



Appendix E to Attachment 1 to Item 4.5.2.

Appendix E – Tech Memo 4

Date of meeting: 12 March 2024

Location: Council Chambers

Time: 6:30 p.m.

Technical Memorandum

Memo No.	04 - Landfill	Date of Issue	5 May 2023
Subject	Landfill Technical Memo	Discipline	Waste Management
Project Title	Hawkesbury Landfill Management Strategy Beyond 2026	Project No.	30019111
Document No.	Tech Memo – 04 - Landfill	Revision	03
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Reviewed by	Matt Fraser, Manager Waste & Resource Recovery Qld/NT	Approved by	Matt Fraser, Manager Waste & Resource Recovery Qld/NT
Prepared for	Hawkesbury City Council	Attention to	Sam Swain
Attachments	30019111-ID-Combined 30019111-ID-WEST-Optimized		

1. Purpose/Introduction

SMEC has been engaged by Hawkesbury City Council (HCC) to investigate potential options for expansion and continued use of the Hawkesbury Waste Management Facility (HWMF) beyond 2026 which is the expected date for all remaining air space within the final landfill cell to be exhausted. Without action to reduce waste disposal quantities or extend the air space at the HCWMF, HCC will need to establish an alternative waste disposal option by 2026.

It is understood that the Facility currently accepts around 24,000 tonnes of waste per year and a new landfill cell (Cell 6) is being developed to extend the life of the landfill at HCWMF to approximately 2026. A number of options are being considered by HCC in managing waste services beyond 2026, including expansion of the existing landfill, development of the site for other waste management functions (i.e., transfer stations), or closure and relocation of waste and resource recovery functions to an alternative location.

The purpose of this Technical Memorandum (Memo) is to present a summary of works and findings for the potential expansion of the existing landfill operation by expanding the current footprint and repurposing the old landfill sections of the HCWMF.

1.1 Site Description

The HCWMF is located within the Hawkesbury Local Government Area (LGA) north of “The Driftway” and on land formally identified as Lot 194 DP823986 and Lot 192 DP729625 (the Site). The Site is bounded by Blacktown Road to its northeast and the Royal Australian Air Force (RAAF) Richmond airbase is located approximately 3km north of the Site.

The Western Sydney University’s Hawkesbury campus is located west of the Site on land identified as Lot 181 DP39768.

1.2 Landfill Context

The HWMF is owned and operated by Hawkesbury City Council in accordance with the Environmental Protection Licence No 5293 issued by NSW EPA. This Licence is a major determinant of the operational requirements for the current landfill operations.

The construction of landfill cells at the Site is approved under Development Approval (DA) 253 of 1987. Under this DA, the landfill development areas (Stage 1 and 2) have been defined and presented in Figure 1: HCC Waste Management Facility original drawing in DA 253/87.



Figure 1: HCC Waste Management Facility original drawing in DA 253/87

Figure 1 shows the following key information.

1. The western sector of the Site has been identified almost exclusively for disposal of waste in land as landfill operations, as shown as 'Stage 1' and 'Stage 2'.
2. It has been proposed and approved to develop the landfill areas in stages, with the north part of the west area (Stage 1) to be developed first and the south section, close to The Driftway Road (Stage 2) at a later date. Each stage was allocated approximately 80.000 m² of useable area.
3. Stage 1 area was always considered to be use as a landfill operation.

As part of the requirements defined by the NSW EPA, each landfill operator must present a Landfill Environmental Management Plant (LEMP) which needs to be regularly updated to reflect any new development. The below image presents the earliest version of the LEMP developed by PKK for HCC in 2001.

A critical aspect of the LEMP of 2001 is that the assigned area for landfill operations have been slightly altered. While the previously defined Stage 2 area maintains its use for landfill activities, the previous Stage 1 has been re-purposed for the stockpiling of the excavated material extracted from the construction of cells 1-6 (located in Stage 2) to be later used for capping of these cells.

1. Cell 6 detailed design following the approved DA 253 of 1987
2. Cell 1 to 6 capping detailed design for the closure of the landfill operations at this Site. Capping of the landfill cells was not part of the DA 253/87, so a Development Application was required to be lodged. The DA for these activities is still under evaluation process by HCC.
3. A revised version of the LEMP (2021) to contain previous cells information and the final capping for all previously approved cells (cells 1 to 6).

Area 1: Current site compound, and waste storage areas for green waste, scrap metal, timber waste, bricks/concrete and waste tyres. These stockpiled materials are removed periodically from site to be recycled by contractors. Landfilling also occurred in this area without an engineered lining system. It is not clear the extent of the filling in this area.

The area to the north of the current landfill operation (formerly defined as Stage 1 in DA 253/87) has been left outside of the area assigned for landfill operations in the LEMP 2021.

