

C23030

STEENBERG ESTATE PROPERTY COMPANY

STEENBERG ESTATE DAMS

DESIGN REPORT IN SUPPORT OF THE WULA

REV 0

NOVEMBER 2025

STOREY ENG (PTY) LTD

engineering • management • consulting

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C23030

STEENBERG ESTATE DAMS**DESIGN REPORT IN SUPPORT OF THE WULA****1 INTRODUCTION****1.1 Introduction**

The Steenberg Estate Property Company (Steenberg) is concerned about the adequacy and reliability of the water supply for irrigating the golf course. Currently, some of the irrigation water is treated effluent supplied from the Cape Flats Wastewater Treatment Works. Steenberg is worried that the pipeline supplying the treated effluent water will become increasingly difficult to maintain as more low-cost and informal housing is built along the pipeline route, the pipe ages and more breakages occur.

Consequently, Steenberg intends to increase the water storage capacity on the golf course to ensure that the golf course's water demands can be met during periods of downtime while pipeline repairs or maintenance are undertaken. To this end, Steenberg proposes enlarging two of the existing golf course dams.

Storey ENG (Pty) Ltd (Storey ENG) was appointed to design the enlargement of the two dams, namely the dam at the northern entrance and the dam at the 5th tees. In accordance with the National Water Act, Act No 36 of 1998 (NWA) a water use licence is required to increase the dams' storage capacities. This report is in support of the water use licence application (WULA) process.

2 DESCRIPTION OF THE DAMS**2.1 Location of the Dams**

The northern entrance dam is situated on Erf 12379, Cape, and the dam at the 5th tees is situated on Erf 11193, Cape. The erven are located in the Tokai area, as shown in Figure 1 and drawing C23030/c/001 (see Appendix A). The nearest airport with commercial flights is Cape Town International Airport. The dam will be located in Quaternary Catchment G22D.

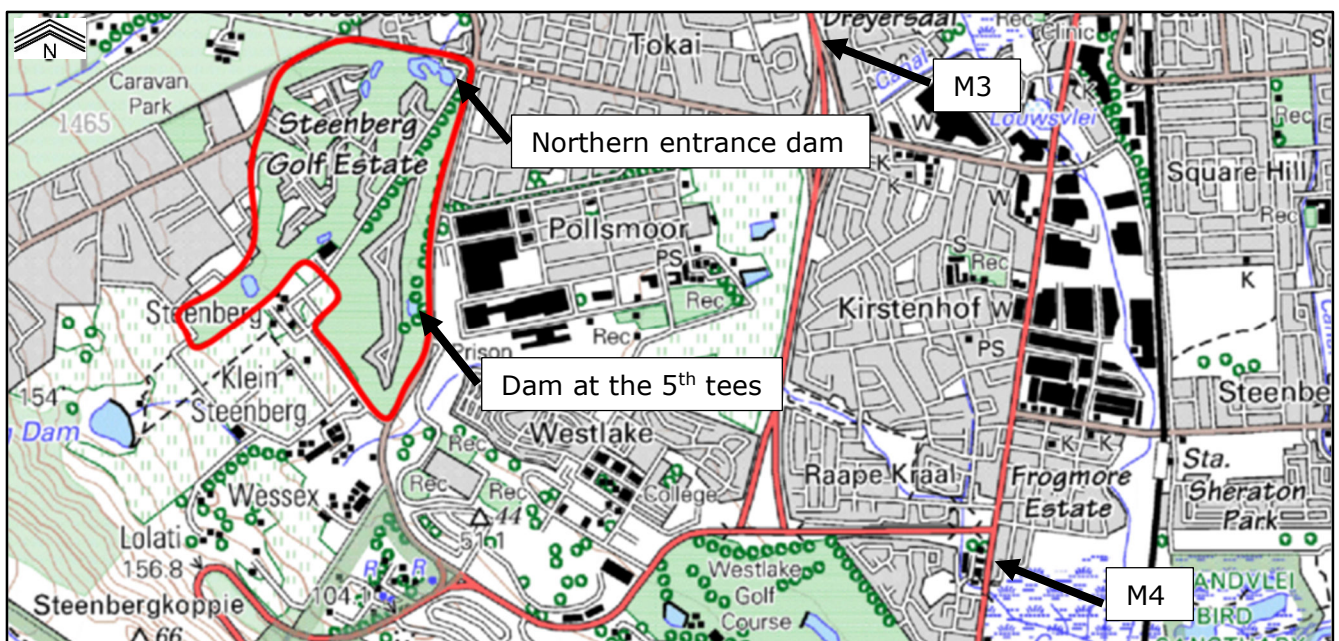


Figure 1 – Locality plan

2.1.1 Dam at the Northern Entrance

Satellite images of the site of the dam are shown in Figure 2 and drawing C23030/c/050 (see Appendix A). The coordinates of the dam are 34°3'44.71"S and 18°25'55.93"E.



Figure 2 – Satellite image of the northern entrance dam (Courtesy Esri)

2.1.2 Dam at the 5th Tees

Satellite images of the site of the dam are shown in Figure 3 and drawing C23030/c/051 (see Appendix A). The coordinates of the dam are 34°4'13.69"S and 18°25'50.04"E.

2.2 General Description

2.2.1 Dam at the Northern Entrance

The dam at the northern entrance is currently below ground level with an estimated storage capacity of 6 360 m³. It will be enlarged to have a maximum embankment height of 1,3 m and a capacity of 23 560 m³.



Figure 3 – Satellite image of the dam at the 5th tees (Courtesy Esri)

The enlarged dam will comprise an off-stream earth-fill embankment. It will be lined with a geofabric composite Keytech X1000 liner (GCL) covered with a 300 mm thick soil layer.

The surface area at the full supply level (FSL) will increase from 0,232 ha to 0,75 ha.

The dam is currently predominantly filled with groundwater. After the enlargement, groundwater will continue to be the dam's primary source of water.

The enlarged dam will not have a formal spillway, as there is minimal inflow into the dam. However, the water will be able to flow from the dam in the northwestern corner through an uncontrolled open channel. It will not have an outlet pipe, as much of the dam basin will be below ground level. Water will be abstracted from the dam using submersible pumps suspended from a float, similar to the current method.

2.2.2 Dam at the 5th Tees

The dam at the 5th tees is currently below ground level with an estimated storage capacity of 8 250 m³. It will be enlarged to have a maximum embankment height of 3,0 m and a capacity of 32 690 m³.

