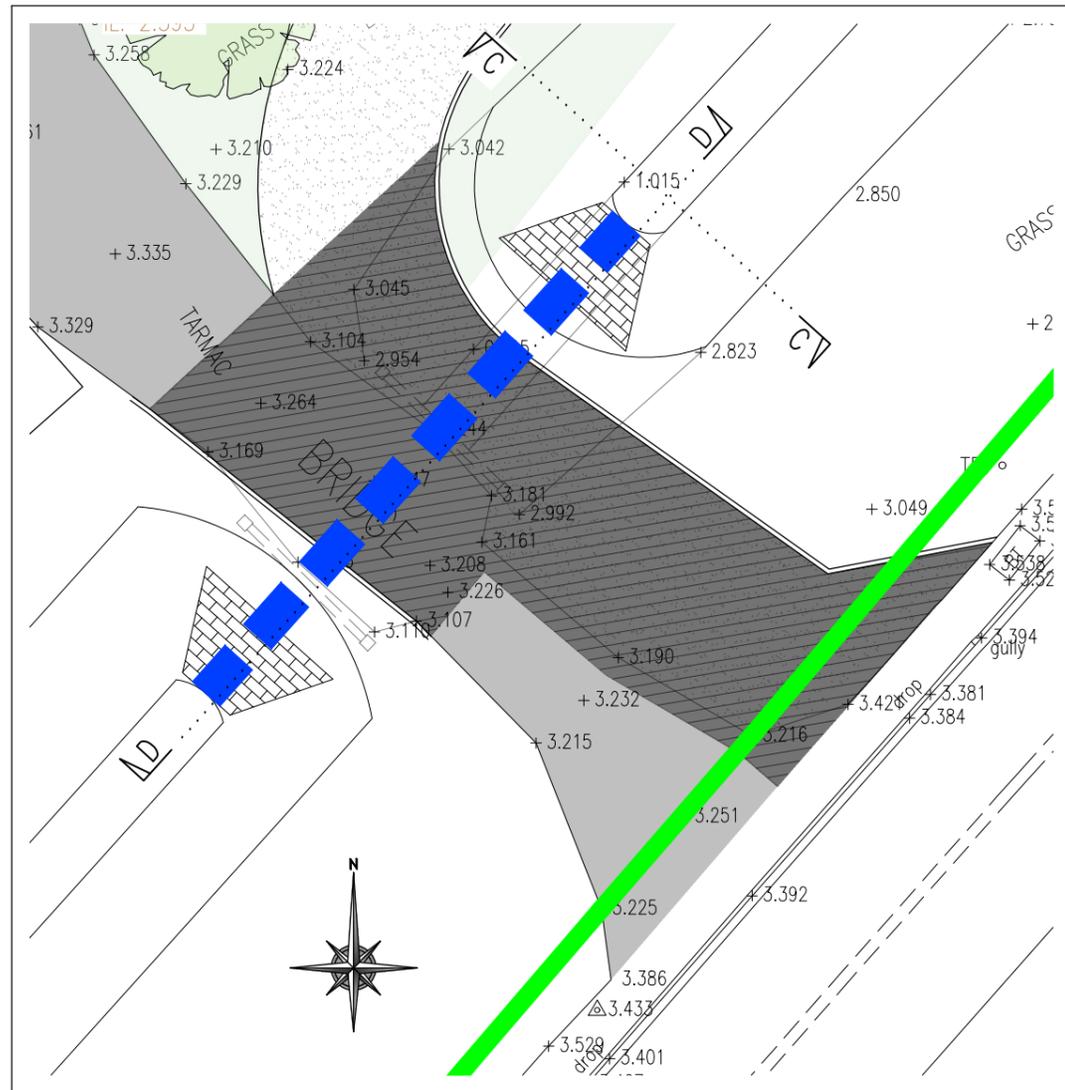
PLEASE REFER TO ARCHITECTS DRAWINGS FOR  
CONFIRMATION OF ALL WALL/SETTING OUT  
DIMENSIONS PRIOR TO COMMENCING OF WORKS

THIS DRAWING MUST BE READ IN CONJUNCTION  
WITH ALL RELEVANT DRAWINGS & STRUCTURAL  
CALCULATIONS

Appendix F – Proposed Bridge Culvert Arrangement ‘SW25-346-015’



