Report

Engineering Report

Green Steel Monofill, Hampton Downs

61 Hampton Downs Road, Hampton Downs, Waikato

VOLUME 1 – REPORT AND FIGURES

Prepared for National Green Steel Limited

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Engineering Report

Green Steel Monofill

61 Hampton Downs Road, Hampton Downs, Waikato

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Engineering Report

Green Steel Monofill

61 Hampton Downs Road, Hampton Downs, Waikato

1. Introduction

1.1 Project Scope and Aim

National Green Steel Limited proposes to develop an integrated metals resource recovery and steel manufacturing plant at 61 Hampton Downs Road, Hampton Downs, Waikato. The project is termed "*The Green Steel Project*", entailing the development of a steel smelter facility and steel fabrication plant, shown on the Site Plan PD3 of the project development drawings (Appendix A). The smelter complex will require the construction of a large main building platform for the proposed arc furnace, mill areas, transformers and switches, stores and administration buildings, covering a combined area of 21.2 hectares. Additionally, and integral to the project, is the installation and operation of a shredder and materials recycling-recovery facility on the site. The shredder plant primarily processes end-of-life vehicles (ELVs) which are shredded, and recovered materials sorted for sale to various markets. The Green Steel project is aimed at creating a closed circular economy for ELVs in New Zealand.

National Steel[1] currently owns and operates a scrap metals shredding and materials recovery facility in Manukau, Auckland, for the recovery of recyclable materials for reuse. Metals recovered include steel, aluminium, tin, zinc, lead, nickel, copper and various other mixed metals and materials. The process recovers some 75% by mass of materials processed. The remaining ~25% is described as a waste "floc", which is notably still a resource with reuse potential, for example, as thermal fuel use. Green Steel intends to store the waste floc in two monofill sites located southwest and northeast of the arc furnace central facilities (Figure M1.2).

Currently, the waste "floc" produced by the recycling-recovery process, is disposed to landfill. A volume of up to some $200m^3$ of floc is produced daily from the plant, which at a general bulk density of $0.5t/m^3$ equates to approximately 100 tonnes per day, 3,000 tonnes per month and approximately 36,000 tonnes annually. After placement and compaction in the monofill, the $200m^3$ of loose floc is expected to occupy $100m^3$ of air space at an overall density of $1t/m^3$.

[1] National Green Steel Limited and National Steel Limited are both owned by Mr Vipan Garg.

No other waste type is to be disposed into the proposed monofills. Slag waste, derived from the steel smelting processes, is to be treated on site (recovered and recycled into aggregate), and excess slag will be disposed to landfill.

The extent of the earthworks for the main platform is some 32.7 hectares and some 44.7*ha* for the overall development, comprising the main platform and several proposed perimeter platforms, – across a total property area of some 53.7 hectares. The southwest monofill (Figures M2.1, M2.4 and M2.6) covers an area of some 6.1 hectares, providing a floc fill capacity of approximately 327,400m^3 if cut to RL20*m* or up to 566,500m^3 if cut to RL12*m*. The northeast monofill (Figures M2.2, M2.5, M2.7 and M5.2) covers an area of some 2 hectares, providing a floc fill capacity of approximately 95,100m^3. Combined capacity of the monofills is some 422,500 to 661,200m^3, providing an estimated airspace life of approximately 12 to 18 years (SW monofill cut to RL20 or RL12*m* respectively). Figure M2.3 provides earthworks cut and fill details.

1.2 Project Background

National Green Steel Limited is a specialist New Zealand steel and metal recovery and recycling company with plants located across the country in Manukau, Auckland and Christchurch. The company primarily recovers metal resources from end-of-life vehicles (ELVs), most of which are sent off-shore (e.g., India) for processing and up-cycling into useable products. The circularity of these resources is not currently embedded in the country since no processing plants are available and/or there is no available capacity. New Zealand's Waste Strategy (MfE, March 2024) emphasises that the country moves towards a Circular Economy (CE), expressing that *"We need high-quality systems and infrastructure for the whole country that enable widespread circular management of products and materials, including reuse, repair and recycling."*

Aligned with a national vision to achieve a low-emissions, low-waste society, embedding circular economy principles by 2050 in New Zealand, National Green Steel Limited proposes to establish in-country processing of recovered metals to recycle ELVs. To achieve a full circular economy and avoid landfill disposal, National Green Steel proposes that two monofill sites be developed and operated on the arc furnace site. The term "monofill" is used since only this waste stream will be disposed to these sites. Available (clean) technologies for the conversion of such floc wastes to other uses, such as alternative fuel energy recovery from refuse-derived fuel (RDF) or solid refuse fuel (SRF), are still to be explored in New Zealand. Hence, the monofill sites provide for the effective "storage" of this resource material until such time as it can be used effectively.

The Waste Minimisation Act of 2008 (WMA, 2008) is designed to encourage waste diversion from landfills, as well as the minimisation and reduction in the quantities of waste disposed. The Act requires industry to consider the following waste hierarchal steps (in order of importance):

• reduction; • reuse; • recycling; • recovery; • treatment; and lastly • disposal

It is widely accepted internationally that "recovery" includes the recovery of energy.

National Steel is a 2019 Sustainable Business Network award winner with a "Zero Waste" ethos. The proposed monofills provide an undertaking aimed at possible resource recovery and reuse of the floc material when (and if) viable technologies arise in the future. Notwithstanding this, the sites are to be engineered for the safe disposal of the floc material for the foreseeable future.

This report provides the Engineering Report addressing engineering design, stormwater drainage controls, leachate management and disposal, ancillary works and contingency management controls for the two monofill sites. Site access and operational management are mentioned but addressed in greater detail in the monofill Management Plan (Appendix D).

2. Site Description

2.1 Site Location and Access

The site is located at 61 Hampton Downs Road, Hampton Downs, Waikato. Access is via State Highway 1 (SH1), turning west into Hampton Downs Road and entering the property from the northern side via a section of Harness Road and an existing tar-sealed road (turning south).

The Hampton Downs Motorsport Park is located immediately north of the property, and the operational Hampton Downs Landfill site is situated to the west – both are accessed from Hampton Downs Road. The Hampton Downs Landfill site (Figure A below) serves the solid waste disposal needs of the cities of Auckland and Hamilton, as well as several other areas of North Island. The Spring Hill Corrections Facility is situated to the south, as shown in Figure A below. A site location plan is presented in Figure PD1 of the project development drawings and in Figure M1.2.

Figure A: The site at 61 Hampton Downs Road, Hampton Downs, Waikato, viewing southwards from the hillside on the northern side of Harness Road.

2.2 Site Description

A detailed description of the arc furnace site is provided in Earthtech (2025c).

The property comprises five (5) lots: Lot 1 of DPS45893 and Lots 1 to 4 of DP310030. None of the five lots have been developed as rural living lots (Figures PD1 and PD2).

The proposed arc furnace development area is located within a *horseshoe*-shaped ridge line (Figure M3.1). The two monofill sites are located in the northeast and southwest areas of the site.

Several existing flow paths originate from the ridgeline around the property, draining in a northerly direction. Manmade farm drains transect the lower-lying ground to the north. Both monofill sites are drained by local catchments to the northeast and southwest, respectively, i.e. they are self-contained and isolated from the main horseshoe perimeter catchment.

3. Project Description

3.1 Proposed Monofills Development

Green Steel intends to store the waste floc in two monofill sites located southwest and northeast of the arc furnace central facilities (Figure M1.2). All earthworks details are included in the Earthworks Management and Erosion and Sediment Control Plan (ref: R4392-3; Earthtech, March 2025A).

As mentioned above, the southwest monofill (Figures M2.1, M2.4 and M2.6) covers an area of approximately 6.1 hectares, providing a floc fill capacity which could be varied depending on the level of the basegrade cut. Floc waste fill capacity of approximately 327,400m^3 is provided if cut to RL20*m*, increasing up to approximately 556,500m^3 if cut to RL12*m*. The northeast monofill (Figures M2.2, M2.5, M2.7 and M5.2) covers an area of some two hectares, providing a floc fill capacity of approximately 95,100m^3. Combined capacity of the monofills is some 422,500 to 661,200m^3, providing an estimated airspace life of approximately 12 to 18 years (SW monofill cut to RL20 or RL12*m* respectively), and possibly 20 years allowing for consolidation.

3.2 Proposed Southwest Monofill Development

The site is located on the southwest side of the horseshoe ridge. Extensive earthworks (Figure M2.3) are proposed to accommodate the monofill on a safe and stable site that is suitable for the construction of a Class 1 landfill liner.

Existing site contours and the southwest monofill footprint area are shown in Figure M2.1, together with cross-sections D-D1 and J-J1 in Figures M4.1 and M4.2. Note that cutting the subgrade to a deeper level (i.e. RL12*m* instead of the former RL22*m* noted in the Monofill Preliminary Geotechnical Assessment Report (Appendix B)) will provide a larger, stable lining area and a significant increase in the monofill volume. This option is recommended and will largely remove the need for stability remedial works on the southwestern slopes. Details are shown in the layout plan (Figure M2.1) and

cross-sections (Figures M4.1 and M4.2). Proposed basegrade preparation details are shown in Figure M2.4.

The steep southwest-facing slopes (Sections J-J1 and Y-Y1 shown in the Preliminary Geotechnical Assessment Report (Appendix B) have been mapped as unstable ground up to 6*m* depth. Note: Section Y-Y1 was identified as a key cross-section adopted for stability analysis (refer to Appendix C1). These will be cut away and stabilised with compacted fill or stabilised with a buttress fill.

The monofill floor liner is graded at a basegrade slope of 1 in 100 (1%) (up to 1 in 40 (2.5%), dependent on final geometric design arrangements) towards the arc furnace site. Finished monofill side slopes are expected to vary from a maximum of 1 on 2 to a gently domed cap at RL45*m*. Leachate will thus be drained to a collection chamber located at the low point on the inner (northern edge) adjoining the main building platform. Toe bund, liner, subsoil drainage and leachate drainage details are shown in Figure M5.3.

Figure B: Southwest Monofill viewing eastwards from Harness Road (link road to the Corrections Facility). The Waipapa Stream flows along the site boundary where the vegetation is evident mid-photograph.

3.3 Proposed Northeast Monofill Development

The site is located on the northeast side of the horseshoe ridge. Bulk earthworks are proposed to accommodate the monofill on a safe and stable site that is suitable for the construction of a Class 1 landfill liner.

Existing site contours and the northeast monofill footprint area are shown in Figure M2.2, together with cross-sections G-G1 and H-H1 in Figures M4.4 and M4.5, respectively.

The existing shared accessway (within an easement) is to remain in place. Stage 1 of the monofill is limited to the area to the north of the accessway. A possible Stage 2 area could be anticipated to the

south. If the accessway is relocated to the south, Stages 1 and 2 could be merged into a single larger monofill.

The steep slopes in the two gullies will be cut away to flatter grades, and a compacted fill toe buttress will be constructed along the northern boundary.

The monofill liner is graded at 1 in 25 to the southwest. Finished monofill side slopes are expected to vary from a maximum of 1 on 2 to a gently domed cap at RL38*m*.

Figure C: Northeast Monofill viewing southeastwards, showing the existing valley areas offering available airspace volume. The existing farmhouse buildings are visible on the left side of the horizon, and existing access road through the site is visible on the extreme right.

4. Monofill Design

4.1 Geotechnical Design

4.1.1. Site-Specific Geotechnical Investigations

The geotechnical design for the monofills is detailed in the Monofill Preliminary Geotechnical Assessment Report (Appendix B). Site investigations and geotechnical features identified from site mapping are shown in Figure M1.1. Several groundwater seepages encountered are also shown (Figure M1.1) which flow into the ground of the inner *horseshoe*, and existing farm drains convey water across the central and northern lower portions of the site.

4.1.2. Site Geology and Soil Types

The New Zealand Geological Map (GNS Science, Geology 2.0.0 (gns.cri.nz)) indicates three units underlying the site (Figure M3.1 in the Monofill Preliminary Geotechnical Assessment Report), as follows:

Q1a — Taupo Pumice Alluvium – referred to as Young Alluvium. This unit underlies the very low-lying ground (≤RL4*m*) and includes numerous open channel drains constructed for farm drainage purposes. The drains discharge to the Waipapa Stream, which is controlled by a pumped outlet into the Waikato River.

eQa — Rhyolitic Terrace Deposits – shown on the eastern side of the site and the eastern arm of the *horseshoe*.

Mwa — Amokura Formation underlies the balance of the site. This unit consists of alternating layers of siltstone and sandstone and is a sub-unit of the Waitemata Group rocks.

There is a possibility that the *Kaawa Formation (Pk)* also unlays parts of the side around the outer *horseshoe*. Extensive *Kaawa Sands* were encountered at the adjacent Spring Hill Corrections Facility to the south. This is mentioned in the Monofill Preliminary Geotechnical Assessment Report.

Underlying soils, based on preliminary geotechnical investigations, are shown in long-section A-A (PD5.1) and cross-sections B-B and C-C (PD5.2).

4.1.3. Proposed Use of Site Soil Materials and Engineering Properties

Several soil types have been encountered across the monofill site, and comments on treatment and/or use are provided as follows:

- All organic soils, including peats to be cut to spoil, preloaded where necessary (requires specific design), or left in place where large settlements are acceptable.

- All terrace deposits are potentially compressible and need to be confirmed for strength and depth. The base of the ancestral Waikato River is approximately RL-5*m*, thus limiting the maximum depth to the terrace deposits.

- For compacted low permeability fill and/or liner material, target Amokura Formation (both weathered and unweathered). Limited quantities of H-K Ash are present and suitable for liner protection soil.

- Design preliminary cut and fill slopes at 1 on 3 unless retained. Note that there is obvious landslip movement on the existing outer slopes of the southwest monofill. This material

will be largely removed and significantly lowered to form the monofill bowl. Amokura bedrock has been identified on these slopes between RL7*m* and RL20*m*. A large cut will form the southwest monofill site, reducing the ground elevation by >20*m* resulting in an improvement to the stability of these slopes.

- Regional bedding of the Amokura bedrock is northwest, which is neutral in regard to monofill stability.
- Geotechnical design parameters are provided in the Monofill Preliminary Geotechnical Assessment Report (Earthtech, 202). The following key points are noted:
    - All silts and clays are prone to shrink/swell movements. Laboratory testing of soils will support high-quality requirements for liner cohesive soils.
    - The liquefaction risk is low in these materials but cannot be ruled out entirely. Seismic design has been applied to all stability calculation considerations.

4.1.4. Stability Analyses

Preliminary investigations and a conservative stability assessment of each site, provided in the Monofill Preliminary Geotechnical Assessment Report, indicate that both sites will be suitable for the intended monofill use.

Stability of the key cross-sections was analysed using the SLOPE/W module of GeoStudio (2024) software. This calculates the Factor of Safety (FoS) under various loading and groundwater conditions. The analysis employed the Morgenstern-Price method with the entry-exit slip surface option to evaluate the stability under both static and seismic conditions. The monofill was modelled to a 1v:3h gradient. Analytical results showing Slope/W outputs are attached in Appendix C of the Monofill Preliminary Geotechnical Assessment Report.

Sandy soils of the Kaawa Formation, below the groundwater table, are potentially liquefiable but too old to be of any concern.

4.2 Groundwater Conditions

Several groundwater seepages were identified in the geotechnical mapping shown in Figure M1.1, and found to emanate between approximately RL25*m* and RL35*m* to the north of the proposed southwest monofill site. Exploratory borehole BH42 indicated a groundwater table at approximately RL9.0*m*, shown in Figure M6.2.

Groundwater levels beneath the monofill sites are expected to be at or just below liner level. Several subsoil drains are to be constructed underneath the liner (barrier) system of each monofill, ensuring groundwater is suitably drained from under the monofill liner. Importantly, these subsoil drains

provide an appropriate leachate detection (and potential extraction) system below the liner, minimising potential effects on surface water and groundwater.

4.3 Access to Monofill Sites

Access to both monofills will be via a proposed weighbridge facility to be located on the main incoming access road to the Green Steel facility overall. A possible location for the weighbridge is south of the truck parking area on the northwestern end of the main building platform. Proposed access roadways to the southwest and northeast monofills are shown in Figures M5.1 and M5.2, respectively.

Indicative access tracks to the working faces of each monofill are also shown. A specialist bin-haulage truck may be used to transport waste to the working face, or alternatively, a *tipping head* technique may be applied to allow access for road-going trucks.

Truck parking siding areas for access to proposed leachate extraction (load out) points are additionally shown in Figures M5.5 and M5.6.

4.4 Monofill Staging, Volumes and Density

4.4.1. Staging Details

The monofill sites have been designed with four development stages in the southwest monofill and two development stages for the northeast monofill. Each proposed stage may be subdivided into sub-stages to meet the rate of filling requirements and budget.

Southwest Monofill - Stage 1

The northeastern portion of the monofill, shown in Figure M5.1, is to be developed initially. This follows a *bottom-up* approach, ensuring all main leachate and subsoil drainage systems are connected and fully functioning. Compacted cohesive soil earth bunds are to be constructed around the perimeter of the Stage 1 *cell*.

Construct stormwater controls and erosion and sediment control systems in accordance with Figure M5.7 and the Erosion and Sediment Control Plan (ESCP) (Earthtech, 2025A). Following bulk earthworks, cutting the basegrade down to a selected design level, i.e. RL20*m* currently shown in Figures M4.1 and M4.2, or alternatively, to the RL12*m* level. This is to be determined following finalisation of the earthworks volumes for the Green Steel Project overall. Then proceed to construct and install all subsoil drainage pipework and chambers. Place the Class 1 engineered lining system, as per details provided in Figures M2.4 and M5.8, commencing along the northeastern edge (Figure M5.1), progressing westwards across the base of the cell. Sections of the stormwater control edge bunds will require removal and reinstatement following placement of the lining system. The construction of the leachate drainage blanket follows all leachate drainage pipework located in the valleys.

Entrance access road is to be constructed as shown in Figures M5.1 and M5.2. Recommend placing a protective layer of geotextile (A29 or equivalent) and 0.5*m bridging soil layer* along the top of liner (against the inner edge of the liner anchor bund). This layer will offer appropriate additional protection under the access road entrant across the liner. Initially, a 1*m* depth floc layer is to be gently dozed across the lining system and track rolled. Normal waste filling may then proceed with conventional landfill-type equipment (with steel cleats).

Estimated liner area is ~8,000m^2, and waste fill volume (cut to the RL12*m* profile) of approximately 98,000m^3. At 36,000*t*/*annum* and effective volume of 1t/m^3 gives approximately three (2.5 to 3) years.

Southwest Monofill - Stage 2

Construct the compacted cohesive soil earth bunds around the perimeter of the Stage 2 *cell* (shown in Figure M5.1). Construct and install the decanting earth bund sediment control device in the northwestern corner of the cell and bund surround to direct stormwater flows. Construct the extensions to the subsoil drains through the portions of the cell on the eastern side and through the central low point, i.e. through section J-J1. Proceed to construct the lining system to the base or side-slope lining details, as shown in Figures M2.4 and M5.8. Extend access road into cell as required to suitably dispose of wastes at the operational filling face.

Estimated liner area is ~12,600m^2, and waste fill volume (cut to the RL12*m* profile) of approximately 205,000m^3. At 36,000*t*/*annum* and effective volume of 1t/m^3 gives approximately six (5.5 to 6) years. Overlay ("piggy-back") wastes over Stage 1 to achieve final fill height for Stage 2.

Southwest Monofill - Stage 3

Similar to Stages 1 and 2, construct the compacted cohesive soil earth bunds around the perimeter of the Stage 3 *cell* (shown in Figure M5.1). Construct and install the decanting earth bund sediment control device in the northeastern corner of the cell and bund surround to direct stormwater flows. Construct extensions to the subsoil drains through the central portion of the cell. Proceed to construct the lining system to the base or side-slope lining details, as shown in Figures M2.4 and M5.8. Extend access road into the cell as required to suitably dispose of wastes at the operational filling face.

Estimated liner area is ~7,500m^2, and waste fill volume (cut to the RL12*m* profile) of approximately 84,000m^3. At 36,000*t*/*annum* and effective volume of 1t/m^3 gives approximately two (2 to 2.5) years. Overlay ("piggy-back") wastes over Stage 1 to achieve final fill height for Stage 3.

Southwest Monofill - Stage 4

Similar to Stages 1, 2 and 3, construct the compacted cohesive soil earth bunds around the perimeter of the Stage 4 *cell* (shown in Figure M5.1). Construct and install the decanting earth bund sediment control device in the northwestern corner of the cell and bund surround to direct stormwater flows. Also, construct an earth bund around the groundwater production well (if installed), providing a 5*m* radius (thus 10*m* diameter) around the well. Note: special construction design details are applicable to this well, around which earth fill material is to be placed (not floc waste) – refer to section 10.5 (Water Supply) in this report for further details.

Construct extensions to the subsoil drains through the western portion of the cell. Proceed to construct the lining system to the base or side-slope lining details shown in Figures M2.4 and M5.8. Extend access road into cell as required to suitably dispose of wastes at the operational filling face.

Estimated liner area is ~12,300m^2, and waste fill volume (cut to the RL12*m* profile) of approximately 179,500m^3. At 36,000*t*/*annum* and effective volume of 1t/m^3 gives approximately five (5) years. Overlay ("piggy-back") wastes over Stages 3, 2 and 1 to achieve final fill height for Stage 4 and the monofill overall.

Northeast Monofill - Stage 1

Stage 1 is to be developed initially, following a *bottom-up* approach, ensuring all main leachate and subsoil drainage systems are connected and fully functioning prior to lining construction works.

Construct the compacted cohesive soil earth bund along the RL35*m* contour around the perimeter of the Stage 1 *cell* (shown in Figure M5.2). Construct and install the decanting earth bund sediment control devices on the northern boundary at the locations shown (section lines G-G1 and H-H1 in Figure M2.2). Construct subsoil drains through section lines G-G1 and H-H1 (final locations to be agreed on-site by the engineer). Proceed to construct the lining system to the base or side-slope lining details shown in Figures M2.5 and M5.8. Construct the access road into the cell from the entrance gate, running around the eastern boundary of the monofill - to suitably dispose of wastes at the operational filling face.