The enlarged dam will comprise an off-stream earth-fill embankment. It will be lined with a geofabric composite Keytech X1000 liner (GCL) covered with a 300 mm thick soil layer. The surface area at the full supply level (FSL) will increase from 0,242 ha to 1,185 ha.

The dam is currently filled with a mixture of treated effluent and surface water. After the enlargement, the mixture of treated effluent and surface water will continue to be the dam's primary source of water.

The enlarged dam will have an uncontrolled open-channel spillway. It will not have an outlet pipe, as much of the dam basin will be below ground level. Water will be abstracted from the dam with submersible pumps supported by a float.

2.3 Classification and Registration of Dams

Neither of the enlarged dams will be "a dam with a safety risk" in terms of the National Water Act, 1998 (Act 36 of 1998), as they will not have a capacity in excess of 50 000 m³ and an embankment height in excess of 5 m. As such, they will not be registered with the Dam Safety Office (DSO) of the Department: Water and Sanitation (DWS). Hence, they will not have a DSO registration number.

2.4 Main Features of the Dams

2.4.1 Dam at the Northern Entrance

The main features of the enlarged dam at the northern entrance are set out in Table 1.

Table 1 – Main features of the enlarged dam at the northern entrance

Level of non-overspill crest	30,9 m MSL
Full supply level (FSL)	30,1 m MSL
Freeboard	0,8 m
Maximum wall height	1,3 m
Crest width	3,0 m
Embankment length	395 m
Upstream slope	1 vert : 3,0 hor
Downstream slope	1 vert : 3,0 hor
Capacity	23 560 m ³
Full supply level surface area	0,75 ha
Design floods	RDF (1 : 50 yr) = 0,7 m ³ /s RDD (Routed RDF) = 0,45 m ³ /s SEF (1 : 100 yr) = 0,8 m ³ /s SED (Routed SEF) = 0,5 m ³ /s
Spillway	Informal, uncontrolled open channel
Spillway capacity	31,53 m ³ /s
Lining	GCL with 300 mm thick soil covering

Outlet pipe	Submersible pumps suspended from a float
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2.4.2 Dam at the 5th Tees

The main features of the enlarged dam at the 5th tees are set out in Table 2.

Table 2 – Main features of the enlarged dam at the 5th tees

Level of non-overspill crest	40,3 m MSL
Full supply level (FSL)	41,1 m MSL
Freeboard	0,8 m
Maximum wall height	3,0 m
Crest width	3,0 m
Embankment length	730 m
Upstream slope	1 vert : 3 hor
Downstream slope	1 vert : 3,0 hor
Capacity	32 690 m ³
Full supply level surface area	1,185 ha
Design floods	RDF (1 : 50 yr) = 1,6 m ³ /s RDD (Routed RDF) = 0,12 m ³ /s SEF (1 : 100 yr) = 1,8 m ³ /s SED (Routed SEF) = 0,13 m ³ /s
Spillway	Uncontrolled open channel
Spillway capacity	0,53 m ³ /s
Lining	GCL with 300 mm thick soil covering
Outlet pipe	Submersible pumps suspended from a float

3 HYDROLOGY

Both dams are off-stream dams. However, portions of the dams are below ground, and thus, the dams have catchment areas. The water flowing into the dams consists of runoff water from the dams' catchment areas, groundwater and a mixture of surface water and treated effluent.

3.1.1 Dam at the Northern Entrance

The Alternative Rational Method 2 was used to calculate the RDF and SEF for the northern entrance dam. The results are set out below.

$$\text{RDF (1 : 50 yr)} = 0,7 \text{ m}^3/\text{s}$$

$$\text{SEF (1 : 100 yr)} = 0,8 \text{ m}^3/\text{s}$$

$$\text{RDD (routed 1 : 50 yr)} = 0,45 \text{ m}^3/\text{s}$$

$$\text{SED (routed 1 : 100 yr)} = 0,5 \text{ m}^3/\text{s}$$

3.1.2 Dam at the 5th Tees

The Alternative Rational Method 2 was also used to calculate the RDF and SEF for the dam at the 5th tees. The results are set out below.

RDF (1 : 50 yr) = 0,7 m³/s

SEF (1 : 100 yr) = 0,8 m³/s

RDD (routed 1 : 50 yr) = 0,45 m³/s

SED (routed 1 : 100 yr) = 0,5 m³/s

4 GEOLOGY AND GEOTECHNICS

The geology of the dam sites comprises mainly Quaternary quartz sand of the Springfontein Formation and occasional Quaternary calcareous coastal dune sand of the Witzand Formation.

5 EMBANKMENT

5.1.1 Dam at the Northern Entrance

The layout of the dam at the northern entrance is shown in Figure 4 and drawing C23030/c/035 (see Appendix A). The typical section is shown in Figure 5, Figure 6 and drawing C23030/c/035 (see Appendix A).

The design provides for a uniform, unzoned embankment constructed with the material excavated from the dam basin. The material will be compacted to a minimum 95% Proctor density at the Optimum Moisture Content plus 2% (OMC+2%). No provision is made for a cut-off trench and core as the dam will be lined.

The upstream slope will be 1 vert : 3,0 hor and the downstream slope 1 vert : 3,0 hor. In some sections, the dam will have a vertical retaining wall with stone cladding similar to the retaining walls in dams elsewhere on the golf course.

The crest will be 3 m wide with a 3% slope towards the dam basin. No gravel cap will be provided on the crest. The full supply level will be 30,1 m MSL, and the non-overspill crest level will be 30,9 m MSL. The freeboard will be 0,8 m. This is deemed adequate given that it is an off-stream dam, and the fetch is very short.

5.1.2 Dam at the 5th Tees

The layout of the dam is shown in Figure 7 and drawing C23030/c/024 (see Appendix A). The typical section is shown in Figure 8, Figure 9 and drawing C23030/c/024 (see Appendix A).

The design provides for a uniform, unzoned embankment constructed with the material excavated from the dam basin. The material will be compacted to a minimum 95% Proctor density at OMC+2%. No provision is made for a cut-off trench and core as the dam will be lined.

The upstream slope will be 1 vert : 3,0 hor and the downstream slope 1 vert : 3,0 hor. In some sections, the dam will have a vertical retaining wall with stone cladding similar to the other dam retaining walls elsewhere on the golf course.

The crest will be 3 m wide with a 3% slope towards the dam basin. No gravel cap will be provided on the crest. The full supply level will be 30,1 m MSL, and the non-overspill crest level will be 30,9 m MSL. The freeboard will be 0,8 m. This is deemed adequate given that it is an off-stream dam, and the fetch is very short.