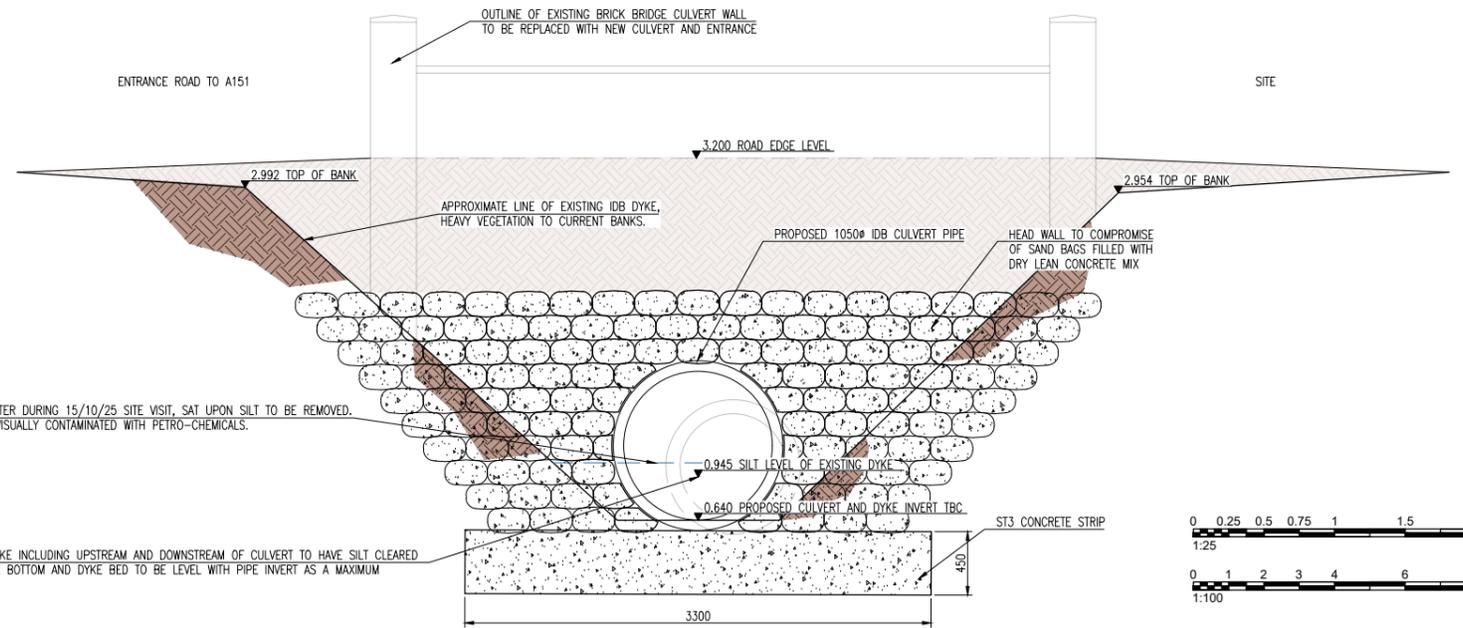
SECTION D-D  
THROUGH PROPOSED SANDBAG BRIDGE IDB CULVERT  
SCALE 1:25



PLAN VIEW  
UPON PROPOSED SANDBAG BRIDGE IDB CULVERT  
SCALE 1:100

KEY:

	PROPOSED IDB SURFACE WATER CULVERT
	EXISTING SITE LEVEL
	PROPOSED SITE LEVEL
	PROPOSED SURFACE FALL
	PROPOSED AREA OF REPLACEMENT ENTRANCE PERMEABLE TARMAC ROAD INCLUDING 600mm TIE IN TO EXISTING TARMAC
	EXISTING ON-SITE TARMAC ENTRANCE TO REMAIN
	PROPOSED PERMEABLE SURFACED SITE ROADWAY
	DENOTES APPROXIMATE LINE OF HIGHWAY BOUNDARY



ELEVATION C-C  
UPON PROPOSED SANDBAG BRIDGE IDB CULVERT  
SCALE 1:25



PLEASE REFER TO ARCHITECTS DRAWINGS FOR  
CONFIRMATION OF ALL WALL/SETTING OUT  
DIMENSIONS PRIOR TO COMMENCING OF WORKS

THIS DRAWING MUST BE READ IN CONJUNCTION  
WITH ALL RELEVANT DRAWINGS & STRUCTURAL  
CALCULATIONS

REV.	DESCRIPTION	DRN.	APP.	DATE
-	FIRST ISSUE - FOR INFORMATION	MRB	APW	24.10.25

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STATUS: FOR INFORMATION

CLIENT: KIRK CONNECTED CONSTRUCTION LTD.

