Construction Engineer's Report under the Reservoirs Act 1975

Monk Lake No 2

Staplehurst

For

Taytime Ltd

August 2024

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Hydroplan
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DOCUMENT RECORD SHEET

Revision No	Issue Date	Description	Prepared	Checked
P1	27-8-24	Issued for review	ASC	NOR
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1 NAME AND SITUATION OF RESERVOIR

1.1 Reservoir name

Monk Lake No 2

1.2 Situation

Staplehurst Road, Marden, Tonbridge, Kent, TN12 9BS
OS Grid Reference: TQ768476
The reservoir is to the east of the A229 road about
4 km north-north-east of Staplehurst.

2 NAME AND ADDRESS OF ENGINEER

Andrew Sheerman-Chase
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Unit 12 Riverside Park
Station Road
Wimborne
Dorset
Tel 07799 133412
Email andrew.sheerman-chase@virgin.net

All Reservoirs Panel of Engineers
Appointed until 9th August 2029

3 NAME AND ADDRESS OF UNDERTAKER

Taytime Ltd
Monk Lakes, Staplehurst Road,
Marden, Tonbridge, Kent,
TN12 9BS.

4 DATE OF INSPECTION

13th August 2024

5 INFORMATION AVAILABLE

A list of information made available to me is given in the table below. The original drawings referred to in Mr Cale's report of 5 December 2007 have been lost but there was a small scale reproduction in his report.

Date	Description	Prepared by
5th Dec 2007	Inspection Report	Stewart Cale
10th June 2009	Proof of Evidence	Stewart Cale
July 2015	Groundwater Monitoring Report	Peter Brett Consultants
26th June 2018	Preliminary Certificate	G Wilson

February 2019	Response to Maidstone Borough Council Regarding Water Issues	Hafrenwater
27th Sept 2019	Proposed Site Layout	Next Phase Ltd
May 2021	Limited Topographical survey	J C White Ltd
11th June 2021	Limited Topographical survey	J C White Ltd
26th Sept 2022	Letter re Project Status	G Wilson

Table 1 Information Available

6 DESCRIPTION OF THE RESERVOIR

6.1 General

The location of the lake is shown in Figure 1. The original scheme for the three lakes was developed by Montana Land Surveyors and shown in Figure 2. A more recent survey layout from 2019 is given in Figure 3.

Details of the reservoir given in the table below.

Storage Volume	47,000 m^3
Surface Area	30,768 m^2
Embankment Height	4.50 m
Lake Floor Level	20.00 mOD
Design Crest Level	22.00 mOD
Category	Non-impounding

Table 2 Details of Lake

The reservoirs are filled by water pumped from the River Beult. The lake is situated partly within the River Terrace Gravels but is reportedly lined with Weald Clay.

6.2 Background

There have been four Construction Engineers, under the Reservoirs Act, involved with this lake as follows

Engineer	Appointed	
	from	to
Stewart Cale	April 2008	Unknown
Nick Reilly	Unknown	2017
Geoff Wilson	2017	January 2024
Andrew Sheerman-Chase	January 2024	Current

Table 3 Construction Engineers under Act

Planning permission for the lakes was obtained in 2003 for the previous owner Mr Hughes. It is understood that works were commenced in 2005. In March 2008 it was reported that the ownership had been transferred to Mr Guy Harrison of Taytime Ltd.

Works were halted prior to completion on the 30th April 2008 but recommenced early in 2013. At the time of the Stewart Cale report in 2007 the works had been completed but not operational. A Preliminary Certificate was issued by Mr Geoff Wilson on 26th June 2018 to allow filling to a level of 21.60 mOD.

As part of the conditions on issuing the Preliminary Certificate it was required that a survey was carried out. This was undertaken by JC White Geomatics and from the survey it was found that there was insufficient freeboard. It was recommended that the overflow was lowered by 150 mm. This was completed in August 2024.

6.2.1 Stewart Cale's Report 2007

Stewart Cale, an All Reservoirs Panel Engineer, carried out an inspection as Construction Engineer on 7th November 2007. It is not thought that he was involved in the early stages of construction but was subsequently brought in when the reservoir was almost complete.