Tech Memo 01 – Landfill



Figure 3: HCC Landfill filling areas presented in LEMP 2021 (Tonkin Consulting Pty Ltd, 2021)



Figure 4: HCC Landfill final capping drawings presented in LEMP 2021 (Tonkin Consulting Pty Ltd, 2021)

1.2.1 Cell 6 Construction and Leachate Pipeline

At the end of 2021 a tender process was conducted and awarded for the construction of new landfill works which included the following portions:

- Separate Portion A1: Construction of Cell 6
- Separate Portion A2: Design and Construction of Leachate pipeline to connect Cell 6 to sewage pipeline.
- Separate Portion B: Capping of Cells 1 to 5 and sedimentation basin.

The works for Separate Portions 1A and 1B were scheduled to start on April 2022, but due to extreme weather in the area and disputes on the extraction of water from the cell area, works related to the construction of this final cell has not commenced until April 2023.

Information on the additional airspace to be provided by this new cell presented in the 2021 LEMP indicates 200,000 m³.

1.2.2 Capping of Cells 1 to 6

As indicated in the previous section, landfilling of waste at the current landfill Site will cease once the air space within Cell 6 is exhausted. The LEMP 2021 indicates that the Site has approximately 96,000 m³ of remaining air space in the existing landfill cells 1-5, which combined with the additional volume to be provided by Cell 6, results in an available air space of approximately 300,000 m³.

There are some elements to be considered in this information;

- It was expected for Cell 6 to be operational at the end of 2022, but according to the latest construction program, this new cell will most likely start operation at the end of 2023. This situation has forced for the extended use of Cell 5.
- It is not clear if the additional material disposed in Cell 5 will remain in Cell 5 or will be transferred into Cell 6 once this unit becomes operational.
- HCC has indicated that it does not intend to utilise Cells 1 and 2 located north of the current landfill area for waste disposal purposes. These previously filled cells provide the most available air space when measured against final capping height proposed by LEMP 2021.

2. Options Assessment

HCC has engaged SMEC to develop a landfill management strategy beyond 2026 based on the expectation that the existing landfill operation (Cells 1 to 6) will reach its capacity and municipal solid waste will be able to be disposed in this premise.

The information previously presented indicates that the current landfill operation may extend beyond 2026 based on the following:

1. Previously filled landfill cells, especially Cells 1 and 2, have remaining airspace when compared to the current LEMP 2021 proposed capping height. Even though the current landfill cells have been filled beyond their expected closure date (2022 when cell 6 was expected to start operations), the difference between the existing levels and final cap design presents close to 90,000 m³ of additional air space.
2. An area bigger than the currently approved landfill footprint has been considered and used for landfill applications in the past. i.e. Stage 1 for landfill operation in the original DA 253/87.
3. It may be possible for further landfilling to be undertaken in this area by following to be updated waste management guidelines,
4. Since the development of the previous LEMP in 2001, many landfills existing in the Sydney have closed, leaving only one currently operating in the metropolitan region (Cleanaway's Lucas Height Landfill). This landfill scarcity, combined with a negative regulatory position towards alternative waste disposal

technologies (Energy from Waste, MSW composting into MWOO), encourages the maximum use of a landfill asset in the greater Sydney area.

5. Disposal cost for MSW will continue to increase within diminishing air space in the region. Extending the life of the existing landfill makes financial sense and secures HCC a disposal solution for the short to medium term.

For these reasons the expansion of the landfill in different scenarios will be presented.

2.1 Option 1: Landfill North Expansion

The most evident expansion proposal to be explored is to the area north of the existing landfill cells, in what was defined as Stage 1 in the original development application.

This area has been previously used to dispose of material excavated from currently operating cells, but also for the landfilling of waste in areas not precisely defined. This area is elevated above flood levels, and appears suitable for any proposed future landfill expansion.



Figure 5: Proposed North Landfill expansion

A range of alternatives can be explored to expand the landfill operations to the north of the current landfill cells at the Site. Regardless of the option to be selected, all of them will have to address the following issues.

Permits Requirements

Current landfill permits consider the construction and operation of landfill cells for the existing cells (1 to 5) and future Cell 6. The most recent Environmental Protection Licence (EPL) indicates that landfilling in cells 1-4 must cease by June 30th 2021. Any future expansion will require new authorisation to build and operate new cells. Considering that the north area has been “intervened” in the past, and the fact that DA 253/87 has approved the use of the north area for landfill purposes (formerly known as Stage 1), the aspects that require a DA revision are;

- Re-assessment of the north area to overcome existing LEMP 2021 in order to revert to original DA 253/87 so landfill operations in the north section can be performed.

- Re-opening of closed cells 1, 2 and part of 4 to improve air space usage and reach maximum defined height for existing and future cell operations.
- Define a new capping strategy and height as the new broader landfill area will encompass a bigger volume and footprint, as well as potentially additional height.

The type of permits required for a north expansion (EIS, DA or both) will need to be assessed by planning professionals.