PROJECT: PROPOSED PADEL COURTS & OFFICE BUILDING  
HOLBEACH ROAD, SPALDING, LINCOLNSHIRE

TITLE: PROPOSED BRIDGE CULVERT ARRANGEMENT

DATE	OCT. '25	SCALE	DRAWING NO.	REV.
DRAWN	MRB	1:100 1:25	SW25-346-015	-

Appendix G – Proposed Causeway Flow+ Infiltration Basin System Modelling

**Design Settings**

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

**Nodes**

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S12	0.004	5.00	3.300	450	526873.757	324124.637	0.840	2.460
S27	0.031	5.00	3.350	450	526906.437	324106.250	0.900	2.450
S02	0.014	5.00	3.450	450	526908.932	324119.621	0.975	2.475
S03			3.300	450	526899.187	324118.095	0.945	2.355
S06 BASIN			3.150	1200	526895.198	324118.789	0.825	2.325

**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	S12	S06 BASIN	19.906	0.600	2.460	2.325	0.135	147.5	150	5.40	50.0
2.000	S27	S03	13.888	0.600	2.450	2.355	0.095	146.2	150	5.28	50.0
3.000	S02	S03	9.864	0.600	2.475	2.405	0.070	140.9	150	5.19	50.0
2.001	S03	S06 BASIN	4.049	0.600	2.355	2.328	0.027	150.0	150	5.36	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	0.825	14.6	0.5	0.690	0.675	0.004	0.0	20	0.389
2.000	0.829	14.6	4.1	0.750	0.795	0.031	0.0	55	0.715
3.000	0.844	14.9	1.9	0.825	0.745	0.014	0.0	37	0.584
2.001	0.818	14.5	6.1	0.795	0.672	0.045	0.0	68	0.782

**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	19.906	147.5	150	Circular	3.300	2.460	0.690	3.150	2.325	0.675
2.000	13.888	146.2	150	Circular	3.350	2.450	0.750	3.300	2.355	0.795
3.000	9.864	140.9	150	Circular	3.450	2.475	0.825	3.300	2.405	0.745
2.001	4.049	150.0	150	Circular	3.300	2.355	0.795	3.150	2.328	0.672

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S12	450	Manhole	Adoptable	S06 BASIN	1200	Manhole	Adoptable
2.000	S27	450	Manhole	Adoptable	S03	450	Manhole	Adoptable
3.000	S02	450	Manhole	Adoptable	S03	450	Manhole	Adoptable
2.001	S03	450	Manhole	Adoptable	S06 BASIN	1200	Manhole	Adoptable

**Manhole Schedule**

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S12	526873.757	324124.637	3.300	0.840	450		0	1.000	2.460	150
S27	526906.437	324106.250	3.350	0.900	450		0	2.000	2.450	150
S02	526908.932	324119.621	3.450	0.975	450		0	3.000	2.475	150
S03	526899.187	324118.095	3.300	0.945	450		1 2	3.000 2.000	2.405 2.355	150 150
S06 BASIN	526895.198	324118.789	3.150	0.825	1200		1 2	2.001 1.000	2.328 2.325	150 150

**Simulation Settings**

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Rate(s)	x
Rainfall Events	Singular	Drain Down Time (mins)	240	Check Discharge Volume	x
Summer CV	0.750	Additional Storage (m³/ha)	0.0		
Analysis Speed	Normal	Starting Level (m)			

**Storm Durations**

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

**Node S06 BASIN Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.02999	Safety Factor	3.0	Invert Level (m)	2.300
Side Inf Coefficient (m/hr)	0.02999	Porosity	1.00	Time to half empty (mins)	1816

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5.9	5.9	0.850	89.0	90.9

**Results for 2 year Critical Storm Duration. Lowest mass balance: 98.54%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
720 minute summer	S12	690	2.612	0.152	0.1	0.0242	0.0000	SURCHARGED
720 minute summer	S27	720	2.612	0.162	0.6	0.0257	0.0000	SURCHARGED
720 minute summer	S02	705	2.612	0.137	0.3	0.0218	0.0000	OK
720 minute summer	S03	720	2.612	0.257	0.8	0.0408	0.0000	SURCHARGED
720 minute summer	S06 BASIN	720	2.612	0.287	0.9	6.9224	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )
720 minute summer	S12	1.000	S06 BASIN	0.1	0.011	0.006	0.3504
720 minute summer	S27	2.000	S03	0.6	0.236	0.039	0.2445
720 minute summer	S02	3.000	S03	0.3	0.247	0.018	0.1700
720 minute summer	S03	2.001	S06 BASIN	0.8	0.243	0.056	0.0713
720 minute summer	S06 BASIN	Infiltration		0.1			