Estimated liner area is ~8,300m^2, and waste fill volume of approximately 46,100m^3. At 36,000*t*/*annum* and effective volume of 1t/m^3 gives <1 year.

Northeast Monofill - Stage 2

Check the integrity of the compacted cohesive soil earth bund along the RL30*m* and repair or reinstate where required. Construct and install the decanting earth bund sediment control device at the location shown (Figure M5.2) and provide a temporary treated stormwater drain

conveying waters to the northeastern cornerpoint of the monofill. Extend the subsoil drain through section line H-H1 (Figure M2.2) - final location to be agreed on-site by the engineer. Proceed to construct the lining system to the base or side-slope lining details shown in Figures M2.5 and M5.8. Construct the access road into the cell, suitably bridging over the lining system into Stage 2 filling area.

Estimated liner area is ~11,600m^2, and waste fill volume of approximately 49,000m^3, increasing by some further 35,000m^3 if extended across the eastern portion of Stage 2 and overlaying ("piggy-backing") wastes over Stage 1 to achieve final fill height for Stage 2. At 36,000t/*annum*, and effective volume of 1t/m^3 gives approximately 2 (1.5 to 2) years.

4.4.2. Volumes and Density

Thus, the southwest monofill (Figures M2.1, M2.4, M2.6, M4.1, M4.2, M5.1, M5.3, M5.5, M5.6, M5.7 and M5.8) covers a combined area of some 6.1 hectares (4.04 hectares for floc waste and 2.06 hectares for buttress fill material) – providing a floc fill capacity of approximately 327,400m^3 if cut to RL20m or up to 566,500m^3 if cut to RL12m.

The northeast monofill (Figures M2.2, M2.5, M2.7, M4.4, M4.5, M5.2, M5.5, M5.7 and M5.8)) covers an area of some 2 hectares providing a floc fill capacity of approximately 95,100m^3. Combined capacity of the monofills is up to some 661,200m^3, providing an estimated airspace life of approximately 18 years, at a filling rate of 36,000m^3/yr.

These volumes include the floc and anticipated cover soil layers. A production rate of some 100 tonnes/*day* = 200m^3/*day* loose floc. Compacted on-site to density of 1t/m^3 (including daily and intermediate soil cover). Hence, filling rate is 100m^3/*day* over a seven-day week or 140m^3/*day* over a five-day week.

4.5 Earthworks

4.5.1. Site Preparation Works

Figures M5.1 and M5.2 indicate the site preparation works in place and ready for the first truckload of floc for the southwest and northeast monofill sites, respectively.

4.5.2. Stage 1 Filling

Earthworks are to be limited to a section of each stage and to be carried out incrementally in accordance with the operational (filling) plan. Designated stockpile areas for the excavated materials, i.e. topsoil, cohesive (silty clays and clayey silts) soils, cover soil and probable sandstone intermediate material, are to be located in pre-planned areas. Stage 1 of the southwest monofill site is to be developed from the toe bund (northern part of the cell) and will proceed along the eastern side of the stage, then proceed to the western side – hence *bottom-up*

then *top-down*. Thus, waste filling will be constructed and filled in a clockwise direction. The stage filling sequences are illustrated in a series of drawings in Figure D below.

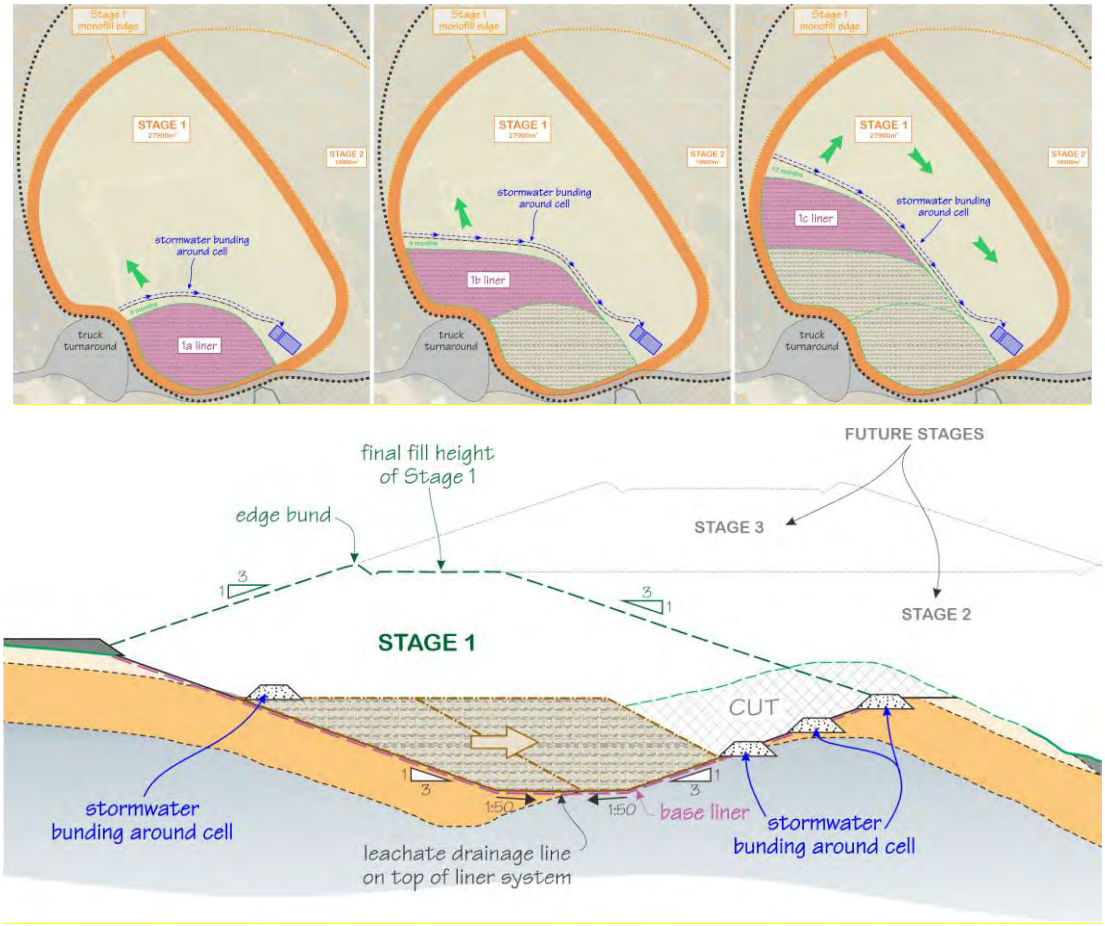

Figure D: Illustration images demonstrating the proposed filling process of the monofill, showing filling sequencing and stormwater controls.

4.5.3. Toe Embankments

The toe embankments at the base of the two valleys will be constructed as a dam with undercutting of any weak material (if encountered), provision of subsoil drains and placement of compacted engineered fill to provide a secure and stable toe zone. Engineering details for toe bund design details are shown in Figures M5.3 and M5.4. An access track will be placed over the toe embankment to allow access for monitoring and maintenance. The downslope faces can be planted immediately upon completion. Full engineering specifications and drawings "for construction" will need to be prepared and approved prior to construction. This will likely include significant further geotechnical investigations across the monofill sites (including the toe embankment areas) to assess existing ground conditions and in-situ soil characteristics.

4.5.4. Fill Footprint and Undercutting Prior to Liner Construction

Earthworks prior to filling would include:

a. Sediment and stormwater control works.
b. Excavation and undercutting of weaker alluvial and colluvial soils (if and where found) on the slopes and in the valley floors.
c. Installation of subsoil drains to collect any seepage water.
d. Construction of a starter embankment at the low point of the stage (the toe embankments).
e. Removal of topsoil immediately ahead of areas to be lined and filled.
f. Construction of the liner and leachate collection systems.
g. Provision of access to place the waste and cover materials.

4.5.5. Floc Fill Placement

The only material permitted as monofill material on this site is the floc material from National Steel's processing operations. The material will be typically carted in 20*t* type truck and trailer units to a suitable off-load point on or adjacent to the active cell area. It will then be off-loaded within the lined area of the monofill and pushed by a dozer to the final placement area, followed by track rolling and placement of temporary cover material.

The proposed filling technique to be employed is that of the "Cellular Technique", whereby small individual cells are planned, stormwater appropriately managed around such cells, rainwater ingress minimised through the use of temporary covers and a continued (daily) cover-soil operation, and a bottom-up and/or top-down fill approach employed. Further details are provided in the Management Plan (Appendix D). Placement of cover material will be applied only to completed "lifts" of terraced floc waste material – since reuse of this material as a future resource is a probability.

As the final contours are reached in each substage, the final cap will be placed as soon as possible, followed by grassing and/or planting. This provides a secure cover and capping system, which allows the diversion of clean runoff back into the waterways and a visual screen to the ongoing filling operations.

4.5.6. Temporary Cover Material

This will include clay, silt and possibly sands and weathered sandstone or siltstone sourced on-site. Material will be placed as daily cover where required, intermediate cover over areas left for any period exceeding three months and final cover as part of the final cap. Daily cover may include tarpaulins instead of soil.

4.5.7. Final Cap Materials

Selected topsoil and cohesive (clays and silts) soils will be sourced and stockpiled on-site for reuse as needed. The final cap will be shaped and mounded to shed stormwater and grassed or planted with vegetation appropriate for possible future access to the stored resources of this monofill. Revegetation is likely to be grassed with light grazing or native shrubs such as low-growing manuka and/or flax.

4.6 Lining System

The monofill will include a Class 1 base liner (ref. item 5.6 Technical Guidelines; WasteMINZ, 2023) – as defined by the nature of the waste stream (non-putrescible industrial). The site owner has opted to install a Class 1 (Type 2) liner, albeit a Class 2 liner system would suffice for this waste type. A Class 1 liner will suitably contain (and collect) leachate emissions and prevent potential leakage. Strategically located leachate drainage is also required.

The selected liner system design is shown in Figure E below. A leachate drainage layer is to be placed over the lower portion of the liner and is termed the "Base Liner System". On the slide slopes, leachate *finger drains* are to be constructed, and the liner system is termed the "Side Slope Lining System". Subsoil drains are to be installed at strategic positions under the lining system, as shown in Figures 2.5, 5.3, 5.4 and 5.8. Collectively, i.e. liner system, leachate drainage layer, and subsoil drainage are known as the monofill barrier system.

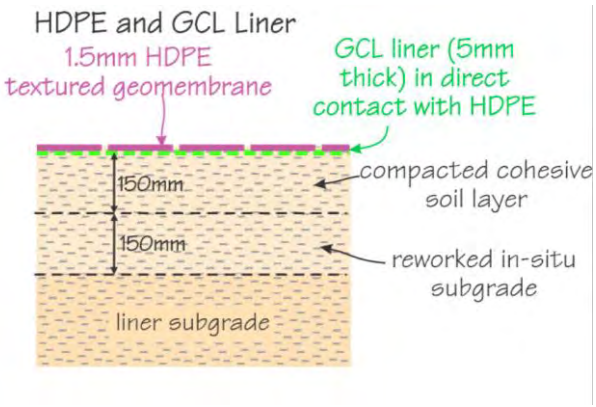

Figure E: Selected Liner Option

Typical installation details across the floor, side slopes and on the upslope side of the toe bunds are shown in Figures M5.1, M5.2, M5.3, M5.4 and M5.8.

The lining system is to be constructed in accordance with best practice procedures that are routinely applied at all of the major MSW landfill sites, i.e. each cell or stage requires design approval, QA/QC during construction and implementation of rigorous leak detection QC measures prior to sign off on each stage of the liner. A Quality Control Plan (QCP), for the construction of the monofill liner (barrier) is attached in Appendix E.

4.7 Leachate Collection System

Leachate drainage and management will include the installation of simple drainage lines (HDPE 150*mmØ* perforated pipes) along the length of each valley to an outlet and a discharge chamber below the toe bund (Figures M5.3 and M5.4). This system will allow for full control and collection for off-site removal of the leachate. Lysimeter studies have established the anticipated quantity and quality characteristics of the leachate.

Figures M2.4, M2.5, M5.4, M5.6 and M5.8 indicate the following leachate collection details:

- A full 200*mm* thick drainage collection layer on the valley floors.
- Finger collection drains on the valley sides (side slopes).
- Leachate drainage pipes flow into the collection chamber and then into a pumping chamber.
- For the southwest monofill, level control and pumping direct to minimum storage of 2 x 25,000 litre tanks (or 1 x 50,000 litre) located in an engineered, bunded 'tank farm' to the north of the stage 1 cell. A truck parking area for pumping out leachate is shown in Figures M5.4 and M5.6. Additional tanks will be added if required, and the bunded area will be appropriately sized for future extension. (Note: leachate flow rates reduce as all stages reach final height and are graded and covered with intermediate soil cover (or other impermeable covers) and later capped.)
- A leachate storage tank(s) providing 25,000 litre minimum storage for the northeast monofill. The location is still to be determined but will likely be on the higher ground to the east within a bunded area or a self-bunded type tank.
- Electronic system to manage faults and communication to dedicated call-out technician.
- Valves to close automatically if tanks are full, thereby providing storage in the monofill base as a backup to the tanks.
- Volume backup is equivalent to six months of leachate (high) flow.
    - Assume storage (southwest monofill) to top of toe bund, allow ~2.5*m*, i.e. elevation RL22.5*m* at the top of the toe bund, providing a lined floor area (Stage 1) of some 4,000m^2, thus storage volume = 10,000m^3;
    - At an estimated daily flow rate of 16.6m^3/*day*, the storage provided is 602 days or approximately twenty (20) months. This is emergency storage only and should not be used on a routine basis.
    - Similarly, the northeast monofill base area is some 2,000m^2; thus, storage volume = 5,000m^3. At an estimated daily flow rate of 10.0m^3/*day*, the storage provided is 500 days, or approximately sixteen (16) months.

4.8 Subsoil Drainage System

An engineered subsoil drainage system will be provided below the base liner in each valley. This also provides an appropriate leakage detection system for the site, as the outlets can be continuously monitored. The subsoil drains extend beneath the compacted engineered fill for the toe embankments to a monitoring manhole on the downstream side (Figures M5.3 and M5.4).

Subsoil water discharge from the southwest monofill will then be directed into a stormwater channel flowing into the stormwater retention pond (SRP), shown in Figure M5.5. Subsoil water discharge from the northeast monofill is to continue discharge to the existing receiving environment (Figure M5.5).

4.9 Liner and Leachate Collection Details

Preliminary design details are provided in Figures M5.3, M5.4 and M5.6, and general details in Figure 5.8. Draft specifications and QA procedures are provided in the Management Plan (Appendix D).

5. Stormwater Management

5.1 Stormwater Flows

Each monofill area entails extensive earthworks to cut to the required basegrade level, and form the liner base. The monofill will, in effect, be an independent rainfall catchment area – of the extent of the proposed lined area.

Applicable rainfall intensity and depth values are provided by the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS) [use: HIRDS V4 (Oct. 2023), https://hirds.niwa.co.nz/]. The nearest rainfall gauging station is located at Meremere, which provides rainfall data dating back to the 1960s. Further rainfall information is provided in the Earthworks Management and Erosion and Sediment Control Plan (Earthtech, 2025A).

5.2 Clean and Dirty Stormwater Diversions

Stormwater controls and sediment control devices are to be constructed ahead of any earthworks being undertaken. Site preparation details for each monofill site are provided in Figures M5.1, M5.2 and M5.7. Earthworks must avoid entrapment of rainfall in large *bowl* areas, ensuring practicable outlet points through earth decanting bunds or similar devices (Figure M5.8). Diversion bunds for clean stormwater flows (Figures M5.2 and M5.7) are to be strategically positioned to direct clean water away from the monofill, towards the Waipapa Stream, to the south or alternative natural receiving environmental areas.

Stormwater sediment retention ponds will be constructed in key locations shown.

Where earth diversion bunds have been removed or bridged (for example, to gain temporary access), it is crucial that they be immediately reinstated during potential rainy periods.

5.3 Erosion and Sediment Control Plans

Earthworks will require careful engineering and management with the provision of strategically positioned stormwater retention and settlement/stilling ponds. There will be a staging of erosion and sediment control measures. The catchment areas of the proposed monofill stages can be carefully

controlled and limited by installing effective bunding around the areas where floc is being placed to minimise the risk of stormwater entry into the site.

Synchronisation with the earthworks, construction and operation will be crucial. Figures M5.1 and M5.2 provide details for the enabling works that must be in place at 'Day 1', showing the placement of erosion and sediment control devices as well as stormwater sediment retention ponds (SRPs). Figure M5.7 indicates the locations of the required sediment retention controls, and details of proposed sediment control devices are provided in Figure 5.8.

Sediment control will be undertaken in accordance with the Waikato Regional Council Guidelines (Waikato Regional Council Technical Report 2020/07: Waikato Stormwater Management Guideline, updated version May 2020 and Erosion and Sediment Control Guidelines for Soil Disturbing Activities (TR2009/02)), and supporting factsheets - as well as with any site-specific silt control report prepared for each stage.

A site-specific and sediment control report has been prepared by Earthtech (2025A) and is included in the application material for the Green Steel Project overall.

6. Leachate Production and Controls

6.1 General

Placement of temporary caps and the final cap will be undertaken to limit leachate production as far as possible. Leachate waters will require effective management to ensure complete separation from other waters on site.

All leachate will be collected and transported by tanker off-site to a suitable trade waste disposal point, i.e. Watercare's Trade Waste in Wiri, Auckland or alternatively at a suitable site in Hamilton, for example, Pukete Wastewater Treatment Plant (WWTP).

6.2 Leachate Production Estimates

The monofill is designed, constructed and operated in accordance with standard municipal solid waste landfills. The floc is very different to MSW type waste; however, it is expected that it will behave in a similar physical manner in regard to leachate production rates. Leachate quality will be distinctly different to MSW landfill leachate since there will be no biological breakdown of the wastes. Appendix C provides a report detailing waste lysimeter trials carried out and the concentrations of various parameters established through these trials. The lysimeter trials have demonstrated that leachate quality is generally within the limits of what is described as Construction and Demolition (C&D) (Class 2) and Managed Fill (Class 3) type waste. In conclusion, while a Class 2 landfill lining system could be recommended for the proposed monofill development at the site, a Class 1 (Type 2) lining system is provided as a significant benefit. This design ensures minimal potential impact on the receiving environment at the site, as demonstrated in Figures M2.4 and M2.5.

Leachate flow is essentially created by rainfall which infiltrates the cover and capping materials and slowly percolates down through the waste to collect in the purpose-designed leachate collection layer which sits directly on top of the landfill liner. Daily leachate flow is affected by:

- Daily rainfall
- Daily evaporation
- Surface area of exposed waste
- Cover and capping layers (with grades) which deflect the rainfall
- Absorptive capacity of the floc which can absorb significant quantities during wet weather and evaporate significant quantities via wicking in dry weather
- Rate of placement of the waste and compactive effort
- Diversion controls in place to divert clean runoff.

Typical MSW landfills return leachate flows as a percentage of annual rainfall, provided in Table 6.1.

Table 6.1: Estimated leachate flows as a percentage of annual rainfall

Operational Area	Intermediate Cover Area	Final Cap Area
20%	12%	7%

Leachate flow rates are highly sensitive to major storm events and the type of cover at the time of the event. Heavy-duty plastic and/or heavy-duty canvas type tarpaulins may be used in specific areas where soil cover is difficult to place.

Assuming an annual rainfall of 1,400*mm/year*, the leachate flow rates have been estimated, as shown in Table 6.2.

As the monofill increases in size, the buffering capacity of the site increases, and daily averages should be more accurate. At the start of filling, Stage 1a (of Stage 1) is operational over 0.5*ha* and exposed to a single heavy rainfall event. In this situation, it is standard practice to complete the Stage 1a liner area and then provide temporary baffles to deflect clean stormwater runoff from lined areas that are not yet covered.

Table 6.2: Leachate production best estimates calculated on a high-end (1.4*m*) of annual average rainfall

Monofill Stage	Total Area	Unit	Operational 20% Area (ha)	Volume (m^3/day)	Intermediate Cover 12% Area (ha)	Volume (m^3/day)	Final Cover 7% Area (ha)	Volume (m^3/day)	Total Est. Leachate Production (m^3/day)
Stage 1a (SW Monofill)	50 x 100 Area =								
	5,000	m^2							
	0.5	ha	0.5	3.8	-	0	-	0	**3.8**
Stages 1 & 2 (SW Monofill)	27,000	m^2							
	2.7	ha	0.5	3.8	1.2	5.5	1.0	2.7	**12.0**
Stages 3 & 4 (SW Monofill)	2.7 +1.45 =								
	4.15	ha	0.5	3.8	1.55	7.1	2.1	5.6	**16.6**
Stages 1 & 2 (NE Monofill)	0.5 + 1.54 =								
	2.04	ha	0.5	3.8	1.04	4.8	0.5	1.3	**10.0**
Long Term (All Monofill Stages)	6.2	ha	0	0.0	0	0.0	6.2	16.7	**16.7**

The above estimates need to be interpreted with caution and allowance for unforeseen events (heavy rainfall and maximum operational area). Seasonal influence can be very strong, with higher flows in winter (June to November) and lower flows in summer. Extreme out of season storm events, can be anticipated in modern climatic changing times.
The site should be designed to accommodate the following leachate flows:

- Year 1 – 6m^3/*day* with peak of 12m^3/*day* over three days
- Year 5 – 14m^3/*day* with peak of 20m^3/*day* over three days
- Year 10 – 20m^3/*day* with peak of 25m^3/*day* over three days
  Long-term flow rate estimate at 15 to 17m^3/*day*

The emergency leachate storage system (close the outlet valves and store leachate in the base of each stage) should only be used for exceptional rainfall events.

6.3 Leachate Quality, Treatment and Disposal

The leachate quality is expected to mirror the results obtained in the lysimeter trials (Appendix C). Predicted leachate quality concentrations for parameters of particular concern are provided in the following Table 6.3. The leachate strengths relate to the initial flush conditions when new floc is placed on the site and then the expected strength in the longer term.