In his report he stated that the construction commenced in 2005. The fill for Lake 2 was being excavated from the adjacent fishing lakes. These lakes (Lake No 1 and No 3) do not come under the Reservoirs Act as the water stored was largely below ground.

At the time of his visit the embankment for Lake No 2 was virtually complete except on the south-west side where there were vehicle access points. The embankment at that time had been constructed to an elevation of 21.5 m OD with a crest width of between 15 and 20 m but it was proposed to reduce this to about 13 to 18 m and raise the embankment to 22.00 m OD.

The external slopes varied between 1 to 3 ½ to 1 to 4.2. The external slopes near Hertsfield Farm and adjacent houses was to be at 1 in 8. The embankments to the south-west and south were yet to be completed but were to be constructed to a slope of 1 in 3.5.

Mr Cale stated that the geology under the site was Weald Clay with River Terraces in the northern part of the site. The geological map of the area is reproduced in Figure 5. The reservoir was to be clay lined with material taken from the adjacent borrow areas.

During his inspection the embankments were checked with a hand driven spike and found to be well compacted and the external slopes stable. Photographs taken during his inspection show 100mm overflow pipe being installed.

In the report it is stated that the floor was to be constructed to 20.00 m OD and the embankment crest was to be at 22 m OD. With a water level of 21.6 metres OD is suggested that this would give a freeboard of 400 mm which he considered adequate.

6.2.2 Stewart Cale, Proof of Evidence 10th June 2009

The Proof of Evidence produced by Mr Stewart Cale was related to an appeal against the Enforcement Notice issued by Maidstone Borough Council.

In this document he confirmed that he had been appointed as Construction Engineer under Reservoirs Act in April 2008. He said that there had been planning difficulties and that the proposed slope adjacent to the dwellings on Hertsfield Lane was to be at 1 in 8 - that is an angle

of 7°. He expected the slope at this angle would be stable. In the south-east areas the slope would be at 1 in 4. He said that he had observed no sign of distress or settlement or movement when inspecting the embankments in November 2007 although at that time the reservoir had not been brought into service.

Mr Cale said that the original drawing showing the planning application in 2003 gave the proposed arrangement of the lakes (Figure 2). The actual construction was very similar to that proposed. The main concern was the external embankments and he understood that the aboveground lakes would largely be outside the 2003 floodplain. The lakes, he believed, had been constructed using a clay lining of Weald Clay. He understood that the water depth would be fairly constant in the region of 1.4 to 1.5 metres. The top of the banks was to be 2.0 m above the reservoir base.

Mr Cale said that although he had received no details of calculations but he noted, during his 2007 visit, that the works were to a good standard.

6.2.3 Letter Geoff Wilson 26th September 2022

Mr Wilson noted that he was appointed in 2017 to replace the retired Construction Engineer. A Preliminary Certificate was issued in June 2018. He stated that he was now working to issue the Construction Certificate and the Final Certificate once a couple of issues have been resolved[1]. He confirmed that Monk Lake No 2 was fully compliant with the requirements of the Reservoirs Act.

6.2.4 Geoff Wilson's email 24th May 2024

Mr Wilson commented on a topographical survey in which he advised insufficient freeboard in 2022. He suggested that the embankment should be raised by 200 mm.

6.2.5 Geoff Wilson's Email 22nd July 2024

In this email he recommended that the overflow pipe be reduced by 150 mm.

6.3 Overflow

There are no drawing showing details of the overflow. From my site inspection there appears to be 100 mm plastic pipe within a concrete support. The overflow discharges probably into Lake No 3.

6.4 Instrumentation

There is no instrumentation installed in this lake.

Recommendation: a gauge board should be installed to indicate the top water level of 21.6 m OD.

6.5 Access

Access is off of the Staplehurst Road A229. There is a tarmac road in the 1st section and then onto a gravel surfaced road and car park by the site office.

[1] The main issue was the level of the overflow and lack of freeboard found following a survey by JC White Surveyors.

6.6 Downstream conditions

The lake is situated adjacent to the floodplain of the River Beult. To the north and south are the Monk Lake No 1 and No 3. To the west are a large number of fishponds which form part of the Riverfield Fish Farm.

