# The Sizewell C Project

SZC Co.'s Response to the Secretary of State's Request for Further Information dated 18 March 2022: Appendix 3 - The Drainage Strategy Part 3 of 12

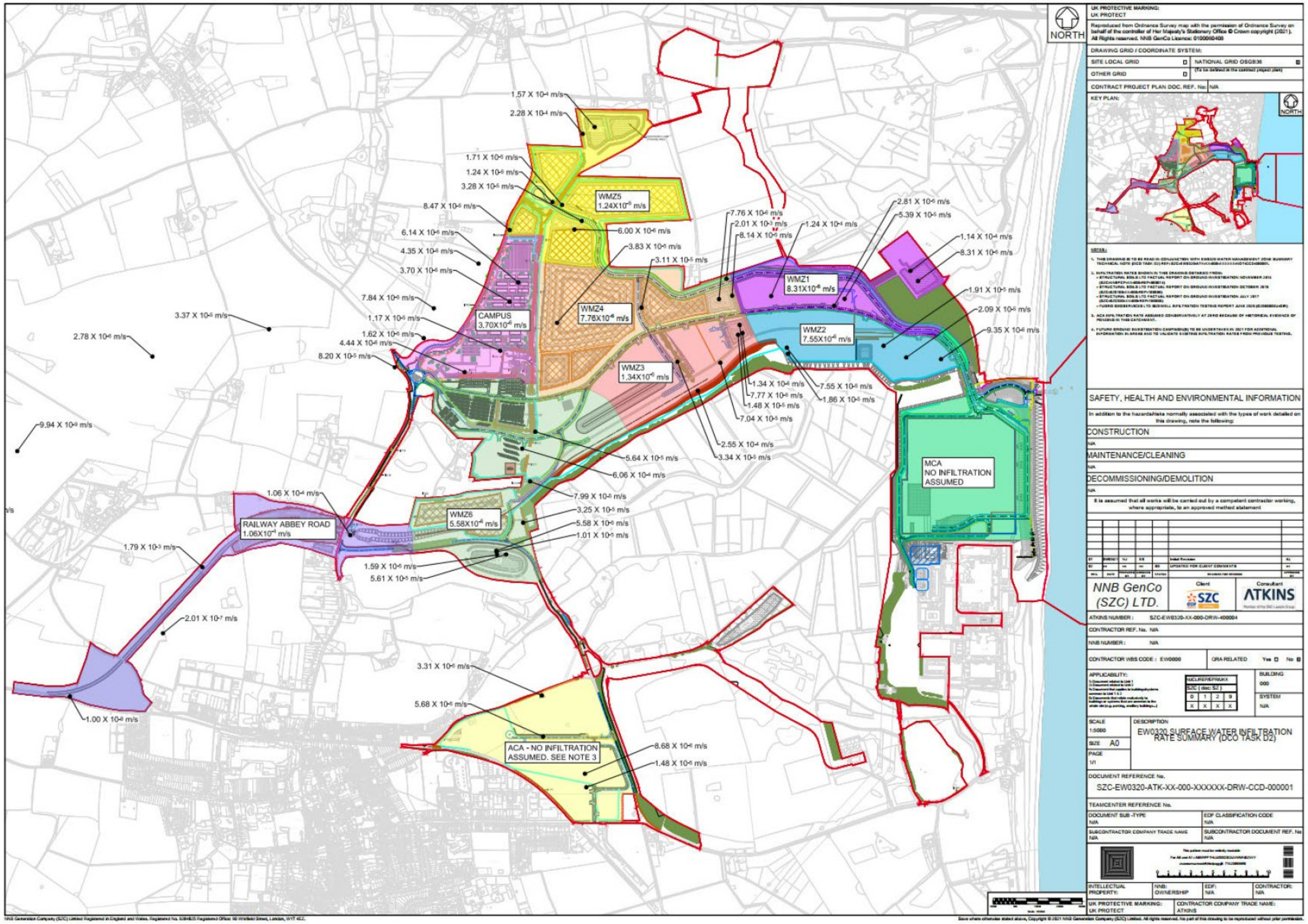
Revision: 2.0

April 2022

Sizewell C
Doing the power of good for Britain
EDF CGN

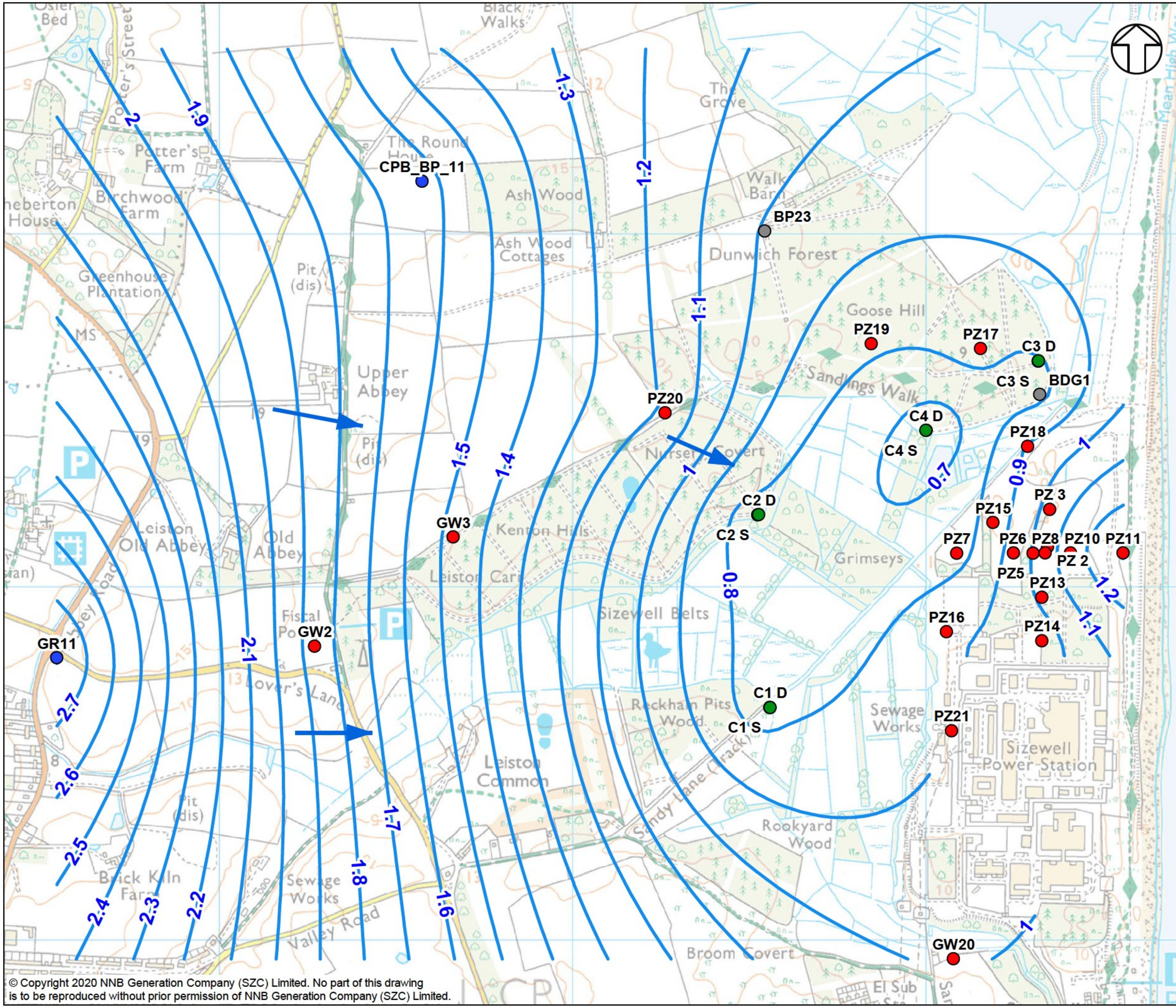
# ANNEX A

## Infiltration Tests Summary Drawing


WMZ5
1.24X10-6 m/s
WMZ4
7.76X10-6 m/s
CAMPUS
3.70X10-6 m/s
WMZ1
8.31X10-6 m/s
WMZ2
7.55X10-6 m/s
WMZ3
1.34X10-6 m/s
WMZ6
5.58X10-6 m/s
RAILWAY ABBEY ROAD
1.06X10-4 m/s
MCA
NO INFILTRATION
ASSUMED
ACA - NO INFILTRATION
ASSUMED. SEE NOTE 3
NORTH
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
CONSTRUCTION
MAINTENANCE/CLEANING
DECOMMISSIONING/DEMOLITION
NNB GenCo
(SZC) LTD.
ATKINS
EW0320 SURFACE WATER INFILTRATION
RATE SUMMARY (DCO TASK D2)
SZC-EW0320-ATK-XX-000-XXXXXX-DRW-CCD-000001

# ANNEX B

## Infiltration Tests Summary Drawing






NOTES

PEAT CONTOURS ARE CONSTRAINED TO THE EXTENT OF THE PEAT DEPOSITS

KEY

- 2010 BOREHOLES
- 2013 BOREHOLES
- 2014 BOREHOLES
- 2015 BOREHOLES
- GROUNDWATER CRAG CONTOURS (MAOD) - WINTER 2018
- GROUNDWATER FLOW DIRECTION

NOT PROTECTIVELY MARKED



Project Title:
SIZEWELL C PROJECT
ENVIRONMENTAL STATEMENT
VOLUME 2
CHAPTER 19B1
GROUNDWATER AND SURFACE WATER APPENDIX B1

DRAWING TITLE:
GROUNDWATER CONTOURS IN CRAG AQUIFER DURING WINTER 20 8 ( 9 2 2018)

DRAWING NO:
FIGURE 19B 1.16

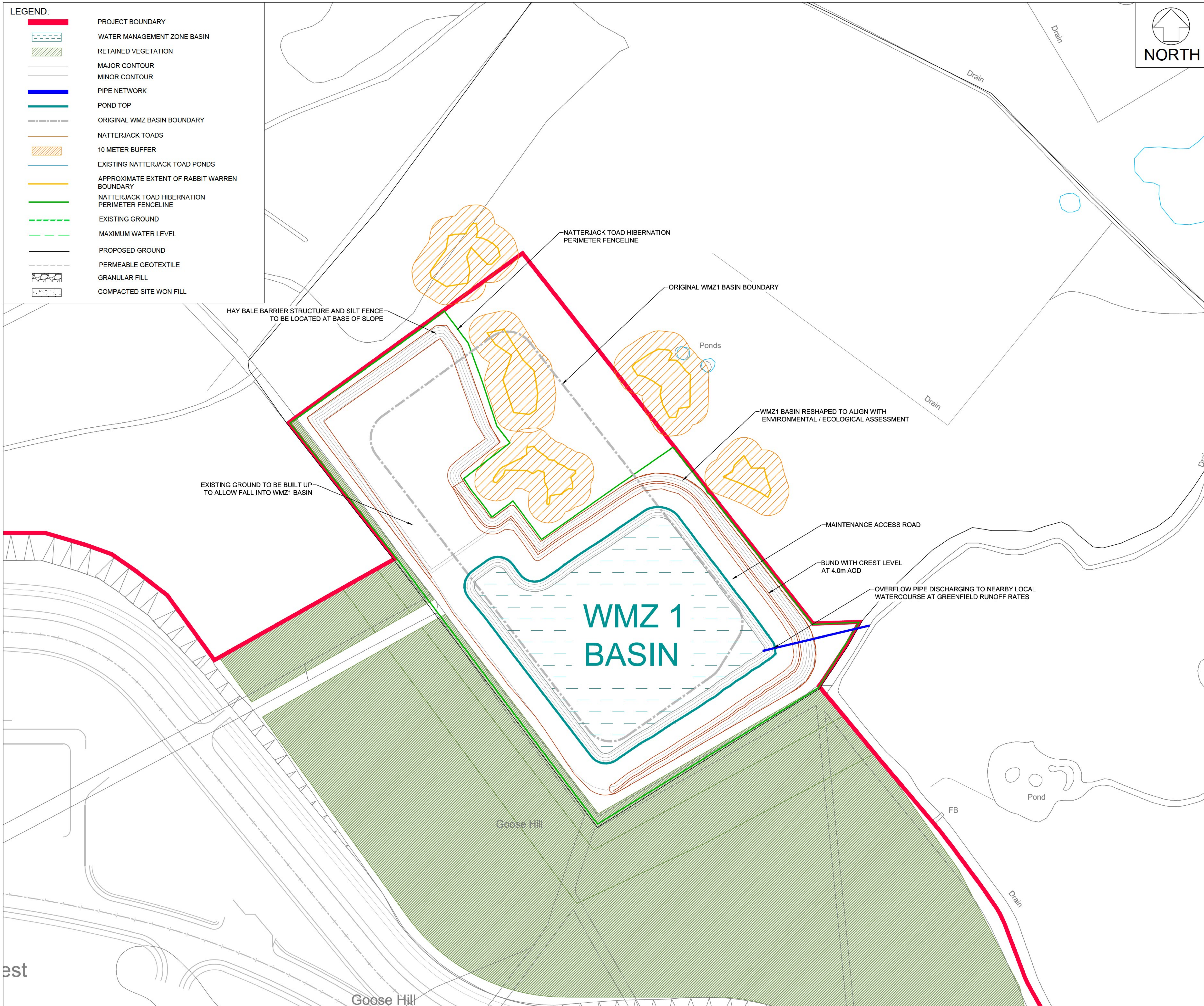
| DATE: | DRAWN: | SCALE: |
| --- | --- | --- |
| JAN 2020 | S.R.H | 1:10,103 @A3 |