During the early operational phase of the monofill, leachate volumes from the waste body are to be stored in leachate tanks as described previously and transported by tanker off-site for disposal to a trade-waste outfall or wastewater treatment plant (WWTP). Once the filling of the monofill stage has

been established after several months, allowing for attenuated leachate flows to percolate through a waste matrix, leachate quality should stabilise from the early quality concentrations that will be encountered. The Monofill Monitoring Plan (MMonP) includes an evaluation of surface and groundwater effects covering potential liner leakage, and the dilution effects of subsoil and surface water flows affecting the proposed monofill (Earthtech, 2025D). It is noted that the potential liner leakage volume calculated and provided in the MMP (i.e. 2.2*ℓ/day*) is a theoretical value applied to evaluate potential environmental effects only.

With the onset of stable leachate quality concentrations, a treatment system may be considered in the future. Note that any on-site treatment system will require the appropriate consents, and these are not part of the current application. This application relies on leachate capture, temporary storage in tanks and transportation by tanker off-site for treatment.

Table 6.3: Leachate Quality Predictions from National Steel's Monofill

Leachate Lysimeter Apparatus and Experimentation

Establishment on Wednesday 27 January 2021 at National Steel's Yard

Leachate Quality Predictions*			
Parameter	Units	Initial Flush Leaching Strength	Long Term Leaching Strength
pH	-	7.0 to 7.1	7.2 to 7.3
PFAS	µg/l	0.700	<0.1
Boron	mg/l	5.0	0.8
Chromium (Cr)	mg/l	0.05	0.003
Copper (Cu)	mg/l	0.23	0.003
Iron	mg/l	47.0	0.05
Lead (Pb)	mg/l	0.22	0.18
Manganese (Mn)	mg/l	4.1	0.2
Nickel (Ni)	mg/l	0.32	0.002
Zinc (Zn)	mg/l	16.0	0.83
Ethylene glycol	mg/l	<20	<20
Chemical Oxygen Demand (COD)	mg/l	2,000	280

*based on lysimeter trials set up on 27/01/2021

7. Final Capping, End-Use and Reuse

7.1 Monofill Closure and End-Use

The final cap has been specifically designed to exclude stormwater infiltration as far as is practicable. It will support suitable soil conditions for vegetation planting, i.e. grasses and low-growing vegetation. The cap area will either be returned as vegetation belts around the site perimeter or fenced and planted with vegetation appropriate to the possible later access to the monofilled resource. Final

closure and capping can be undertaken at any stage without involving major works, as the intermediate slopes at a maximum of 1 on 3 could be capped as-is.

The final monofill shown in Figures M2.6 and M2.7 is to be landformed, graded and vegetated to blend with the surrounding hills around the *horseshoe* perimeter of the Green Steel Project site. The intermediate access roads and stormwater controls are expected to remain in place.

The capping system is to consist of a 200*mm* thick topsoil layer, overlaying compacted layers of selected soils of a combined depth of 600*mm* (track rolled or light compaction), suitable for long-term grass growth. These layers are to be placed over a 200*mm* thick intermediate soil cap.

The final cap is expected to be detailed as shown in Figure G below as follows:

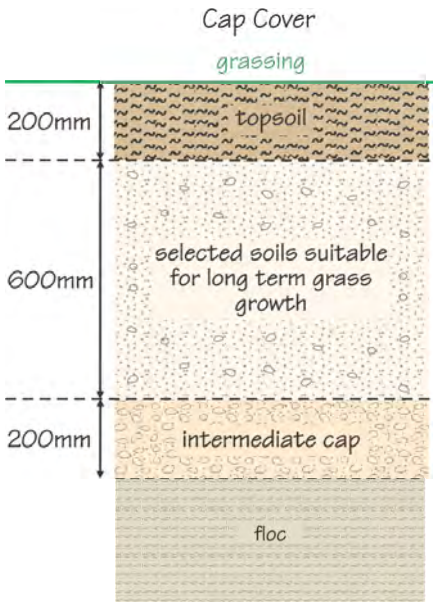

Figure G: Monofill Capping Detail

Vegetation cover includes grassed areas, sediment control vegetative strips, flax and other low-ground cover shrubs that require little maintenance.

Filling is to take place from the lowest part of Stage 1, i.e. a "bottom-up" approach. Once the front (northern portion) embankment is completed on Stage 1 (termed Stage 1a in Table 6.2), the slope face should be shaped, compacted, topsoiled and vegetated incrementally as the fill rises vertically. This approach is colloquially termed a "rising green wall". This same approach would be applicable to the completion of the southern perimeter slopes of the (southwest) monofill. There are distinct leachate management advantages with this option whereby the final engineering arrangement of the leachate drainage system is 'plumbed in' prior to the start of filling. As the filling proceeds through the stage (and additional stages), a "top-down" filling method is used.

7.2 Monofill Reuse and Removal

At some stage during the filling of the monofill site or even after final closure of the site, it is expected that the site will re-open to recover the monofill floc for use.

This process is simply a reversal of the placement process, utilising similar equipment and techniques, i.e. a staged process requiring:

- Stripping of topsoil for reuse.
- Removal of final cap and/or intermediate cover layers.
- Lifting the floc material and loading it into road transport trucks and transfer units for delivery off-site.
- Removal of leachate collection systems and liner systems for disposal at a lined landfill facility.
- Re-contouring and re-shaping the basegrade profile to accommodate the intermediate cover and capping materials.
- Replacement of subsoil drains (where required) and topsoil layers to return the site to alternative use (native vegetation restoration).
- Decommissioning of the sediment control systems and removal of all unwanted pipes, culverts, pumps and delivery lines.
- Decommissioning of the leachate tank storage facilities and site office facilities.

Note that stormwater and sediment control processes will be maintained on the site until full restoration to the final end-use is completed.

8. Monofill Landfill Gas

The monofill floc material is considered inert, comprising non-biodegradable materials, and no landfill gas or odours are anticipated.

9. Settlement

No settlement issues are anticipated in the relatively strong soils and hard/rock material which underlie the site. The floc material itself is not expected to undergo any more than 10% vertical settlement as further load is placed. Effective doming and shaping of the cap will avoid any ponding and depressions which typically cause stormwater issues on municipal solid waste landfills. For comparison purposes, MSW landfills typically settle up to 30% as this is generated by further load and by biological degradation.

10. Ancillary Works

10.1 Site Access and Gate Controls

The monofill sites are to be accessed via a proposed weighbridge facility, indicatively shown in Figure M5.2, which in turn is accessed from a main entrance gate off Hampton Downs Road and/or the Harness Road loop road section (Figure M1.1). Each monofill area will be fenced and access to the

monofill will be via an independent site entrance gate. When a shredder and materials recovery plant is established on the Green Steel site, vehicles may also access the monofill from within the property, via the weighbridge. The main gate is to be closed outside of operating hours. The entrance gate to the monofill site access road leading into the site, located some short distance (~1.0*km*) into the site, will remain closed at all times – openable by National Green Steel's drivers arriving at the site.

An electronic control system will be introduced to maintain site visit records of all vehicles entering the monofill as well as possible others – who will all be required to be made aware of site health and safety requirements by way of induction and access information capture.

10.2 Truck Turnaround Area

Truck turnaround is provided by the roadway alignment on the northern edge of the southwest monofill (Stage 1), where the access road intercepts access road into the monofill footprint. Vehicles will be required to follow the route of the internal roadway to turn the vehicle around. A turning area is possible at the northeast monofill by following the peripheral access track, turning full circle left on the elevated ground to the east, and allowing for an adequate turning circle area for truck-and-trailer trucks. Smaller truck and trailer units will be able to access the lower levels of the monofill stages via a purpose-built access road – details are shown in Figure M5.1.

10.3 Site Roading and Passing Bays

Site access roads are to be gravel (metalled) type roads of a single or dual carriageway width of typically 3.5*m* to 5.5*m* (Figure M5.1). Permanent access roads, are to be constructed within the Green Steel facility as part of the internal roads network, as shown in the Site Plan PD3 of the project development drawings. Proposed access roads are shown in the site preparation plans in Figures M5.1 and M5.2. Access roads into the monofill are to be single lane. A passing bay may be provided at a strategic location between the point of entrance to the cell and the disposal face.

Access roads within the cell are to be crossfalled to drain into the waste body area. All access roads will include stormwater culvert crossing where required.

10.4 Site Facilities

10.4.1. Site Office and Ablution Facilities

The site offices, staff facilities and ablution facilities are to be provided for the Green Steel Project overall, as shown in the Site Plan PD3 of the project development drawings. A small site office is to be placed alongside the monofill site (whichever is in operation), providing facilities for site operational staff only. Ablutions are to be linked to the site sewer disposal system comprising an on-site package treatment plant and treated wastewater irrigation areas, shown in Figure PD3. Where possible, existing structures and infrastructure will be 'recycled' and utilised. There is unlikely to be more than two operators on the site during the day, with no one staying overnight.

10.4.2. Leachate Tank Farm

A leachate tank farm comprising 2 x 25,000 litre tanks (or 1 x 50,000 litre tank) is to be constructed on the northern edge of the southwest monofill, within a bunded area. Similarly, a tank farm of 25,000 litre minimum capacity is to be constructed within a bunded area for the northeast monofill. Leachate will be pumped from the two collection manholes at the base of the monofill low point/valley. The tanks are to be constructed within a lined bunded area sized to a volume equal to at least one full tank volume plus 0.3*m* freeboard within the bund. The tanks are to be plumbed to a pumping system within the bunded area to allow for direct filling of a tanker. A level-controlled-switch pump located in a sump within the bund will allow for removal of any spillage or wash water within the bund back into the tanks. Overflow from the bund will discharge back to the Stage 1 lined area.

10.4.3. Wheel Wash

A wheel-washing facility is to be provided on-site, allowing for the washing of the wheels of all vehicle types. Initially, a portable-type trailer unit (tank with pump and lance) will be available on-site. Truck washings will be directed to a discharge area with flow through a grease trap and overflow to a purpose-built percolation area.

The location of a wheel washing facility is yet to be confirmed, but it is expected to initially be a portable high-pressure water unit type or an elevated mobile type fabricated unit, with wash water directed to a soil, oil and grease trap (SOGT) to the dirty water system or leachate.

10.4.4. Diesel Storage

A mobile diesel storage tanker trailer is to be used on the site of some 1,000 litre capacity. A permanent diesel tank is currently not envisaged on site. Diesel is required to refuel the earthworks and site operations only. Road tankers will not be allowed to refuel on-site.

10.5 Water Supply

Water supply planned for the monofill sites entails potential water takes from a combination of sources, i.e. groundwater, rainwater/stormwater, potable water supply and river water supply. Details are provided in the Water Take and Supply Plan (Earthtech, 2025B) for probable use by water tanker.

Should a groundwater production bore be required to be located within the southwest monofill area, as currently shown, the following engineering options would be considered to ensure no potential impacts on water quality:

- No floc waste filling to take place around the production bore area, allowing, say, a radius of 5*m* (~10*m* diameter). An outer protective sleeve is to be placed around the production bore casing, suitably secured, and the void *cone* to be filled with compacted soil to final monofill level; or

- The monofill fill area is to be shifted or extended laterally to accommodate groundwater extraction. This could be likely in the case of a cluster of production bores; or

- Production bore casing to penetrate through the lining system. In this case, the liner base would be graded away from the area, ensuring that leachate cannot potentially pond in the area. Additionally, a specialist HDPE *top hat* would be welded on the liner, sleeving the production bore casing throughout the vertical length. Selected low permeability cohesive soil is to be compacted around the HDPE sleeve placed in *lift* increments as the monofill height progresses.

- Or a combination of the above.

11. Contingency Events

The monofill sites may be subjected to possible extreme natural and/or manmade events that fall outside the range of anticipated design scenarios. Possible events are listed below, along with probable response actions.

11.1 Extreme Weather and Flooding

Extreme weather, which could cause flooding, would be in the context of extremely high rainfall. Such an event could cause a significant rise in water levels of the Waipapa Stream. However, the lowest point of the monofill (southwest) is RL12*m* which is some 7.5*m* above the 1:100 year flood level and very unlikely to pose any flood risk concern.

Flooding within the operational area of the stage and damage from such an event could entail:

- Higher than anticipated erosion resulting in high sediment loads to the constructed systems and possible carry-over of sediment to the downstream environment;
- Scour and erosion damage to site stormwater infrastructure (control bunds and channels); and
- Flooding within the lined area filled with waste resulting in a significant increase in leachate from the storm event.

The engineered toe bund itself will provide further protection offering an additional 2.5*m* to 3*m* of vertical height to surrounding ground. In most cases, the engineered stormwater sediment retention (treatment) ponds will manage or limit potential environmental concerns and effects. Notwithstanding this, after such an event, some or all of the following may be required to be undertaken:

i. Immediately advise the Waikato Regional Council if there has been a breach of any consent condition; and
ii. Take immediate corrective action to prevent any discharges of waste or leachate into the stormwater system; and
iii. Investigate and monitor whether there have been any downstream effects and scope required remedial action; and

iv. Carry out immediate repairs to site stormwater infrastructure with a focus on areas that may cause further scour, erosion and sediment transport to the ponds; and
v. Restore the capacity of the ponds by removing excess sediment; and
vi. Provide a report to the Waikato Regional Council describing the event, damages caused, environmental concerns identified, and remedial action taken.

11.2 Earthquake

A major earthquake event in this area is unlikely; however, it cannot be ignored. Seismic design parameters are provided in the Monofill Preliminary Geotechnical Assessment Report and a detailed design of the toe bunds and side slopes will include design for a 1:500 year event.

A large earthquake event could cause the following:

- Shaking damage to the leachate storage tanks and pipework;
- Instability of the toe bund and monofill face; and
- Instability of any internal working face within the stage; and
- Lateral displacement within the lined area of the stage which could result in possible excessive strains and/or rupture of the landfill lining system.

All of the above are engineering works that will be designed for a 1:500-year return period event. After such a major earthquake event, the following may be required:

i. Detailed inspection of the damaged areas by an appropriately trained and/or experienced professional and observations recorded; and
ii. A scope of the damages that are of concern in the context of physical damage, safety concerns and potential environmental impact concerns; and
iii. Advise the Waikato Regional Council of the event and damages caused, followed by a later report on remedial actions carried out; and
iv. Carry out required repairs and re-establish the integrity of the lined monofill.

11.3 Monofill Fire

The risk of a fire is, by and large, directly related to two crucial factors, i.e. the professional quality of the daily filling operation and environmental (weather) conditions. Indeed, it is also vital that the waste stream be visually checked prior to disposal for the potential of any fires, i.e. smouldering or smoking wastes arriving on site. A “No Naked Flames” and “No Smoking” safety doctrine must be exercised for the site.

The following points of importance are noted on fire risks and risk management:

- Soil cover material is to be readily available in close vicinity (within 100*m*) to the disposal face; and

- The filling operation should adopt a technique of constructing landformed terraces that are continuously compacted and covered with other layers of waste and/or cover soil (at least 100*mm* thick); and
- Water should be readily available for firefighting. Typically, a pumped supply from an available stormwater pond; and
- A fire within the monofill body can cause possible damage to the lining system and any pipework.

Any fire event should be recorded in the site management information system, and any significant fire event which has caused any physical damage to the site or equipment must be reported to the Waikato Regional Council. After such a significant fire event, the following may be required:

i. Detailed inspection of any damaged areas or suspected damaged (burnt) areas by an appropriately trained and/or experienced professional and observations recorded (note that liner protection layers should be carefully removed during inspections to ensure no new damage is caused); and
ii. Repairs are carried out as quickly as possible, and design-engineered conditions re-established.

11.4 Pipe Blockage (Main Leachate Line)

A blockage of the main leachate conveying pipe would result in a ponding of leachate against the toe bund. The engineering design is robust to this concern, with the placement of a pipe network and stone drainage 'blanket' throughout the base of the monofill. However, a single outlet point does exit the toe bund into the leachate storage tanks which could become blocked for any unforeseen reason. Regularly checking this system (weekly), specifically the outlet pipe into the leachate storage tanks, should be carried out. Additionally, this line should be checked via camera inspection through the leachate flushing line.

Blockage could also occur to the subsoil drainage line beneath the monofill. Similarly, this line should be inspected regularly (monthly) through the inspection chamber located immediately below the stability toe bund.

The potential effects of these events are generally described under 'Extreme Weather' and 'Leachate Leak or Spillage'. Any contingent action that may be necessary would require inspection by an appropriately experienced professional and appropriate remedial options implemented as soon as practicable.

11.5 Fault Rupture or Landslip

A slip could occur in the monofill waste body or the surrounding ground (geology). The former, depending on where it occurs within the stage, may impede operations but may not create an environmental effect and may pose minimal concern. Of significance would be a landslip which may:

- Rupture the lining system; and/or
- Impede any major stormwater infrastructure; and/or
- Result in the exposure of floc or leachate (causing leachate to flow into the environment – possibly in the case of a side-slope slip-failure).

Actions to be taken in these instances are generally described in other points. A landslip of any nature should be inspected and assessed by an appropriately experienced and trained professional. The cause and effects of the slip should be documented, and a scope for remedial action provided. The significance of such a slip may become an operational or construction issue whereby the lining system would need to be repaired before filling in the cell (Stage) can proceed.

11.6 Dam Burst of Sediment Retention Pond

A "dam burst" of the toe bund is unlikely due to the engineering nature of this stability structure. A "dam burst" of a downstream stormwater sediment retention pond is likely to result in the event of floodwater flows causing scour, erosion and large build-ups of sediment. The latter dam burst would pose potential downstream environmental effects by way of sediment discharge to the stream. To manage this risk, stormwater sediment retention ponds have been located, whenever possible, within the cell of the stage under construction. The pond sizes are limited to a maximum catchment area of 3 to 5 hectares, limiting the amount of storage in each pond.

After such an event, the contingent actions should be the same as those listed above under 'Extreme Weather and Flooding'.

- Important action would be the immediate notification of the Waikato Regional Council if there has been a breach of any consent condition; and
- The taking of immediate action to prevent any ongoing discharges of sediment into the downstream environment.

11.7 Leachate Leak or Spillage

The spillage or discharge of any leachate can occur from various points of the monofill development. The locations of most significant concern are those outside of the lined area of the stage as follows:

- Discharge of leachate within the stage and overtopping a clay-soil edge control bund and flowing into the forebay of the stormwater sediment retention pond; or
- Overtopping of the storage tanks at the toe of the monofill; and/or

- A burst rising main pipe or joint failure in any of the connections of the leachate rising main; and
- A leachate storage tank failure within the bunded storage area causing overflowing into the bunded area; and
- Spillage at the tanker filling area. This unintended discharge would flow into the bunded area.

In the case of any of the above happening, actions would include:

i. Immediately advise the Waikato Regional Council if there has been a breach of any consent condition; and
ii. Take immediate corrective action to prevent any further discharges of leachate into the receiving environment and/or stormwater system; and
iii. Determine the extent of any discharge to the stormwater pond(s) and whether the concentration of any contaminants in the pond is likely to exceed discharge allowance and/or cause any potential downstream environmental effects;
iv. If contaminant concentrations are unacceptable, hold any discharges from the pond system and develop a plan for emergency treatment of the contaminant(s) of concern;
v. Investigate and monitor whether there have been any downstream effects and scope required remedial action; and
vi. Continue to discharge from the ponds when safe to do so; and
vii. Provide a report to Waikato Regional Council describing the event and any impacts caused, environmental concerns identified, and remedial action taken.

11.8 Early Closure

Early closure of the monofill operation and facility can occur in the case of an unforeseen unfortunate event, for example, a legal requirement, an environmental situation or a financial circumstance.

Maintaining a small operational footprint within each sub-stage is important in the case of such an event. The work and expense required to effectively close and cap the monofill at the current point of the development would be manageable and affordable.

Closure engineering requirements include placing the final capping layer on compacted, graded wastes, establishing final landscaping and removing any facilities and infrastructure that is not required during the aftercare period, or the modifying of such infrastructure for the aftercare period. Aftercare of the monofill activities includes maintenance of the cap, vegetation (as required), stormwater channels, the leachate system (inspection and flushing if required) and ongoing environmental monitoring.

12. Management Plan

A detailed monofill Management Plan (ManMP) will be required prior to construction. An provisional MMP is attached in Appendix D. Final details of the ManMP will be completed once consents are granted and updated as filling progresses. The MMP covers site daily operational management, site access, materials and construction details and specifications, environmental monitoring, and consent conditions.

The monofill Management Plan (ManMP) is to provide a single document tool for the management and operation of the monofill site, providing details, explanations, processes and procedures that will ensure efficient site operation adhering to engineering design and environmental consent conditions.

13. Monitoring Plan

A Monofill Monitoring Plan (MMonP) has been prepared (Earthtech, 2025D) and is to be submitted with the application submission documentation. The MonMP includes:

- Leachate quality sampling
- Stormwater sampling, including streamwater sampling upstream and downstream of the site
- Groundwater sampling
- Air discharge and dust control reporting
- Nuisance incident log and reporting
- Regular annual reports
- Landfill gas monitoring would not be required for this monofill waste type.

Proposed monitoring borehole locations are shown in Figure M1.3.

14. Engineering Consents Required

14.1 Earthworks

Undertake earthworks to construct the monofill preparation works (toe bund, liner, staging bunds, daily and intermediate cover, final cap) and construction of access roads. Monofill construction works to be scheduled only between September to May or weather dependent (based on recent climatic shifts), and site operations to continue throughout the year.

14.2 Stockpile Materials

Create temporary stockpiles for topsoil, cover soil, clay, possibly sandstone/siltstone material and organic soils. Specially prepared bunded areas must be provided for any acid soils if found on site. Acidic type soil stockpiles should be cstabilised to prevent erosion. All stockpiles are to be located within the overall footprint where possible. Stockpiles are to be covered as necessary to prevent erosion and dust blow. Designated stockpiles for excavated topsoil, clay soil and other soil materials are to be located within planned earthworks areas shown in the Earthworks Management and Erosion and Sediment Control Plan (Earthtech, 2025A).