7 CONDITION OF RESERVOIR

7.1 General

The inspection was carried out on 13th August 2024. During the inspection I was accompanied by Morgan Kinsey-Jones.

The weather during the inspection was hot and sunny with a temperature of 24°C. The water level was estimated to be 300 to 400 mm below the overflow.

7.2 Reservoir Embankments

7.2.1 East Embankment.

In this section the embankment was about 4 m high. The outer slope was at about 1 in 3.5 and covered with close mown grass. There were a few small to medium sized trees on the slope. The crest width was at least 15 metres and covered with close cut grass and the surface was a little undulating.

On the inner slope was a dense covering of small willow saplings. On a short section the vegetation had been cut back to provide access for the fishermen. The slope was at about 1 in 4. There was no evidence of wave erosion. The water level at the time was about 800 mm below the crest.

7.2.2 South Embankment.

The outer slope was about 3 metres high and had a slope of about 1 in 3.5 and covered with rough grass and various weeds and occasional shrubs. The crest in this area varied between about 12 and 18 metre wide. The inner slope was at 1 in 3 and covered with short grass but along the water line was sedge and some small willows. There was no evidence of wave erosion.

7.2.3 West Embankment.

On the west embankment the outer slope was very shallow at about 1 in 6 or flatter. The upper part was covered with short mown grass and in the lower part rather tufted grass with thistles. Below the slope is Hertfield Farm and adjacent properties. The overall height of the slope here was estimated to be about 4 metres.

7.2.4 North Embankment.

The outer slope of the embankment was about 3 to 4 metres high and a slope of 1 in 3.5 and covered with short cut grass and occasional weeds. The crest was very wide here being in excess of 20 metres. The inner slope was at about 1 in 4 to 1 in 5 and covered with tree saplings to about 3 or 4 metres high. There were occasional breaks in the tree cover. There was no evidence of wave erosion.

7.2.5 Settlement and movement

There was no evidence of movement in the slopes. Some desiccation cracking was apparent. The surface was undulating so it was not possible to assess if there had been localised settlements**Error! Reference source not found.**.

7.2.6 Seepage performance

There was a no evidence of seepages or damp areas at the toe of the embankments.

7.3 Inlet structures

There is no inlet structures associated with this reservoir.

7.4 Outlet works

The condition of the overflow was assessed by viewing from the closest embankment and from close up photographs taken the previous week during lowering of the overflow pipe.

7.5 Drawdown Arrangement and means of controlling inflow

There is no low level outlet. Inflows are controlled by stopping pumping.

7.6 Access and security provisions

There is good access to this reservoir. Access to the site is controlled by a gated barrier**.**

8 ENGINEER'S FINDINGS

8.1 Reservoir risk analysis

A risk assessment was carried out with reference to the document Guide to Risk Assessment for Reservoir Safety Management published in 2013. A Tier 1 qualitative risk assessment was undertaken.

Hazard	Likelihood	Consequence	Comments and mitigating measures
Overtopping	Low	Low	The embankment can tolerate overtopping due to the large width and good quality grass cover.
Blockage of Overflow	Moderate	Low	The lake is rarely up to the level of the overflow.
Internal (Piping) Erosion	Low	Low	The considerable width of the embankment and nature of the clay soils results in a low probability of piping erosion
Slip in Inner Slope	Low	Low	The inner slope is relatively flat and slips are unlikely. If they occur carry out remedial works
Slip in Outer Slope	Low	Low	The outer slopes are at 1 in 3.5 to 1 in 8 - slips are very unlikely.

Table 4 Risk Assessment

8.2 Seismic risk

It was determined that the reservoir is in Zone B (Figure 5 of An Engineering Guide to Seismic Risk to Dams in the United Kingdom). In Zone B there is a moderate chance of local earthquakes but larger events are rare

A seismic evaluation was carried out in accordance with the guide and the results shown in the table below.

Capacity	0
Height	0
Evacuation	4
Downstream Damage	4
Classification Factor	8
Category	II
Earthquake Zone	B
PGA (Table 4)	0.125g
Level of Safety Evaluation (Table 5)	Eb

Table 5 Seismic Evaluation

This has a low classification factor falling into a safety evaluation (table 5 of the guide) of E_a where no seismic safety evaluation is required. There are no aspects of this lake which are vulnerable to earthquake shaking.

