Contents

1. Introduction

West Lay propose to build an engineered wetland to act as a polishing effluent treatment facility on a 20-acre parcel of land immediately northeast of The Aspall Cyder House site. Once constructed, treated cyder effluent will be discharged to the wetland treatment facility for polishing treatment. While it is expected that the wetland system will operate primarily as a fully consumptive system (evapotranspiration will exceed input for most of the year), discharge will from the site will be facilitated when the wetland reaches capacity. Discharge from the wetland will meet the present consented limits. It is considered that this discharge scenario will follow prolonged heavy rainfall events or storms.

The design creates a wetland environment where plants, structures, bacterial medium produce a lasting living ecosystem. The engineered wetland will create biotic and abiotic systems linked by the nutrient cycles and resulting energy flows from any waste water.

- System type

The West Lay engineered wetland system will be a Surface Flow Constructed Wetland. It will be a naturally sustainable environment in which an ecosystem will develop to utilise the nutrients and remove other constituents produced from the Aspall Cyder site effluent via the metabolism of the macro and micro flora and fauna and sequestration within soil profile generated within the wetland cells.

These created environments are intended to be progressively developed and refined over time to improve tolerance to seasonal environmental variation and normal fluctuations in receiving effluent quantity and quality, through the use of internal storage, back pumping to increase retention time, and optional artificial aeration to enhance aerobic digestion.

The combination of planting (reed, cress and willow bed), and natural development of invertebrates (algae and bacterial colonies), are considered to form a diverse and multi seasonal capacity to deal with wastewater. These plant systems will develop to take up the usual issues of phosphates, nitrates, ammonia, suspended solids and chemical oxygen demand (COD).

The constructed wetlands have been designed to operate to, and will be maintained to meet environmental protection requirements and permit conditions.

---

2. System Description

The engineered wetland system comprises five separate ponds, each designed to provide different functions:

- Pond 1 The receiving basin which will provide initial settlement of any solids. Forced aeration will keep the basin aerobic and prevent odour.
- Pond 2 A horizontal sub-surface flow reed bed which will act as a filter for any solids that enter the system, slow the flow to ensure maximum retention time and exposure to micro life in the rhizome.
- Pond 3 A floating cell which will remove dissolved phosphate, ammonia and nitrogen.
- Pond 4 A horizontal surface flow willow plantation which will provide high evapotranspiration and growth of willow.
- Pond 5 A ‘Flash Pond’ which will be used as an overflow pond in flood conditions in the winter. In summer it will be utilised for sludge management from Pond 1.

- Discharge, if it occurs, will be from Pond 4.
- Ponds 2, 3 and 4 can be back pumped to the previous pond and if necessary to Pond 1.

The general arrangement of the wetland is shown on Figure 1. A more detailed plan of the wetland setup and infrastructure is given on Design Proposal Drawing MWE_22203_ASP_DP_12_09.23.