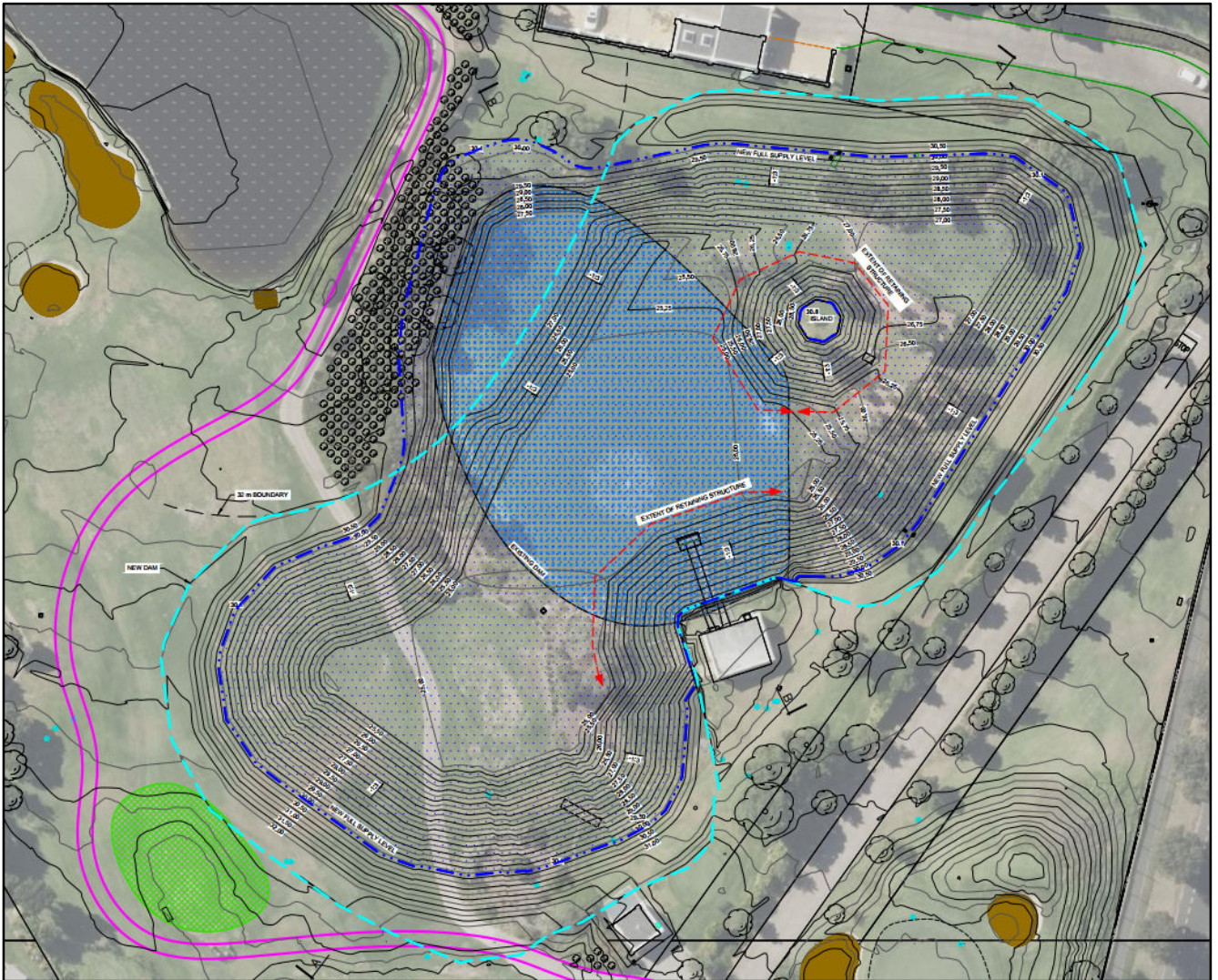


Figure 4 – Northern entrance dam layout

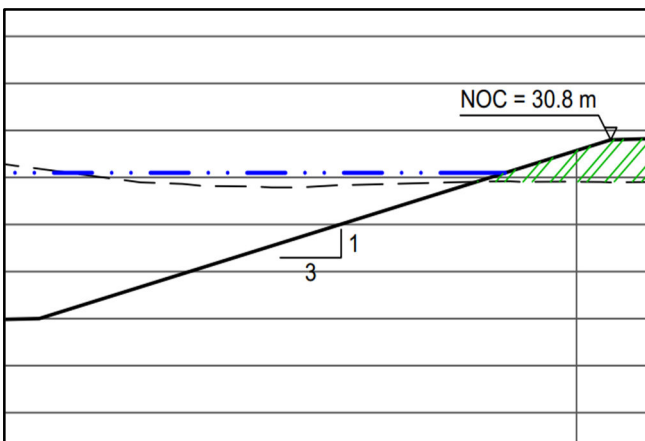


Figure 5 – Northern entrance dam's typical details for the earth embankment

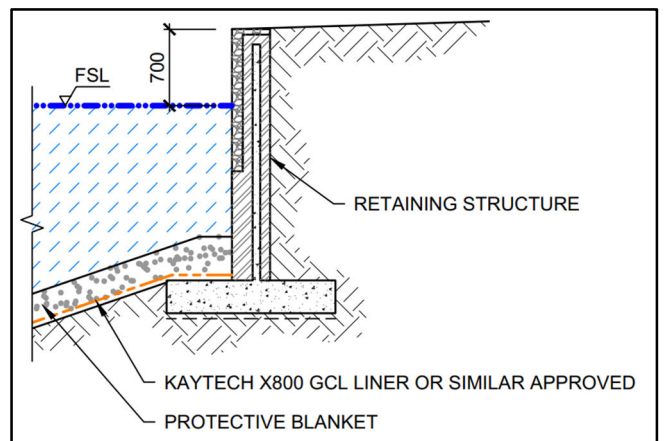


Figure 6 – Northern entrance dam's typical details for the retaining wall

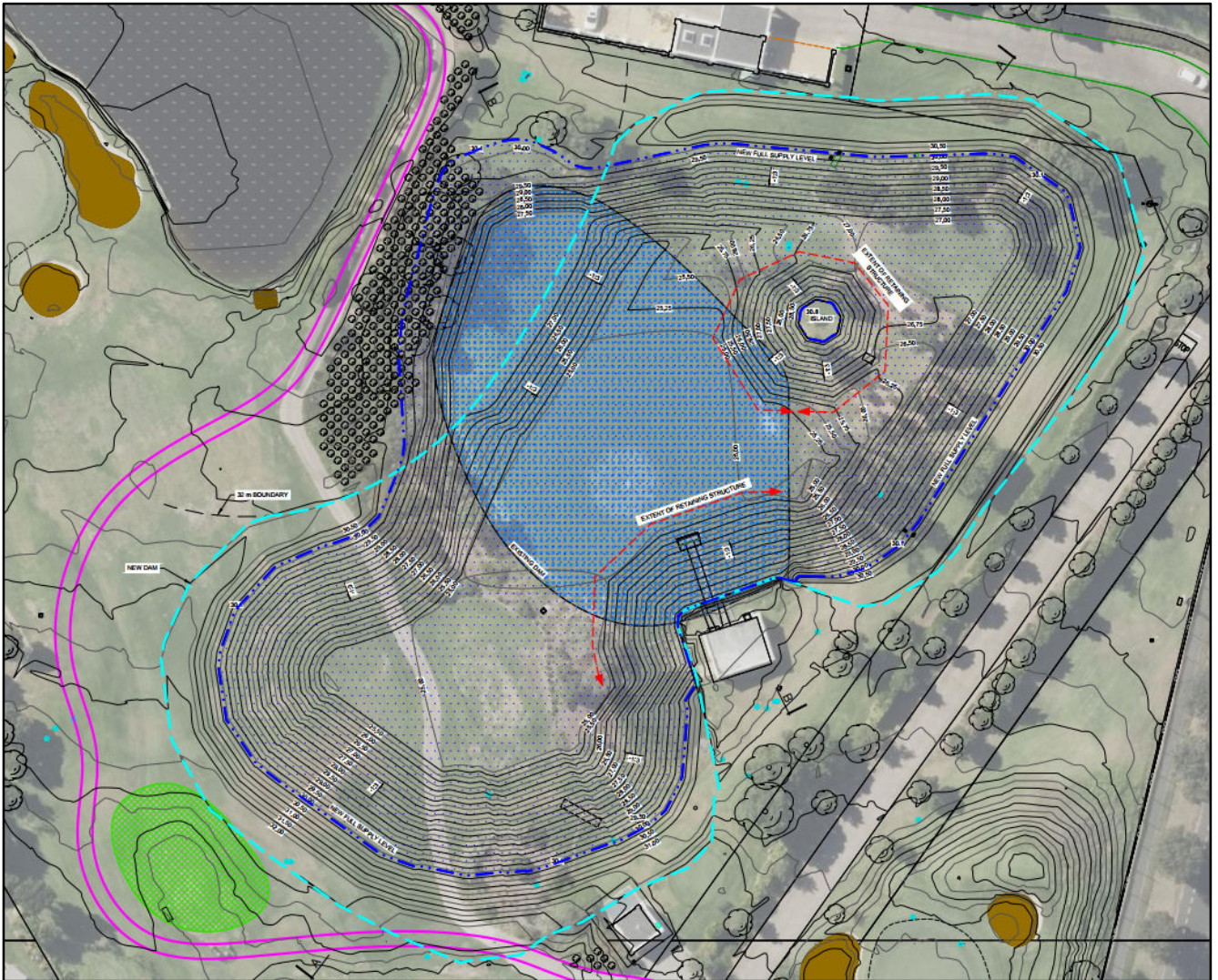


Figure 7 – Dam at the 5th tees layout

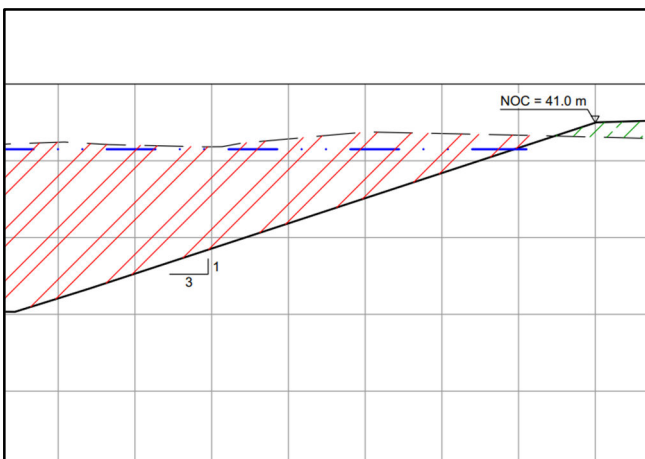


Figure 8 – Dam at the 5th tees typical details of the earth embankment

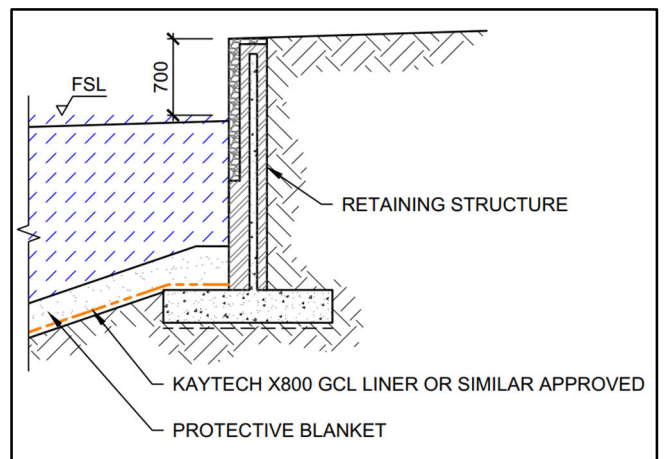


Figure 9 – Dam at the 5th tees typical details of the retaining wall

6 SUB-SOIL DRAINS

If the groundwater seeps into the excavation of the dam basins, subsoil drains will be installed underneath the liner to prevent it from floating. These will drain into a sump from where the water will be pumped into a swale to promote groundwater recharge.

7 OUTLET WORKS

The outlet works will comprise floating submersible pumps with a discharge pipe.

8 INSTRUMENTATION

The dams will be equipped with basic instrumentation only. It will be limited to no-swimming signs erected around the perimeter of the dams.

9 SPECIFICATIONS

The specifications according to which the enlargement of the dams are to be constructed will be SANS 1200, the Standardised Specifications for Civil Engineering Construction.