Waste Exhumation

When the first LEMP was presented in 2001, there was the expectancy that the northern area will be used exclusively for the stockpiling of excavated material from cell construction activities (presented in Fig.2). However, there is clear evidence that waste has been disposed in this area, including Asbestos contaminated soil. There are two approaches that can be followed for removing waste from this area:

1. The floor could be raised (to avoid cutting into floor) to achieve a suitable sub-base for a landfill cell. This option would reduce available airspace for landfill purposes, and may require significant fill material to achieve required levels.
2. Grading the floor by cutting into the floor and perform a “waste exhumation”. In NSW, this activity requires approval from the NSW EPA.

The assessment performed in this project, and the volumes of additional airspace presented later in more detail have considered the grading of current floor stockpiles of excavated material.

Stormwater and Leachate Management

The landfill expansion will need to redefine the location of the stormwater management infrastructure considering that the existing water storage pond is located north of Cell 1, where the expansion of landfill cells will be developed.

Leachate management infrastructure will need to be re-assessed as current and proposed leachate infrastructure is remote from the proposed expansion area.

2.1.1 Conservative approach – RL35.5 option

The conservative approach for landfill expansion considers two different sections:

North Expansion:	Where the excavated soil is profiled and shaped to contain new landfill cells.
Existing cells:	Where a new liner is placed on top of Cells 1 and 2 and part of Cells 3 and 4 in order to maximise the approved air space still available in these cells.

In this approach, the height to be reached at the final capping is the same height proposed by Tonkin in their capping design for Cells 1-6 presented to HCC for approval (RL35.5).

Figures 6 and 7 provide a description of the areas involved and the final landfill cap profile. It is understood that this north section has not been fully utilised in order to allow for the potential location of future stormwater management infrastructure.

The development of the North area is expected to provide in the order of **200,000 m³** of additional air space if waste exhumation is considered, and **145,000 m³** of additional air space if the floor is lifted above the current natural surface (excluding the material required to be placed for the whole landfill final cap).

Is important to mention that the eastern edge of existing Cell 2 and Cell 4 appear to have had quarrying undertaken, and the cap design will require consideration of this area, either to replace this material, lower the cap, or undertake additional engineering to install a steeper cap.



Figure 7: Different Landfill Development Areas in the proposed north landfill expansion

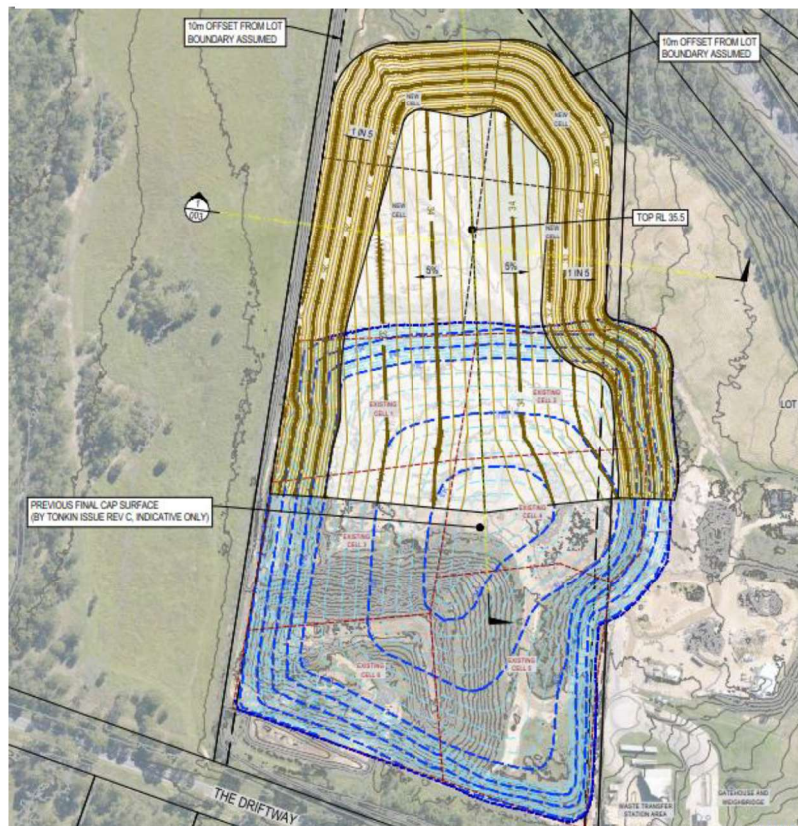


Figure 6: Final footprint and volume for conservative approach

2.1.2 Aggressive approach – RL45 option

The aggressive landfill expansion option considers the same footprint area presented previously but increasing the final capping height of all the landfill footprint, including existing cells (3, 4 and 5) and future Cell 6.

In this option, the height to be reached at the final capping is at RL 45 (See Figure 8), with the inclusion of a working platform at the top of the landfill.