Figure 1 Wetland general arrangement

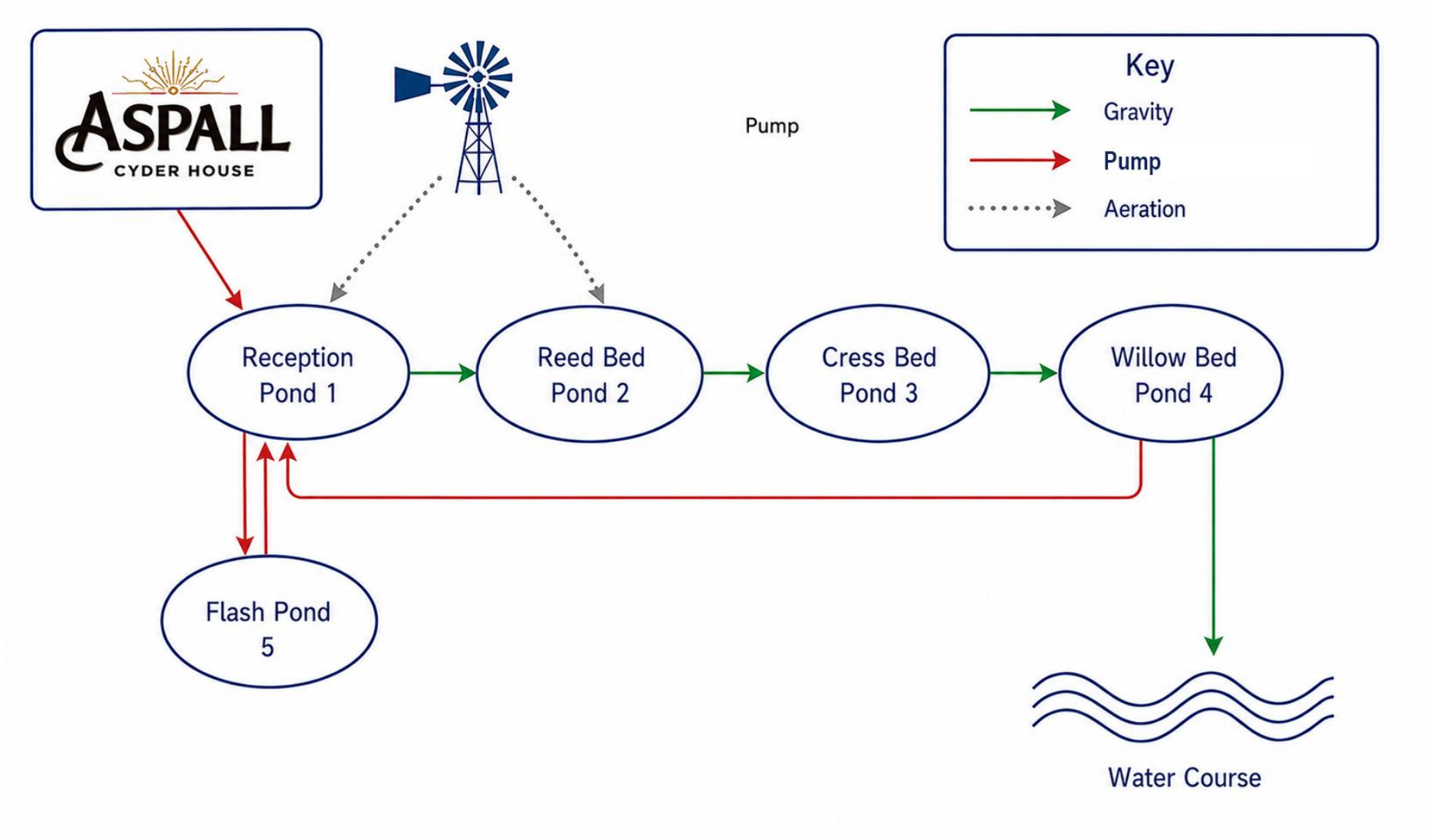


Table 1 Waste acceptance criteria (inflow)

Emission point reference and location	Parameter	Quantity	Unit
WT1 (Treated ETP discharge ETP into wetland)	Total daily volume	450	m^3/day
	Chemical oxygen demand	300	mg/l
	Biological oxygen demand	30	mg/l
	Total suspended solids	60	mg/l
	Ammonia (as N)	9	mg/l
	Total phosphorus	3	mg/l
	Total nitrogen	60	mg/l
	pH	6.0 – 9.0	pH unit

Table 2 Operating volumes and retention times

Pond	Volume (m3) – minimum	Volume (m3) maximum	Retention time (design min.) days	Retention time (design max.) days
1	6,000	6,000	28	28
2	910	9,000	4	43
3	1,465	8,665	7	41
4	1,520	21,000	7	10
5	2,528	2,528	-	-

Table 3 Discharge limits (WL1)

Emission point reference and location	Parameter	Quantity	Unit
WL1 (Discharge from wetland – Pond 4)	Total daily volume	210	m^3/day
	Chemical oxygen demand	100	mg/l
	Biological oxygen demand	10	mg/l
	Total suspended solids	20	mg/l
	Ammonia (as N)	3	mg/l
	Total phosphorus	1	mg/l
	Total nitrogen	20	mg/l
	pH	6.0 – 9.0	pH unit