8.3 Internal Erosion

The depth of water in the lake is only 2 m or less. With the wide crest and flat slopes the seepage path is long and piping erosion is unlikely.

8.4 Adequacy under Flooding Conditions

This is a non-impounding reservoir. It has virtually no catchment as the embankment crest is graded off to the outer slope.

They are issues concerning surface water flooding related to the Hertsfield Farm and adjacent buildings. This has been dealt with in the February 2019 report by Hafrenwater and is outside the scope of this report.

8.5 Reservoir Category and Freeboard

In the report by Mr Cale he suggested this was a Category B reservoir because the risk to properties downstream. In the original design the crest level proposed was 22.0 m OD giving a freeboard a 400 mm.

Information from JC White Survey

Crest Low point	21.91	mOD		
Original overflow level	21.92	mOD	-0.01	m
Overflow pipe reduced	0.15	m		
New Top of Overflow	21.77	mOD	0.14	m
Preliminary Certificate	21.60	mOD	0.31	m

Table 6 Levels and Freeboard

The latest survey information (JC White Surveys) indicates a minimum crest level on the east embankment of 21.91 m. The design crest level was supposed to be 22.0 m OD. A Preliminary Certificate has been given with a top water level of 21.6 m OD. The freeboard is less than proposed in the design and is 310 mm. Another issue is that the overflow pipe, although it has

been reduced by 150 mm, it has an estimated elevation of 21.77 m OD which gives a freeboard of only 140 mm.

My conclusion is that 300 mm freeboard is acceptable given the following factors.

a) This is a non-impounding reservoir and is filled by pumping.
b) The embankments are robust in construction having a crest width of 12 m or more with modest side slopes of 1 in 3.5 or flatter.
c) The embankments are constructed of Weald Clay which is good for embankment construction.
d) The east embankment is protected by 3 islands and the fetch is between 14 and 94 metres.
e) The upstream slope has a dense covering of willow and other small saplings reducing the effect of waves.

8.6 Adequacy of low-level outlets and means of controlling inflow

This is a non-impounding reservoir so there is no inflow apart from direct rainfall and pumping. There is no means of lowering the water in the reservoir apart from pumping. This issue should be dealt with in the on-site emergency plan.

8.7 Adequacy of access provisions from maintenance and emergencies

There is adequate access for maintenance and emergencies.

9 SUPERVISION PROVIDED BY THE UNDERTAKER

There is good surveillance of the reservoir. The fisheries manager is on site most days

9.1 Correctness of the PFR

At the present time there is no reservoir record book (PFR).

Recommendation The undertaker should prepare a reservoir record book in the recommended format for a High-Risk reservoir.

9.2 Compliance with water level monitoring

There is no recording of water levels. However, the site staff do keep close eye on the water levels.

Recommendation: Water levels should be recorded at monthly intervals once the reservoir record book has been prepared.

9.3 Instrumentation

There is no instrumentation installed in this lake.

9.4 Reservoir surveillance

The surveillance of this reservoir is good. The site office is situated at the toe of embankment and a close watch is kept on the water levels.

Recommendation. It is recommended that a visual examination of the structure is carried out at monthly intervals.

9.5 Emergency planning

There is an on-site emergency plan but it is incomplete.

Recommendation: Enter all the necessary information into the on-site emergency plan

10 RECOMMENDATIONS

1) A water level gauge should be installed to clearly indicate the top water level of 21.6 m OD.
2) A reservoir record book (PFR) should be commenced. The previous Construction Engineer Mr Wilson may be able to help on this aspect.
3) The On-site Emergency Plan should be completed.
4) Any notable occurrence such as subsidence or cracking in the embankments (apart from desiccation cracking) should be reported to the Reservoir Safety Engineer.

11 SIGNATURE OF THE ENGINEER

12 DATE OF THE REPORT

27th August 2024

Appendix 1 Figures

Figure 1 Location of Lake

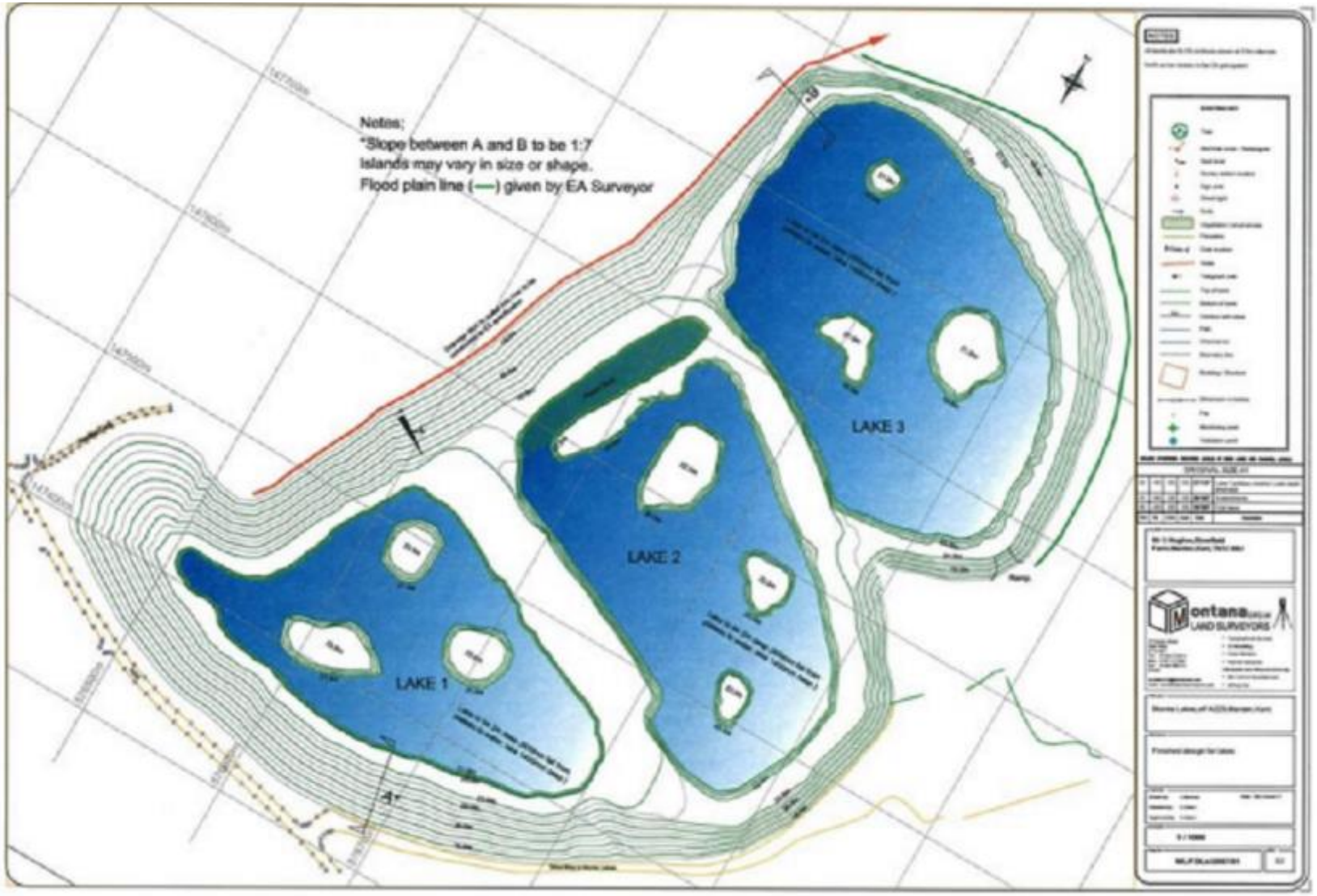

Figure 2 Original Layout Plan – Montana Surveys c2005

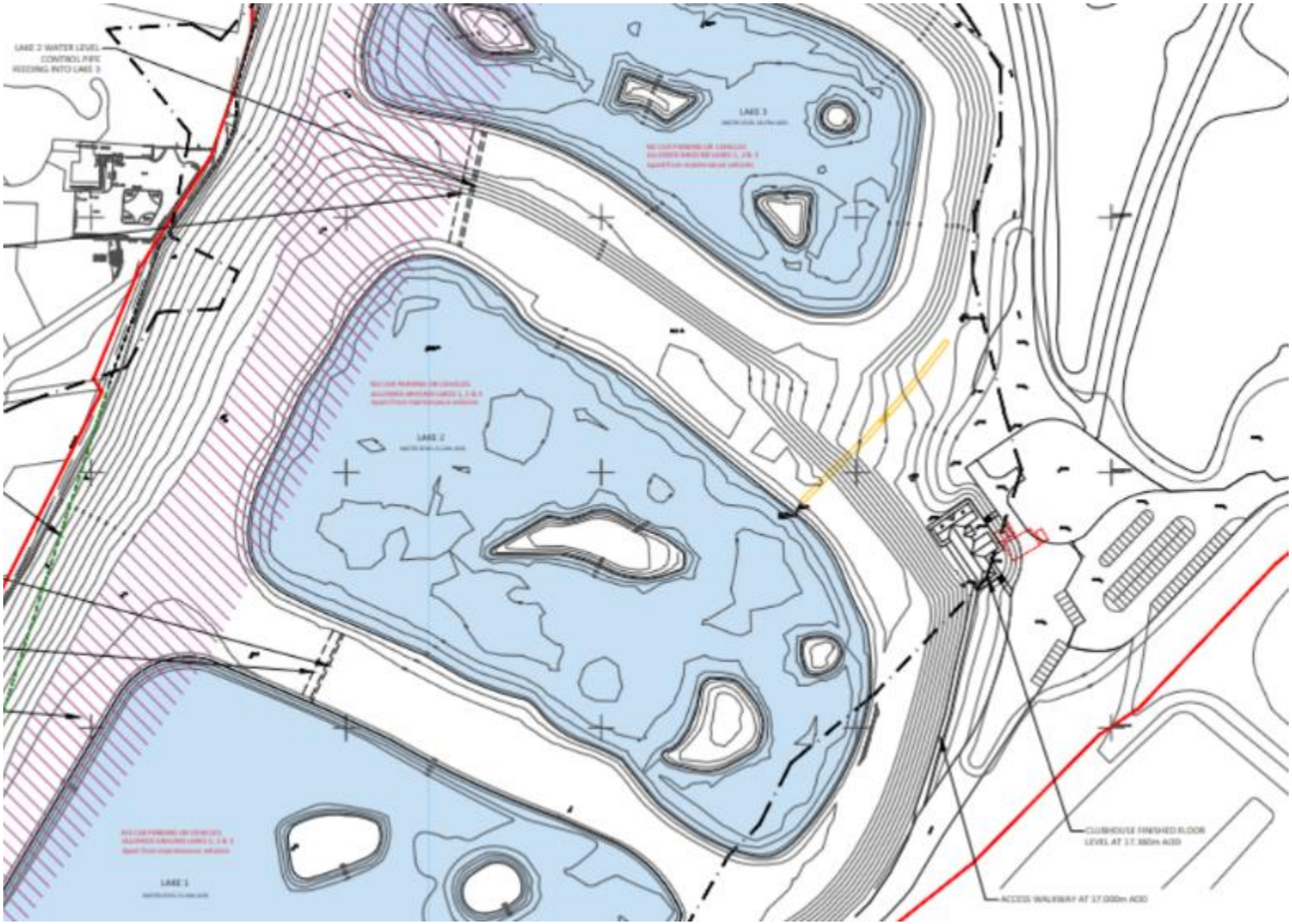

Figure 3 Survey Plan 2019 - NextPhase

Figure 4 Satellite Image of Lake No 2

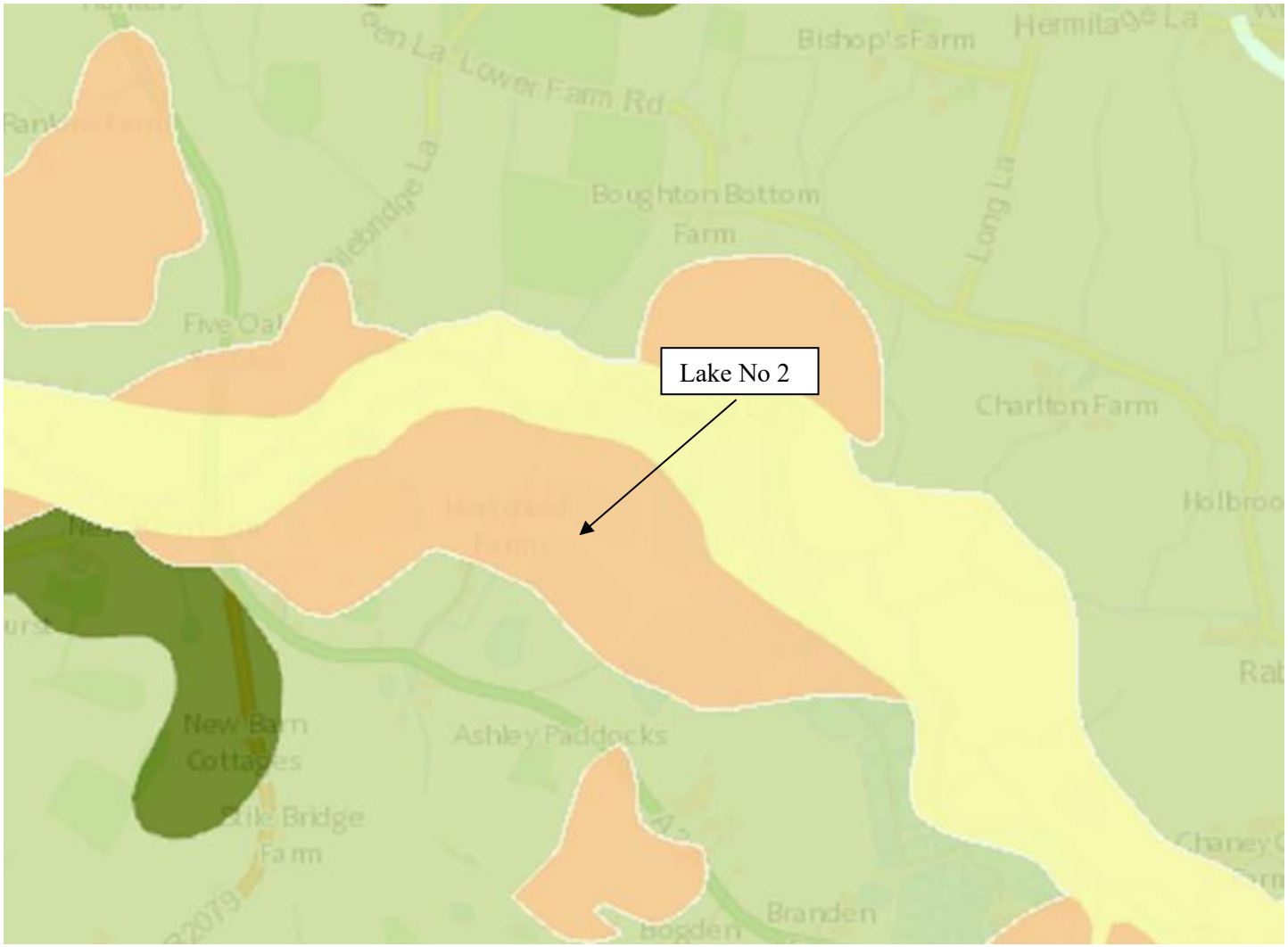

Figure 5 Geology of Area

Appendix 2 Photographs

Photograph 1 East embankment outer slope

Photograph 2 East embankment crest

Photograph 3 East embankment inner slope

Photograph 4 South embankment outer slope

Photograph 5 South embankment crest and inner slope

Photograph 6 West embankment crest and inner slope

Photograph 7 West embankment outer slope

Photograph 8 Desiccation cracking in clay

Photograph 9 North embankment outer slope

Photograph 10 North embankment crest

Photograph 11 Overflow viewed from embankment

Photograph 12 Measuring overflow pipe before cutting 150 mm

Photograph 13 Overflow pipe after cutting