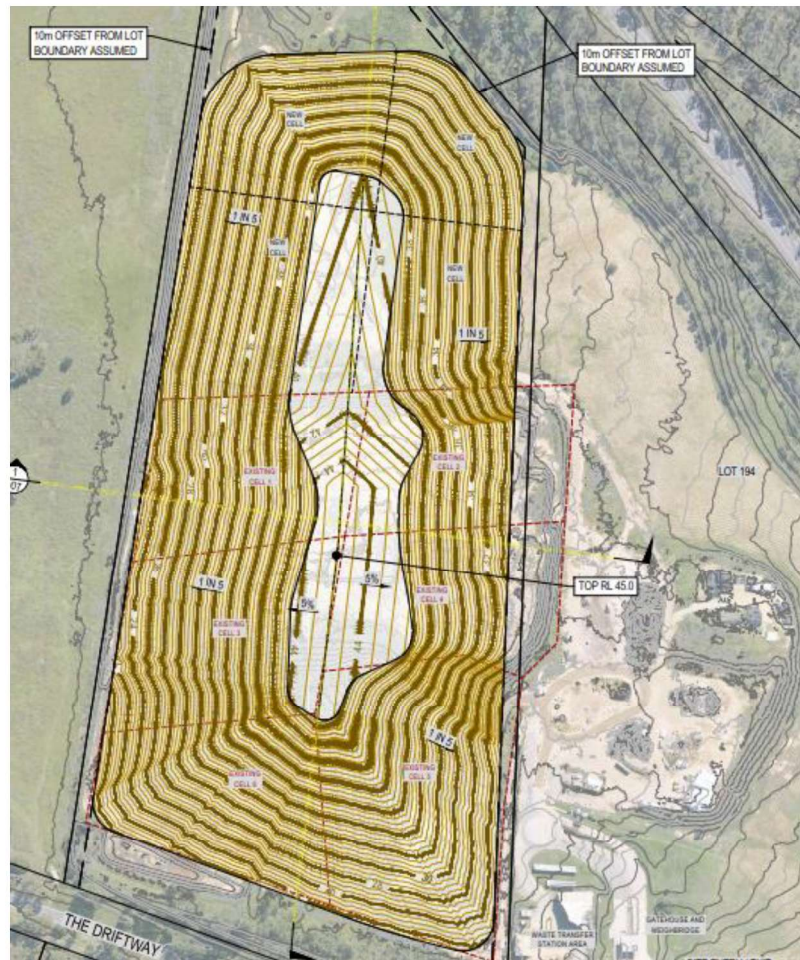


Figure 8: Final footprint and volume for aggressive approach

Is expected to obtain an additional **700,000 m³** of air space for waste disposal, discounted the material required to be placed for the whole landfill final cap.

For analysis purposes, we have only presented the raise of waste volume footprint within in the cadastral boundary, but note capping will likely require spilling into the adjoining lot (eastern side towards the current resource recovery platform).

2.2 Option 2: Landfill West Expansion

The use of the area located to the north-west of the existing Waste Management Facility (Lot 32 DP1270808) requires a more exhaustive assessment as presented in our Planning analysis. This lot is currently administrated by Western Sydney University and has a different zoning.

In order to explore the potential use of this area for landfill expansion, we have considered in this analysis that the land use has been granted. If council wishes to pursue landfilling on this lot, both planning and regulatory approval will need to be sought.

Land Use and Permits

Lot 32 currently sits zoned as SP1 Education Agriculture under the HLEP 2012. Waste management facilities and waste disposal facilities are not considered an ancillary use for the current zoning, which means that a Planning Proposal for rezoning (to SP1 Waste Management Facility, or similar) would be required.

Should a rezoning be obtained, an Environmental Impact Study and a Development Application will have to be submitted, considering the latest requirement for these types of facilities.

EPA Guidelines for Landfills

Any new landfill facility to be developed in NSW needs to comply with the current NSW EPA Environmental Guidelines Solid Waste Landfill 2016. An important criterion that may affect the installation of a new landfill on this land are buffer distances. The EPA guidelines supports the NSW Department of Planning and Environment's EIS Practice Guidelines related to Landfills (Table 1) that indicates the list of inappropriate areas for landfilling, including sites located near the following areas:

- Within 250 metres (or other protection zone) of an area of significant environmental or conservation value identified under relevant legislation or environmental planning instruments, including national parks, historic and heritage areas, conservation areas, wilderness areas, wetlands, littoral rainforests, critical habitats, scenic areas, scientific areas and cultural areas.
- within specially reserved drinking water catchments, such as special areas identified by the Sydney Catchment Authority, Sydney Water and local water supply authorities
- within 250 metres of a residential zone or dwelling, school or hospital not associated with the facility
- in or within 40 metres of a permanent or intermittent water body or in an area overlying an aquifer that contains drinking water quality groundwater that is vulnerable to pollution;
- within a karst region or with substrata that are prone to land slip or subsidence
- within a floodway that may be subject to washout during a major flood event (a 1-in-100-year event).

Any potential new landfill operation in Lot 32 will not comply with several of the above-mentioned restriction so a special authorization will must be requested to NSW EPA during the EIS process.