- Energy Consumption

  Use sources:

Location	Pump (rating kW) and no	No of pumps	Estimated duration (hrs/yr)	Energy Source
Pond 1 – sludge management	7.5 (1No)	1	800	Renewable (solar & battery [generator backup])
Pond 4 back pumping	1.5 (2No)	2	80	Renewable (solar & battery [generator backup])
Pumping to Pond 5	7.5 (1No)	1	40	Renewable (wind solar & battery [generator backup])
Pumping from Pond 5	n/a (gravity return)	-	-	n/a

Efficiency measures:

- Aeration of Pond 1 and Pond 3 stone bed will be undertaken with windmill aerators (Fishkit or similar); the proposed windmill aerators will provide constant aeration to the ponds in wind speeds >2mph (negates the need for mains power).
- Flow though the wetland system during standard operation will be via gravity.

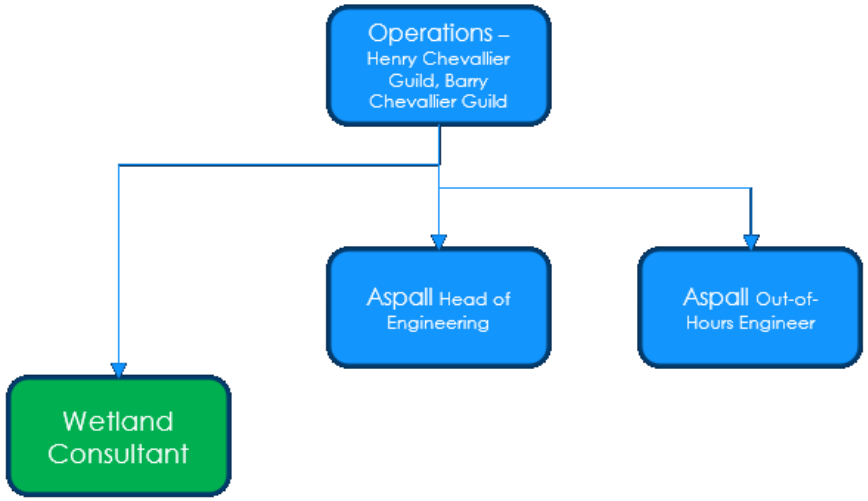
- Maintenance
    - A maintenance inventory is kept for all mechanical assets on site with manufacturers' recommended maintenance schedules.

Item	No	Maintenance frequency
Surface water pump	2	Annual
Sludge pump	1	Annual
Windmill aerator	1	Annual
Tractor	1	Annual
Mower	1	Annual

3. Management

- An environmental management system (EMS) will cover the elements required by the Environmental Permit; this will include a register of the site operations, maintenance procedures; non-conformances; actions; staff training and records management.
- Organisational Structure

  Roles



Name	Role	Employer	Contact Details
Henry Chevallier Guild	Operations	West Lay	07768 842296
Barry Chevallier Guild	Operations	West Lay	07768 842497
Tim Watts	Wetland Consultant	Framlingham Environmental	07470937763
Scott Sumpter	Head of Engineering	Aspall Cydery	07788 219634
n/a	Out of hours engineer (24/7)	Aspall Cydery	01728 860510

  - There are 2 site operators and a wetland consultant.
  - The site operators are responsible for monitoring, recording, reporting incidents and responding to them. Routine maintenance such as grass cutting and habitat control fall within their remit as well as annual maintenance on both the wetlands and the operating machinery.

    The site operators are also responsible for liaising with and reporting to the Aspall site team and ensuring contractual KPI's and service levels are met.
  - The wetlands designer is retained on an on-going consultancy basis to advise in the early phases of the wetlands plant growth and management and assist in annual maintenance operations.
  - Aspall Cydery designated contact is the Head of Engineering. West Lay also maintain a contact for out of hours support.