SCALE BAR
0 0.1 0.2 0.3 0.4 0.5 KM

# ANNEX C

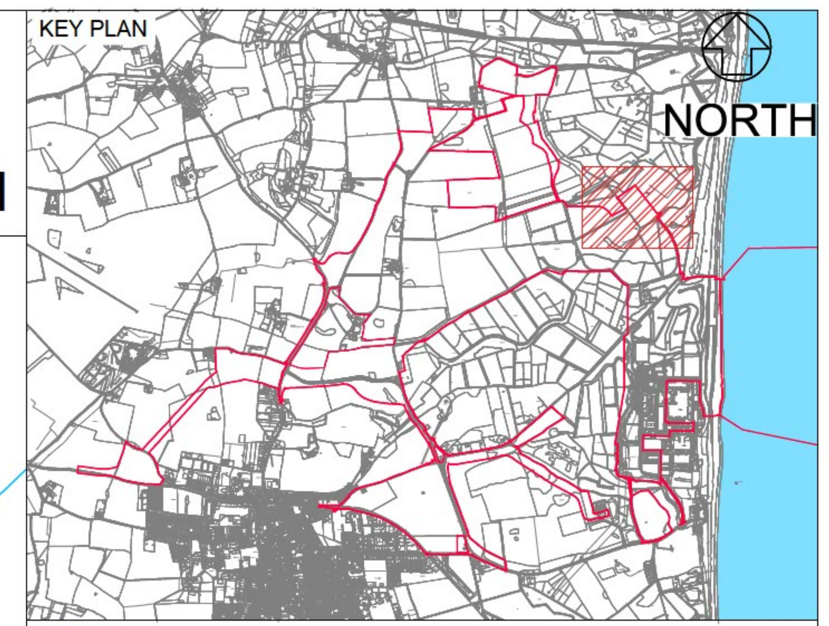
Figure 1 – Water Management Zone 1 Basin

Figure 2 – Water Management Zones 3 and 4 Basins






KEY PLAN




NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

REFERENCES:

1. SZC_MDS_RABBIT WARREN INFO

| REVISION | DATE | DRAWN | CHECKED | REASONS FOR REVISION / COMMENTS | APPROVED |
|---|---|---|---|---|---|
| 01 | JULY 2021 | SN | RV | DCO SUBMISSION | SZC Co |

NOT PROTECTIVELY MARKED



PROJECT:
SIZEWELL C

DOCUMENT:
MAIN DEVELOPMENT SITE
WATER MANAGEMENT ZONE SUMMARY
ANNEX C
DEADLINE 5 SUBMISSION JULY 2021

DRAWING TITLE:
WATER MANAGEMENT ZONE 1
DESIGN UPDATE - PLAN

| FIGURE NO: | REVISION: |
|---|---|
| FIGURE 1 | 01 |

| DATE: | DRAWN: | SCALE: |
|---|---|---|
| JULY 2021 | SN | 1:1000 |

SCALE BAR:
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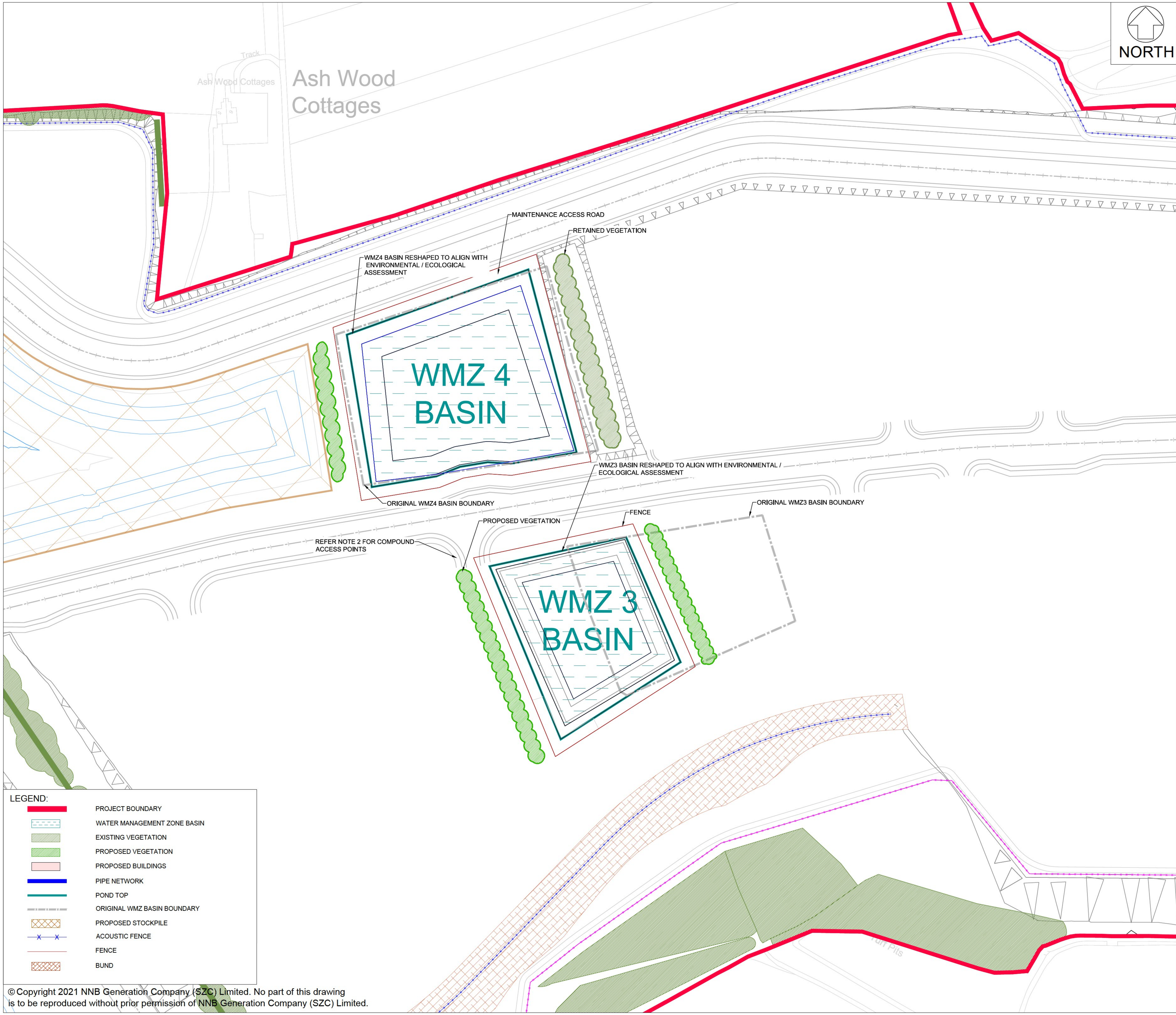
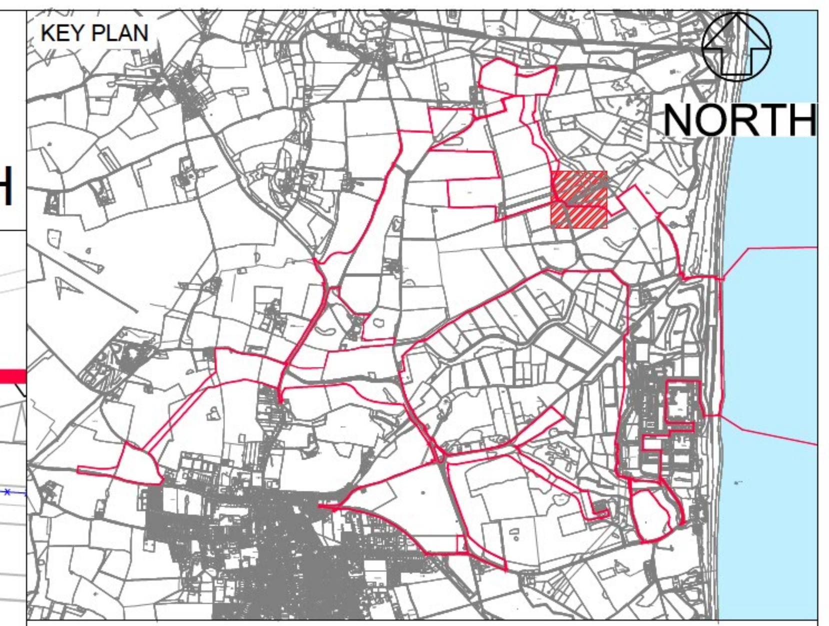
Scale 1:1000






KEY PLAN




NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. COMPOUND ACCESS POINTS TO BE UPDATED IN THE NEXT DESIGN PHASE.

| REVISION | DATE | DRAWN | CHECKED | REASONS FOR REVISION / COMMENTS | APPROVED |
|---|---|---|---|---|---|
| 01 | JULY 2021 | SN | RV | DCO SUBMISSION | SZC Co |

NOT PROTECTIVELY MARKED



PROJECT:
SIZEWELL C

DOCUMENT:
MAIN DEVELOPMENT SITE
WATER MANAGEMENT ZONE SUMMARY
ANNEX C
DEADLINE 5 SUBMISSION JULY 2021

DRAWING TITLE:
WATER MANAGEMENT ZONE 3 &4 DESIGN UPDATE PLAN LAYOUT

| FIGURE NO: | REVISION: |
|---|---|
| FIGURE 2 | 01 |

| DATE: | DRAWN: | SCALE: |
|---|---|---|
| JULY 2021 | SN | 1:1000 |

SCALE BAR:
10m 0m 10m 20m 30m 40m 50m 60m 70m
Scale 1:1000

# ANNEX 2A.4: ACA DRAINAGE STRATEGY TECHNICAL NOTE

# CONTENTS



# TABLES

## FIGURES



## APPENDICES

# GLOSSARY

| | |
|---|---|
| 2D/ 3D/ 4D | 2-/ 3-/ 4-Dimensional |
| ACA | Ancillary Construction Area (known as "LEEIE" or "Land East of Eastlands Industrial Estate" in the DCO application) |
| AD | Associated Development |
| BOD | Basis of Design |
| BYLOR | Bouygues Travaux Publics / Laing O'Rourke (Joint Venture) |
| CDM | Construction (Design & Management) Regulations 2015 |
| CIRIA | Construction Industry Research and Information Association |
| DCO | Development Consent Order |
| EA | Environment Agency |
| ECI | Early Contractor Involvement |
| EDF | Electricité de France |
| EPRTM | Trade name for reactor type proposed for SZC |
| ESC | East Suffolk Council |
| EW | Enabling Works |
| EWBD | Enabling Works Basic Design |
| HGV | Heavy Goods Vehicle |
| IDB | Internal Drainage Board |
| IDT | Integrated Design Team |
| LEEIE | Land East of the Eastlands Industrial Estate (referred to as the "ACA" or "Ancillary Construction Area" in this document |
| LLFA | Lead Local Flood Authority |
| mAOD | Metres Above Ordnance Datum |
| MCA | Main Construction Area |
| MW | Megawatt |
| NNB | Nuclear New Build |
| PIMP | Percentage Impermeable |
| QS | Quantity Survey (/ -or/ -ing) |
| RSPB | Royal Society for the Protection of Birds |
| SCC | Suffolk County Council |
| SFR | Safety Functional Requirement |
| SHE | Safety, Health and Environment |
| SSSI | Site of Specific Scientific Interest |
| SuDS | Sustainable Drainage Systems |
| SZB | Sizewell B |
| SZC | Sizewell C |
| TCA | Temporary Construction Area |
| TSS | Total Suspended Solids |
| WBS | Work Breakdown Structure (Package) |
| WMZ | Water Management Zone |

# OVERVIEW – SECOND REVISION

The Sizewell C (SZC) Development Consent Order (DCO) has been submitted and included a site wide Outline Drainage Strategy. This technical note aims to provide a more detailed background of the proposed Ancillary Construction Area (ACA) site (also known as Land East of Eastlands Industrial Estate (LEEIE)) and explain the development of the surface water management proposals for the site while it is operational.