The below image presents the potential area that a new landfill exploitation to the west of current operations will look like and how fits into the proposed total footprint area. This concept considers the following:

- Based on the unknown limitations regarding boundaries and buffer zone, we have considered at least 50 m distance from existing creek and minimal tree removal, hence the curved shape at the north contour of the new landfill area.
- The new landfill area will merge with existing landfill site, meaning that the capping maximum height will be the same, resulting at the end of the site landfill operations in a uniform landmass.
- On the north side this new landfill is matching with the new north expansion.

The two options presented for the north expansion provides different final heights which provide different additional landfill volume. Consequently, the west expansion provides the following estimated volumes.

Western Lot to RL35.5: **550,000 m³**

Western Lot to RL45: **800,000 m³**

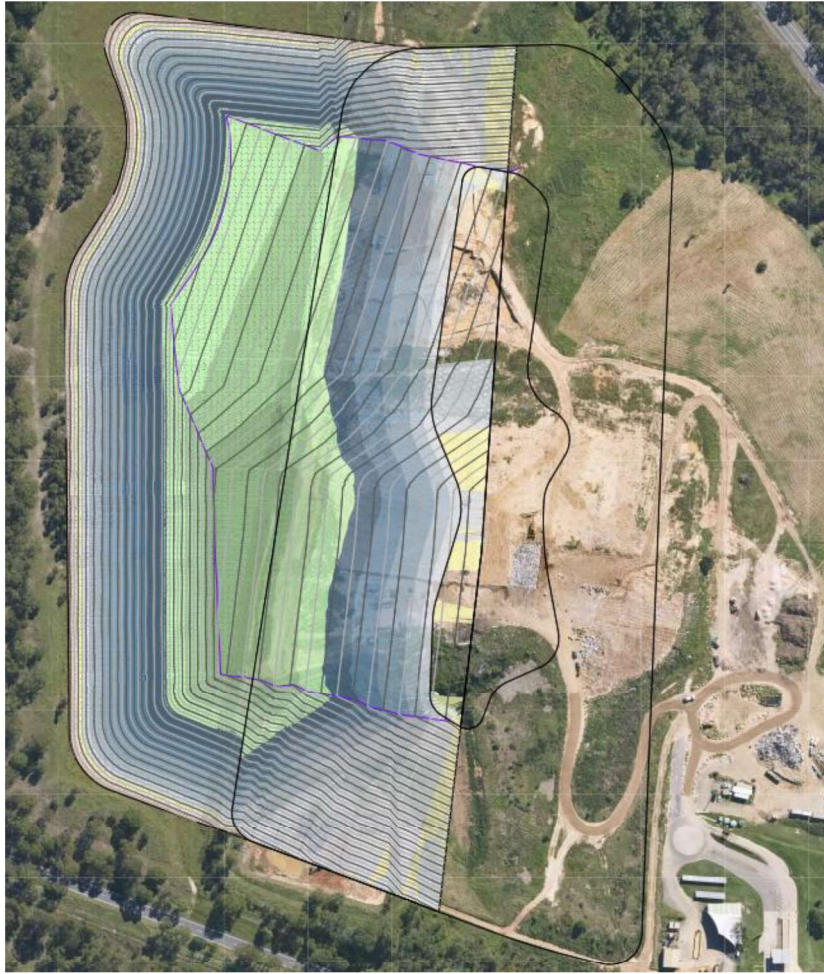


Figure 9: Potential Landfill West Expansion

3. Conclusions

The expansion of landfill operations in all cases will provide significant additional air space and landfill capabilities to Hawkesbury City Council.

An expansion to the north represents a very realistic and plausible project to be pursued by HCC, which can provide between 145,000 m³ and 700,000 m³ depending on the approach that is selected.

A more challenging and uncertain expansion to the west can add to the above-mentioned figures, between 550,000 m³ and 800,000 m³ also depending on the approach to be selected (final capping height).

A list of drawings has been prepared to better illustrate these findings and are provided as separate documents.