The sections of the specifications that will apply are:

- AA – General (Small Works)
- AD – General (Small Dams)
- C – Site Clearance
- DE – Small Earth Dams
- DK – Gabions and Pitching
- GA – Concrete (Small Works)
- L – Medium Pressure Pipelines
- LB – Bedding
- LE – Stormwater Drainage

10 QUALITY CONTROL

Quality control will, in the first instance, be the responsibility of the contractor. The engineer responsible for construction monitoring will, however, be undertaking regular site inspections (at least once every fortnight). During these inspections, the engineer will monitor progress, the setting out of the works, the selection and processing of materials, and the testing carried out.

Compaction tests will need to be done on an ongoing basis by the contractor. The engineer will have random control testing carried out by a commercial laboratory.

11 PUBLIC SAFETY

The dam is located on private property, which is fenced off and has access control. The general public should, therefore, not have ready access to the dam. Signage will, however, be erected to warn homeowners and golfers not to swim in the dam.

12 SUMMARY

Steenberg is concerned about the adequacy and reliability of the water supply for irrigating the golf course. Thus, they intend to increase the water storage capacity on the golf course, by enlarging two of the dams. This will ensure that the golf course's water demands can be met during periods of downtime while pipeline repairs or maintenance are undertaken.



Johan Pieterse B Eng Civil (Pret)
Author



Pierre Storey Pr Eng B Eng Civil (Stell)
Project Director

APPENDIX A - DRAWINGS

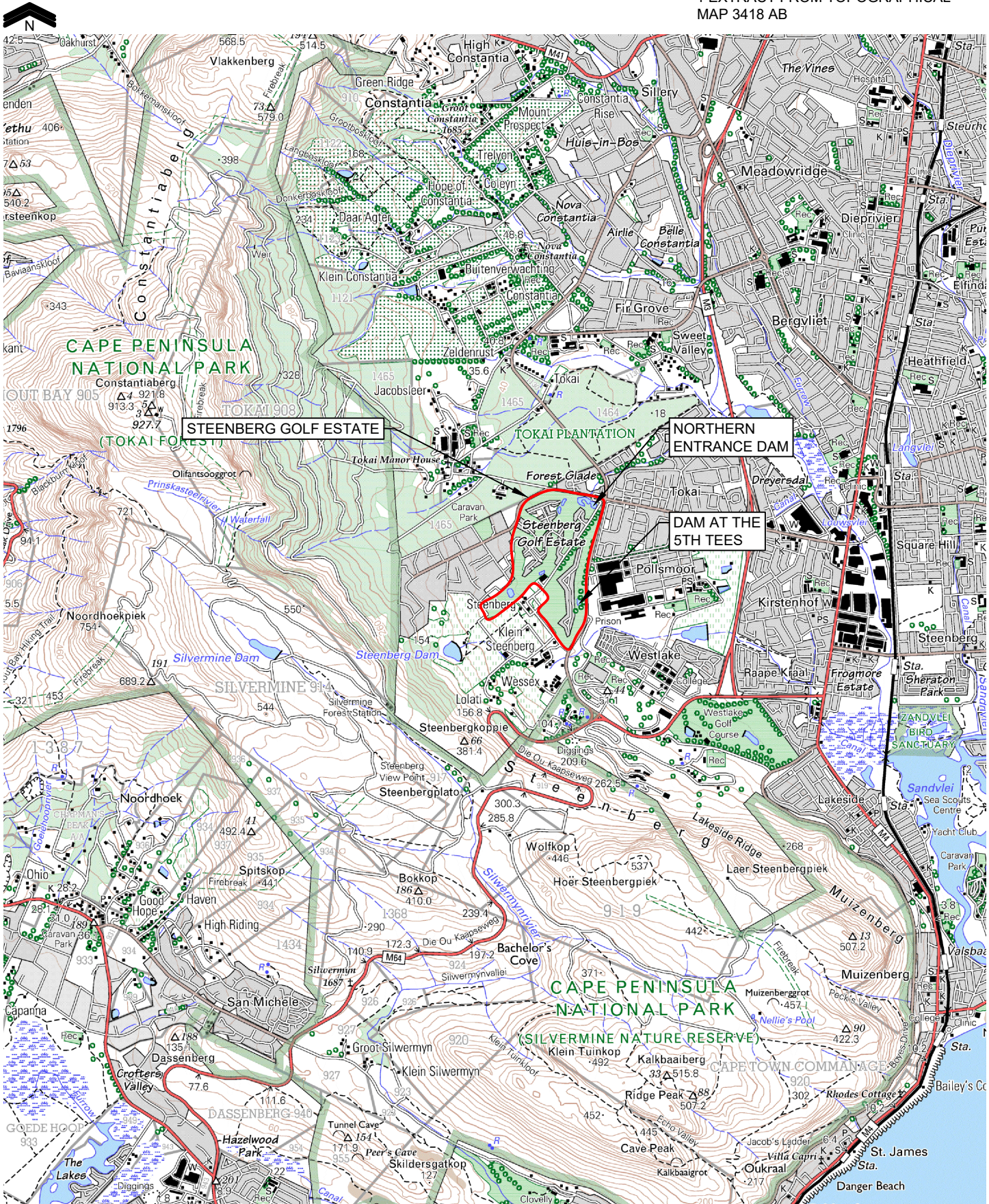
The following drawings are issued separately with the report:

drawing no	revision	title
C23030/c/001	B	Locality Plan
C23030/c/024	G	Dam Layout at the 5 th Tees – Option 1
C23030/c/035	F	Dam Layout North Entrance – Option 5
C23030/c/050	A	Satellite Image – Northern Entrance Dam
C23030/c/051	A	Satellite Image – 5 th Tees Dam

NOTES

GENERAL

1 EXTRACT FROM TOPOGRAPHICAL
MAP 3418 AB

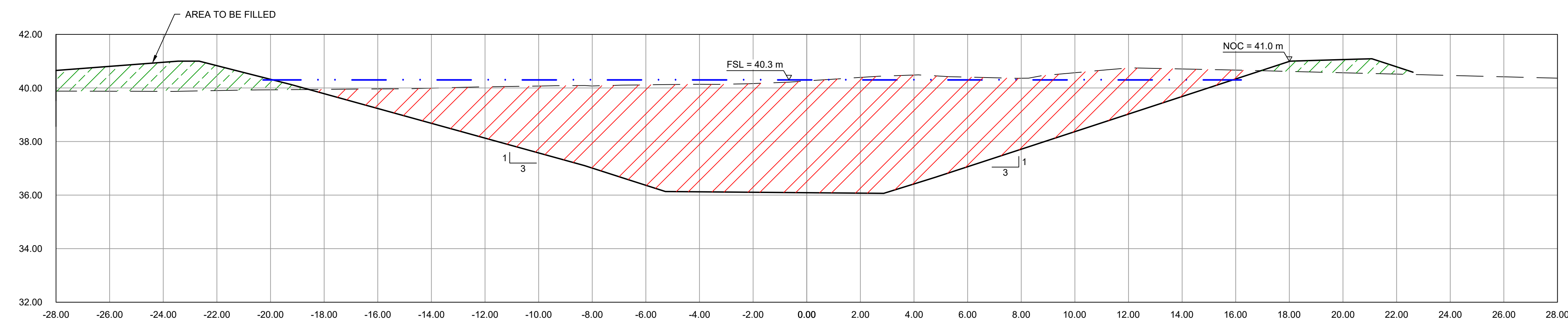


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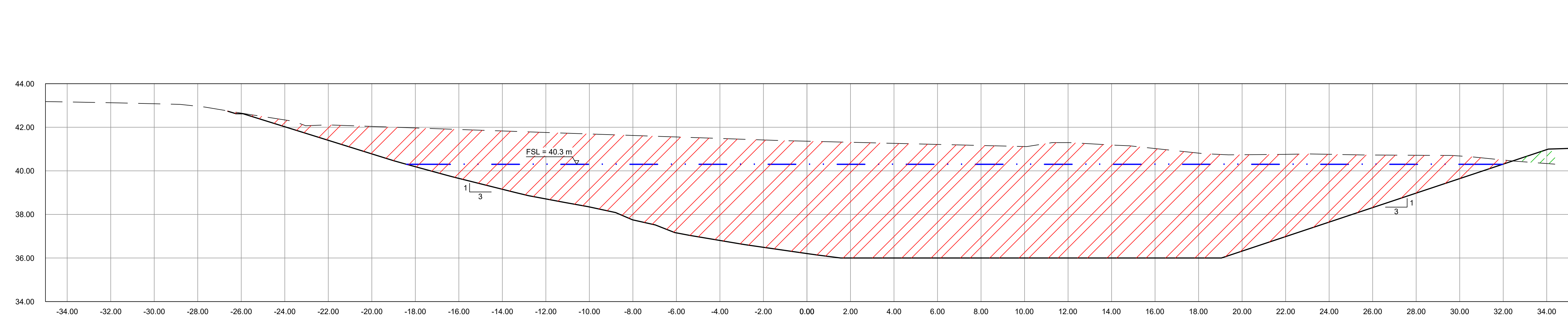
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			project STEENBERG ESTATE DAMS				
	design P STOREY Pr Eng		date 2025-11-06		scale 1 : 50 000	drawing no C23030/c/001	rev B



LAYOUT PLAN
NTS

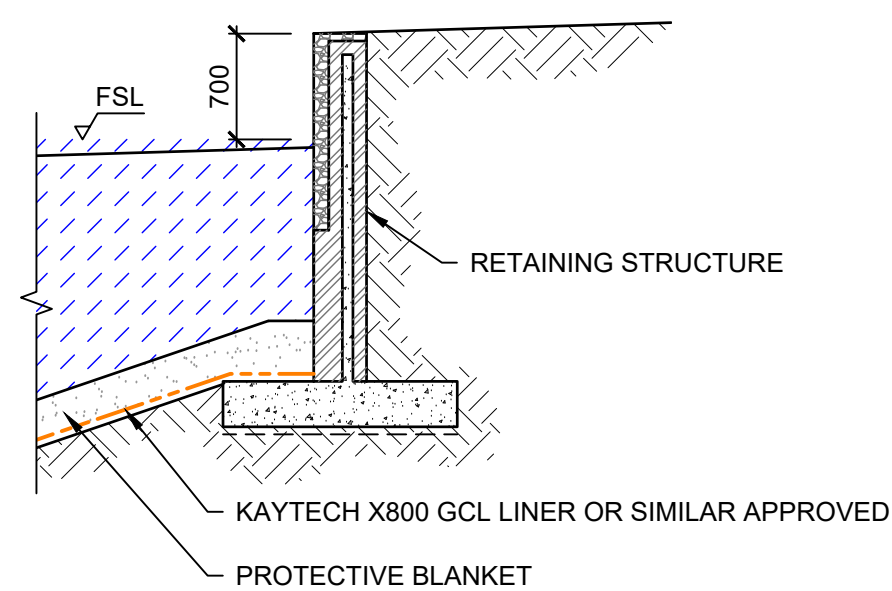


SECTION A - A
1:100



SECTION B - B
1:100

VOLUMES
EXCESS CUT MATERIAL = 30 200 m³
WATER CAPACITY = 32 690 m³



RETAINING STRUCTURE
1:50

NOTES

GENERAL

- 1 ALL WORK SHALL BE IN ACCORDANCE WITH:
a) SANS 1200 - THE STANDARDIZED SPECIFICATION FOR WORKS OF CIVIL ENGINEERING CONSTRUCTION AS AMENDED
b) ALL RELEVANT PARTICULAR SPECIFICATIONS
c) ALL DRAWINGS
d) ALL ENGINEER'S INSTRUCTIONS AND VARIATION ORDERS
- 2 PRIOR TO PUTTING ANY WORK IN HAND THE CONTRACTOR SHALL:
a) CHECK ALL DIMENSIONS, LEVELS AND SETTING OUT INFORMATION BOTH ON SITE AND ON THE DRAWINGS
b) IMMEDIATELY REPORT ANY DISCREPANCIES TO THE ENGINEER
c) OBTAIN WRITTEN CLARIFICATION OF THE DISCREPANCY
d) LOCATE ALL EXISTING SERVICES IN THE AREA OF THE WORKS
- 3 DRAWINGS SHALL NOT BE SCALED
- 4 NO ALTERATIONS SHALL BE MADE TO THE DESIGNS WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER

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REV	DESCRIPTION	DATE
G	ISSUED FOR APPROVAL	2025-06-06
F	LAYOUT AMENDED	2025-06-12
E	ISSUED FOR COMMENT	2025-02-21
D	LAYOUT PREVIEW AMENDED	2025-02-20
C	LAYOUT AMENDED	2025-01-16
B	ISSUED FOR DISCUSSION	2025-01-31
A		2025-01-24

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STEENBERG ESTATE DAMS
DAM LAYOUT AT THE 5TH
TEES - OPTION 1

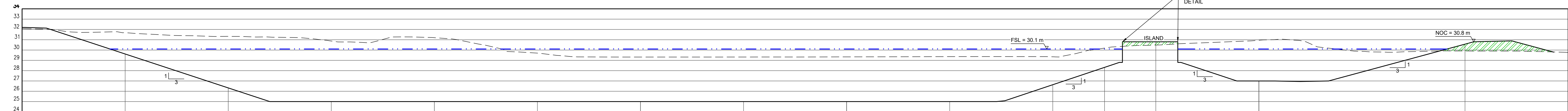
Design: P STOREY Pr Eng
Drawn: I GERMISHUYS
Scale: AS SHOWN

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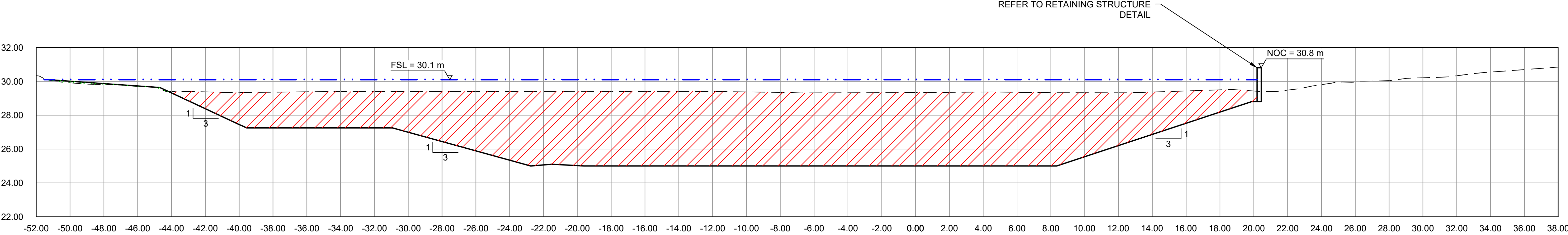
LAYOUT PLAN

1:250



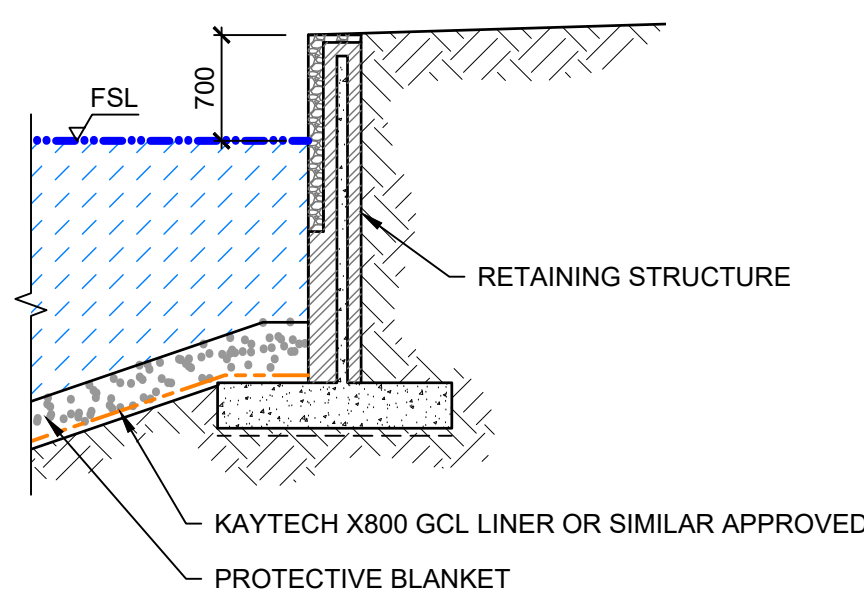
SECTION A - A

1:150



SECTION B - B

1:150



RETAINING STRUCTURE

1:50

VOLUMES
EXCESS CUT MATERIAL = 19 030 m³
WATER CAPACITY = 23 500m³

NOTES

GENERAL

- 1 ALL WORK SHALL BE IN ACCORDANCE WITH:
 - a) SANS 1000 - THE STANDARDIZED SPECIFICATION FOR WORKS OF CIVIL ENGINEERING CONSTRUCTION AS AMENDED
 - b) ALL RELEVANT PARTICULAR SPECIFICATIONS
 - c) ALL DRAWINGS
 - d) ALL ENGINEERS INSTRUCTIONS AND VARIATION ORDERS
- 2 PRIOR TO PUTTING ANY WORK IN HAND THE CONTRACTOR SHALL:
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1	ISSUED FOR APPROVAL	2025-06-06
2	LAYOUT AMENDED	2025-03-12
3	ISSUED FOR COMMENT	2025-03-21
4	LAYOUT PREVIEW AMENDED	2025-03-26
5	LAYOUT AMENDED	2025-02-18
6	ISSUED FOR DISCUSSION	2025-01-31

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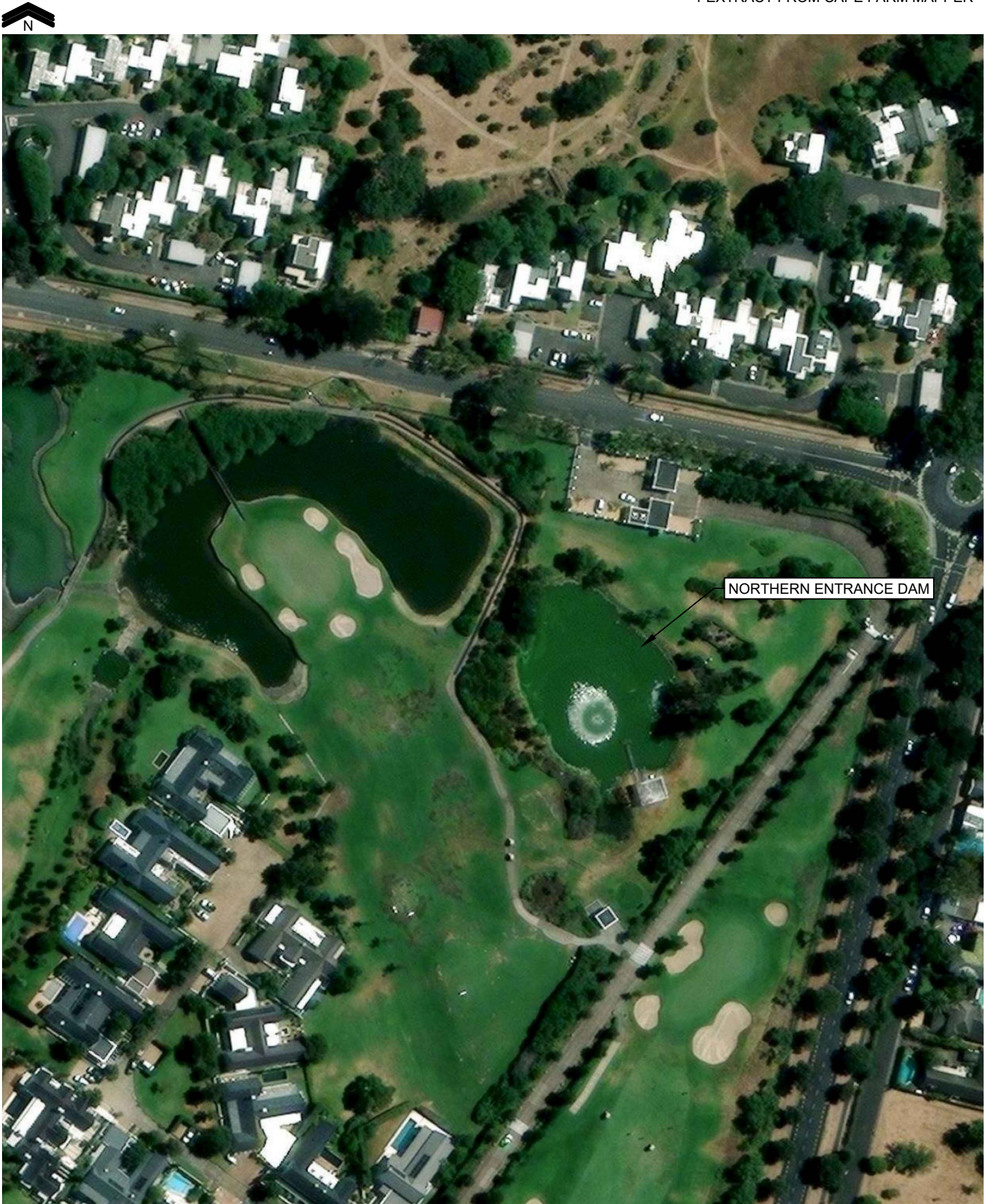
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STEENBERG ESTATE DAMS
DAM LAYOUT NORTH
ENTRANCE - OPTION 5

Design: P O Storey Pr Eng
Drawn: P O Storey Pr Eng

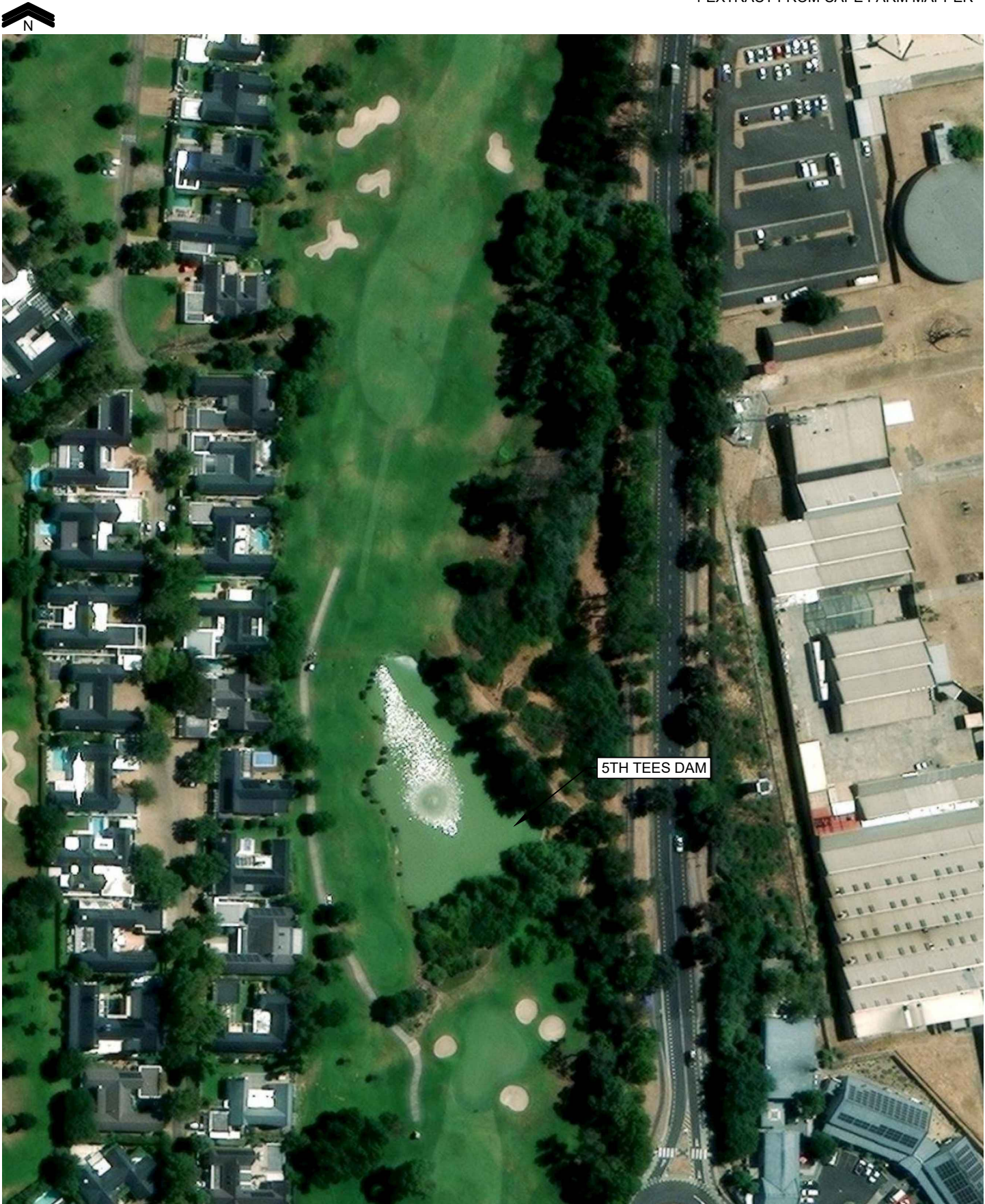
1: GERMISHUYS
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			project STEENBERG ESTATE DAMS				
	design P STOREY Pr Eng		date 2025-11-06		scale NTS	drawing no C23030/c/050	rev A



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			SATELLITE IMAGE - 5TH TEES DAM		
design		date	scale	drawing no	rev
P STOREY Pr Eng		2025-11-06	NTS	C23030/c/051	A