**Results for 10 year Critical Storm Duration. Lowest mass balance: 96.73%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
480 minute summer	S12	480	2.756	0.296	0.2	0.0470	0.0000	SURCHARGED
480 minute summer	S27	480	2.756	0.306	1.4	0.0486	0.0000	SURCHARGED
480 minute summer	S02	480	2.756	0.281	0.7	0.0446	0.0000	SURCHARGED
480 minute summer	S03	480	2.756	0.401	2.0	0.0637	0.0000	SURCHARGED
480 minute summer	S06 BASIN	480	2.756	0.431	2.1	13.3194	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )
480 minute summer	S12	1.000	S06 BASIN	0.2	0.009	0.011	0.3504
480 minute summer	S27	2.000	S03	1.3	0.251	0.092	0.2445
480 minute summer	S02	3.000	S03	0.6	0.247	0.043	0.1737
480 minute summer	S03	2.001	S06 BASIN	1.9	0.288	0.135	0.0713
480 minute summer	S06 BASIN	Infiltration		0.1			

**Results for 30 year Critical Storm Duration. Lowest mass balance: 96.16%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
600 minute summer	S12	600	2.846	0.386	0.2	0.0613	0.0000	SURCHARGED
600 minute summer	S27	600	2.846	0.396	1.5	0.0629	0.0000	SURCHARGED
600 minute summer	S02	600	2.846	0.371	0.7	0.0589	0.0000	SURCHARGED
600 minute summer	S03	600	2.846	0.491	2.1	0.0780	0.0000	SURCHARGED
600 minute summer	S06 BASIN	600	2.846	0.521	2.2	18.3678	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )
600 minute summer	S12	1.000	S06 BASIN	0.2	0.009	0.011	0.3504
600 minute summer	S27	2.000	S03	1.5	0.252	0.099	0.2445
600 minute summer	S02	3.000	S03	0.7	0.247	0.044	0.1737
600 minute summer	S03	2.001	S06 BASIN	2.1	0.288	0.143	0.0713
600 minute summer	S06 BASIN	Infiltration		0.2			

**Results for 100 year Critical Storm Duration. Lowest mass balance: 95.90%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
720 minute summer	S12	720	2.943	0.483	0.2	0.0767	0.0000	SURCHARGED
720 minute summer	S27	720	2.943	0.493	1.8	0.0783	0.0000	SURCHARGED
720 minute summer	S02	720	2.943	0.468	0.8	0.0743	0.0000	SURCHARGED
720 minute summer	S03	720	2.943	0.588	2.5	0.0934	0.0000	SURCHARGED
720 minute summer	S06 BASIN	720	2.943	0.618	2.6	24.6738	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )
720 minute summer	S12	1.000	S06 BASIN	0.2	0.010	0.012	0.3504
720 minute summer	S27	2.000	S03	1.8	0.253	0.120	0.2445
720 minute summer	S02	3.000	S03	0.8	0.247	0.051	0.1737
720 minute summer	S03	2.001	S06 BASIN	2.5	0.324	0.170	0.0713
720 minute summer	S06 BASIN	Infiltration		0.2			

**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.73%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
1440 minute summer	S12	1260	3.085	0.625	0.2	0.0994	0.0000	FLOOD RISK
15 minute summer	S27	11	3.093	0.643	23.0	0.1023	0.0000	FLOOD RISK
1440 minute summer	S02	1260	3.085	0.610	0.7	0.0970	0.0000	SURCHARGED
1440 minute summer	S03	1260	3.085	0.730	2.0	0.1161	0.0000	FLOOD RISK
1440 minute summer	S06 BASIN	1260	3.085	0.760	2.2	35.6321	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )
1440 minute summer	S12	1.000	S06 BASIN	0.2	0.010	0.012	0.3504
15 minute summer	S27	2.000	S03	21.4	1.218	1.464	0.2445
1440 minute summer	S02	3.000	S03	0.7	0.247	0.045	0.1737
1440 minute summer	S03	2.001	S06 BASIN	2.0	0.288	0.139	0.0713
1440 minute summer	S06 BASIN	Infiltration		0.2			

**Results for Consecutive Rainfall Critical Storm Duration. Lowest mass balance: 97.88%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
1440-480	S12	1260	3.085	0.625	0.2	0.0994	0.0000	FLOOD RISK
1440-480	S27	1260	3.085	0.635	1.4	0.1010	0.0000	FLOOD RISK
1440-480	S02	1260	3.085	0.610	0.7	0.0970	0.0000	SURCHARGED
1440-480	S03	1260	3.085	0.730	2.0	0.1161	0.0000	FLOOD RISK
1440-480	S06 BASIN	1260	3.085	0.760	2.2	35.6321	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )
1440-480	S12	1.000	S06 BASIN	0.2	0.010	0.012	0.3504
1440-480	S27	2.000	S03	1.4	0.183	0.094	0.2445
1440-480	S02	3.000	S03	0.7	0.247	0.045	0.1737
1440-480	S03	2.001	S06 BASIN	2.0	0.288	0.139	0.0713
1440-480	S06 BASIN	Infiltration		0.2			