- Site Security
  - The western end of site will be secured via a locked entrance gate, fence and tall hedge.
  - The northern border will be secured by a deep ditch and bund.
  - The southern end of site borders the Aspall site and its security perimeter fence (1.7m high) for 100m from the western end of the site.
  - CCTV cameras will be located around site for monitoring purposes.
- Site training
  - The site operators are suitably trained Technically Competent Managers in accordance with environmental permitting regulations.

- Site operators are sufficiently trained to ensure that they are technically competent to operate the plant according to the manufacturer's recommendations.

- Monitoring

  Influent effluent (WT1): Quality (weekly) and Rate (Daily)

  Discharge effluent (SP1): Quality (weekly when discharging) and Rate (daily when discharging).

---

4. Site Operations

- Site overview and process:

- Daily operations
    - Treated effluent from the Aspall Cyder aerobic digestion system will be discharged by Aspall to Pond 1 via a 4” pipe and a header main. Transfer will be controlled by a manual valve prior to Pond 1. Pond 1 will be aerated via windmill aerators.
    - Effluent will gravity overflow through 6” Halo flow valves into Pond 2. Pond 2 will receive effluent into an aerated stone bed; aeration socks will be placed within standard 300mm perforated pipe in a loop so that the socks can easily be removed and inspected. Aeration will be provided by windmill aerators.
    - Pond 2 will be planted with a wide variety of species: Common reed, lesser reedmace, great reedmace, yellow flag, sweet flag, lesser pond sedge, pendulous sedge, reed sweet grass, greater pond sedge, branched Bur-reed, soft rush, hard rush and purple loosestrife.

      Water flow direction is controlled with coir matting to ensure maximum retention time and exposure to plants. Water gravity feeds through the pond to the outlet which is a ‘monk’ boarded weir, to Pond 3 via a 6” pipe. The water level in Pond 2 will be controlled with the monk weir board system. The water level will be maintained to provide a depth of 300mm to 500 mm above the bed level, depending on the season.
    - Pond 3 will be planted with a wide variety of species: Water cress, fools water cress, water plantain, brook lime, water mint, lesser water parsnip, marsh marigold, bog bean, water dropworts, water star worts, amphibious bistort, bur reed, greater pond sedge, yellow flag iris.

      Water flow direction is controlled with coir matting to ensure maximum retention time and exposure to plants. Water gravity feeds through the pond to the outlet monk boarded weir, to Pond 4 via a 6” pipe. The water level in Pond 3 will be controlled with the monk weir board system. The water level will be maintained to provide a depth of 300 mm to 500 mm above the bed level, depending on the season.
    - Pond 4 will be planted with a range of willow species interspersed with grassland. Willow species are: osier, blue willow, golden willow, flanders red, common alder.

Pond 4 does not require containment within a flowing channel, but rather effluent flow will be dispersed across pond. The water level will respond to seasonal weather conditions with the surface being dry in the summer and standing water developing in the winter.

The discharge pipe valve will be maintained in a locked, closed position unless an active decision to discharge has been authorised.

In the event that Pond 4 approaches capacity and it is not of suitable quality to discharge, it will be pumped from Pond 4 back up to Pond 1 and will re-enter the treatment system.

Wetting Up Phase

- Transfer to Pond 1 will not exceed 210m^3/day during this phase.
- During the wetting up phase, effluent will be passed through to Ponds 2 and 3 at a rate that is appropriate for the planting and growth.
- Effluent may be transferred to Pond 4 to irrigate planting if required.
- No discharge to surface water will take place.