When monofill operations encroach into designated stockpile areas, stockpiles are to be relocated on levelled sections on top of the filled waste body within the stage footprint. As Stage 1 nears completion, new earthworks and stockpile areas will be opened in the Stage 2 footprint, and similarly for Stages 3 and 4.

14.3 Divert and Discharge Stormwater

Divert clean runoff around the earthworks or monofill areas. Divert sediment-laden water to sediment retention ponds prior to discharge. All sediment controls are to follow guidelines provided by Environment Waikato.

14.4 Discharge Contaminants into or onto Land

Authorises discharge of monofill floc from a single source to be contained and stored indefinitely on the site as per the Monofill Design Plans issued for Construction and the monofill Management Plan.

14.5 Discharge Contaminants into Ground and/or Groundwater

Authorises discharge of waste materials and leachate into the ground and/or underlying deep groundwater systems. No leakage through the liner is anticipated with the engineering design approach applied. The subsoil drains will provide an effective precautionary leachate leakage detection system under the lining system.

14.6 Discharge of Contaminants to Air

Authorises the discharge of dust to air, requiring monitoring and suppression by water or other acceptable products.

15. Safety by Design

The engineering design process of the monofills will adopt Safety by Design (SbD) in considering the health and safety risks over the full life cycle of the sites, including construction, operation, maintenance, possible resource extraction, and final closure and aftercare. For the monofills described in this Engineering Report, we have considered SbD as it relates to our scope of work and technical expertise, the purpose and function of the proposed monofill facilities and the proposed construction requirements.

Where possible, we have considered alternative design options to eliminate health and safety risks so far as reasonably possible at this stage, and will continue to enhance the design through to final design for construction. Indeed, if elimination or significant reduction of risk isn't possible, then the degree of risk to be managed by the owner and/or operator will be clearly identified and listed in the monofill Management Plan. Indeed, the placement of floc waste with suitable landfill type machinery, operated by experienced and skilled operators and supervision staff, would be a key element in minimising risk for overall monofill development.

16. Drawings Disclaimer

The are several drawings attached to this report, numbered as Figure M1.1 through M5.8, which are referred to in the technical content of this Preliminary Geotechnical Assessment Report. Certain details may differ slightly from similar drawings (Figures) appearing in other technical reports we have authored for the Green Steel project. This is primarily due to revision updates which are specific to the report. The Green Steel Project Development Drawings (PDDs), numbered PD1 through PD5.2, attached to this report, are consistent throughout our reports - current to the revision and date shown.

17. References

Earthtech (2025A) — *Earthworks Management and Erosion and Sediment Control Plan.* Prepared for National Green Steel Limited. Ref R4392-3, Rev C, dated 23 March 2025.

Earthtech (2025B) — *Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff*. Prepared for National Green Steel Limited. Ref R3660-1, Rev C, dated 23 May 2025.

Earthtech (2025C) — *Preliminary Geotechnical Assessment Report. 61 Hampton Downs Road, Hampton Downs.* Prepared for National Green Steel Limited. Ref R4392-2, Rev D, dated 28 May 2025.

Earthtech (2025D) — *Monitoring Plan and Evaluation of Surface and Groundwater Effects, Green Steel Monofill, Hampton Downs.* Prepared for National Green Steel Limited. Ref R4424-6, Rev A, dated 30 May 2025.

GNS Science (Online) — *Geological Map of New Zealand.* Scale 1:250,000. Retrieved from GNS Science, Geology 2.0.0 (gns.cri.nz) on 12 January 2024.

MfE (2024) — *Te rautaki para | Waste strategy*. *Getting rid of waste for a circular Aotearoa New Zealand*. Wellington: Ministry for the Environment, New Zealand. March 2024.

Waikato Regional Council (2020) — Waikato Regional Council Technical Report 2020/07. Updated version May 2020: *Waikato stormwater management guideline.* Erosion and sediment control guidelines for soil disturbing activities (TR2009/02).

WasteMINZ (2023) — *Technical Guidelines for Disposal to Land.* The Waste Management Institute of New Zealand (WasteMINZ). Rev 3.1, September 2023.

WMA (2008) — *New Zealand Legislation. Waste Minimisation Act 2008*. Waste Minimisation Act 2008 No 89 (as at 01 July 2024), Public Act Contents – New Zealand Legislation

LEGEND

- Boundary
- Possible Landslip (<3m deep)
- Hummocky Ground
- Slope Orientation
- CPT (January 2024)
- Hand Auger (January 2024)
- Hand Auger (November 2024)
- Bore Hole (January 2025)
- Test Pit (April 2025)

Notes:

1. Aerial and contours from RavSurvey, dated 25 March 2024.
2. Platform layout from RavSurvey drawing, Site_Platforms_Option 8, ref DRSL540, dated 10 March 2025.
3. Background aerial from Google.
4. CPT06 not completed.

0m 50 100 150 200 250m

Scale 1:5000

FOR INFORMATION

Note: All drawings are to be approved (initialled) before final issue.

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Site Investigation and Mapping Plan

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	06-12-24	FOR REPORT R4424-1	L.S	A.N	S.SW	
B	18-02-25	BORES ADDED	L.S	A.N	S.SW	
C	29-05-25	TEST PITS ADDED	L.S	A.N	S.SW	

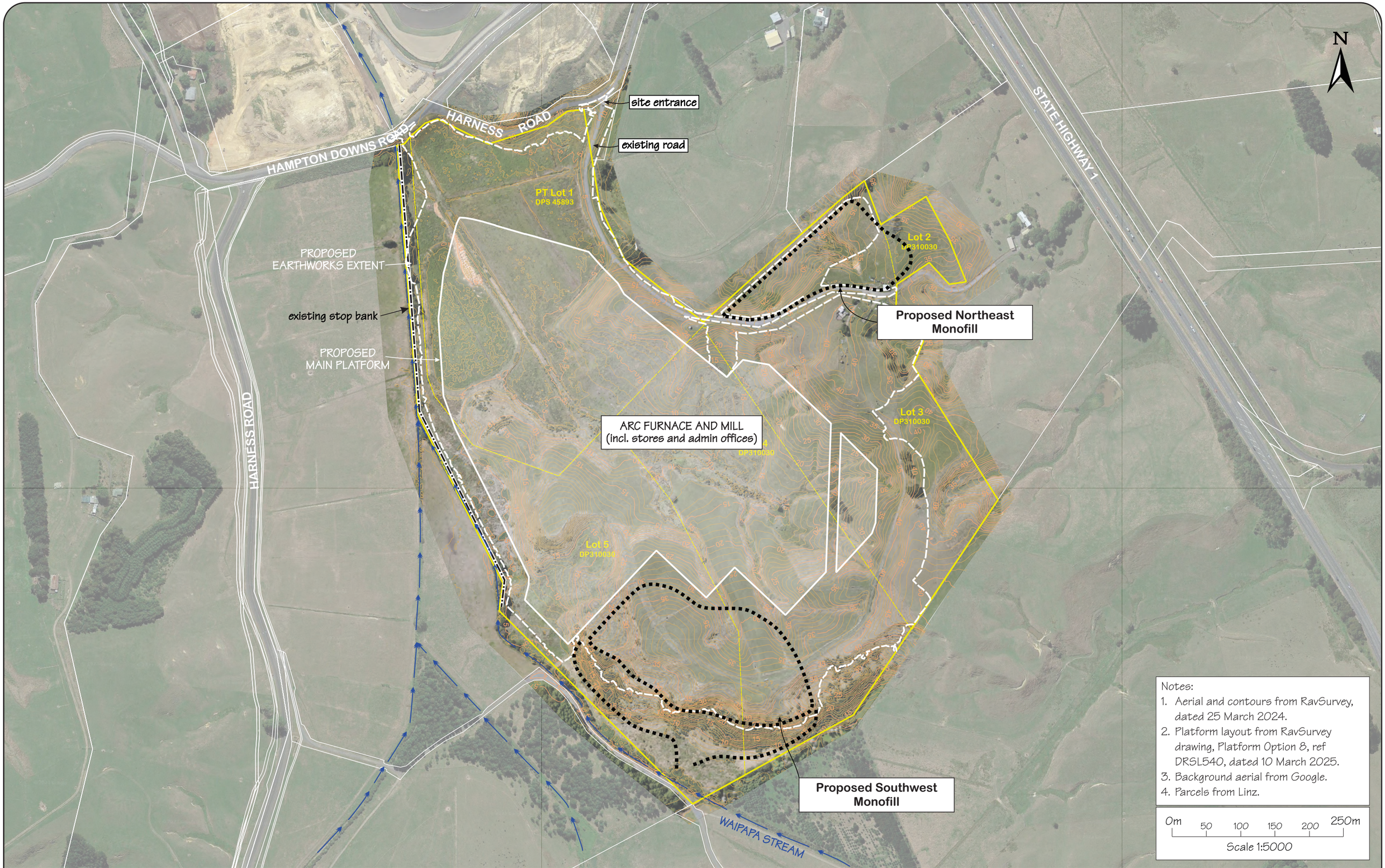
DRAWING NO.: FIG. M1.1

REF: 4424

SCALE: 1:5000

CRS: Mt Eden 2000

DATUM: AVD46



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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Monofill Location Plan

DRAWING NO.: FIG. M1.2

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

REF: 4424

SCALE: 1:5000

CRS: Mt Eden 2000

DATUM: AVD46

N

WAIPAPA STREAM

MBA

MBB

MBC

leachate drainage valley lines

A

B

C

RL20m

RL22m

RL22m

RL23m

proposed access roadway to monofill site

full extent of the liner area is to be placed on excavated cut

slopes to be stabilised by removal of existing weaker soils and replaced with compacted fill, or stabilised from the bottom up with a large buttress fill with a final overall slope of 1 on 4

WAIPAPA STREAM

LEGEND

Proposed Boreholes

- MBA — Proposed Monitoring Borehole
- Liner Area
- Leachate Drains
- Slope Buttress (Cleanfill)
- Clean Water Diversion

Notes:

1. Aerial and contours from RavSurvey, 1m Contour Plan, ref DRSL348, dated 25 March 2024.
2. Platform layout from RavSurvey drawing, Platform Option 8, ref DRSL540 dated 10 March 2025.
3. Background aerial from Google.

0m 50 100 150m

Scale 1:2,500

FOR INFORMATION

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Proposed Monitoring Borehole Locations

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	26-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	14-03-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
C	29-05-25	FINAL	L.S	A.N	S.SW	

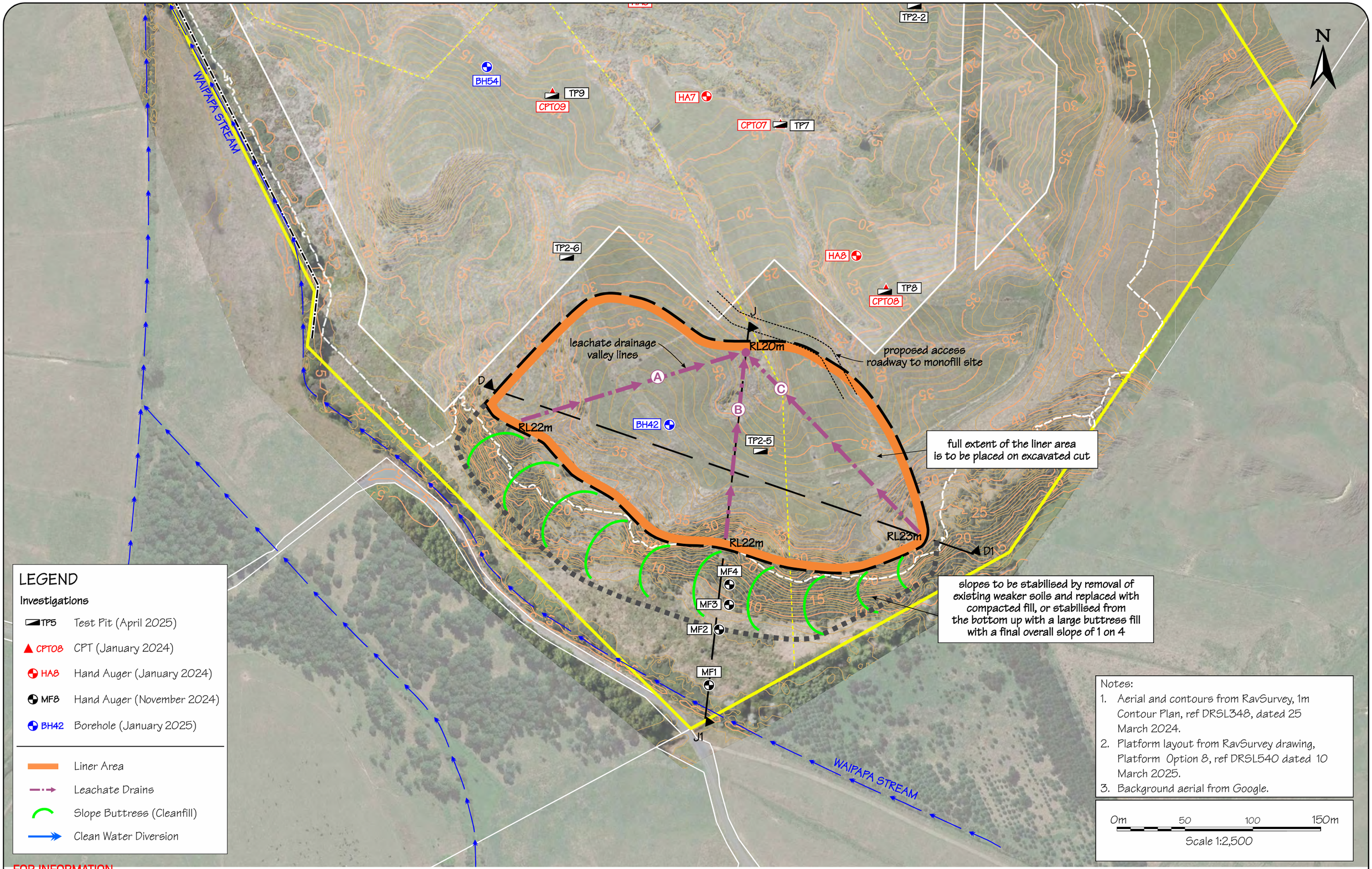
DRAWING NO.: FIG. M1.3

REF: 4424

SCALE: 1:2500

CRS: Mt Eden 2000

DATUM: AVD46



LEGEND

Investigations

- TP5 — Test Pit (April 2025)
- CPT08 — CPT (January 2024)
- HA8 — Hand Auger (January 2024)
- MF8 — Hand Auger (November 2024)
- BH42 — Borehole (January 2025)

- Liner Area
- Leachate Drains
- Slope Buttress (Cleanfill)
- Clean Water Diversion

Notes:
1. Aerial and contours from RavSurvey, 1m Contour Plan, ref DRSL348, dated 25 March 2024.
2. Platform layout from RavSurvey drawing, Platform Option 8, ref DRSL540 dated 10 March 2025.
3. Background aerial from Google.

0m 50 100 150m

Scale 1:2,500

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Site Layout Plan for Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	06-12-24	DRAFT FOR COMMENT	A.N	A.N	S.SW	
B	28-02-25	UPDATE PLATFORMS	L.S	A.N	S.SW	
C	29-05-25	ADD TEST PITS	L.S	A.N	S.SW	

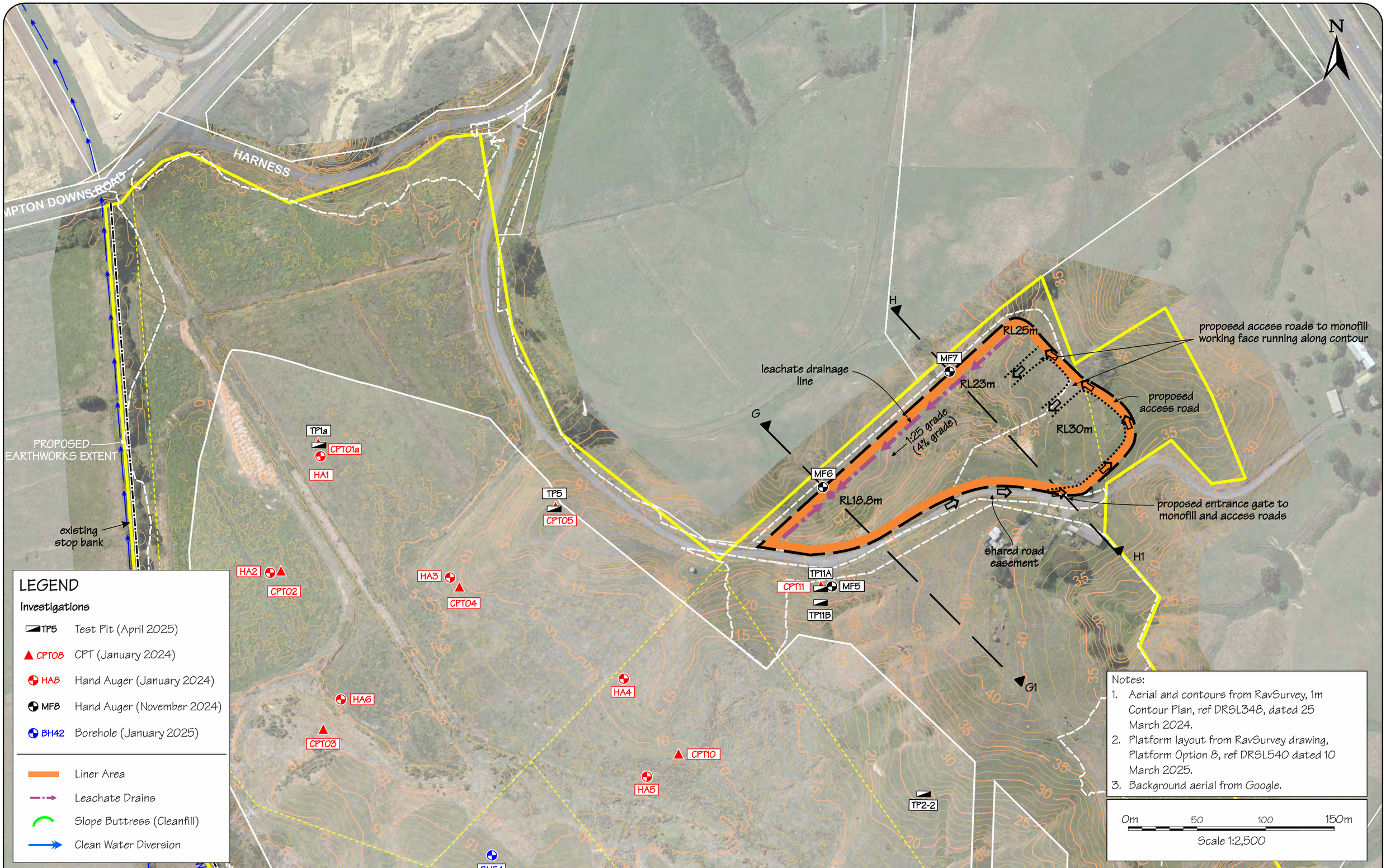
DRAWING NO.: FIG. M2.1

REF: 4424

SCALE: 1:2500

CRS: Mt Eden 2000

DATUM: AVD46



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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Site Layout Plan for Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	06-12-24	DRAFT FOR COMMENT FOR R4424-1	A.N	A.N	S.SW	
B	28-02-25	UPDATE PLATFORMS	L.S	A.N	S.SW	
C	14-03-25	UPDATE SECTIONS	L.S	A.N	S.SW	
D	29-05-25	ADD TEST PITS	L.S	A.N	S.SW	

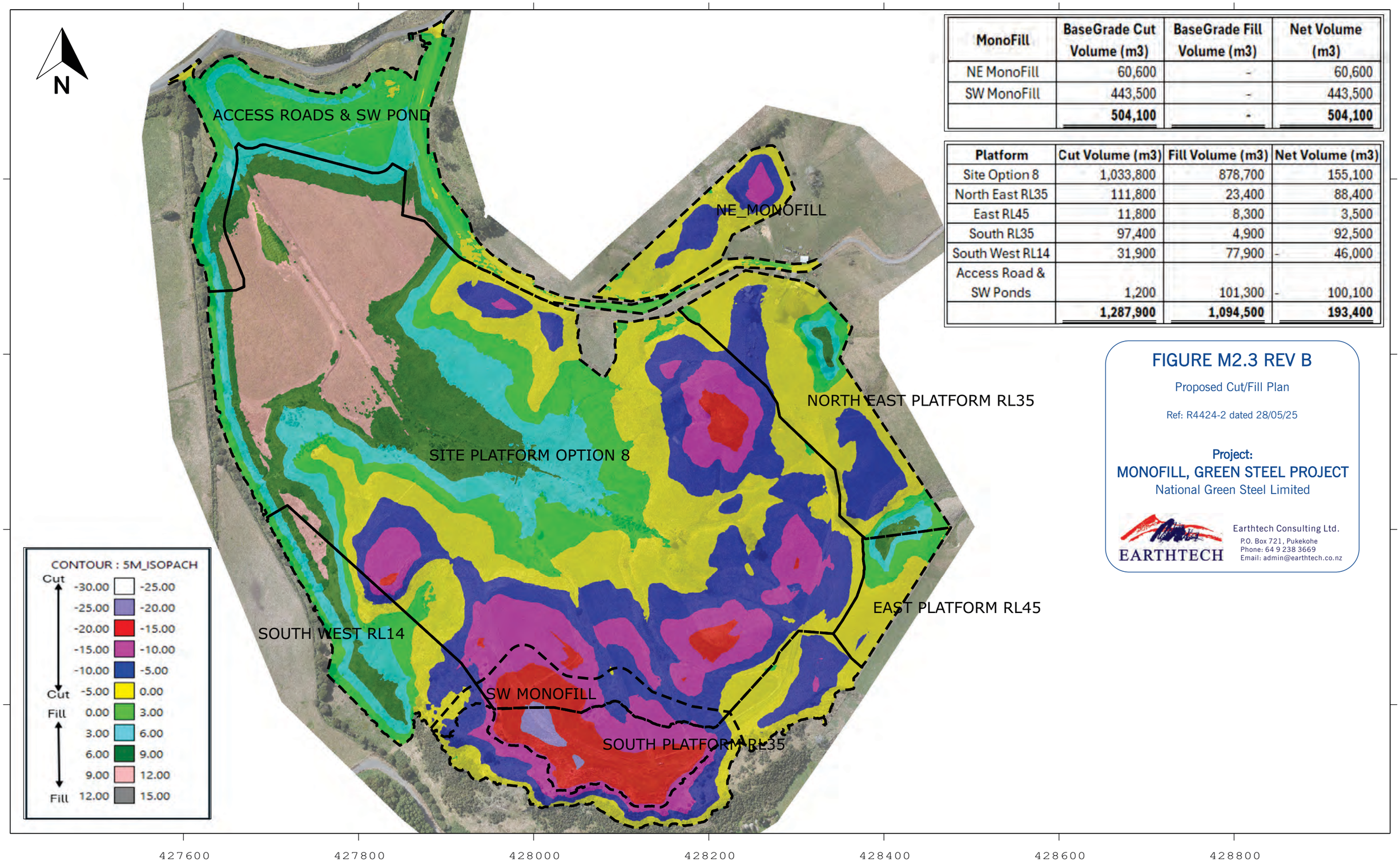
DRAWING NO.: FIG. M2.2

REF: 4424

SCALE: 1:2500

CRS: Mt Eden 2000

DATUM: AVD46



MonoFill	BaseGrade Cut Volume (m3)	BaseGrade Fill Volume (m3)	Net Volume (m3)
NE MonoFill	60,600	-	60,600
SW MonoFill	443,500	-	443,500
	504,100	-	**504,100**