Appendix A

30019111-ID-Combined Drawings

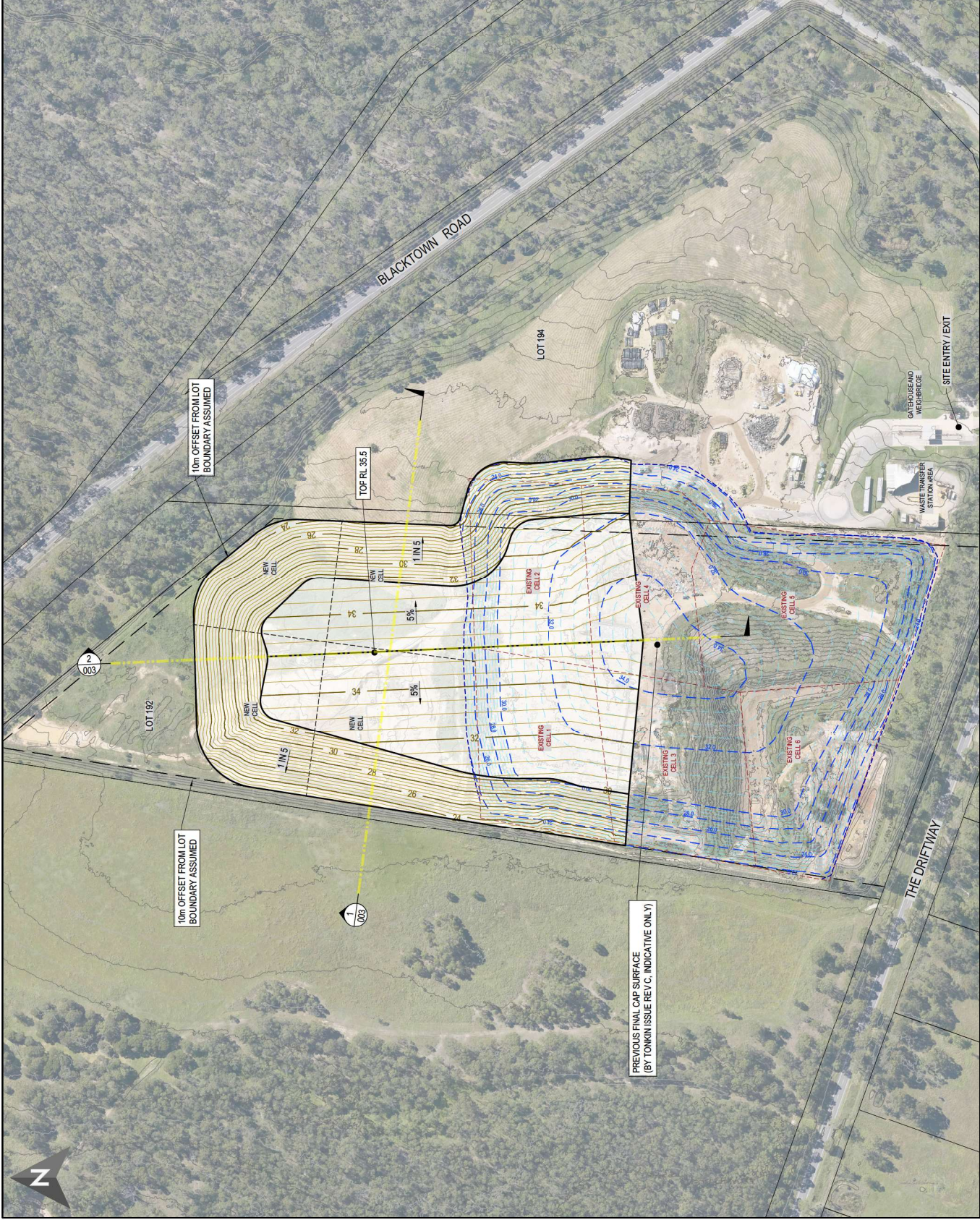


FIGURE TITLE OPTION 1 - PLAN

DRAWING NO. 30019111-ID-001

PROJECT NO. 30019111

DATE 26/05/2023

PROJECT TITLE HAWKSBURY LANDFILL MANAGEMENT STRATEGY
AIRSPACE INVESTIGATION

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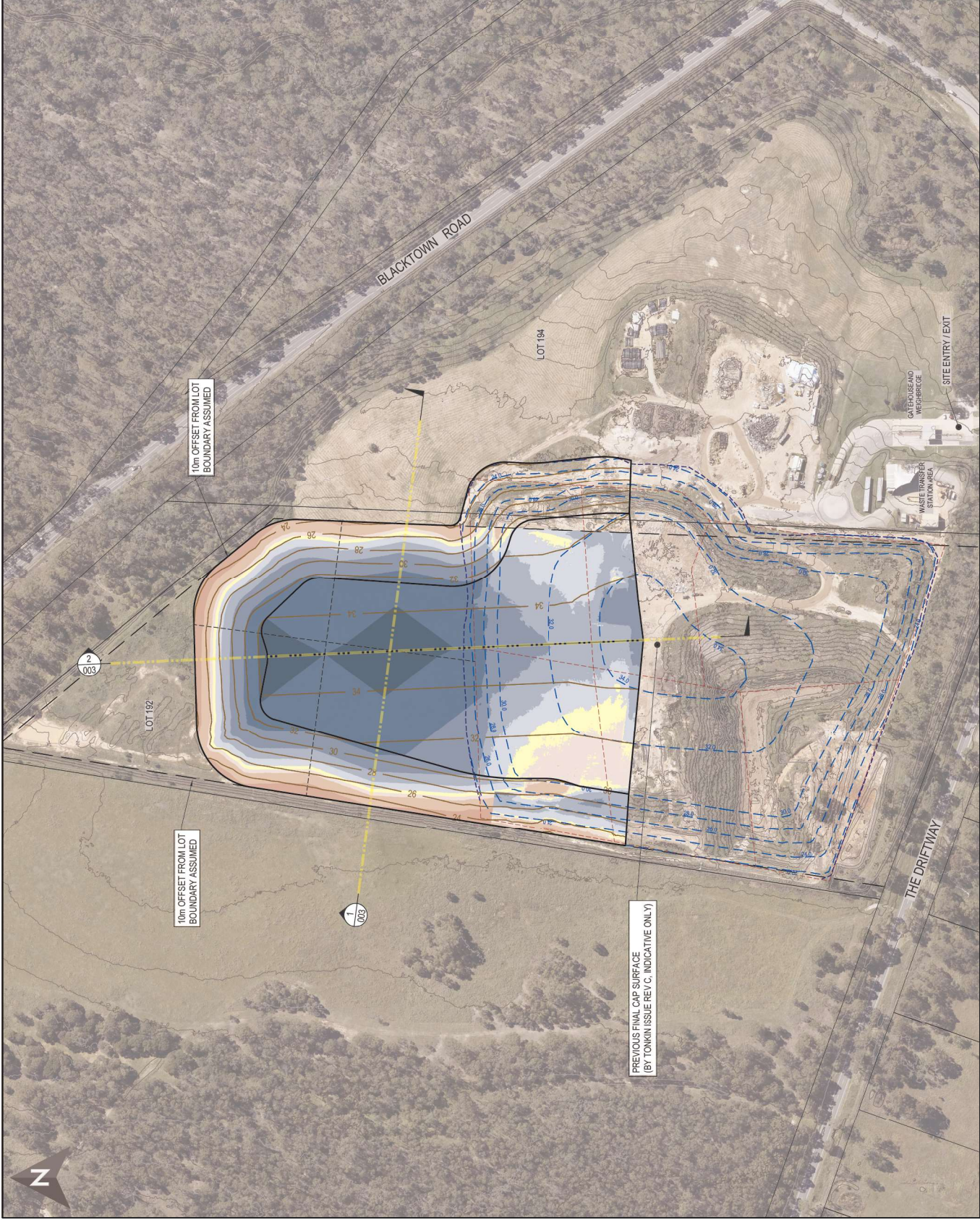
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- NEW CELLS (APPROXIMATE ONLY)

- PREVIOUS CAPPING DESIGN BY TONKIN - APPROXIMATE ONLY
- TOP OF CAP CONTOUR - MAJOR 2.0m INTVL
- EXISTING CELL (APPROXIMATE ONLY)

CUT / FILL DEPTHS RANGE