Operational Phase

- Daily inspections:
    - Daily visual inspection of all ponds to check water levels and adjust weirs as necessary to maintain viable and operational optimisation for plant life.
    - Regular monitoring of vegetation diversity and abundance across all water bodies - necessary to ensure efficient functioning of the treatment system – and identify the presence of non-native species.
    - Inspect for dense plant cover necessary for efficient functioning of the treatment system – daily visual assessment. Ensure no bare, open areas.
    - Ensure no self-sown trees and scrub on verges or in surrounded grassland habitats to avoid shading out of pond plants.
    - Sniff test for any odour emanating from ponds; identify pond source if detected.
- Monthly inspections:

    - Ensure no scrub encroachment into grassland surrounding ponds.
    - Monitor grass length surrounding ponds. Monthly mowing of the main access ways – c.4m margin around the wetland / ponds / mounds – as necessary to maintain clear access.
    - Undertake sniff test to FIDOR standard and record results.
- Operational controls:
    - Flow distribution
    - Rainfall review and recording
    - Water levels in each pond, adjusted via weir boards.
- Monitoring – all discharge permit parameters to be tested as follows:
    - Aspall discharge – daily flow and weekly quality (when discharging)
    - Pond 4 – Daily flow and weekly quality, (when discharging)
- De-sludging
    - Sludge wasting from the base of Pond 1 will be undertaken in the spring and summer months to reduce anaerobic loading in Pond 1 and reduce odour risk. The sump in Pond 1 will be pumped out to Pond 5 between May and September, during dry weather, where it will evaporate and desiccate. Desiccated sludge will be incorporated into the soil at the base of Pond 5 by mechanical rotavating as and when required and the base re-seeded to generate a grass sward.

5. Habitat maintenance

- Monthly:
    - Mow grass around main access ways.
    - Remove any scrub encroaching onto grassland around ponds.
    - Remove self-sown trees on verges / banks of ponds.
- Annually:
    - To maintain the diversity of species and avoid the domination of one, 1/3 of Pond 2 will be thinned. The water will be drained off to Pond 3 and specialist plant used to cut back the vegetation. The resulting cuttings will be dried on site, chipped on site and used for mulching.
    - To maintain on-going diversity and ensure no single species dominates, 1/3 of Pond 3 will be mechanically thinned. The water will be drained off to Willow Bed Pond 4 and cleared. The resulting material will be composted on site and used on the estate.
    - Commercial coppicing of the willow beds in Pond 4 will be undertaken; willow will be removed from site and be used in heritage fencing.
    - General landscape maintenance: Replace dead / dying shrubs within the first five years with species necessary to ensure maximum diversity (unrelated to the optimal operation of the Engineered Wetland).
    - Coppice mature shrubs to create a varied structure.
    - Trim hedges.

6. Contingency

During normal operations the treated effluent will be consumed via evapotranspiration processes in the wetland and a discharge point is provided for (WL1) to allow for conditions following periods of prolonged / heavy rainfall when evapotranspiration levels are low, or emergencies. Discharge can only occur if the water quality meets the discharge criteria.

In the event that the water quality does not meet the discharge criteria but the wetland is approaching capacity, then water will be tankered off site to a suitably permitted facility.

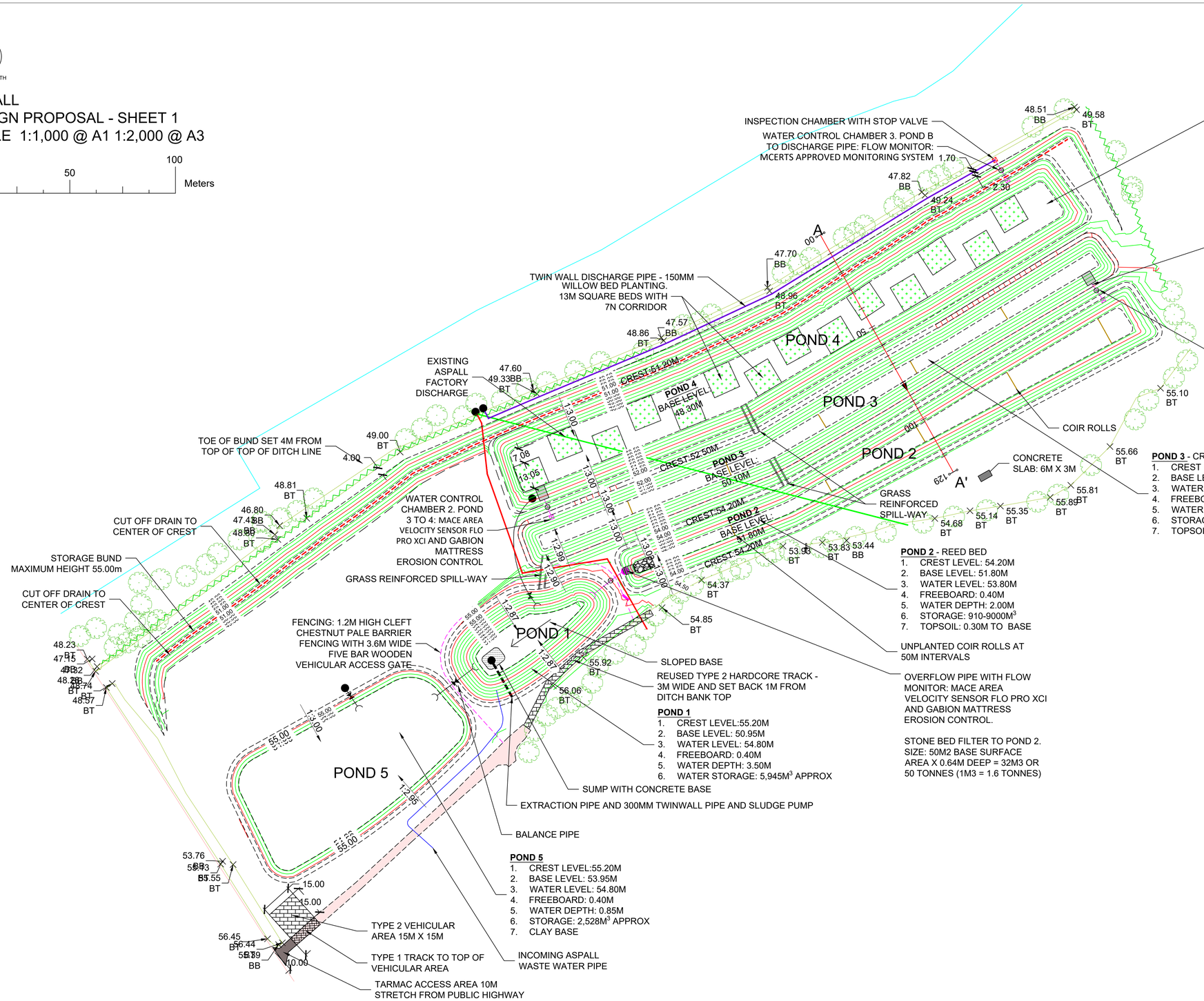
In all other scenarios, the water is retained within the wetland.

Design Proposal Drawing MWE_22203_ASP_DP_12_09.23

APPROX. NORTH

ASPALL
DESIGN PROPOSAL - SHEET 1
SCALE 1:1,000 @ A1 1:2,000 @ A3

0 — 50 — 100 Meters



POND 4 - WILLOWS
1. CREST LEVEL: 51.20M
2. BASE LEVEL: 48.30M
3. WATER LEVEL: 50.80M
4. FREEBOARD: 0.40M
5. WATER DEPTH: 2.50M
6. STORAGE: 1520-21,000M^3
7. TOPSOIL: 0.40M TO BASE

BESPOKE MANUALLY OPERATED DRAIN VALVES, AND OVERFLOWS
DIAMETER: 150mm. OVERFLOW FITTED WITH FLOATING DEBRIS 'HALO' SCREEN.
OVERFLOWS TO BE SET TO NORMAL DESIGNED TOP WATER LEVEL.
OUTFALLING PIPE TO HAVE A "PUDDLE FLANGE", AND CONCRETED INTO THE BANK.
AT POINT OF OUTFALL WATER TO FALL ONTO A 150MM DEEP GABION MATTRESS OF NEXT LAGOON, WITH A TERRAM MEMBRANE BELOW TO PREVENT SOIL EROSION.
LOWEST PIPE AND VALVE CONTROL TO EXTEND OUTWARDS TO FALL INTO CENTRAL SECTION OF ADJOINING WATERCOURSE, AND BE MARKED WITH A WHITE PAINTED MARKER POST.