Platform	Cut Volume (m3)	Fill Volume (m3)	Net Volume (m3)
Site Option 8	1,033,800	878,700	155,100
North East RL35	111,800	23,400	88,400
East RL45	11,800	8,300	3,500
South RL35	97,400	4,900	92,500
South West RL14	31,900	77,900	- 46,000
Access Road & SW Ponds	1,200	101,300	- 100,100
	1,287,900	**1,094,500**	**193,400**

FIGURE M2.3 REV B

Proposed Cut/Fill Plan

Ref: R4424-2 dated 28/05/25

Project:

MONOFILL, GREEN STEEL PROJECT

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100 0 50 100 150 200 250

Metres

NOTE:
- Coordinates are in terms of Geodectic Datum Mt.E den Circuit 2000
- Elevation are in terms of New Zealand Vertical Da tum Auckland 1946
- Survey Origin Linz Code AG88
- Contours shown are 1m Interval
- Contours shown are T op of Vegetation
- SW Pond and Access Road Lineworks adopted from Airey Consultant Ltd DWG File

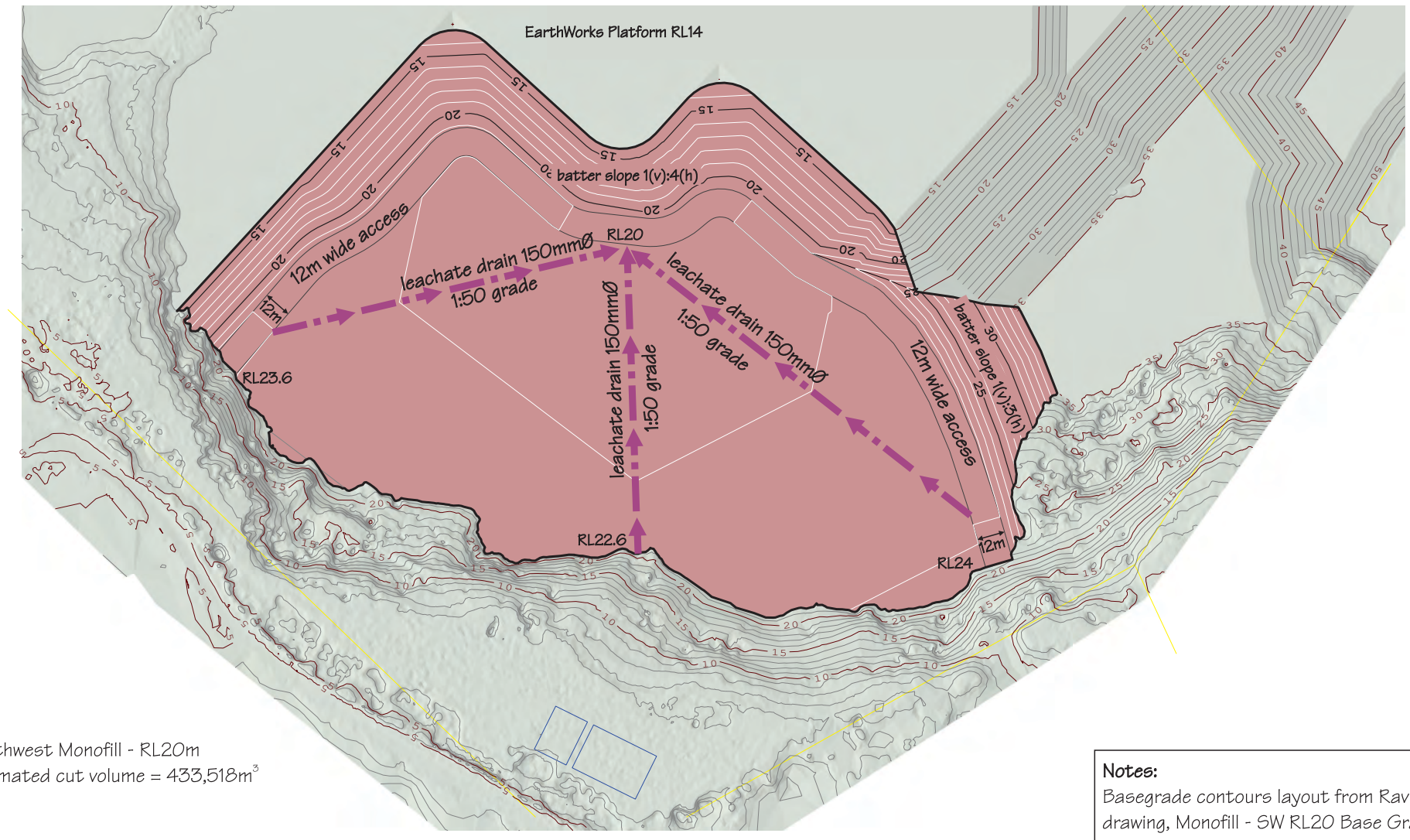
RAVSURVEY LTD
Ph : 021 190 1114 Email : ravi@ravsurvey.co.nz

Title

61 HAMPTON DOWNS SITE

OPTION 8 V2 - PROPOSED CUT & FILL PLAN

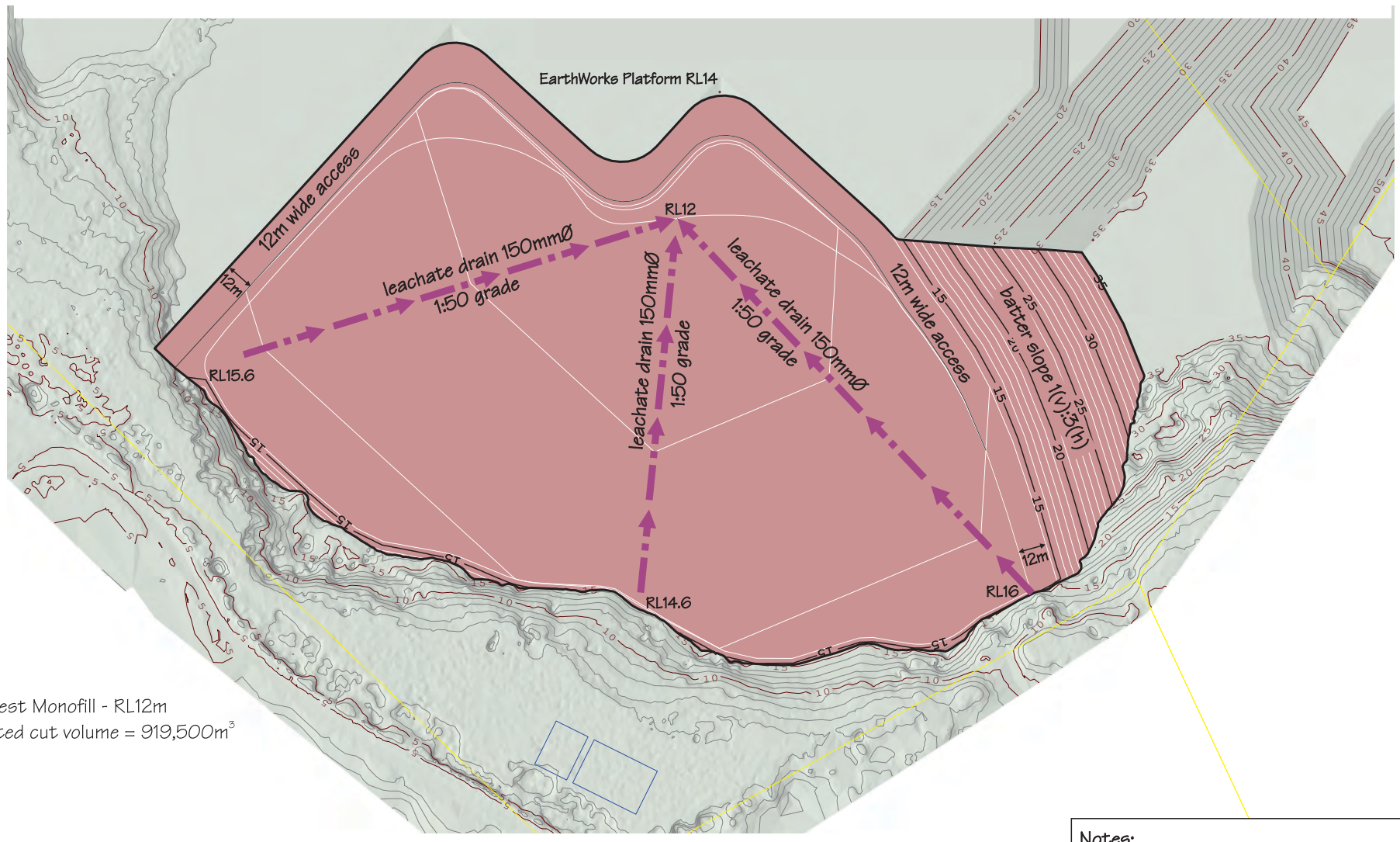
Date : 14-May-2025 | Drawn By : RP
Scale 1:4000 @ A3 | Checked By : RP
Drawing No. DRSL558
Survey Date : 10-Mar24 | Rev_B



Southwest Monofill - RL20m
Estimated cut volume = 433,518m^3

Notes:
Basegrade contours layout from RavSurvey drawing, Monofill - SW RL20 Base Grade, ref DRSL525, dated 25 February 2025.

Basegrade at RL20m



Southwest Monofill - RL12m
Estimated cut volume = 919,500m^3

Notes:
Basegrade contours layout from RavSurvey drawing, Monofill - Southwest Base Grade, ref DRSL522, dated 25 February 2025.

Basegrade at RL12m

0m 50 100 150m
Scale 1:2,500

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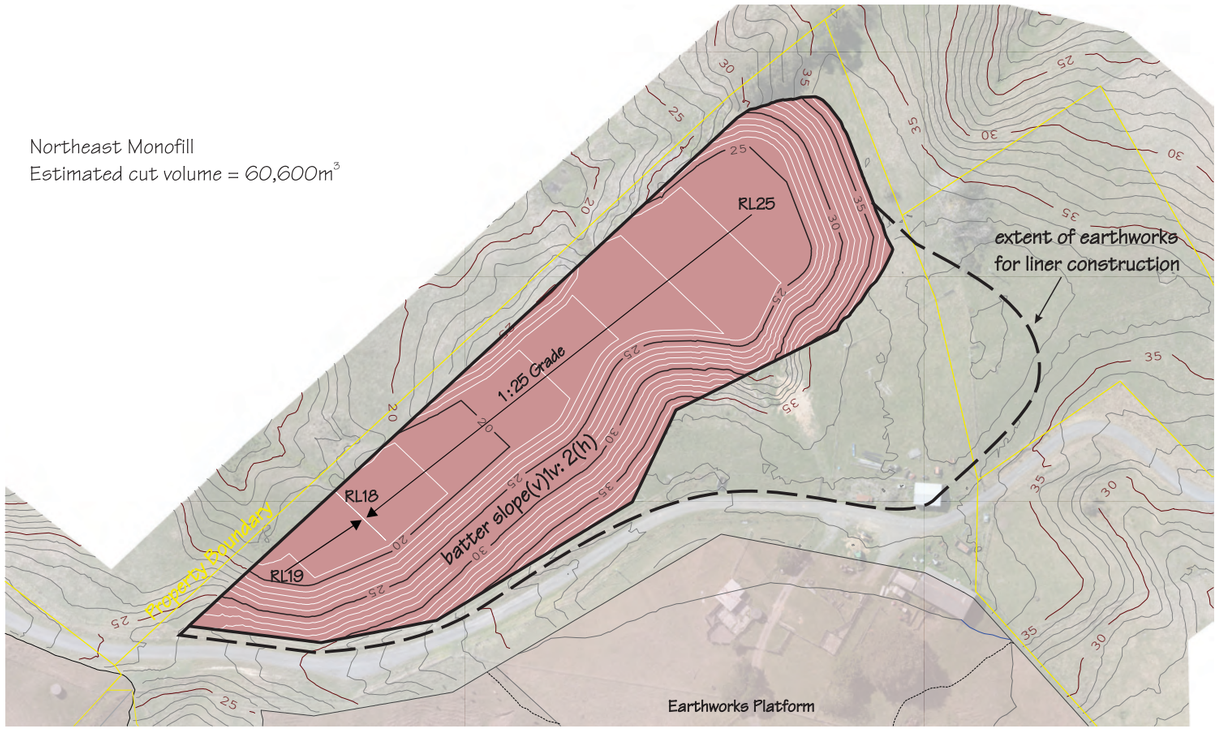
THE GREEN STEEL PROJECT
National Green Steel Limited

Basegrade Contours and Leachate Drainage - Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

DRAWING NO.: **FIG. M2.4**
REF: 4424
SCALE: 1:2500
CRS:
DATUM:

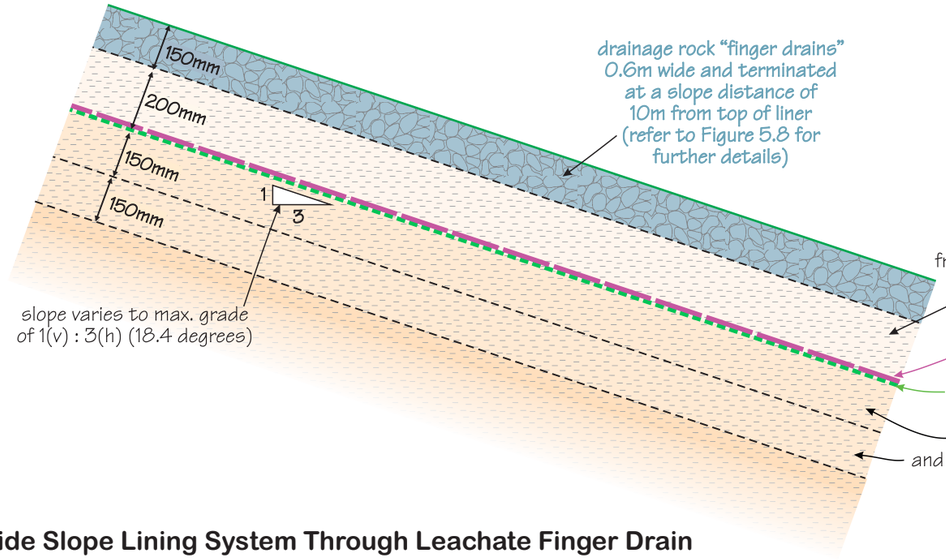
Northeast Monofill
Estimated cut volume = 60,600m^3



Notes:
Basegrade contours layout from RavSurvey drawing, Monofill - North East BaseGrade, ref DRSL519, dated 21 February 2025.

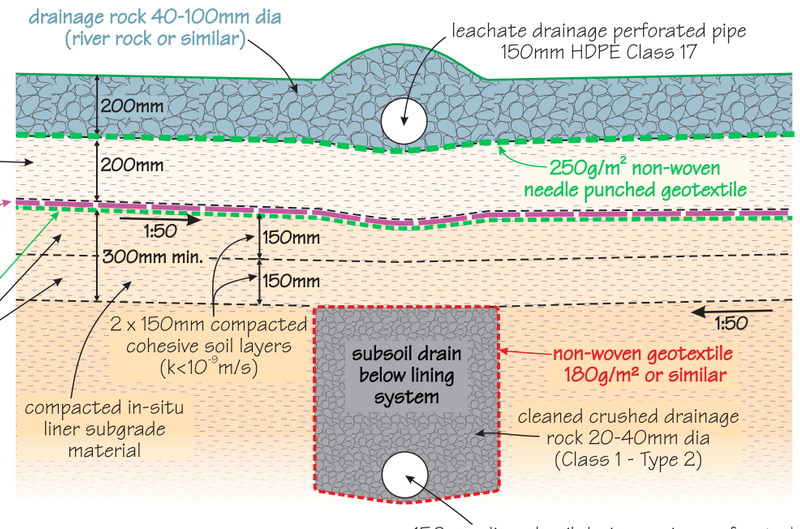
Basegrade Contours

0m 25 50 75m
Scale 1:2,000



Side Slope Lining System Through Leachate Finger Drain

0m 0.5 1m
Scale 1:20



Base Lining System

0m 0.5 1m
Scale 1:20

FOR INFORMATION

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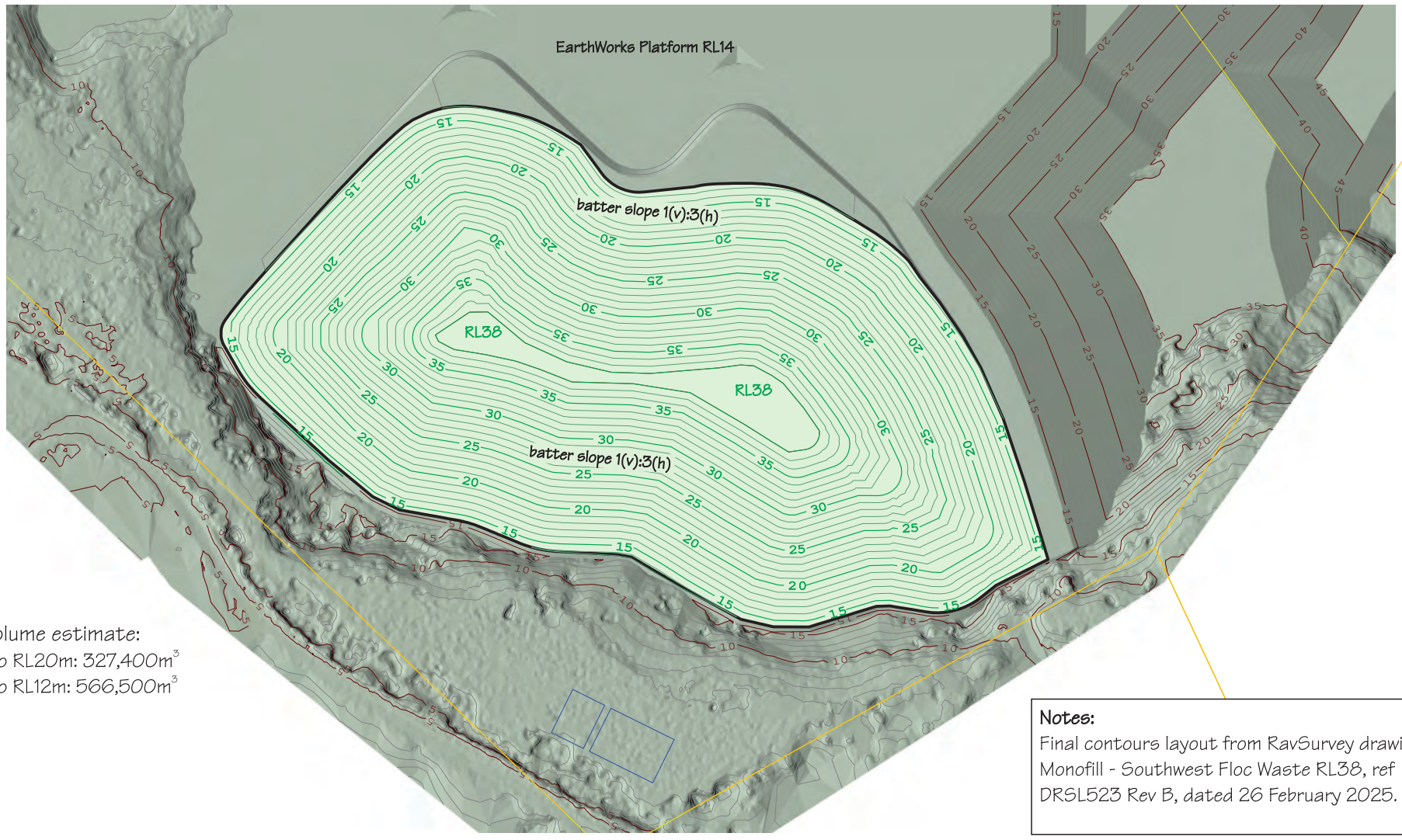
MONOFILL ENGINEERING REPORT
THE GREEN STEEL PROJECT, HAMPTON DOWNS ROAD
National Green Steel Limited

Basegrade Contours and Liner Details - Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	20-02-24	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