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	-5.0m	-2.5m
	-2.5m	-1.0m
CUT	-1.0m	-0.5m
	-0.5m	0.0m
	0.0m	1.0m
FILL	1.0m	2.5m
	2.5m	5.0m
	5.0m	7.5m
FILL	7.5m	10.0m
	10.0m	12.5m
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FILL	15.0m	20.0m
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FIGURE TITLE OPTION 1 - PLAN CUT/FILL / AIRSPACE
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AIRSPACE INVESTIGATION

DATE 26/05/2023

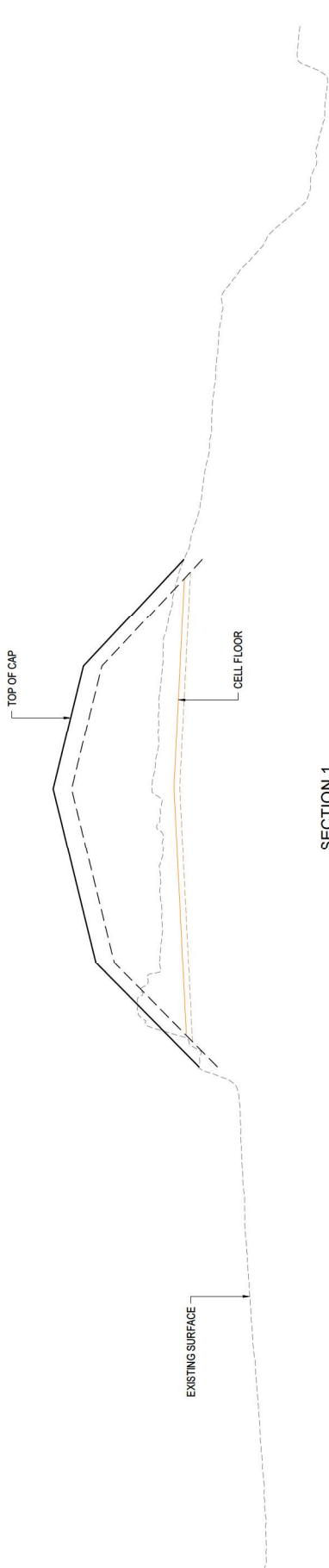
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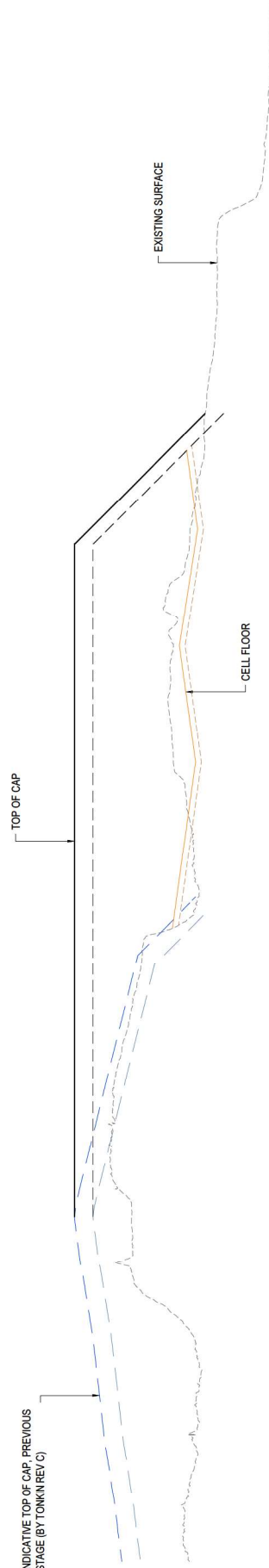
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SECTION 1



SECTION 2

FIGURE TITLE	OPTION 1 - TYPICAL SECTIONS	DATE	26/05/2023
DRAWING NO.	30019111-ID-003		
PROJECT NO.	30019111	PROJECT TITLE	HAWKSBURY LANDFILL MANAGEMENT STRATEGY AIRSPACE INVESTIGATION

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LEGEND

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- DESIGN TOP OF CAP CONTOUR - MAJOR 2.0m INTVL
- DESIGN TOP OF CAP CONTOUR - MINOR 0.5m INTVL
- NEW CELLS (APPROXIMATE ONLY)
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- EXISTING CELLS (APPROXIMATE ONLY)

FIGURE TITLE OPTION 2 - PLAN

DRAWING NO. 30019111-ID-005

PROJECT NO. 30019111

PROJECT TITLE HAWKSBURY LANDFILL MANAGEMENT STRATEGY
AIRSPACE INVESTIGATION

DATE 26/05/2023

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CUT / FILL DEPTHS RANGE

COLOUR	DEPTH RANGE
	CUT
	FILL

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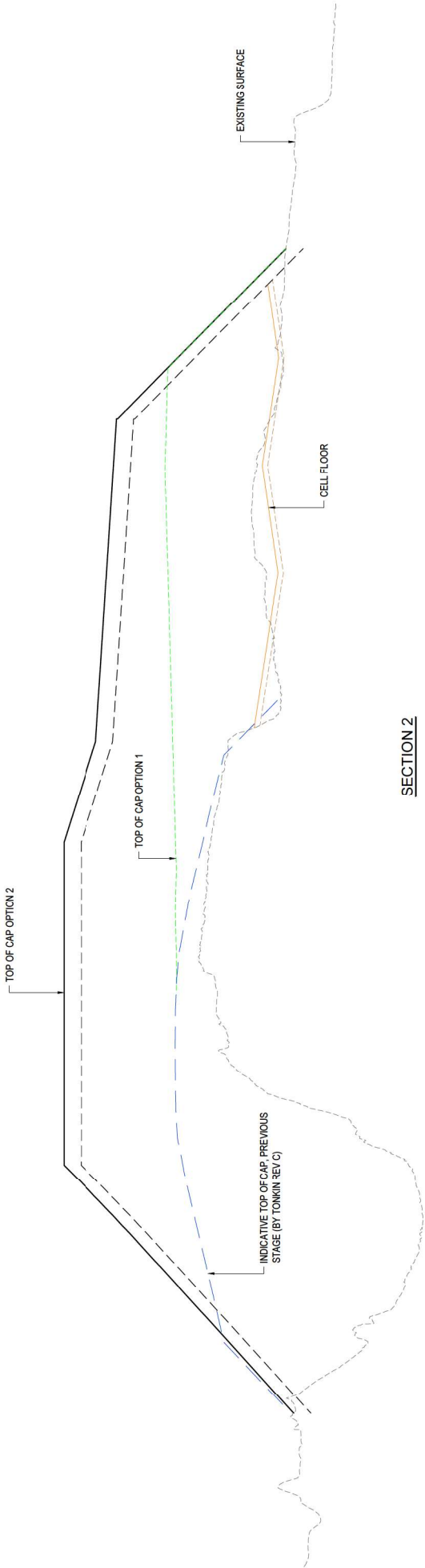
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PROJECT NO. 30019111
PROJECT TITLE HAWKSBURY LANDFILL MANAGEMENT STRATEGY AIRSPACE INVESTIGATION



SECTION 1




SECTION 2

FIGURE TITLE	OPTION 2 - TYPICAL SECTIONS	DATE	26/05/2023
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PROJECT NO.	30019111	PROJECT TITLE	HAWSBURY LANDFILL MANAGEMENT STRATEGY AIRSPACE INVESTIGATION

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Appendix B

30019111-ID-West-Optimized