The ACA will be one of the first areas of development as part of the SZC construction project. The ACA will be temporary and operational for approximately ten years before it is decommissioned at which point the site will be returned to predevelopment condition.

A first issue of the basic drainage design note for the ACA was shared informally with stakeholders during 2020, including East Suffolk Council (ESC), Suffolk County Council (SCC), the Environment Agency (EA), East Suffolk Internal Drainage Board (ESIDB) and Natural England (NE). A meeting was held with stakeholders on 17th December 2020 and feedback gained. In addition, SCC as the Lead Local Flood Authority (LLFA) wrote a letter to SZC Co. dated 8th February 2021 (Appendix A1), setting out concerns around drainage design. Therefore, this document has been revised to address the feedback received.

The surface water drainage design has been progressed to a basic level of design, to demonstrate that the proposed strategy can sufficiently manage surface water runoff generated by the proposed development, within the Order Limits and whilst complying with current local and national guidance.

The revised document:

- Provides more information on historic infiltration data on the ACA,
- Updates the discharge strategy, and therefore Sustainable Drainage (SuDS) proposals,
- Removes below ground storage structures; and
- Provides assurance that the SuDS storage features have been designed in accordance with best practice guidance and shows there is space for these on site within the order limits.

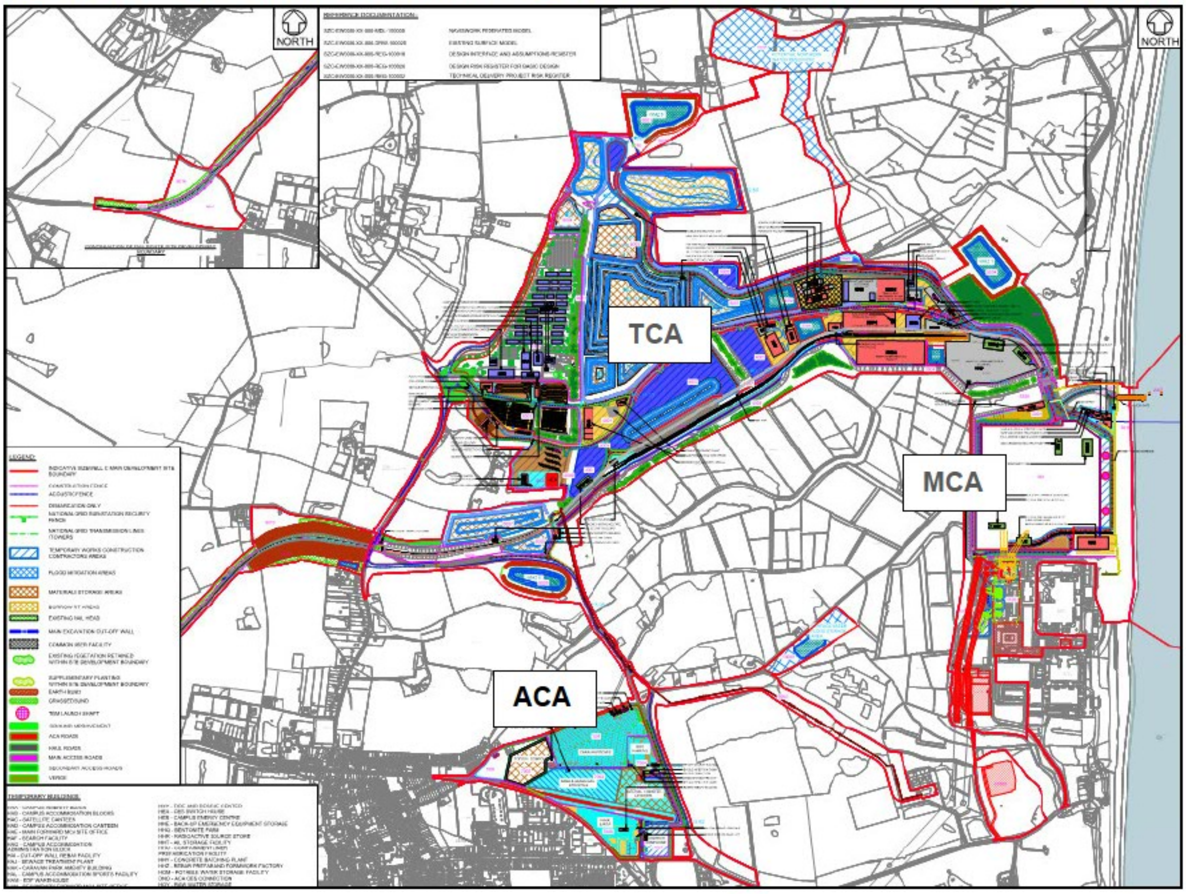
The design will be updated in the next design phase in conjunction with engagement with ESC, SCC, NE, EA and ESIDB.

# 1 INTRODUCTION

## 1.1 General

1.1.1 This technical note has been prepared to provide additional detail on the proposed Sizewell C (SZC) nuclear power station Enabling Works Basic Design (EWBD) surface water management proposals. This document primarily focuses on the Land East of the Eastlands Industrial Estate (LEEIE), as described in the Development Consent Order (DCO) submission, also known as the Ancillary Construction Area (ACA), the location of which is shown in Figure 1-1. Throughout this document, this area will be referred to as the ACA. SZC Co. acknowledge the design of surface water management will be updated and change throughout the next phases of design. SZC Co. will work collaboratively with Suffolk County Council (SCC) and other stakeholders throughout the detailed design phase.

**Figure 1-1 - Sizewell C site, showing DCO boundary, ACA, MCA and TCA areas**




1.1.2 Basic Design has been developed by SZC Co.

## 1.2 Project Background

1.2.1 The Sizewell C site is located on the Suffolk coast, approximately mid-way between Felixstowe and Lowestoft, to the north-east of the town of Leiston.

1.2.2 SZC Co. is applying for development consent to construct, operate and maintain Sizewell C nuclear power station. The project will take approximately 9-12 years to complete construction. The ACA will be required for the duration of this construction period to support the main construction works. After this point, the ACA will be returned to its existing state (i.e. a grassed field). This is summarised in the Development Consent Order (DCO) available publicly.

# 2 ACA CONSTRUCTION AREA

## 2.1 Existing ACA Site

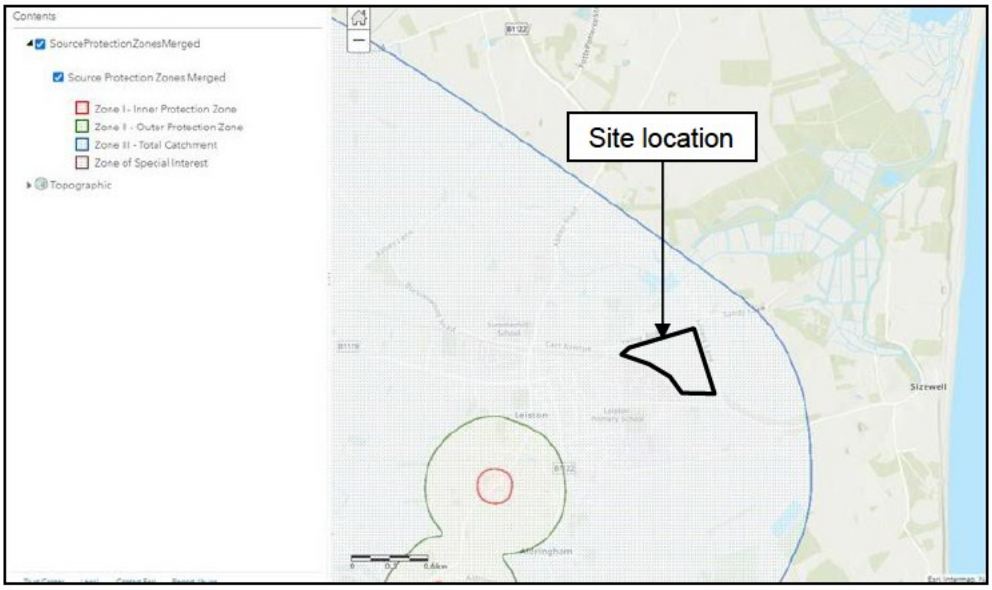
2.1.1 The ACA is currently an agricultural greenfield as shown in Figure 2-1 below, bounded by Valley Road, Lover's Lane, King George's Avenue and an existing railway line from Saxmundham. The site is approximately 30 hectares in area.

**Figure 2-1 - Existing ACA greenfield**


2.1.2 The whole of the proposed ACA is within Zone III of the Environment Agency (EA) groundwater source protection zone, shown in Figure 2-2. Although this does not mean a ban on discharge of surface water to groundwater at this site, it would need to be discussed with the EA should infiltration be considered in future on this site as a means of surface water disposal. However, as set out in Section 3 below, the potential for infiltration is extremely limited.

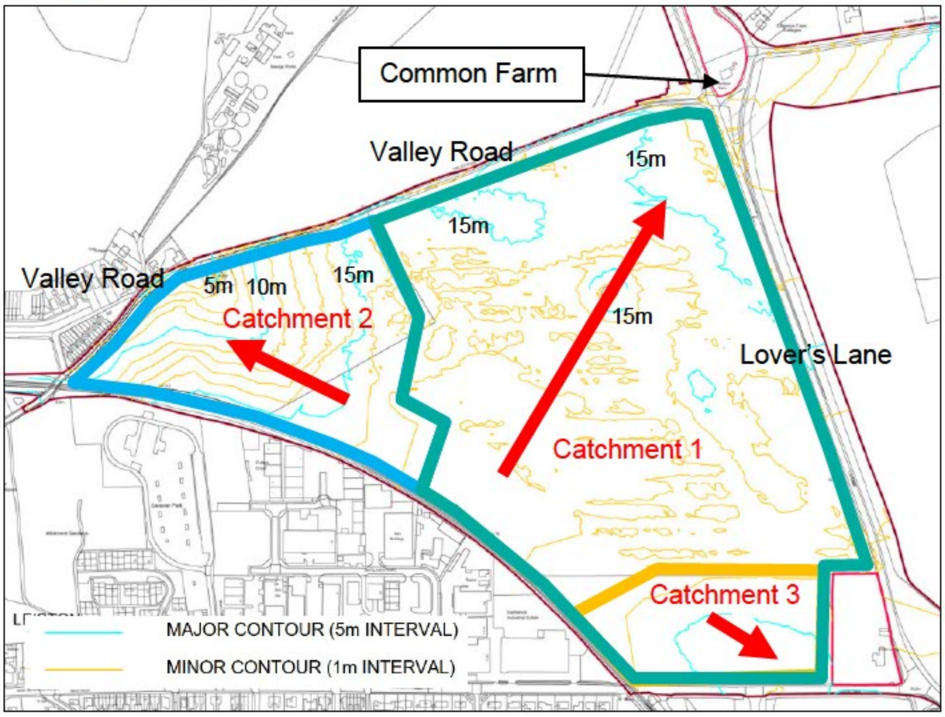
2.1.3 Groundwater levels in the ACA are shown to range between 1.6 mAOD and 2.1 mAOD (based on Environment Statement groundwater contours, presented here as Appendix B1).

### Figure 2-2 - ACA groundwater source protection zone map




2.1.4 Figure 2-3 outlines the natural catchments based on the existing ground levels that were surveyed in 2019 using Lidar. The contours shown are at 1m intervals with the major (5m) contours highlighted in blue. The north-west section of the ACA is set lower than the remainder of the ACA and therefore does not contribute to the same catchment. Runoff from this area poses potential flood risk to the residential dwellings to the north of Valley Road. Catchment 2 encompasses approximately 4.4 ha of the ACA. Catchment 1 generally falls to the north-east to the junction of Valley Road with Lover's Lane at Common Farm which appears to generally travel towards the Leiston Drain. The southern part of the ACA falls south towards King George's Avenue, and is likely captured by an existing network within King George's Avenue, or infiltrates through roadside drainage systems. Catchment 3 currently includes an area of low-medium flood risk (i.e. between 1:30 and 1:1,000-year rainfall events). Flooding in this area will be alleviated as the site will capture surface water via permeable paving as well as a drainage network and discharged to the north.

**Figure 2-3 - ACA site surface existing profile and surface water catchments (Waldeck Drone Survey 2019)**




2.1.5 Further topographical surveys will be undertaken in 2021 to validate the existing data and inform the detailed design.

2.1.6 Greenfield runoff rates for the site have been calculated using UK SuDS guidance and are shown in Table 2-1 below. The output of the results from the UK SuDS calculation is attached in Appendix C1.

**Table 2-1 - ACA greenfield runoff rates**

| Return Period (years) | Greenfield Rate (l/s) |
|---|---|
| 1 | 61.3 |
| $Q_{BAR}$ | **70.4** |
| 30 | 172.5 |
| 100 | 250.6 |

$Q_{BAR}$ - peak rate of flow from a catchment for the mean annual flood - return period of approximately 1:2.3 years.

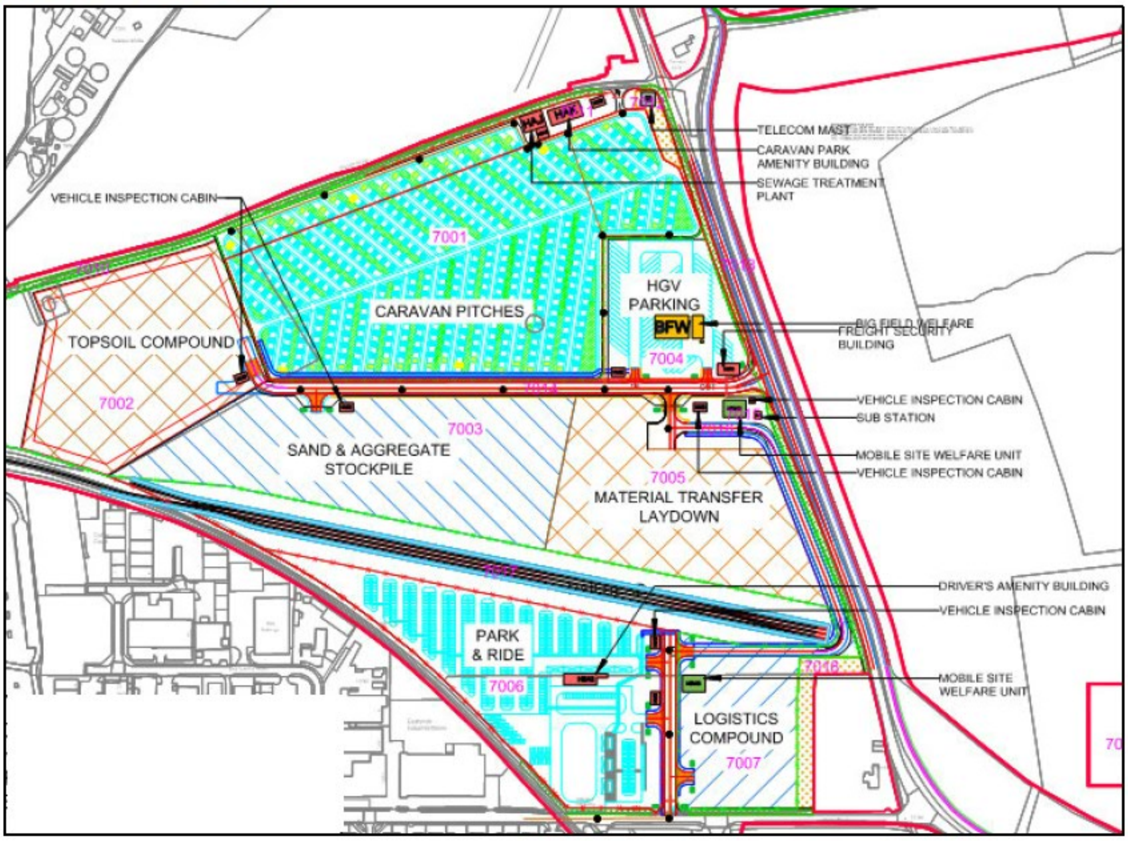
## 2.2 Proposal Overview

2.2.1 The ACA is proposed as a multi-purpose site with the following facilities:

- Caravan pitches to house approximately 400 caravans, providing temporary accommodation for some Contractors.
- Heavy Goods Vehicle (HGV) parking for Contractor vehicles required on site.
- Material stockpile areas – including a sand & aggregate stockpile area, a topsoil stockpile, and material transfer laydown area.
- Park and ride and logistics compounds to allow transport of staff to the main works areas.
- A rail-head central to the site to provide access for deliveries to site via rail.

These areas are shown in Figure 2-4.

**Figure 2-4 - ACA areas**




2.2.2 The ACA is isolated from the TCA and MCA, and therefore has an independent surface water drainage network to that serving the main construction site. With the above in mind, a drainage strategy has been developed for the ACA during the enabling works pre-detailed design stage, building from the overall drainage strategy. This design will be updated and refined during detailed design and with continued engagement with stakeholders such as East Suffolk Council (ESC), SCC, Natural England, the EA, and East Suffolk Internal Drainage Board (IDB). The drainage design strategy is highlighted in the following section.

# 3 ACA DRAINAGE STRATEGY DEVELOPMENT

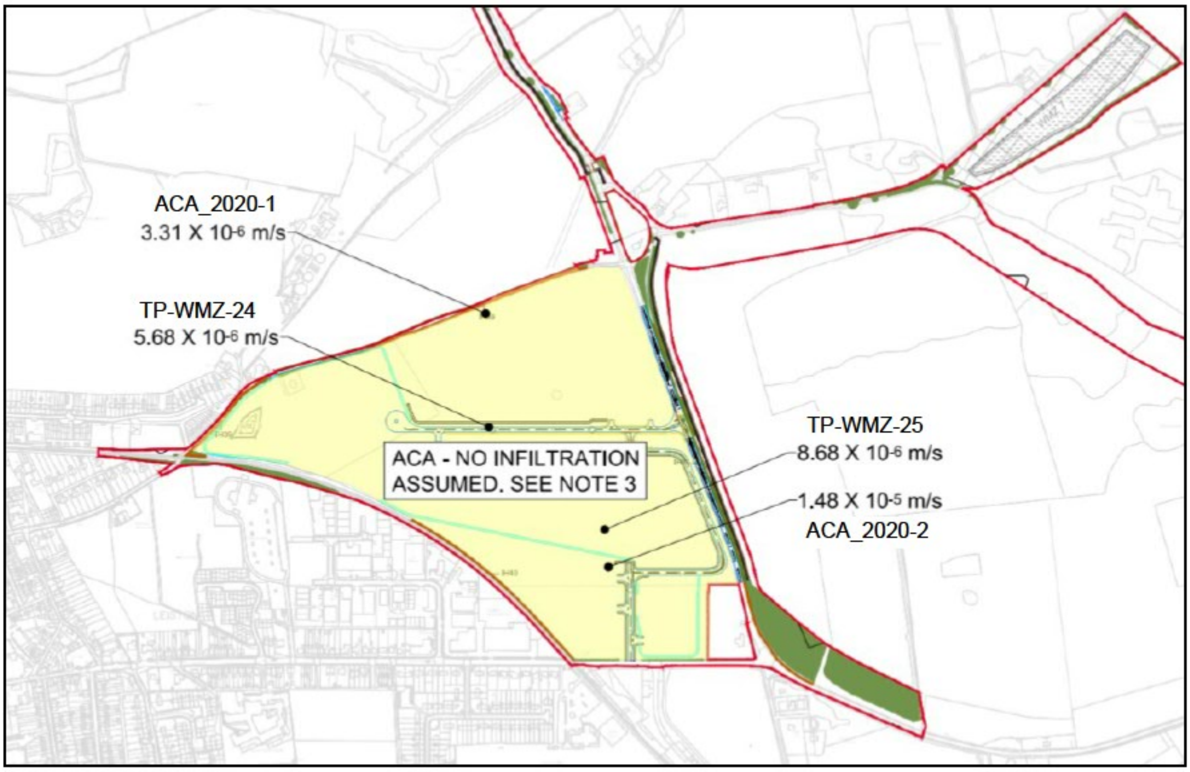
## 3.1 Background

3.1.1 The ACA drainage strategy has been informed by the site-wide Outline Drainage Strategy submitted with the DCO documentation (SZC Development Consent Order Outline Drainage Strategy EN010012-001802-SZC_Bk6_ES_V2_Ch2_Appx2A), as well as the proposed plot plan, described in Section 2.

3.1.2 As stated in the DCO drainage strategy, the ACA is known to have a low infiltration potential and therefore no infiltration has been conservatively assumed in Basic Design. The surface water runoff from this site would be managed on site, stored, and then discharged to a suitable nearby watercourse at an equivalent rate of $Q_{BAR}$, as agreed with external stakeholders on 17th December 2020 (see meeting minutes, item 4 in Appendix D1).

3.1.3 Figure 3-1 shows the historic infiltration rates recorded during ground investigation campaigns in 2016 by Structural Soils Limited (2016 Onshore Ground Investigation Campaign. Factual Report on Ground Investigation ref. SZC-SZC030-XX-000-REP-100000) and in 2020 by Fugro (Report on Ground Investigation without Geotechnical Evaluation. Sizewell Infiltration Testing ref G200003U_GIR Rev 02), within the ACA site. Infiltration test results from both reports are shown in Appendix E1. Whilst infiltration tests completed in April 2020 show improved infiltration rates and a potential opportunity to optimise the surface water drainage design, at this stage, no infiltration is assumed as a conservative measure to ensure that all surface water features are sized adequately. Further infiltration testing is planned in the ACA to confirm the infiltration potential and the design will be revised accordingly during Detailed Design. Infiltration has not been dismissed as an option for surface water disposal, and where permeable pavements are proposed, for example, it is expected that a percentage of surface water will infiltrate to ground. However, given previous history of ponding issues on the site, infiltration has not been relied upon in the design.

**Figure 3-1 - ACA infiltration rate summary (results shown in Appendix E1)**




3.1.4 The proposed drainage design will prioritise SuDS as a means of surface water treatment and discharge where practicable. The SuDS features currently proposed in the ACA include:

- Swales / Infiltration trenches (combined)
- Sediment ponds (2 no.)
- Permeable paving (where suitable) with filter drains

As well as the above, proprietary devices such as oil separators are also considered.

## 3.2 Design Strategy

3.2.1 The three existing catchments on site require different drainage strategies. As no infiltration is assumed, all surface water will be required to be discharged via watercourses adjacent to the site.

3.2.2 The original drainage strategy proposed in basic design aimed to mimic the existing site characteristics and predominantly discharge surface water runoff to the Leiston Drain at outfall O6, along Lover's Lane, at greenfield runoff rates. However, discussions with the EA, ESC, SCC and the IDB in

December 2020 concluded that there was a preference to make the primary surface water discharge from the ACA to the Sizewell Marshes instead (see Appendix D1 for meeting minutes, item 2).

3.2.3 To prevent altering the existing runoff characteristics, outfall O6 has been retained and is proposed to discharge flows from the Catchment 2 within the ACA only. This modification aims to improve water quality and quantity on site whilst providing an opportunity to recharge the Sizewell Marshes Site of Specific Scientific Interest (SSSI). It is important that the SSSI is neither overwhelmed with additional surface water runoff, nor starved of surface water during the construction and operation of SZC. Consequently, the approach adopted for the drainage of this site aims to maintain the existing drainage characteristics and forms the basis of the groundwater and surface water assessment in Volume 2, Chapter 19 of the Environmental Assessment. The importance of maintaining these drainage characteristics for the main development site has been reinforced in discussions with Natural England, the Suffolk Wildlife Trust, the Royal Society for the Protection of Birds (RSPB) and East Suffolk IDB.

3.2.4 Catchment 1 and 3 shown in Figure 2-3 are combined and make up 85% of the site. These catchments are proposed to be collected in gravity networks, either through permeable surfaces and filter drains where suitable, or gullies/channels with silt traps in hard surfaced areas. The surface water will then be conveyed towards a sediment pond east of the ACA, to provide attenuation and additional treatment, before discharging to the Sizewell Marshes.

3.2.5 Surface water runoff in Catchment 2 will be captured separately through swales and a sediment pond within the catchment, and then pumped east towards outfall O6 on Lover's Lane, discharging to the Leiston Drain. See Appendix F1 for the ACA surface water drainage general layout (SZC-EW0320-ATK-XX-000-XXXXXX-DRW-CCD-000004).

3.2.6 The outflow rate at both outfall locations will be restricted to the $Q_{BAR}$ as agreed in the meeting quoted above.

3.2.7 Both sediment ponds (East ACA WMZ and West ACA WMZ) are be sized for a 1 in 100 year return period, including a 20% climate change allowance in accordance with the DCO outline drainage strategy.

3.2.8 A hydraulic model for the overall site has been constructed in Innovyze Microdrainage (2019) to size the networks and attenuation/infiltration features. The hydraulic model parameters used are summarised in Table 3-1.

**Table 3-1 - ACA hydraulic model input parameters**

| | Parameter | Notes |
|---|---|---|
| **Rainfall-Runoff method** | Flood Studies Report (FSR), Flood Estimation Handbook (FEH) 1999 and 2013 | All three models run to undertake sensitivity checks |
| **Return Periods (years)** | 1, 30 and 100 | As per DCO Outline Drainage Strategy [1] |
| **Storm durations (min)** | 15 to 1440 (12 durations modelled) | As per DCO Outline Drainage Strategy [1] |
| **Global time of entry (min)** | 15 | Assumed site wide, however, to be refined (and likely increased) per catchment during detailed design |
| **Volumetric Run-off Coefficient** | 0.761, 0.817 (summer, winter) | Wallingford Procedure Vol 1 Equation 7.3 |
| **Climate change (%)** | 20 | As per DCO Outline Drainage Strategy [1] and EA guidance [2] |
| **PIMP (%)** | 100 | As per DCO Outline Drainage Strategy [1] |

[1] Environmental Statement – 6.3 Volume 2 Main Development Site, Chapter 2 Description of the Permanent Development, Appendix 2A Outline Drainage Strategy (EN010012-001802-SZC_Bk6_ES_V2_Ch2_Appx2A)

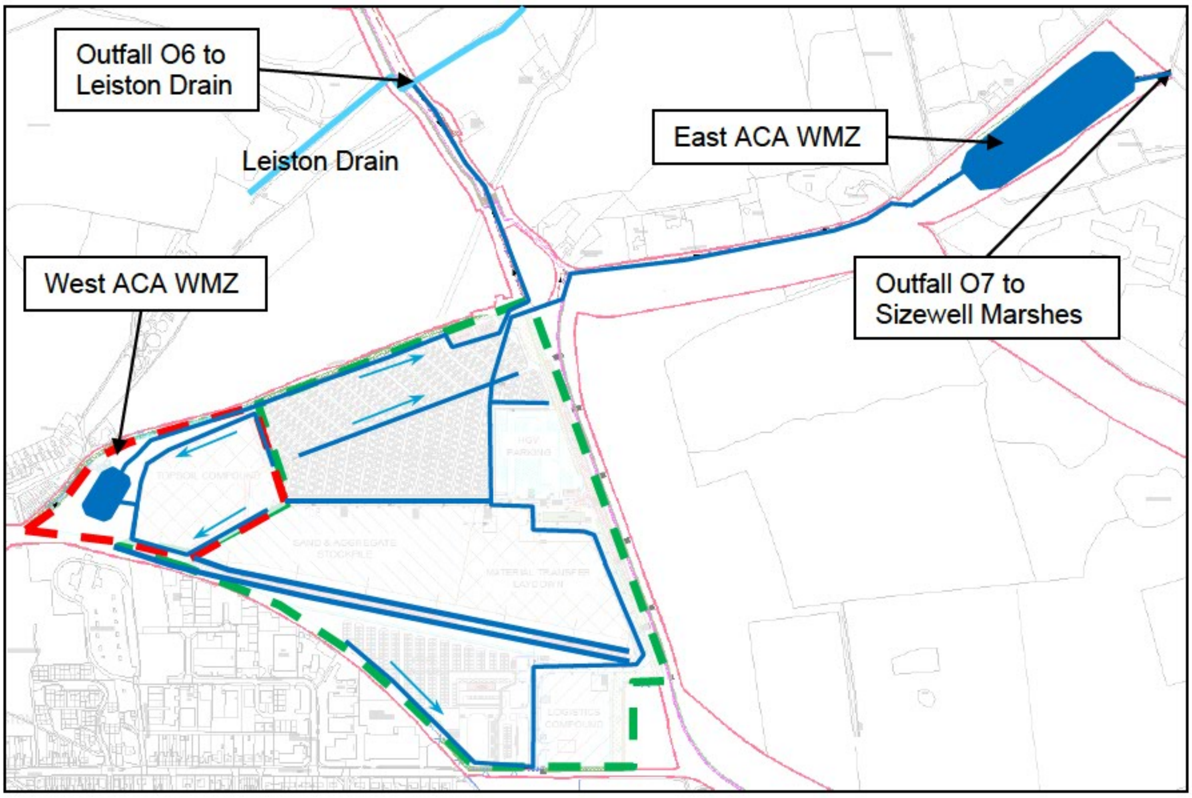
[2] Environment Agency – Flood risk assessment: climate change allowances - Table 2: peak rainfall intensity allowance in small catchments (less than 5 km2) or urban drainage catchments (based on a 1961 to 1990 baseline)

### 3.2.9 Main Catchment Overview (Catchment 1 & 3)

3.2.10 Catchments 1 & 3 are proposed to drain through a trunk network that runs from the park and ride area to the south, around the railhead, along the site access road, through the caravan pitches, to the north east of the main ACA site. This is shown indicatively in Figure 3-2 where catchments 1 & 3 are bound by the dashed-green line. From here, the surface water will be conveyed to an attenuation/infiltration basin (East ACA WMZ) east of the main ACA site, which will provide additional sediment treatment before discharging to the Sizewell Marshes at rate equivalent to $Q_{BAR}$.

3.2.11 Onsite attenuation will be provided in the subbase of the caravan pitches, logistics compound and materials transfer laydown areas, and is discussed further below. Groundwater levels in the ACA are shown to range between 1.6 mAOD and 2.1 mAOD (based on Environment Statement groundwater contours in Appendix B1), much lower than the finished ground levels (average 15 mAOD).

**Figure 3-2 - ACA discharge solution – overview**




3.2.12 The outflow rate at the proposed outfall locations has been proportionally obtained from the calculated $Q_{BAR}$ for the ACA site. Surface water will be restricted to 10.5 l/s and 59.9 l/s at outfall 06 and outfall 07, respectively.

3.2.13 An initial conservative storage estimate for the East ACA WMZ resulted in a storage requirement of 21700 $m^3$ as stated in the Water Management Zone Summary technical note (ref. SZC-EW0321-ATK-XX-000-XXXXXX-NOT-CCD-000001). The assessment allowed for a proposed outflow flowrate of 59.9 l/s, however excluded any allowance for storage upstream of the WMZ within the pipe network and any SuDS features, which will likely result in a lower attenuation volume.

3.2.14 Hydraulic modelling of the ACA has been progressed and the water volume produced during a 100-year rainfall event including 20% climate change is 15,600 $m^3$. The current proposed storage pond using a 59.9 l/s outflow rate is as per Table 3-2. Further work will be undertaken during Detailed Design to refine the hydraulic modelling and optimise the storage requirements.

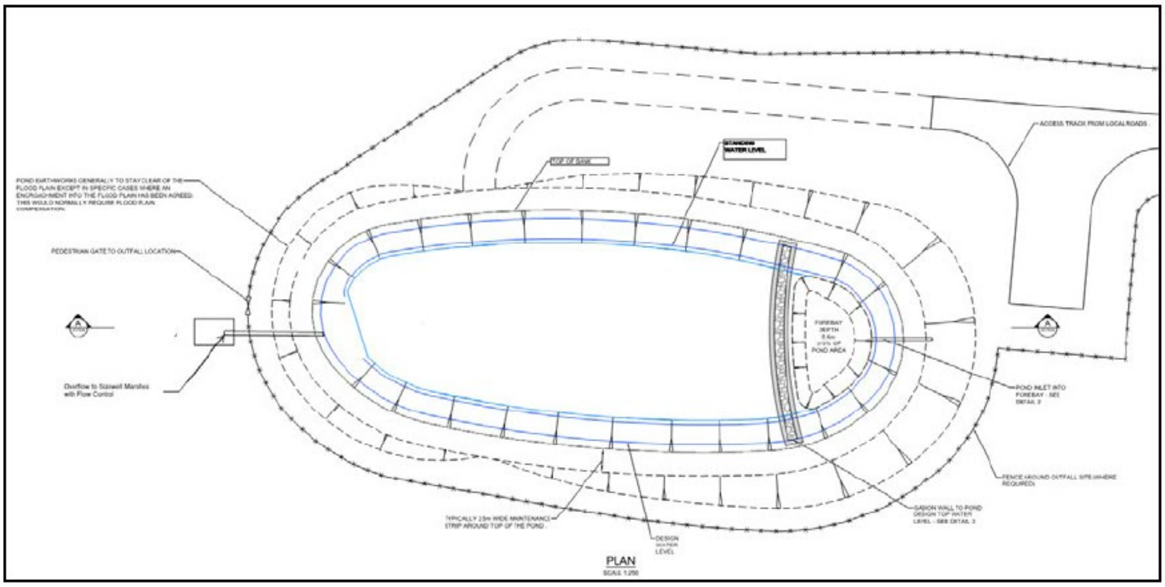
3.2.15 It is acknowledged that the location of the East ACA WMZ is beside a low-lying area which has been identified as being susceptible to flooding in the latest Flood Risk Assessment (FRA). The East ACA WMZ has been positioned to be outside the flooding extent of a 1 in 100 year fluvial flood event + 25% climate change as well as the 1,000 year coastal inundation flood extent.

**Table 3-2 - East ACA WMZ attenuation basin summary**

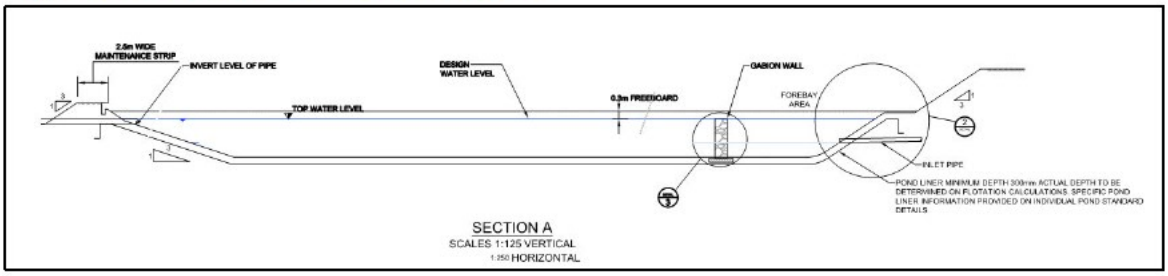
| | Pond / Water Management Zone |
|---|---|
| Pond volume ($m^3$) | 15,650 (3D model volume, excluding freeboard) |
| Crest level (mAOD) | 3.000 |
| Invert level (mAOD) | 1.600 |
| Pond depth (m) | 1.100 (excluding freeboard) |
| Pond side slopes (1:X) | 3 |
| Freeboard (mm) | 300 |
| Groundwater level (mAOD) | 1.100 |

3.2.16 An indicative detail of what the WMZ storage pond may look like is shown in Figure 3-3 and Figure 3-4. The WMZs will be developed during Detailed Design stage and will include details of the sediment forebays, access ramps, inlet and outlet structures and maintenance regimes. The East ACA WMZ is not designed to infiltrate due to the proximity to ground water levels. Whilst it is expected that there could be some limited infiltration, the West ACA WMZ basin is not designed to infiltrate at this stage and is therefore sized conservatively.

### Figure 3-3 - WMZ - indicative detail




### Figure 3-4 - WMZ - indicative section

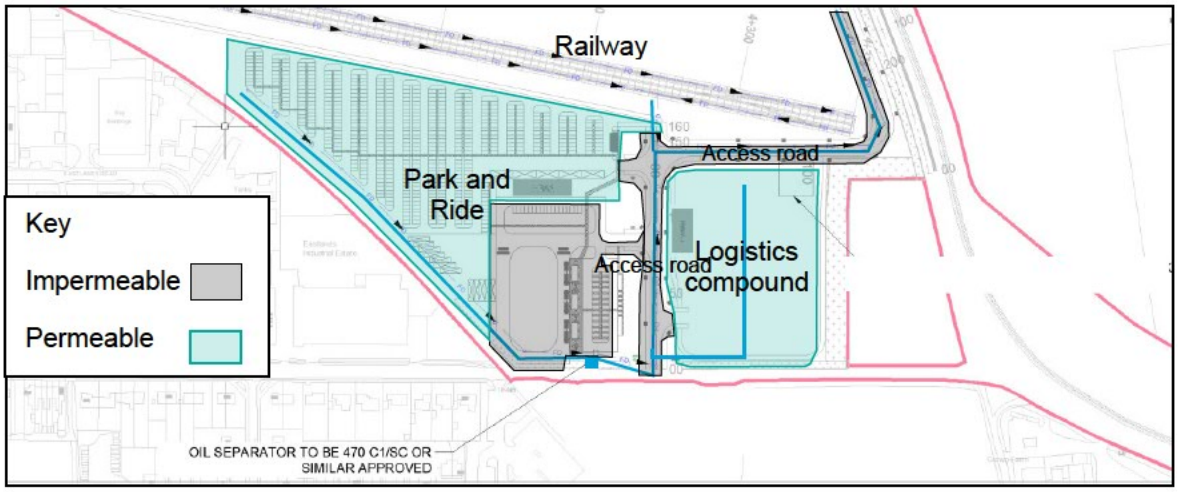



3.2.17 A high-level description of the drainage systems for each area within the main catchment are described in the sections below.

3.2.18 ***Park and Ride***

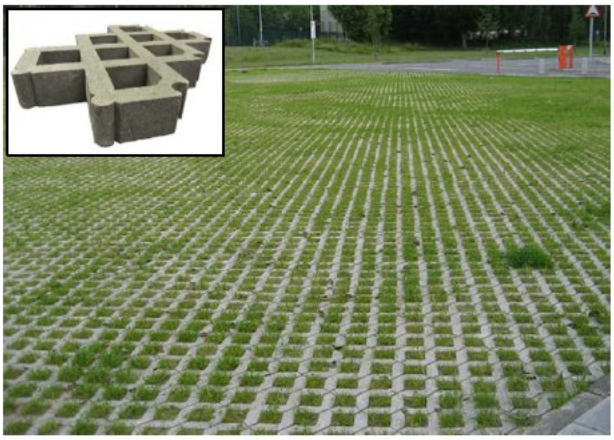
3.2.19 The park and ride area comprises two different surface types as shown in Figure 3-5.

**Figure 3-5 - ACA discharge solution south of railway**




3.2.20 The car parking area is proposed to generally have a permeable surface. This may be a truck-pave solution or similar, as shown in Figure 3-6.

**Figure 3-6 - Truck-pave surface example**



3.2.21 The area to the south-east of the park and ride is reserved for coaches and other large vehicle parking. At this stage, this area is proposed to be concrete pavement with channels and gullies to collect potential oil spills. This area may also be surfaced similarly to the park and ride area and use a permeable pavement but will be considered during Detailed Design.

3.2.22 ***Network Design***

3.2.23 Because the ACA is assumed to have no infiltration, from a hydraulic model perspective, all areas are considered to be 100% impermeable and all surface water runoff will be captured via their respective drainage systems.

3.2.24 The head of the trunk network at the park and ride begins with a 300mm dia. pipe, which increases to a 600mm dia. to drain the runoff from the park and ride. The internal secondary and tertiary networks have not been modelled at this stage, however across the permeable surface, there will be a number of filter drains at the base of the Type 3 pavement build-up which will connect to the trunk main.

3.2.25 For the impermeable surface area in the park and ride, it is proposed to drain the internal areas by a combination of gullies and channels, which drain to the carrier drains. All channels and gullies are to contain silt traps to provide a primary level of treatment. At this stage, an oil separator is proposed to contain the potential risk of oil spillage from the car park where large vehicles are parked long-term in line with pollution prevention guidance. Consideration of an oil separator is based on a risk management approach to provide reliability and robustness in the design to ensure no oils/hydrocarbons enter the SSSI downstream. It is acknowledged that SCC prefers to not use oil separators to capture and treat oil spills and instead supports the use of a lined permeable pavement whereby oil spills can be treated through granular pavement layers. To provide further treatment and protection of the receiving watercourse, a hydrodynamic separator such as a Hydro Downstream Defender may also be utilised in conjunction with a permeable pavement. This approach will be considered at the next design stage and is further discussed in Section 4.4.8.

3.2.26 ***Access Road drainage***

3.2.27 The road surface will be standard asphalt pavement, and runoff is currently proposed to be collected using standard kerb gullies at standard spacing. The gully leads of approximately 150mm diameter shall be connected to the collector system beneath the road. Implementation of a SuDS system such as a filter/fin drain will be considered during detailed design as an alternative to provide surface water treatment at the source. Use of filter drains versus standard collection systems such as kerb and gullies will be considered on a risk-based approach in the next design phase.

3.2.28 Because of the types of vehicles using the roads, a wheel wash is proposed at the entrance to the site to remove sediment from earthworks vehicles before coming into the ACA and going out of the ACA onto the public road. Additional sweeper vehicles will be utilised to maintain the cleanliness of the road. This detail needs to be developed during the next design phase.

3.2.29 ***Logistics Compound***

3.2.30 Similar to the Park and Ride area, the logistics compound is proposed to have permeable surfacing. The pavement build-up beneath this is currently proposed to include a sub-base of Type 3 fill providing a minimum porosity of 30%. Internal secondary and tertiary networks have not been modelled, however across the area, there will be a number of filter drains at the base of the Type 3 pavement layer which will connect to the trunk main.

3.2.31 ***Railway drainage***

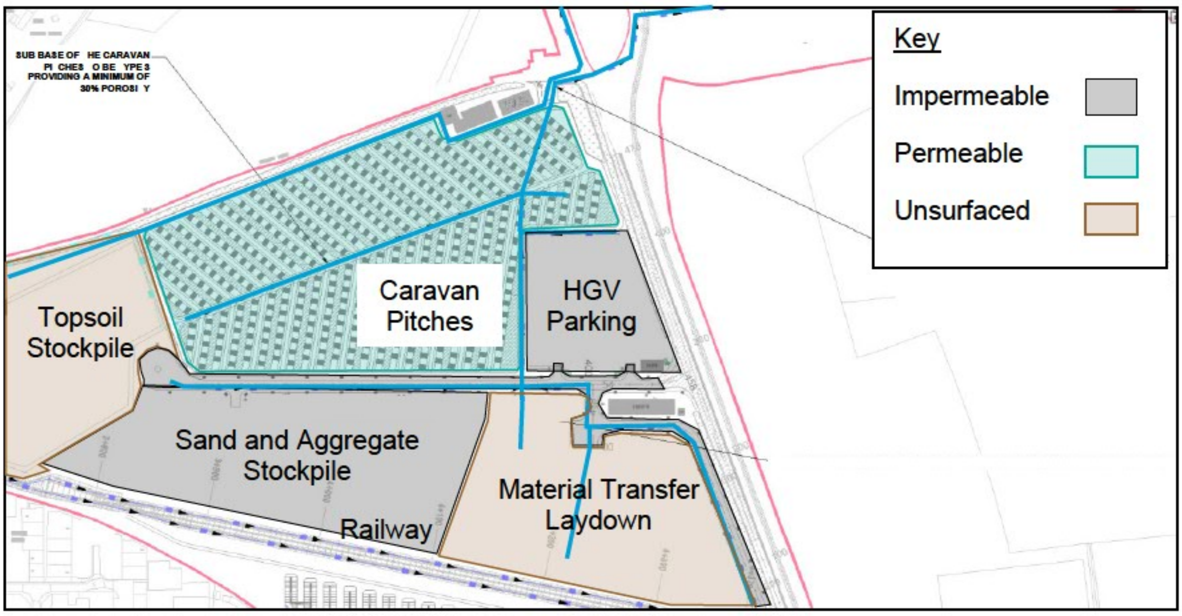
3.2.32 The runoff from the rail route is proposed to be collected by filter drains at a minimum crossfall of 1 in 30 draining on either side of the cutting, with catch pits proposed at 60m centres. The network discharges into the trunk main under the road via a sleeve through the rail retaining wall. Concrete perforated drainage channels will be considered as an alternative to filter drains to reduce the risk of blockages which are commonly experienced when using filter drains in railway applications. The trains will be diesel powered and will be able to park at this railhead. Refuelling will not be permitted on site, therefore the risk of oil spillages is lowered. A by-pass oil separator is proposed in this area to prevent oils and other hydrocarbons from entering the main network.

3.2.33 ***Sand & Aggregate Stockpiles***

3.2.34 The sand and aggregate stockpile areas will likely have a concrete base to allow materials to be constantly deposited in this location and moved around site via excavators and lorries. The surface water is currently proposed to be collected around the perimeter of the area via gullies and channels with silt traps to filter out the sediment. Further sediment settlement will be provided as the flows will convey to the East ACA WMZ. With increased engagement with logistic suppliers of sand and aggregate planned at the next design phase, discussions will consider the possibility to introduce swales in this area to capture and treat surface water runoff. Alternatively, implementation of an SDS Aqua-Xchange or equal filter drain network will be considered at the next design stage as opposed to conventional pipe/gully network to provide treatment opportunity.

3.2.35 It is understood SCC has concerns about blockages of silt traps and the lack of SuDS used in this part of the site. This needs further discussion and collaborative working with SCC and the EA to provide a suitable solution, however at this stage, standard collection methods with silt traps are proposed and maybe revised during Detailed Design. A maintenance management plan will be required and submitted prior to commencement of construction on the site.

**Figure 3-7 - ACA discharge solution north of railway**




3.2.36 ***Material Laydown Transfer***

3.2.37 The material transfer laydown area will likely be a gravelled surface, and therefore will allow surface water to infiltrate through granular materials, be naturally treated, and then be collected through filter drains within the sub-base build-up. A Type 3 granular fill providing a minimum porosity of 30% is proposed to provide storage across this area. Secondary and tertiary filter drains across the material transfer laydown area will convey flows to the trunk main.

3.2.38 ***HGV parking***

3.2.39 The surface of the HGV parking area is currently proposed to be a concreted heavy-duty pavement to allow for vehicle loads from HGVs. The concrete pavement will not allow infiltration, and therefore the surface water is currently proposed to be captured via gullies and channels with silt traps. The HGV area surface water network will be routed to a suitably sized oil separator to treat surface water for potential oil contamination prior to conveyance into the main network for the ACA.

3.2.40 This area will be revisited during Detailed Design to consider use of a permeable surface to filter contaminant naturally and use a SDS Aqua-Xchange or equal filter drain system, however at this stage, an oil separator is considered necessary given the pavement type and intended use.

3.2.41 ***Caravan Pitches***

3.2.42 The caravan pitch area has a permeable pavement surface which is proposed to be truck-pave (Figure 3-6) or similar. The pavement build-up beneath this is currently proposed to include a 200mm thick sub-base of Type 3 fill providing a minimum porosity of 30% this provides attenuation. The thickness of the sub-base has been based on the hydraulic performance and may be revised following structural design of the pavement. The flows will then convey to the trunk main and towards the East ACA WMZ.

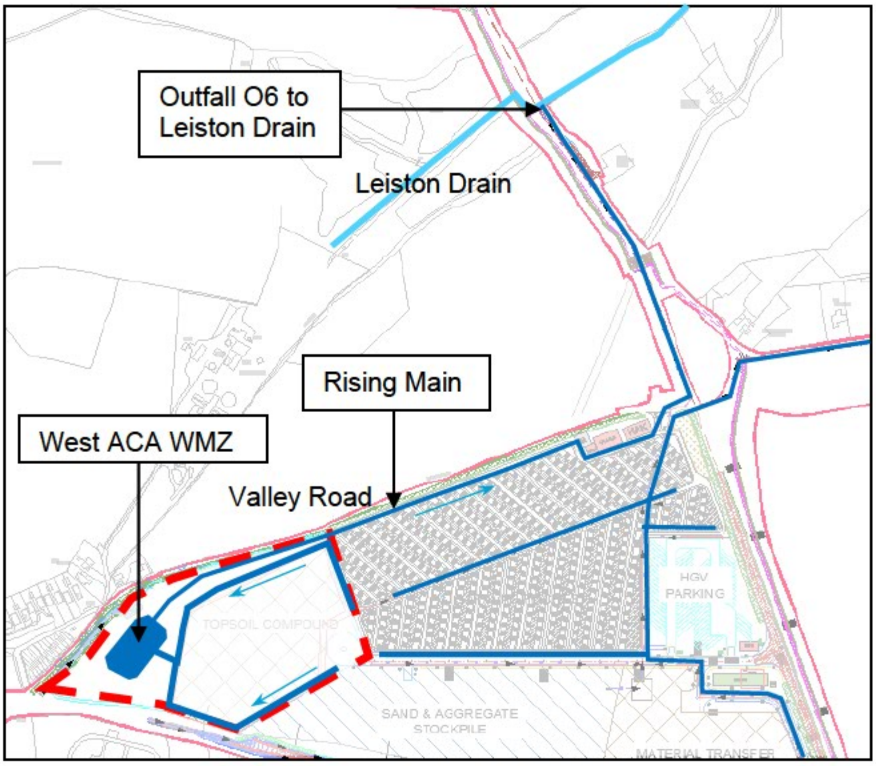
3.2.43 **Topsoil compound and area west of the topsoil compound (Catchment 2)**

3.2.44 This area of the site drains to the north-west towards Valley Road. There is an existing surface water network along Valley Road. SCC have indicated that the external network would require upgrade should a connection from the ACA be made to this asset due to capacity issues. Because of the uncertainty around this, at this stage the current solution will not discharge to the external network. This will be discussed with SCC to assess the possibility and the extent of upgrade to the existing network required.

3.2.45 Therefore, surface water runoff in Catchment 2, indicatively outlined by dashed-red line in Figure 3-8 is proposed to be captured separately through perimeter swales that convey to a sediment pond (West ACA WMZ) within the catchment and to stop any water running off site. As no infiltration is assumed, the attenuated runoff will require pumping from the low point of the site, east towards outfall O6 on Lover's Lane, discharging to the Leiston Drain.

3.2.46 The proposed swales and West ACA WMZ will be sized to accommodate the runoff volumes for a 100-year return period storm event. The swales will be designed in accordance with the CIRIA C753 SuDS Manual and check dams may be incorporated to the design to restrict the average velocity given that the existing ground levels fall steeply and to provide opportunity to treat captured runoff.

### Figure 3-8 - ACA discharge solution – Topsoil Compound and area west of compound




3.2.47 An initial conservative storage estimate for the West ACA WMZ resulted in a storage requirement of 4000 $m^3$, with a proposed flowrate to the Leiston Drain of 10.5 l/s, as stated in the Water Management Zone Summary technical note (ref. SZC-EW0321-ATK-XX-000-XXXXXX-NOT-CCD-000001). The proposed rate is based on the calculated $Q_{BAR}$ for the ACA site (Appendix C1). This assessment was undertaken using a source control calculation, which excluded any onsite storage upstream of the WMZ within the swale network.

3.2.48 Hydraulic modelling of the ACA has been progressed and the water volume produced during a 100-year rainfall event including 20% climate change is 1,900 $m^3$. Further work will be undertaken during Detailed Design to refine the hydraulic modelling and optimise the storage requirements. The current proposed storage pond using an outflow rate of 10.5 l/s is as per Table 3-3.

**Table 3-3 - West ACA WMZ infiltration basin summary**

| | Pond / Water Management Zone |
|---|---|
| **Pond volume ($m^3$)** | 2,100 (3D model volume, excluding freeboard) |
| **Crest level (mAOD)** | 8.000 |
| **Invert level (mAOD)** | 5.700 |
| **Pond depth (m)** | 2.0 (excluding freeboard) |
| **Pond side slopes (1:X)** | 3 |
| **Freeboard (mm)** | 300 |
| **Groundwater level (mAOD)** | 2.100 |

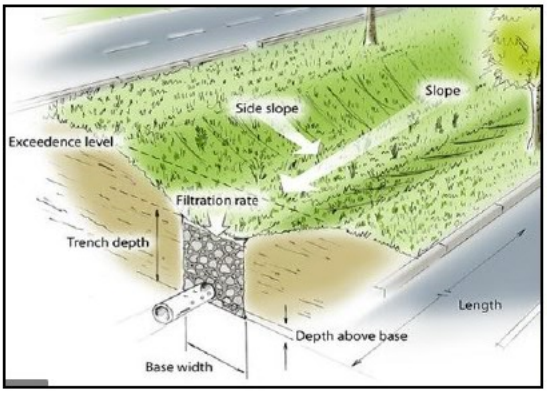
3.2.49 The attenuated volumes will be discharged to the Leiston Drain via a rising main of 100mm diameter at a rising gradient of 1:70 with a duty-assist pump capacity of 10.5l/s. The next stage of design for the West ACA WMZ sediment pond will include assessment for pump failure events to ensure that in the event of a pump failure, surface water runoff would not leave the site.

3.2.50 ***Topsoil Stockpile***

3.2.51 When the site is first occupied, the topsoil across the site will gradually be stripped and stockpiled in the north-west corner of the site as indicated on the general arrangement figures. The topsoil stockpile will be hydroseeded to minimise sediment runoff, however before the grass is established, the surface water will need to be captured and treated prior to discharge to the Leiston Drain. Furthermore, the topsoil stockpile will likely need to be churned approximately every two years to retain the nutrients and minerals in the soil, to allow it to be reused in the future. This will disturb the vegetated state of the topsoil stockpile and increase sediment runoff in the surface water.

3.2.52 The topsoil stockpile is proposed to be surrounded by a combination of hay bales and swales to remove the majority of the sediment in the surface water. The swales will convey surface water runoff towards the north west to the West ACA WMZ where further treatment can be undertaken. A typical detail of the swales and hay bales is shown in Figure 3-9 and Figure 3-10.

**Figure 3-9 - Typical swale/infiltration trench detail**



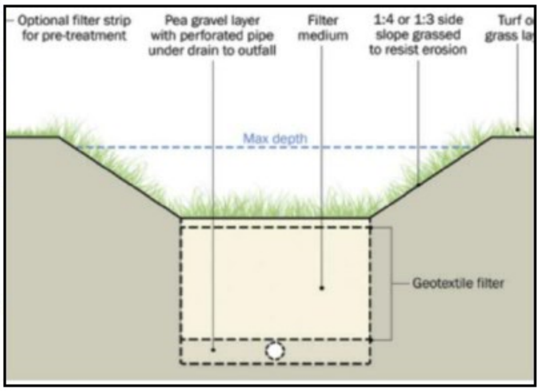
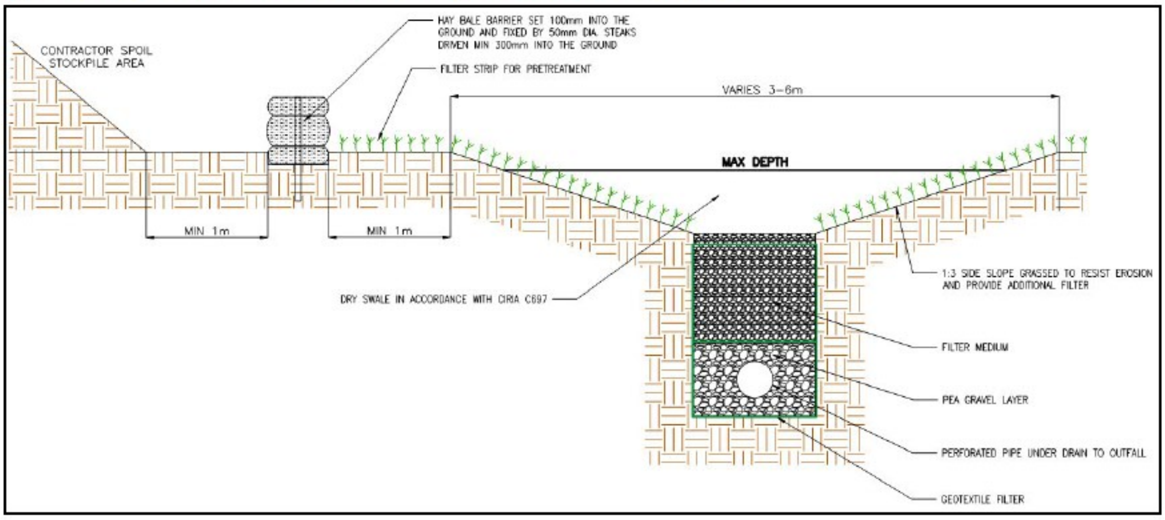




**Figure 3-10 - Stockpile boundary treatment proposal**




# 4 REVIEW OF ACA DRAINAGE STRATEGY THROUGH DETAILED DESIGN

## 4.1 Surface Water Catchment Methods

4.1.1 As the proposed ACA drainage strategy is developed through Detailed Design, it will be assessed to ensure it is the optimal solution to managing surface water on the site. This will include reviewing the design against opportunities where SuDS can be further utilised, with respect to practicality in each location of the ACA. During Detailed Design, the proposed surface water drainage infrastructure will consider failure scenarios to provide assurance that the proposed infrastructure is adequately sized to manage surface water runoff within the order limits, specifically targeted at what happens if the network becomes blocked.

### 4.1.2 SuDS and other design inputs

4.1.3 A priority in design was to use SuDS features where possible for the treatment, maintenance, and sustainability benefits. Table 4-1 shows an overview of the available SuDS techniques based on Table 7.1 of CIRIA. As stated in section 3.1, infiltration structures are not considered at this stage in the design. Living roofs will not be suitable on this industrial construction site either, with most buildings on site being prefabricated structures. Water will be reused as much as possible throughout the construction process. Rainwater harvesting tanks will be investigated in the next design phase, as well as the potential of reusing the WMZ water for construction activities where appropriate. This will also decrease the use of potable water on site.

**Table 4-1 - Overview of SuDS techniques (based on Table 7.1 CIRIA C753)**

| SuDS Techniques | Flood Reduction | Pollution Reduction | Landscape & Wildlife Benefit |
|---|---|---|---|
| Re-use on site | ✓ | ✓ | ✓ |
| Living Roofs | ✓ | ✓ | ✓ |
| Basins & Ponds<br>– Wetland<br>– Balancing pond<br>– Detention basin<br>– Retention pond | ✓ | ✓ | ✓ |
| Filter strips and swales | ✓ | ✓ | ✓ |
| Infiltration<br>– Soakaways<br>– Infiltration trenches<br>– Infiltration basin | ✓ | ✓ | ✓ |
| Permeable surface and filter drains<br>– Gravelled areas<br>– Paving blocks<br>– Porous paving | ✓ | ✓ | |
| Tanked systems<br>– Oversized pipes and box culverts | ✓ | | |

| | | | |
|---|---|---|---|
| – Storm cells | | | |
| Proprietary treatment systems<br>– Oil separators<br>– Settlement units | | ✓ | |

4.1.4 The following SuDS techniques have been proposed in the design of the surface water drainage:

- Swales and a pond (West ACA WMZ) at the topsoil compound.
- A pond (East ACA WMZ) to the east of the site
- Permeable pavements and filter drains at the park and ride, material transfer laydown areas, the caravan pitches and logistics compound.
- Filter drains at the railway track drainage.

4.1.5 The following SuDS techniques will be considered in detailed design phase to further reduce runoff from the development and provide pollution reduction:

- Additional filter strips / filter drains along access roads
- Additional permeable paved areas
- Additional swales

## 4.2 Surface Water Storage Methods

4.2.1 As stated in Section 3.2.9 the ACA will discharge into the surface water network in the vicinity of the site, namely the Leiston Drain and the Sizewell Marshes. Discharge will be limited to a $Q_{BAR}$, therefore on-site attenuation will be required. The following attenuation methods will be utilised:

- Two ponds (WMZs) – west of the topsoil compound and east of ACA.
- Permeable pavements (Type 3 subbase minimum porosity of 30%) - Park and ride, caravan pitches, material transfer laydown areas and logistics compound.

## 4.3 Maintenance

4.3.1 The surface water design aims to minimise maintenance required on site by aiming to use gravity systems rather than pressurised systems as much as possible. There will still be an element of maintenance required by the Contractor over time.

4.3.2 All surface water components are to be managed within the project by the Contractor. Regular maintenance of the surface water system will be undertaken throughout the lifecycle of the ACA. The Contractor will be required to submit a surface water operations and maintenance management plan that complies with the Code of Construction Practice (CoCP) prior to commencing construction on site.

4.3.3 The planned operational life of the ACA is expected to be approximately 10 years, after which it will be returned to its original greenfield condition. Swales and ponds will be maintained to ensure there is enough vegetation to operate as required for filtering runoff but kept cut to ensure the system is free flowing (in accordance with the CIRIA C753 SuDS Manual). Swales and ponds will be dredged of excess silt build up as required.

4.3.4 All below ground drainage will be designed in accordance with Sewers for Adoption (7th ed.) with all allowances for access and jetting. All filter drains with internal perforated pipes will be provided with rodding eyes on the ends.

4.3.5 A designated maintenance management plan will be in place for the life of the development, this will be used to ensure all aspects of the drainage system are regularly maintained as regularly as deemed necessary for each drainage element. The maintenance management plan will be submitted for approval prior to construction on site.

## 4.4 Surface Water Treatment

4.4.1 Pollution risk from runoff from the site has been managed through SuDS (assessed using the index approach) where possible. Where SuDS techniques are not currently proposed, other forms of sediment capture are provided. This is through the inclusion of silt traps, catch pits and oil separators within the traditional drainage systems.

4.4.2 **SuDS Index approach to water quality risk management**

4.4.3 As set out in Section 26.7.1 of the CIRIA C753 SuDS Manual, the simple index approach is used to assess water quality risk management and ultimately determine what SuDS measures are required to treat different types of developments. The steps are set out as:

**Step 1** – Allocate suitable pollution hazard indices for the proposed land use

**Step 2** – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

**Step 3** – Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach

4.4.4 Given the general use of the ACA site we can allocate pollution indices (Table 26.2 CIRIA SuDS Manual) as one of the two categories, show in Table 4-2. The SuDS Manual does not provide a figure suitable for material stockpiles or loose topsoil, so a "medium" level pollution hazard level is assumed for these areas.

**Table 4-2 - Pollution hazard indices for different land use classifications**

| Land Use | Pollution hazard levels | Total suspended solids (TSS) | Metals | Hydrocarbons |
|---|---|---|---|---|
| Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways. | Medium | 0.7 | 0.6 | 0.7 |
| Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways. | High | 0.8 | 0.8 | 0.9 |

4.4.5 Table 4-3 summarises the intended use of each site within the ACA and the assigned pollution hazard level.

**Table 4-3 - ACA pollution hazard indices assigned**

| ACA area | Description of proposed use | Assigned pollution hazard levels |
|---|---|---|
| Park and Ride area | Will be used for transporting site staff from the ACA to and from the TCA and MCA. Will constitute parking for site staff with a dedicated bus service | Medium |

| | | |
|---|---|---|
| Logistics compound | Management depot for transport of staff and good around the sites | Medium |
| Railway | Railhead used for delivery of materials (sands, aggregates and other materials) to the ACA | Medium |
| Material Transfer Laydown | Laydown area for materials delivered to site from the train. | High |
| Sand & Aggregate Stockpile | Laydown area for the storage of sand and aggregates delivered to site from the train | High |
| Topsoil compound | Storage area for stripped topsoil | High |
| HGV parking | Parking area for contractors' HGVs and other plant | High |
| Caravan Pitches | For early contractors' accommodation and compounds | Medium |

4.4.6 Indicative SuDS pollution mitigation indices are stated in Table 26.3 of the CIRIA SuDS Manual, copied into Table 4-4.

**Table 4-4 - Indicative SuDS mitigation indices for discharges to surface waters**

| | Mitigation indices | | |
|---|---|---|---|
| **Land Use** | **TSS** | **Metals** | **Hydrocarbons** |
| Filter strip | 0.4 | 0.4 | 0.5 |
| Filter drain | 0.4 | 0.4 | 0.4 |
| Swales | 0.5 | 0.6 | 0.6 |
| Bioretention system | 0.8 | 0.8 | 0.8 |
| Permeable pavement | 0.7 | 0.6 | 0.7 |
| Detention basin | 0.5 | 0.5 | 0.6 |
| Pond | 0.7 | 0.7 | 0.5 |
| Wetland | 0.8 | 0.8 | 0.8 |

4.4.7 Assessing the proposed SuDS features for each of the ACA area we can determine a total pollution mitigation index (Table 26.3 CIRIA SuDS Manual) for each, see Table 4-5 below. This assessment is based on the current proposals and will be updated during the next design phase to reflect additional SuDS elements that are described in section 3.2.9 and

3.2.43. Where additional SuDS features are not considered appropriate at this design stage, proprietary, non-SuDS treatment are proposed in these areas. This is further discussed in section 4.4.8.

**Table 4-5 - ACA SuDS mitigation indices for discharges to surface waters**

| ACA area | Assigned Pollution hazard levels | SuDS features proposed | Total SuDS mitigation Index | | |
|---|---|---|---|---|---|
| | | | TSS | Metals | Hydrocarbons |
| Park and Ride area | Medium | - Permeable pavement<br>- Pond | 1.05 (>0.7) | 0.95 (>0.6) | 0.95 (>0.7) |
| Logistics compound | Medium | - Permeable Pavement<br>- Pond | 1.05 (>0.7) | 0.95 (>0.6) | 0.95 (>0.7) |
| Railway | Medium | - Filter drains<br>- Pond | 0.75 (>0.7)* | 0.75 (>0.6)* | 0.65 (<0.7)* |
| Material Transfer Laydown | High | - Permeable Pavement<br>- Pond | 1.05 (>0.8) | 0.95 (>0.8) | 0.95 (>0.9) |
| Sand & Aggregate Stockpile | High | - Pond | 0.7 (<0.8)** | NA | NA |
| Topsoil compound | High | - Swale<br>- Pond | 0.85 (>0.8) | 0.95 (>0.8) | 0.85 (<0.9) |
| HGV parking | High | - Pond | 0.7 (<0.8)* | 0.7 (<0.8)* | 0.5 (<0.9)* |
| Caravan Pitches | Medium | - Permeable Pavement<br>- Pond | 1.05 (>0.7) | 0.95 (>0.6) | 0.95 (>0.7) |

** Drainage treatment to be supplemented by proprietary non-SuDS treatment, to be discussed and agreed with LLFA.*

*** Sand & Aggregate stockpile compound to be reviewed in next design phase to investigate the use of swales or filter drains around the perimeter of this compound.*

### 4.4.8 Proprietary drainage methods water quality risk management

4.4.9 As presented above, the current approach to manage surface water runoff along the access roads and sand/aggregate stockpile areas, is to use traditional drainage systems. For the railway and HGV areas supplementary treatment through traditional drainage will also be required. All proprietary drainage features will include silt traps and catch pits in all gullies and manholes, where required separators will be implemented to manage water quality risks from TSS, metals and hydrocarbons.

4.4.10 The HGV parking area is currently proposed to drain through an oil separator to mitigate the risk of hydrocarbon spillage where large vehicles are parked long-term. The design will comply with the initiatives and best practice guidance for pollution prevention for impermeable areas. At this stage, this is deemed to be the most practicable solution. Similarly, the railway drainage will require a by-pass separator before connecting into the sitewide drainage network. The benefit of capturing potential oil spills and treating them in a proprietary device of specific performance specifications is that risk of pollution to downstream sensitive areas is greatly reduced. Proprietary drainage features also provide a level of certainty from past performance that is not immediately offered by vegetative solutions in the early months (sometimes 12 to 18 months) as they establish.

4.4.11 In places, such systems may be used a fail-safe method of treatment to supplement primary treatment observed using SuDS techniques and will be explored in future design stages.

# 5 CONCLUSION

5.1.1 The ACA drainage strategy has been informed by the DCO Outline Drainage Strategy. This includes not relying on infiltration as a means of surface water disposal, aiming to treat at source, and using suitable treatment methods where reasonable on site.

5.1.2 This note highlights that surface water on site will be collected primarily using SuDS techniques in combination with conventional drainage systems, and be stored, treated and discharged to nearby watercourses. There are several SuDS treatment mechanisms proposed on the site, as well as additional proprietary treatment systems. The surface water design prioritises SuDS features as a means of capture, treatment, and storage, and will be further considered in the next design stage.

5.1.3 The surface water design improves the existing flood risk of the site by allowing systems to capture surface water runoff and attenuate this up to the 1 in 100-year storm event, in accordance with national and local guidance. This is particularly shown in the north-west corner of the site, where swales will be installed to intercept overland flow that previously was directed to Valley Road. This area now captures and retains surface water on site and improves the flood risk to the properties downstream.

5.1.4 The surface water drainage design needs to be progressed further, in conjunction with external stakeholders such as ESC, SCC, Natural England, the EA, and East Suffolk IDB. Throughout the next design phase, these stakeholders will be engaged with regularly to enable a suitable design that meets the needs of each party.