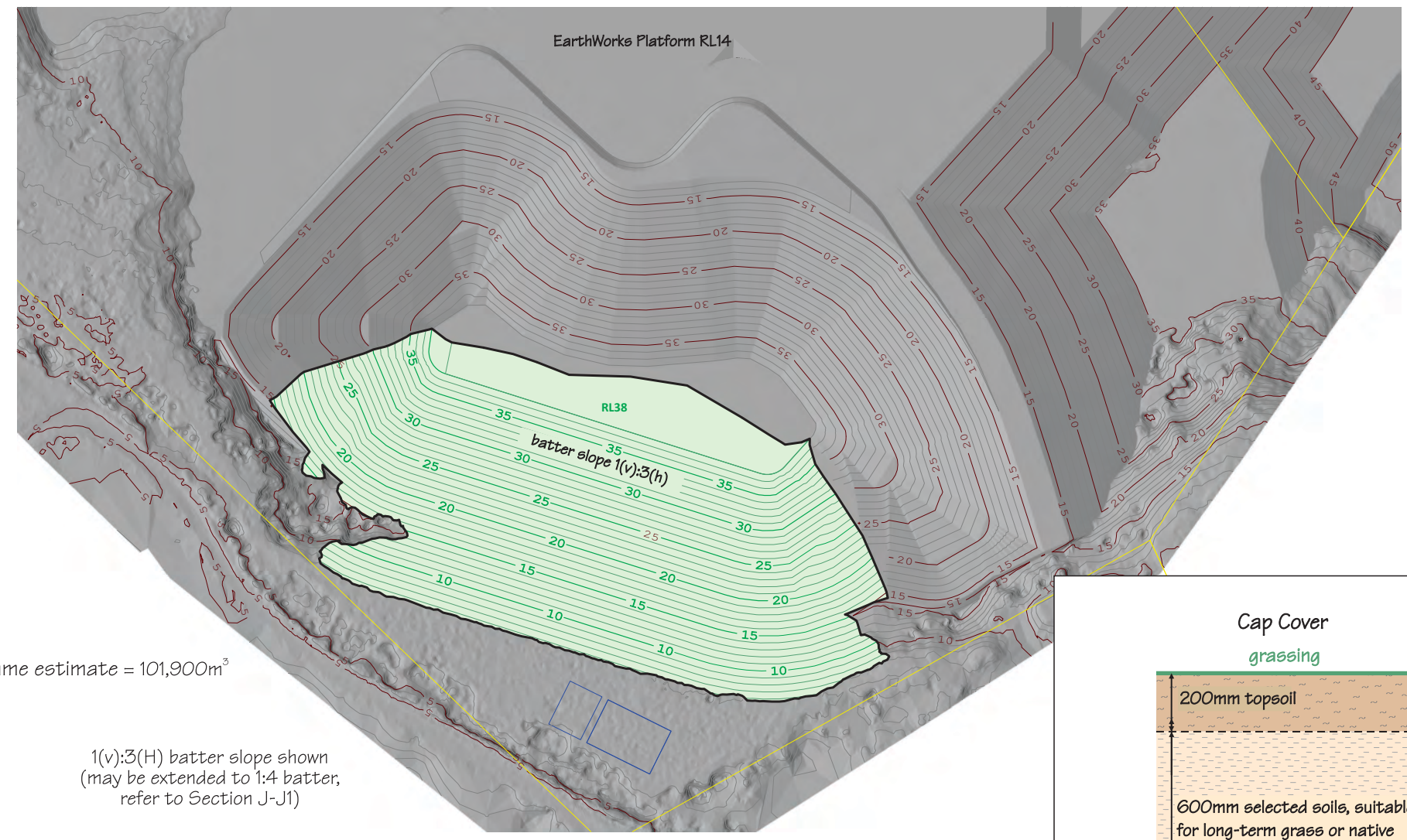
DRAWING NO.: FIG. M2.5
REF: 4424
SCALE: as shown
CRS:
DATUM:



Fill volume estimate:
Cut to RL20m: 327,400m^3
Cut to RL12m: 566,500m^3

Notes:
Final contours layout from RavSurvey drawing, Monofill - Southwest Floc Waste RL38, ref DRSL523 Rev B, dated 26 February 2025.

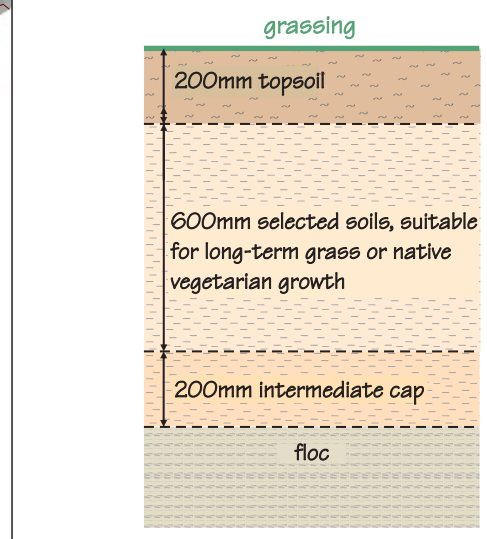
Final Contours - Basegrade at RL12m



Fill volume estimate = 101,900m^3

1(v):3(H) batter slope shown
(may be extended to 1:4 batter, refer to Section J-J1)

Final Contours - Buttress Fill



Final Cover and Capping Detail

0m 50 100 150m
Scale 1:2,500

Notes:
Buttress fill contours layout from RavSurvey drawing, Monofill - Southwest Buttress RL38, ref DRSL524, dated 25 February 2025.

FOR INFORMATION

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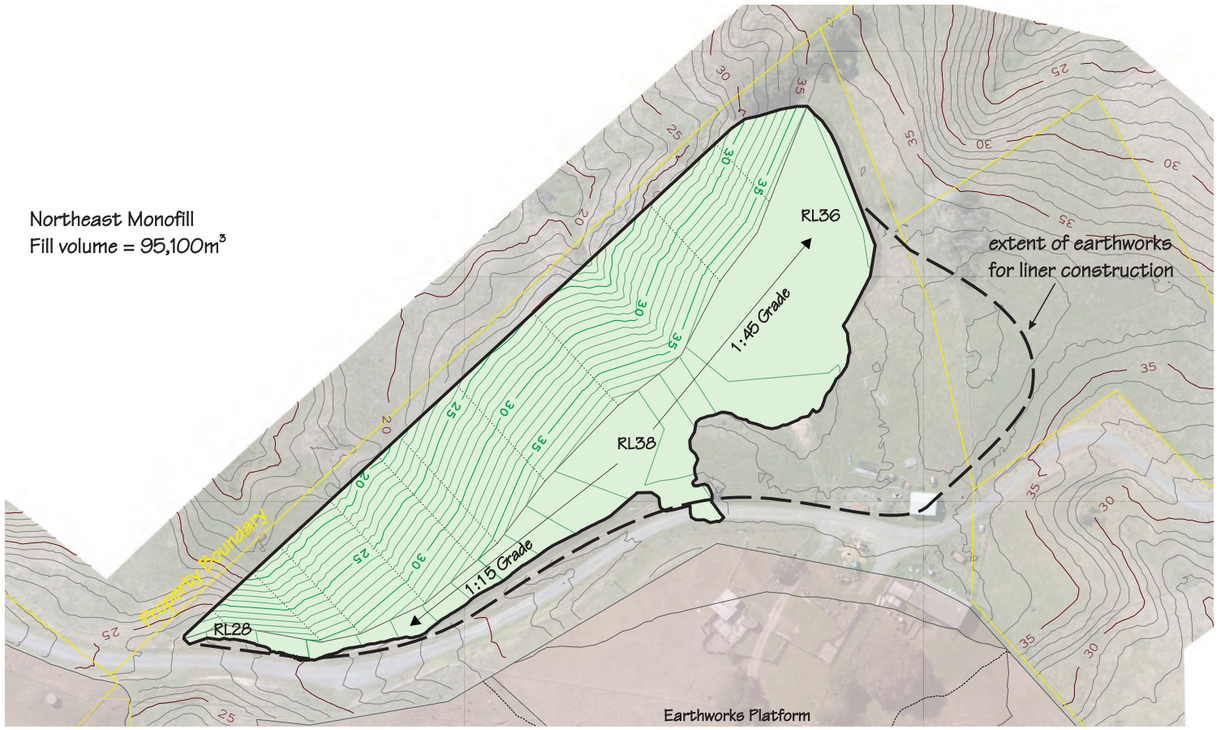
MONOFILL ENGINEERING REPORT
THE GREEN STEEL PROJECT
National Green Steel Limited

Final Fill Contours and Capping - Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

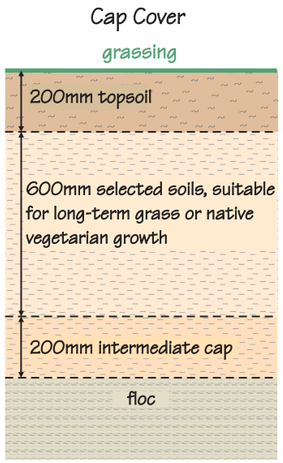
DRAWING NO.: **FIG. M2.6**
REF: 4424
SCALE: 1:2500
CRS:
DATUM:



Notes:
Final fill contours layout from RavSurvey drawing, Monofill - North East Floc Waste, ref DRSL520, dated 21 February 2025.

Final Fill Contours

0m 25 50 75m
Scale 1:2,000



Final Cover and Capping Detail

0m 0.5 1m
Scale 1:20

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MONOFILL ENGINEERING REPORT
THE GREEN STEEL PROJECT, HAMPTON DOWNS ROAD
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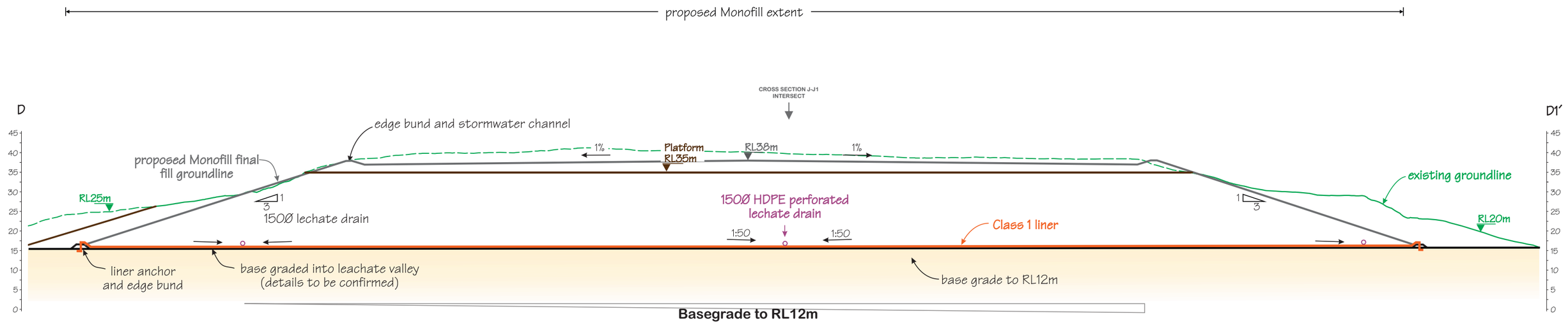
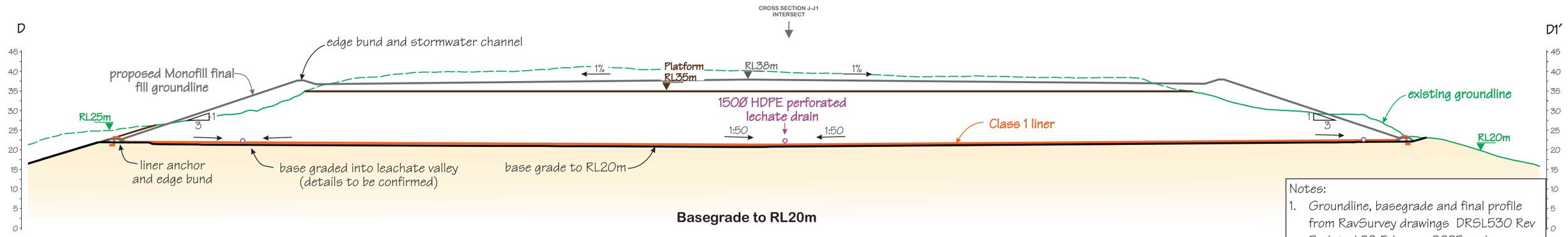
Final Fill Contours and Capping - Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-24	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

DRAWING NO.: FIG. M2.7
REF: 4424
SCALE: as shown
CRS:
DATUM:





Notes:

1. Groundline, basegrade and final profile from RavSurvey drawings DRSL530 Rev B, dated 28 February 2025 and DRSL528, dated 25 February 2025. DRSL482-D, dated 1 November 2024.
2. Indicative ground lines shown and my be amended to suit leachate valley lines.
3. Minimum basegrades of 1:50 (2%) are required for the Class1 liner system.

0m 10 30 50m

Scale 1:1,000

FOR INFORMATION

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MONOFILL GEOTECHNICAL REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Cross-Section D-D1 - Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	06-12-24	DRAFT FOR COMMENT	A.N	A.N	S.SW	
B	28-02-25	DRAFT FOR ENGINEERING REPORT	L.S	A.N	S.SW	
C	30-05-25	FINAL	L.S	A.N	S.SW	

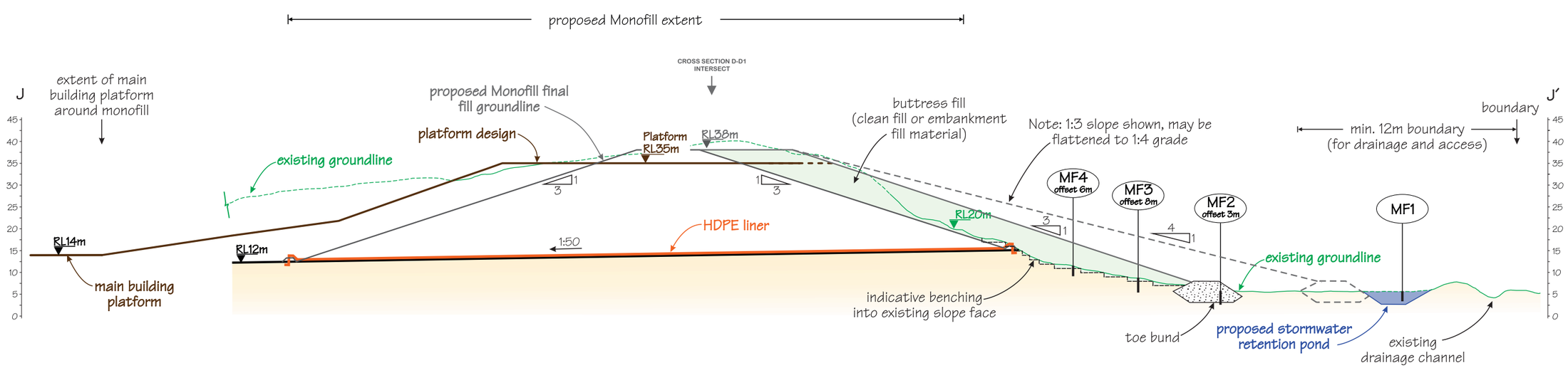
DRAWING NO.: FIG. M4.1

REF: 4424

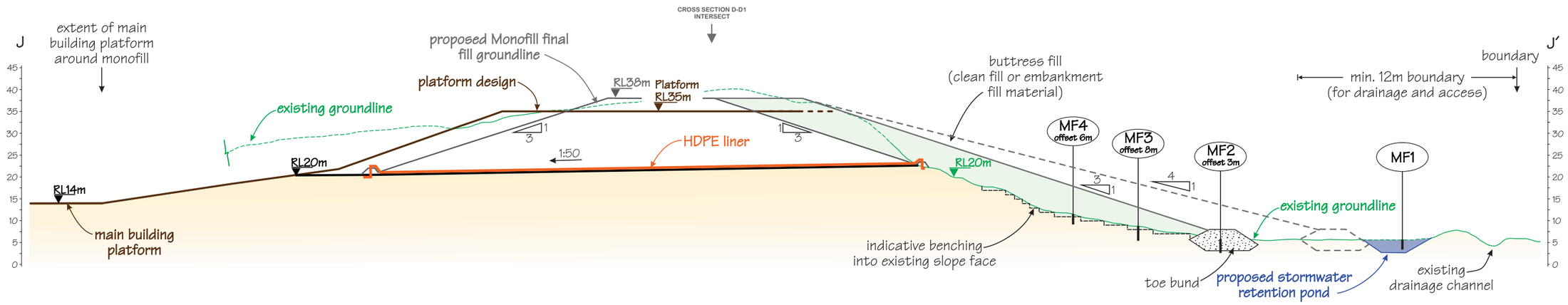
SCALE: 1:1000

CRS: Mt Eden 2000

DATUM: AVD46



Basegrade to RL12m



Basegrade to RL20m

Notes:

1. Groundline, basegrade and final fill contours from RavSurvey drawings DRSL 529 and DRSL531, dated 28 February 2025.
2. Minimum basegrades of 1:50 (2%) are required for the Class 1 liner system.

0m 10 30 50m

Scale 1:1,000

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Cross-Section J-J1 - Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	06-12-24	DRAFT FOR COMMENT	A.N	A.N	S.SW	
B	28-02-25	DRAFT FOR ENGINEERING REPORT	L.S	A.N	S.SW	
C	30-05-25	FINAL	L.S	A.N	S.SW	

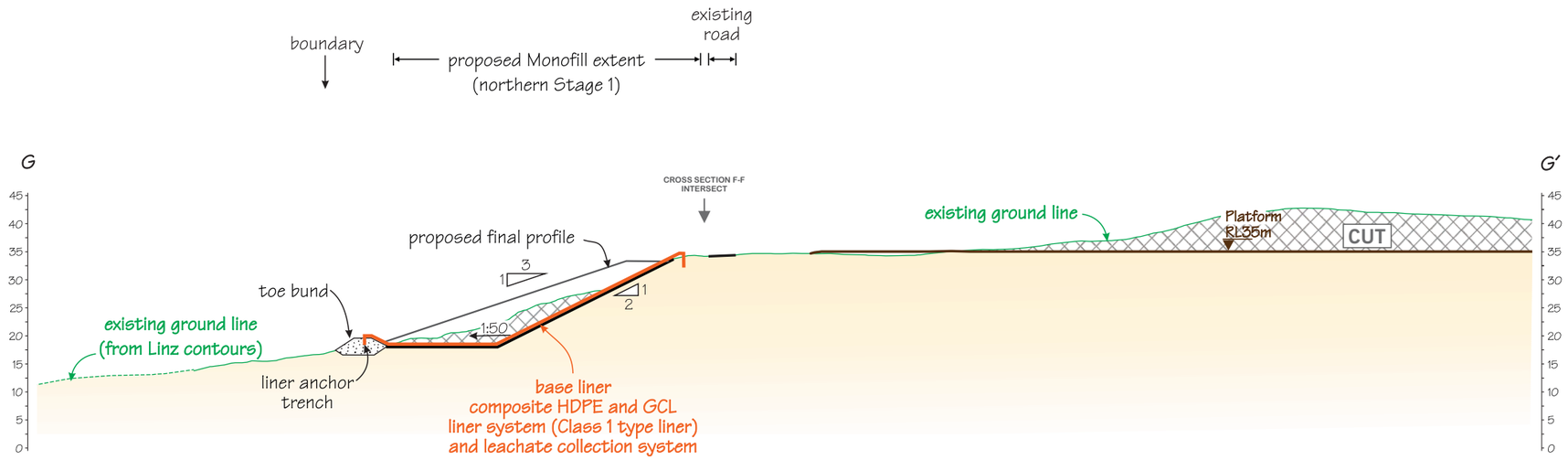
DRAWING NO.: FIG. M4.2

REF: 4424-R2

SCALE: 1:1000

CRS: Mt Eden 2000

DATUM: AVD46



Notes:
1. Layout from RavSurvey drawing DRSL482 Rev C, dated 21 February 2025.

0m 10 30 50m
Scale 1:1,000

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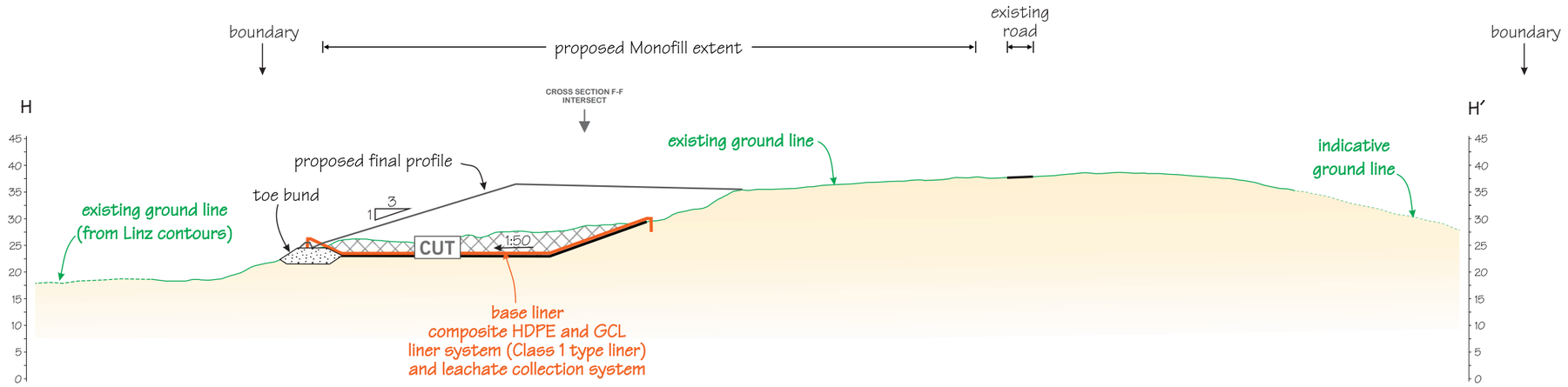
THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD
National Green Steel Limited

Cross-Section G-G1 - Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	29-11-24	DRAFT FOR COMMENT	A.N	A.N	S.SW	
B	24-02-25	UPDATE PLATFORM	L.S	A.N	S.SW	
C	30-05-25	FINAL	L.S	A.N	S.SW	

DRAWING NO.: FIG. M4.4
REF: 4424
SCALE: 1:1000
CRS: Mt Eden 2000
DATUM: AVD46



Notes:
1. Layout from RavSurvey drawing DRSL482 Rev B, dated 21 February 2025.