WATER CONTROL CHAMBER 1. POND 2 TO 3: FLOW MONITOR: MACE AREA VELOCITY SENSOR FLO PRO XCI AND GABION MATTRESS EROSION CONTROL

POND 3 - CRESS BED
1. CREST LEVEL:52.50m
2. BASE LEVEL: 50.10m
3. WATER LEVEL: 52.10M
4. FREEBOARD: 0.40M
5. WATER DEPTH: 2.00M
6. STORAGE: 1465-8665m^3
7. TOPSOIL: 0.50M ON BASE

POND 2 - REED BED
1. CREST LEVEL: 54.20M
2. BASE LEVEL: 51.80M
3. WATER LEVEL: 53.80M
4. FREEBOARD: 0.40M
5. WATER DEPTH: 2.00M
6. STORAGE: 910-9000M^3
7. TOPSOIL: 0.30M TO BASE

POND 1
1. CREST LEVEL:55.20M
2. BASE LEVEL: 50.95M
3. WATER LEVEL: 54.80M
4. FREEBOARD: 0.40M
5. WATER DEPTH: 3.50M
6. WATER STORAGE: 5,945M^3 APPROX

POND 5
1. CREST LEVEL:55.20M
2. BASE LEVEL: 53.95M
3. WATER LEVEL: 54.80M
4. FREEBOARD: 0.40M
5. WATER DEPTH: 0.85M
6. STORAGE: 2,528M^3 APPROX
7. CLAY BASE

KEY - EARTHWORKS
- TOP / BOTTOM OF SLOPE
- 2.5m MAJOR CONTOUR
- 0.5m MINOR CONTOURS
- WATER LINE / LEVEL
- TREE (DEFINED BY CANOPY EXTENTS)
- HEDGE
- TRACK
- BB — POINT - BANK BOTTOM
- BT — POINT - BANK TOP
- BANK TOP AND BOTTOM

KEY - PIPEWORK AND PUMPING
- EXISTING ASPALL FACTORY DISCHARGE - TO BE REMOVED
- PROPOSED FACTORY DISCHARGE
- CHAMBER - WATER CONTROL
- CHAMBER - INSPECTION
- TWIN WALL DISCHARGE PIPE (150MM)
- CUT OFF DRAIN
- PIPE INLET
- PIPE OUTLET
- LOCKABLE VALVE
- PIPE INLET (LOW)
- PIPE OUTLET (LOW)
- SPILLWAY
- VS — VELOCITY SENSOR
- INCOMING ASPALL WASTE WATER PIPE

KEY - LANDSCAPING
- BARRIER FENCING AND GATE
- T2 HARDCORE SURFACE
- T1 HARDCORE SURFACE
- CONCRETE SLAB

KEY - PLANTING
- COIR ROLLS
- WILLOW BEDS

REV	DATE	INITIALS	NOTES
–	09.06.26	PC	MODEL CALCULATION AND DETAILING

SITE: FIELD NORTH OF ASPAL ROAD, ASPALL
CLIENT: ASPALL CIDER
DRAWING TITLE: DESIGN PROPOSAL SHEET 1
DRAWING NUMBER: MWE_22203_ASP_DP_12_09.23
SCALE: AS SHOWN | PAPER SIZE: A1 | DATE: 09.06.26
PROJECT NO.: 22203 | DRAWN BY: PC | REVISION: ~
STATUS: SKETCH ☐ PLANNING ☐ CONSTRUCTION ☑
CHECKED BY: MWE ☑ OTHER ☐ NAME:

MILES WATER ENGINEERING
ADDRESS: SCHOOL HOUSE FARM, GREAT ASHFIELD, BURY ST. EDMUNDS, SUFFOLK IP31 3HJ. PHONE: 01359 242356
E-MAIL: CONTACT@MILES-WATER.COM. WEBSITE: WWW.MILES-WATER.COM