0m 10 30 50m
Scale 1:1,000

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MONOFILL GEOTECHNICAL REPORT
THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD
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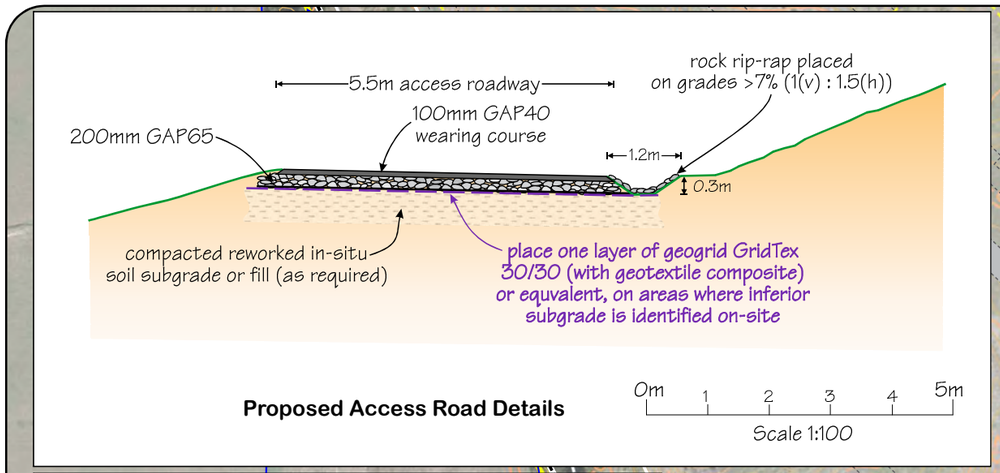
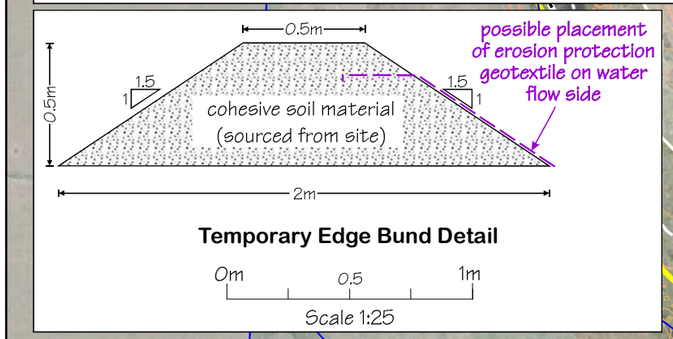
Cross-Section H-H1 - Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	29-11-24	DRAFT FOR COMMENT	A.N	A.N	S.SW	
B	28-02-25	UPDATE FINAL FILL	L.S	A.N	S.SW	
C	30-05-25	FINAL	L.S	A.N	S.SW	VP

DRAWING NO.: FIG. M4.5
REF: 4424
SCALE: 1:1000
CRS: Mt Eden 2000
DATUM: AVD46



Proposed Access Road Details



Temporary Edge Bund Detail

	Volume (m^3)	Area (m^2)
Stage 1	98,000	8,000
Stage 2	205,000	12,600
Stage 3	84,000	7,500
Stage4	179,500	12,300

Notes:
1. Aerial and contours from RavSurvey, 1m Contour Plan, ref DRSL348, dated 25 March 2024.
2. Platform layout from RavSurvey drawing, Platform Option 8, ref DRSL540, dated 10 March 2025.
3. Background aerial from Google.

Preparation Notes:
1. Install sediment control devices.
2. Construct SRPas shown
3. Construct toe drainage and liner details - refer Figure M5.3 and M5.6..
4. Constuct Stage 1 lining system.
5. Commence filling Stage 1 and lining Stage 2.
6. Soil materials (topsoil, selected cohesive soils etc.) stockpile areas to be selected in synchronisation of overall Earthworks Plan for the Green Steel Project.

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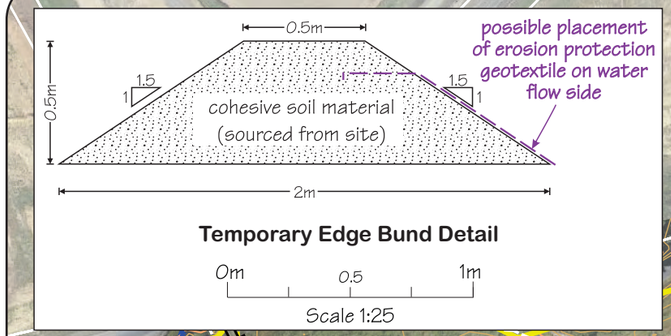
MONOFILL ENGINEERING REPORT
THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD
National Green Steel Limited

Preparation Works and Access - Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

DRAWING NO.: FIG. M5.1
REF: 4424
SCALE: 1:2500
CRS: Mt Eden 2000
DATUM: AVD46



Temporary Edge Bund Detail

0m 0.5 1m

Scale 1:25

N

proposed access to Green Steel facility and the Monofill

stormwater decanting earth bund (refer to Figure M5.8 and the ESCP for details, refer notes for sampling and monitoring requirements)

RL25m

RL23m

RL38m

RL18.8m

dirty water confinement earth edge bund around monofill site (refer detail insert) Note 1m height along boundary

proposed access roads to monofill working face running along contour

clean water diversion

proposed access road

indicative location of wheel washing unit location to be determined upon finalisation of operational layout details

STAGE 1

STAGE 2

treated stormwater to be monitored in accordance with monitoring plan

PROPOSED EARTHWORKS EXTENT

access onto existing road

existing stop bank

PROPOSED MAIN PLATFORM

indicative weighbridge location (to be confirmed)

possible upgrading of this section of existing access road (to be confirmed at detailed design stage)

clean water diversion

compacted cohesive edge bund

shared road easement

dirty water diversion bund to be constructed to "contour drain" detail for sediment control (refer to ESCP)

proposed entrance gate to monofill and access roads

Site Preparation Notes:

1. Install sediment control devices.
2. Construct compacted cohesive soil edge bunds (as shown).
3. Construct contour drain (for Stage 2).
4. Construct access roads into monofill.
5. Prepare Stage 1 earthworks and liner subgrade.
6. Construct lining system (Stage 1).
7. Prepare Stage 2 area.
8. Commence filling Stage 1.
9. Construct lining Stage 2.
10. Commence filling Stage 2.

	Volume (m^3)	Area (m^2)
Stage 1	46,100	8,300
Stage 2	49,000	11,600
Total	**95,100**	**19,900**

Notes:

1. Aerial and contours from RavSurvey, 1m Contour Plan, ref DRSL348, dated 25 March 2024.
2. Platform layout from RavSurvey drawing, Platforms Option 8, ref DRSL540, dated 10 March 2025.
3. Background aerial from Google.
4. Location of wheel wash facility to be determined on finalisation of timing of both monofills.

0m 50 100 150m

Scale 1:2,500

FOR INFORMATION

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Preparation Works and Access - Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	25-02-25	DRAFT FOR COMMENT FOR R4424-1	L.S	A.N	S.SW	
B	28-05-25	FINAL	L.S	A.N	S.SW	

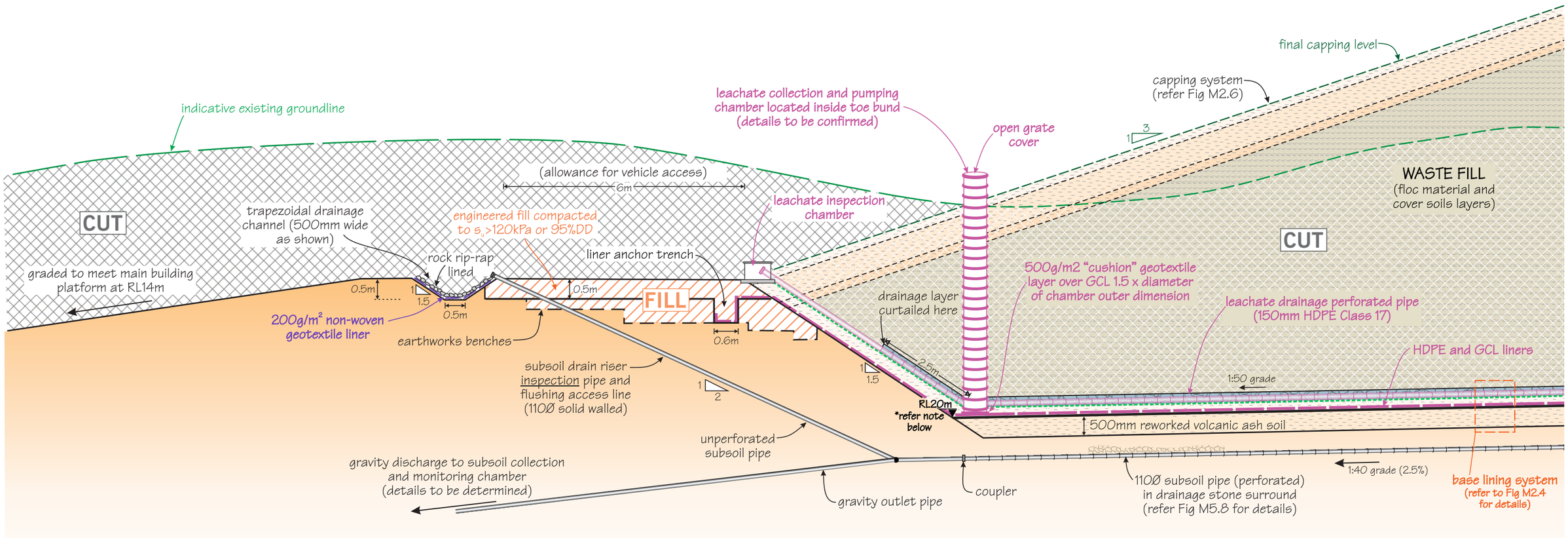
DRAWING NO.: FIG. M5.2

REF: 4424

SCALE: 1:2500

CRS: Mt Eden 2000

DATUM: AVD46



* Base may be lowered to a level of RL12m, dependent upon overall balance of earthworks and requirement for engineered fill material.

RL14m MAIN BUILDING PLATFORM LEVEL

0m 1 3 5m

Scale 1:100

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, HAMPTON DOWNS ROAD

National Green Steel Limited

Toe Bund Details - Southwest Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-24	DRAFT FOR COMMENT	L.S	A.N	S.SW/C.M	
B	30-05-25	FINAL	L.S	A.N	S.SW/C.M	

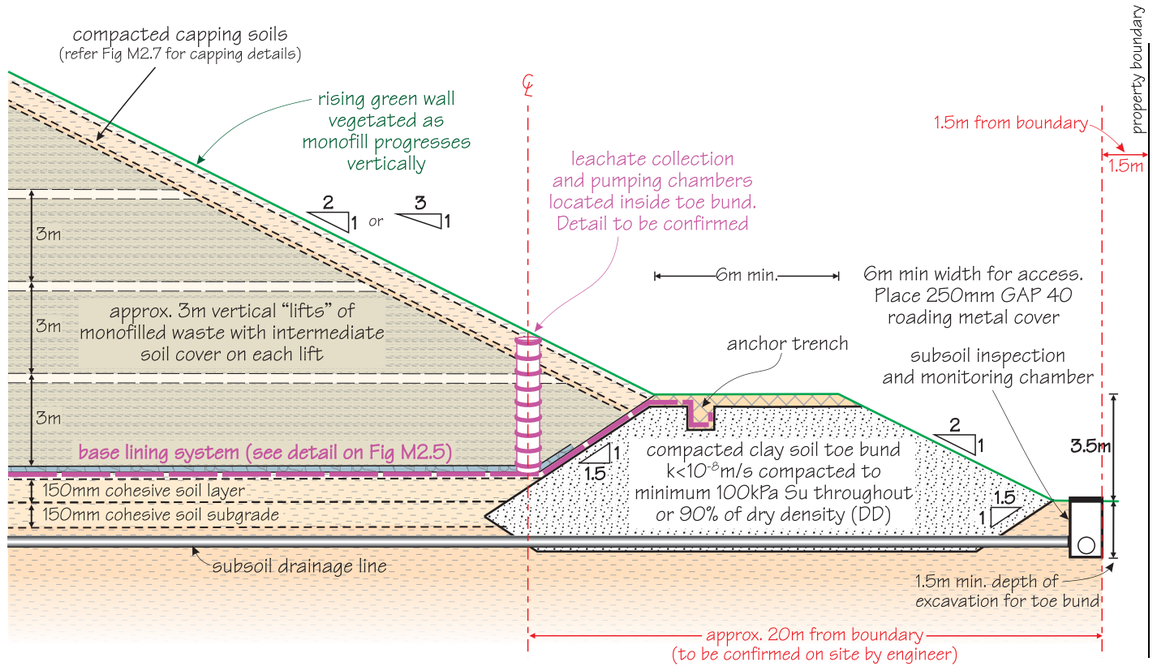
DRAWING NO.: FIG. M5.3

REF: 4424

SCALE: as shown

CRS:

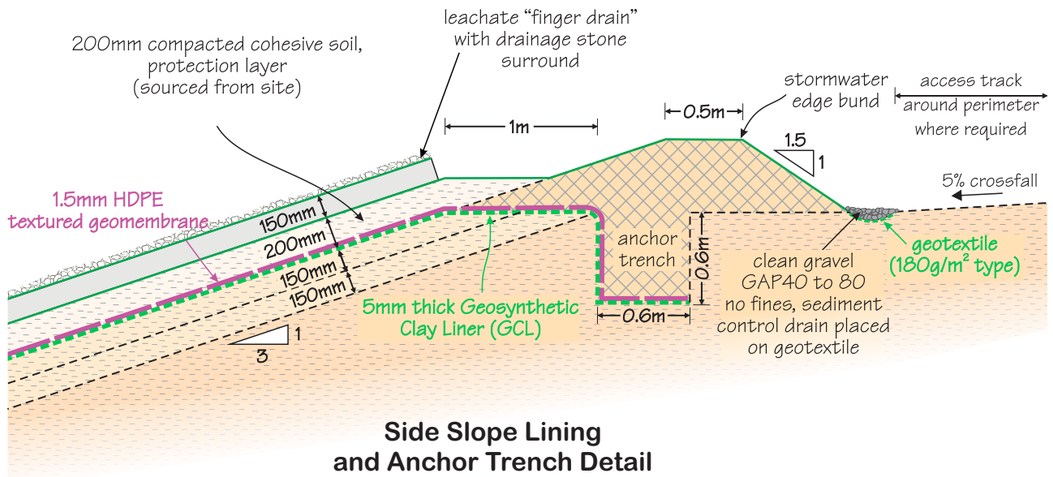
DATUM:



Typical Toe Bund Details

0m 5 10m

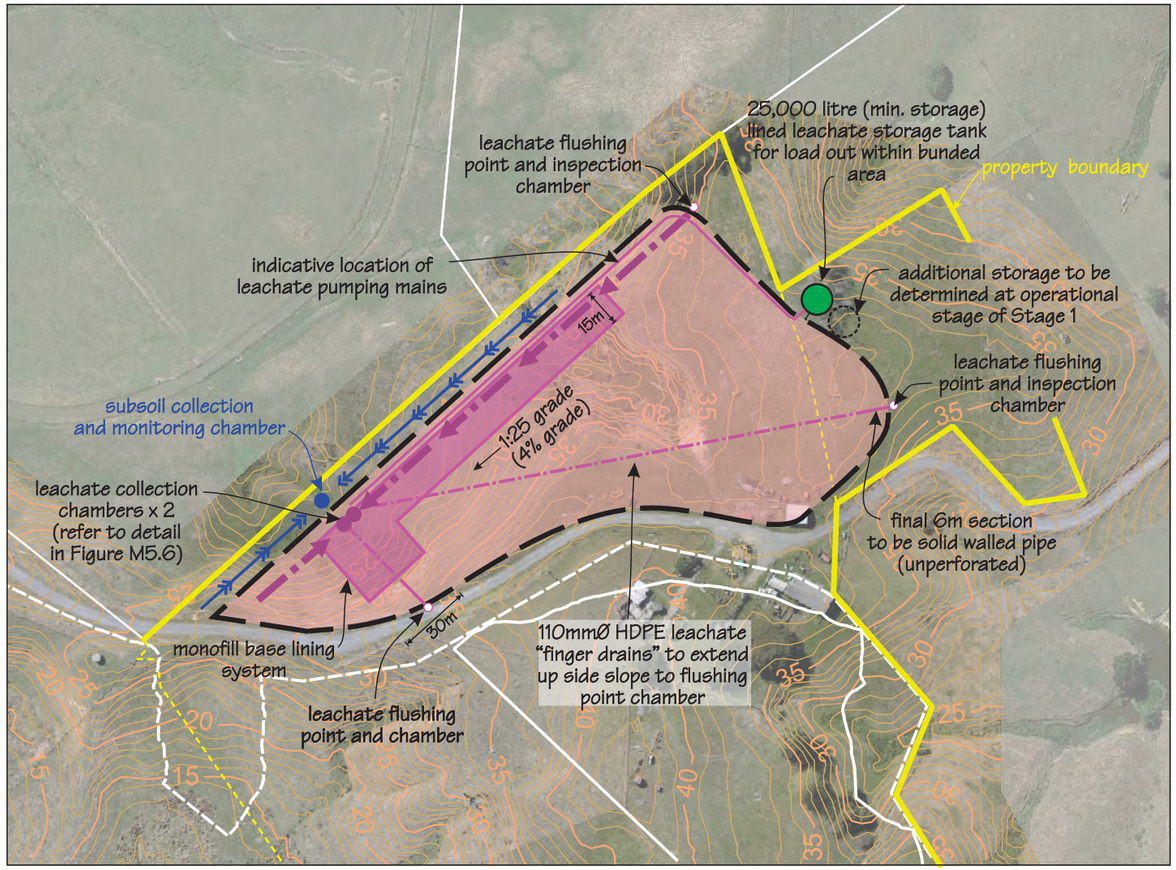
Scale 1:200



Side Slope Lining and Anchor Trench Detail

0m 1 2m

Scale 1:40



0m 50 100 150m

Scale 1:2,500

Area of monofill base lining system

Area of monofill side slope lining system

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, HAMPTON DOWNS ROAD

National Green Steel Limited

Toe Bund Details - Northeast Monofill

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-24	DRAFT FOR COMMENT	L.S	A.N	S.SW/C.M	
B	30-05-25	FINAL	L.S	A.N	S.SW/C.M	

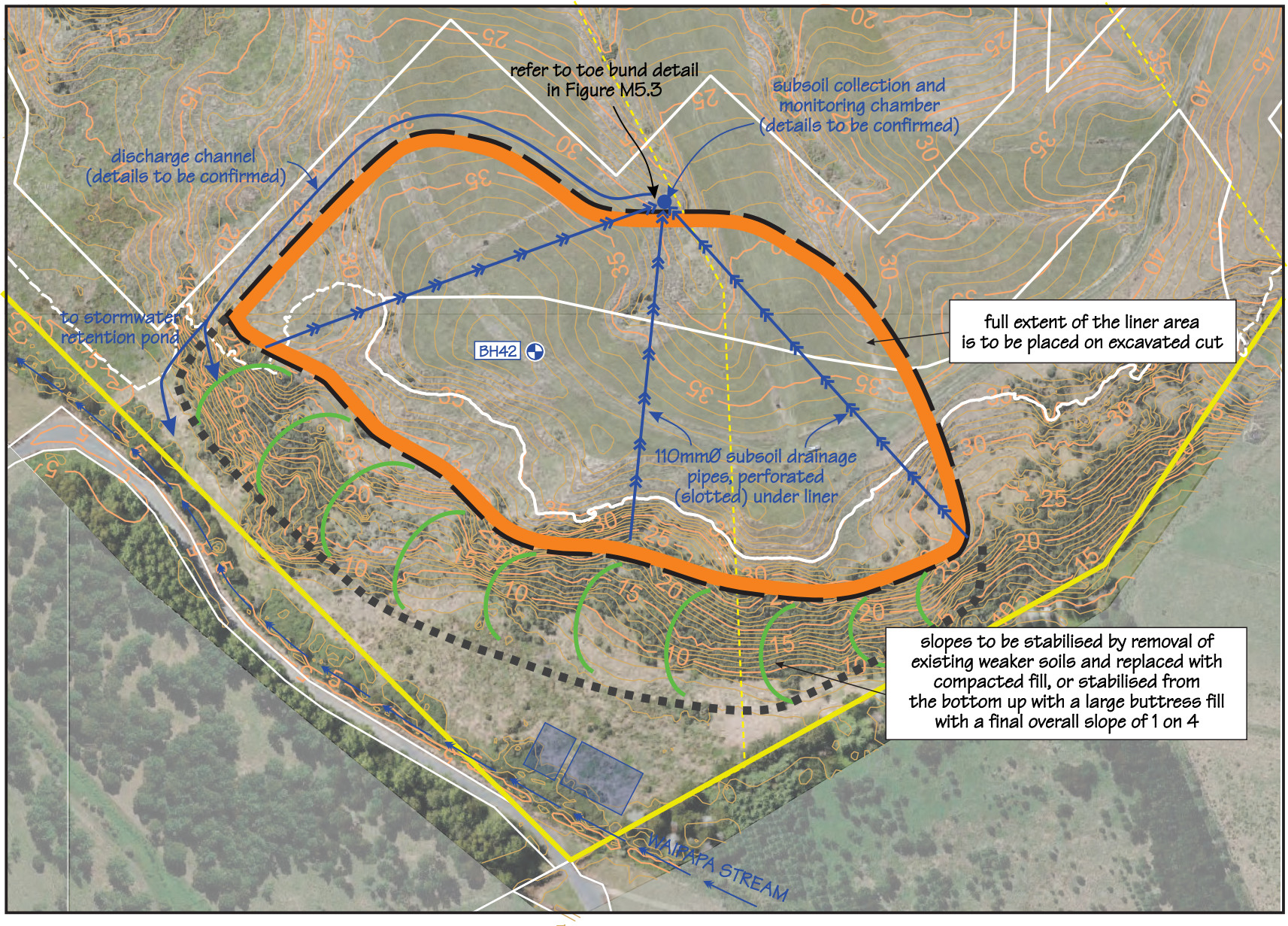
DRAWING NO.: FIG. M5.4

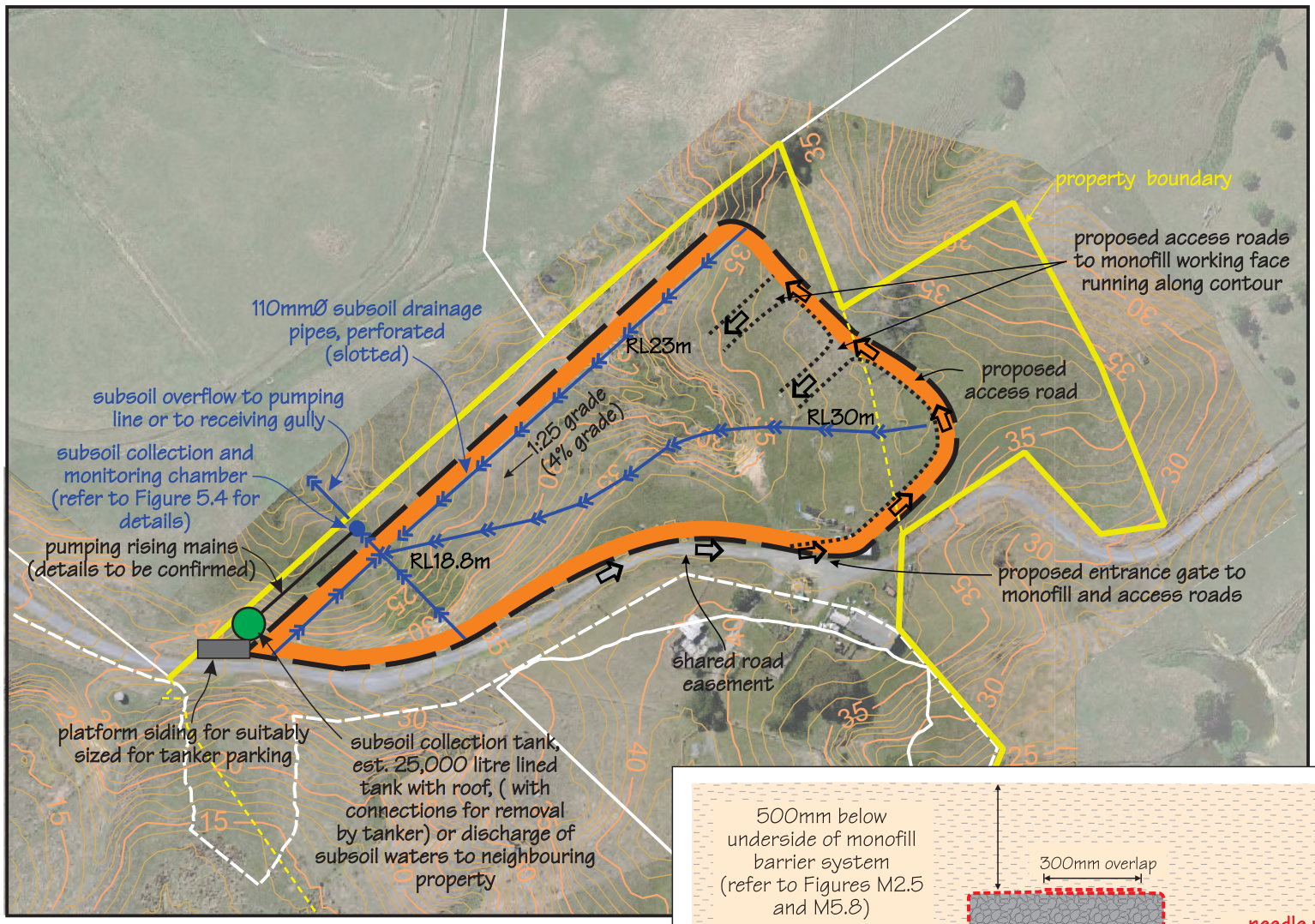
REF: 4424

SCALE: as shown

CRS:

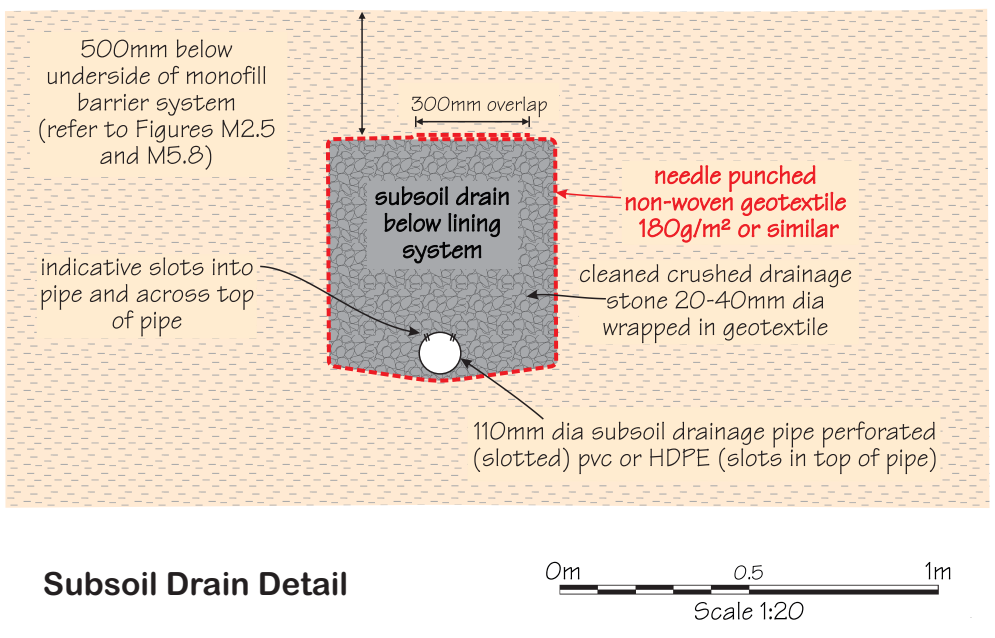
DATUM:





0m 50 100 150m

Scale 1:2,500



Subsoil Drain Detail

0m 0.5 1m

Scale 1:20

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT

National Green Steel Limited

Liner, Leachate and Subsoil Drainage Details

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

DRAWING NO.: **FIG. M5.5**

REF: 4424

SCALE: as shown

CRS:

DATUM:

N

WAIPAPA STREAM

existing stop bank

to weighbridge

indicative location of wheel washing unit location to be determined upon finalisation of operational layout details

access roadway to monofill site

leachate tanker truck filling point (indicatively shown)

leachate pumping line 90mmØ HDPE Class SORII or similar (to be determined)

50,000 litre storage capacity for leachate (staged 25,000l HDPE lined tanks with roofs)

leachate collection and pumping chamber (refer to inset detail 1)

property boundary

side slope lining system (refer Figure M2.4 for details)

leachate flushing point and chamber

base lining system (showing extent of full leachate drainage layer) (refer to Figure M2.4)

A

B

C

final 6m section to be solid walled pipe (unperforated)

leachate flushing point and chamber

110mmØ HDPE leachate "finger drains" to extend up side slope to flushing point chamber

WAIPAPA STREAM

LEGEND

- Liner Area
- Leachate Drains
- Slope Buttress (Fill)
- Stream
- Existing Stop Bank

Note: Leachate chambers are to be located within the landfill footprint itself to avoid any need for liner penetrations through the toe bund (refer Figure M5.3)

HDPE ribbed reinforced overflow storage chamber with electronic level control warning system

Detail 1: Leachate Pumping Chambers

Notes:

1. Aerial and contours from RavSurvey, 1m Contour Plan, ref DRSL348, dated 25 March 2024.
2. Platform layout from RavSurvey drawing, Site_Platforms_Option 7, received 18 February 2025.
3. Background aerial from Google.

0m 50 100 150m

Scale 1:2,500

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Leachate Drainage Plan - Pump Chambers and Tanker Collection Details

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

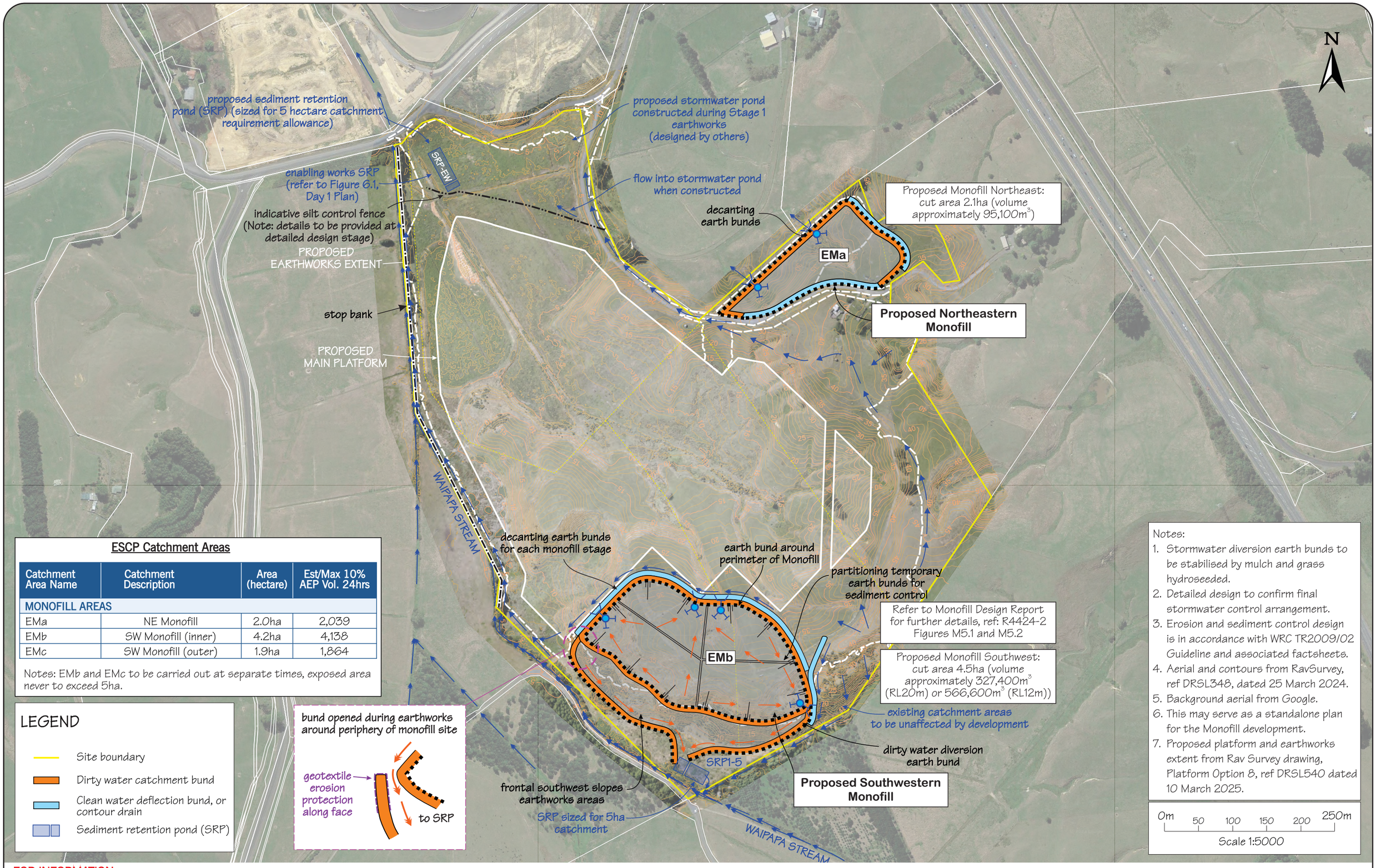
DRAWING NO.: FIG. M5.6

REF: 4424

SCALE: 1:2500

CRS: Mt Eden 2000

DATUM: AVD46



ESCP Catchment Areas

Catchment Area Name	Catchment Description	Area (hectare)	Est/Max 10% AEP Vol. 24hrs
MONOFILL AREAS			
EMa	NE Monofill	2.0ha	2,039
EMb	SW Monofill (inner)	4.2ha	4,138
EMc	SW Monofill (outer)	1.9ha	1,864

Notes: EMb and EMc to be carried out at separate times, exposed area never to exceed 5ha.

LEGEND

- Site boundary
- Dirty water catchment bund
- Clean water deflection bund, or contour drain
- Sediment retention pond (SRP)

bund opened during earthworks around periphery of monofill site

Notes:
1. Stormwater diversion earth bunds to be stabilised by mulch and grass hydroseeded.
2. Detailed design to confirm final stormwater control arrangement.
3. Erosion and sediment control design is in accordance with WRC TR2009/02 Guideline and associated factsheets.
4. Aerial and contours from RavSurvey, ref DRSL348, dated 25 March 2024.
5. Background aerial from Google.
6. This may serve as a standalone plan for the Monofill development.
7. Proposed platform and earthworks extent from Rav Survey drawing, Platform Option 8, ref DRSL540 dated 10 March 2025.

0m 50 100 150 200 250m

Scale 1:5000

FOR INFORMATION

Note: All drawings are to be approved (initialled) before final issue.

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, 61 HAMPTON DOWNS ROAD

National Green Steel Limited

Monofill Stormwater Control Plan

REV	DATE	AMENDMENT/ISSUE	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28-02-25	DRAFT FOR COMMENT	L.S	A.N	S.SW	
B	30-05-25	FINAL	L.S	A.N	S.SW	

DRAWING NO.: FIG. M5.7

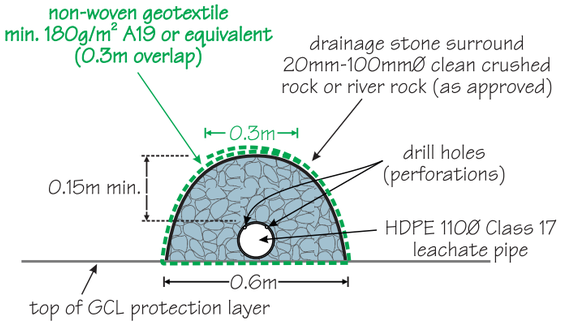
REF: 4424

SCALE: 1:5000

CRS: Mt Eden 2000

DATUM: AVD46

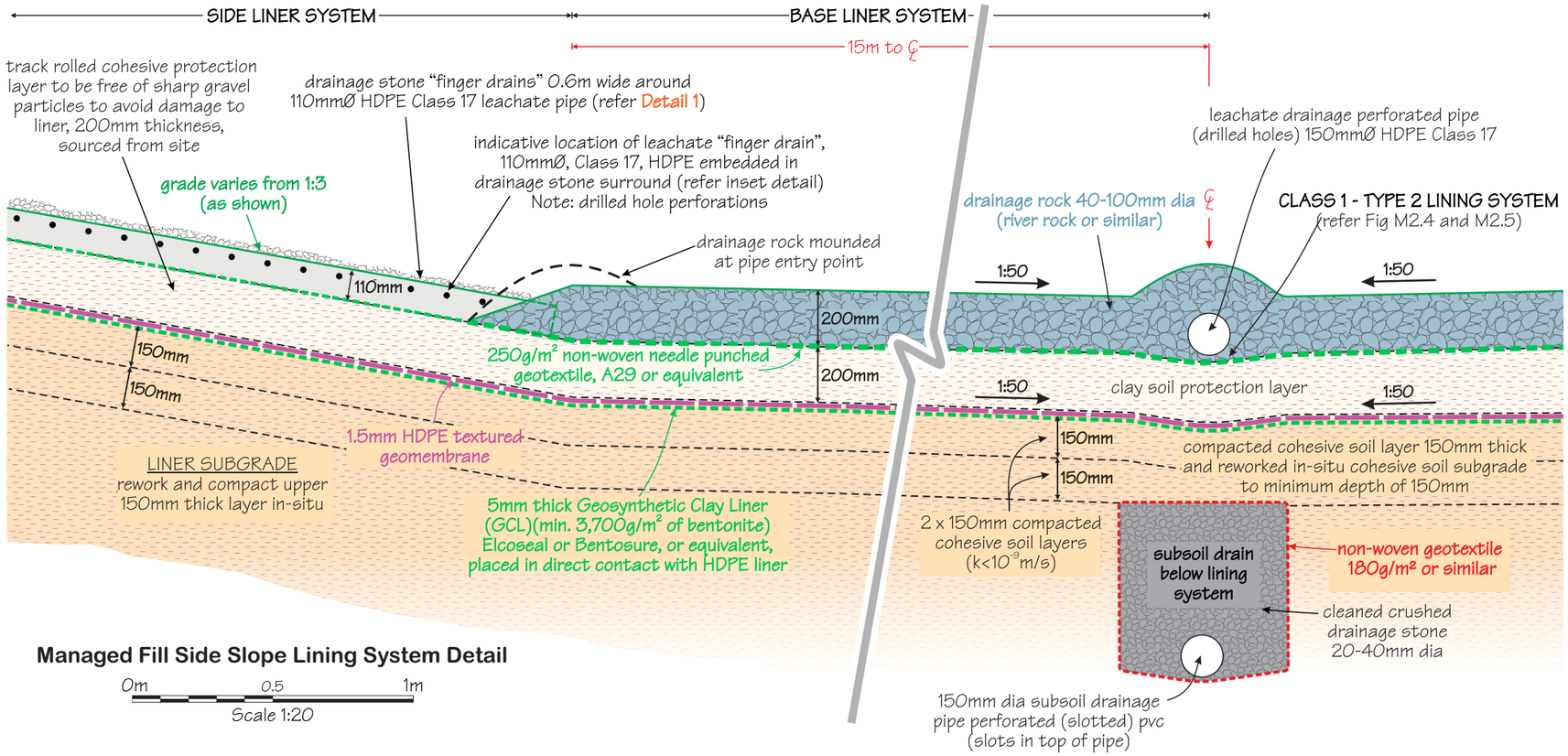
DETAIL 1



Leachate "Finger Drain" Detail 1

0m 0.5 1m

Scale 1:20



Managed Fill Side Slope Lining System Detail

0m 0.5 1m

Scale 1:20

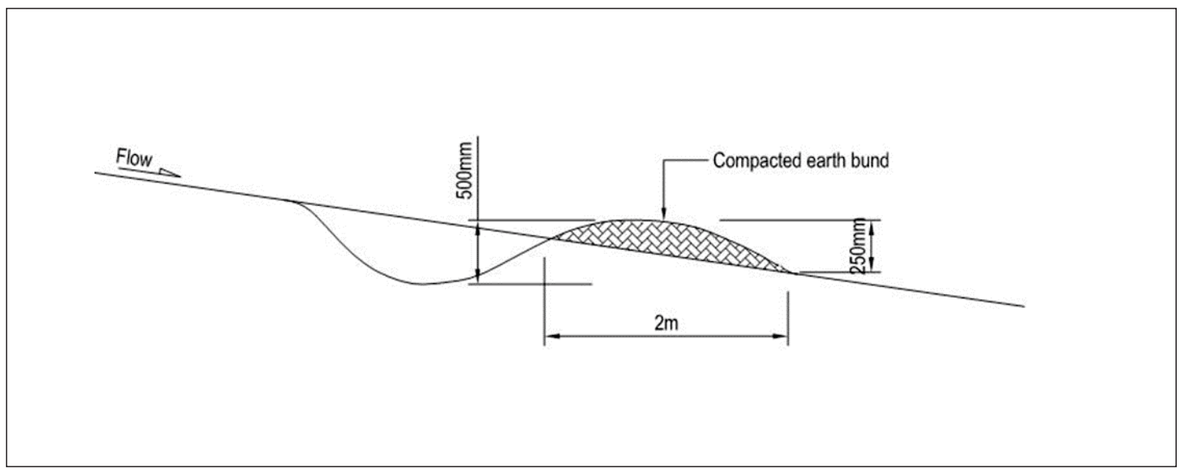


Figure 5.8a: Contour drain cross-section

Sourced from: (AC GD05 (2016): Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region. GD05, dated June 2016)

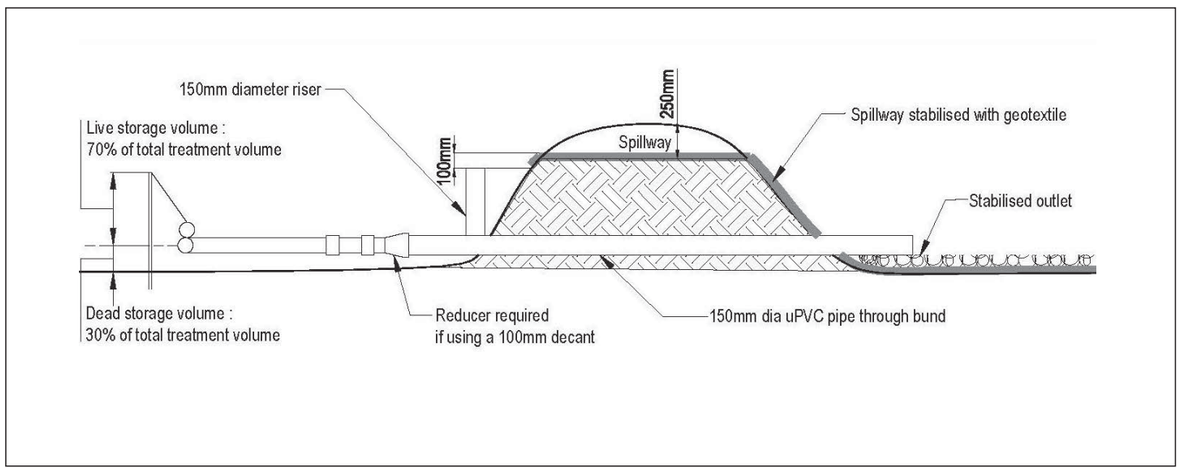


Figure 5.8b: Decanting earth bund

Sourced from: (AC GD05 (2016): Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region. GD05, dated June 2016)

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MONOFILL ENGINEERING REPORT

THE GREEN STEEL PROJECT, HAMPTON DOWNS ROAD

National Green Steel Limited

General Details

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A	28-02-24	DRAFT FOR COMMENT	L.S	A.N	S.SW/C.M	
B	30-05-25	FINAL	L.S	A.N	S.SW/C.M	

DRAWING NO.: FIG. M5.8

REF: 4424

SCALE: as shown

CRS:

DATUM: