

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVALApproval no: **DEV20219/1011**Date: **25 November 2024**

Site Inspection Report

Client	J. Hutchinson Pty Ltd	Project No.	97105.12
Project	Proposed Carpark	Date	2 October 2024
Address	Research Rd, Herston QLD	Reference	R.049.Rev0

As requested by J.Hutchinson Pty Ltd (Hutchies), a senior engineering geologist and principal geotechnical engineer from Douglas Partners Pty Ltd (Douglas) carried out inspections at the above site on 12 April, 4 June and 11 September 2024. The aim of the inspection was to assess the temporary stability of a cut batter at the above mentioned site.

At the time of the inspection, the excavated batter face was cut generally facing the east-northeast cut at a 40° - 50° angle above the horizontal reducing to 30° as the batter faced the north east. The batter was up to 10 m high. The material observed in the batter face generally comprised low to medium strength phyllite. A layer of fill increasing in depth up to 4 m thick as the batter approaches the south was observed. A horizontal shear was observed approximately 1 m from the crest of the batter. The material above the shear indicated signs of deterioration, understood to have been exasabated by vibratory methods used during compaction of the materials on the crest above.

Douglas advised site personnel to ensure no surcharge loads including equipment (such as vibratory rollers) and materials are to be placed in the zone behind the batter crest equal to the batter height.

It is understood that the timeframe for the batter remaining in the current configuration is currently unknown. Douglas is therefore assessing the batter as remaining in the current configuration for a semi-permanent timeframe (ie greater than one year).

Photographs of the batter taken at the time of the inspections are presented in Figures 1 and 2.

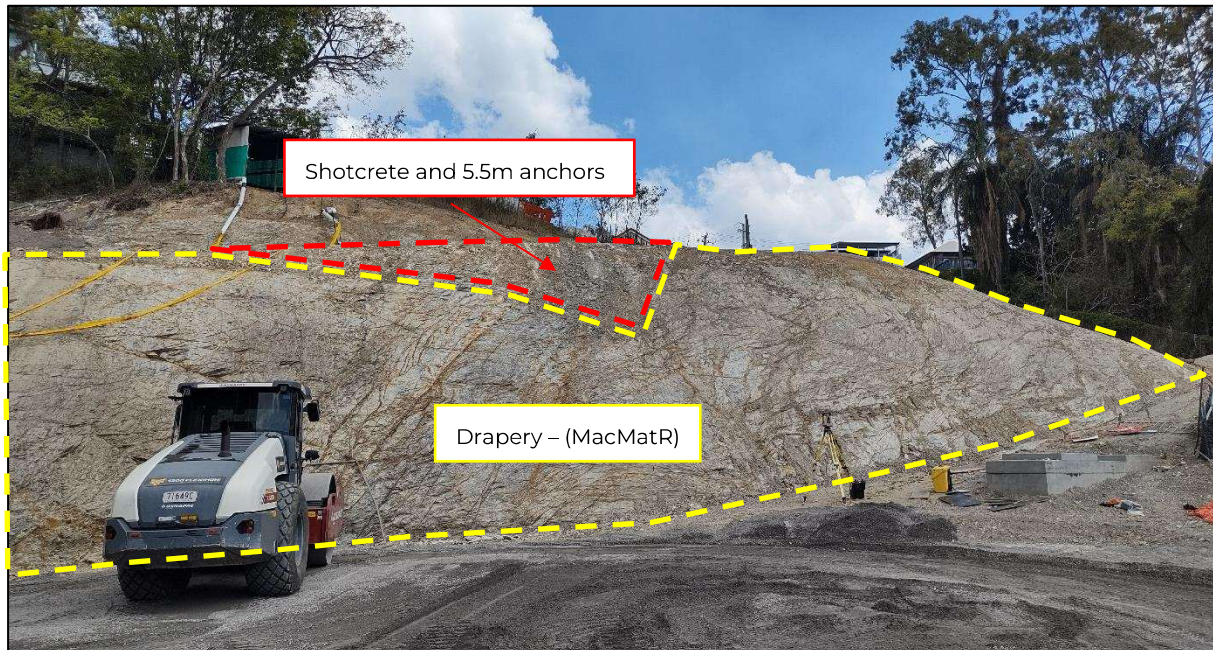


Figure 1: View of the batter looking approximately southwest with indicative retention treatment extent marked up.

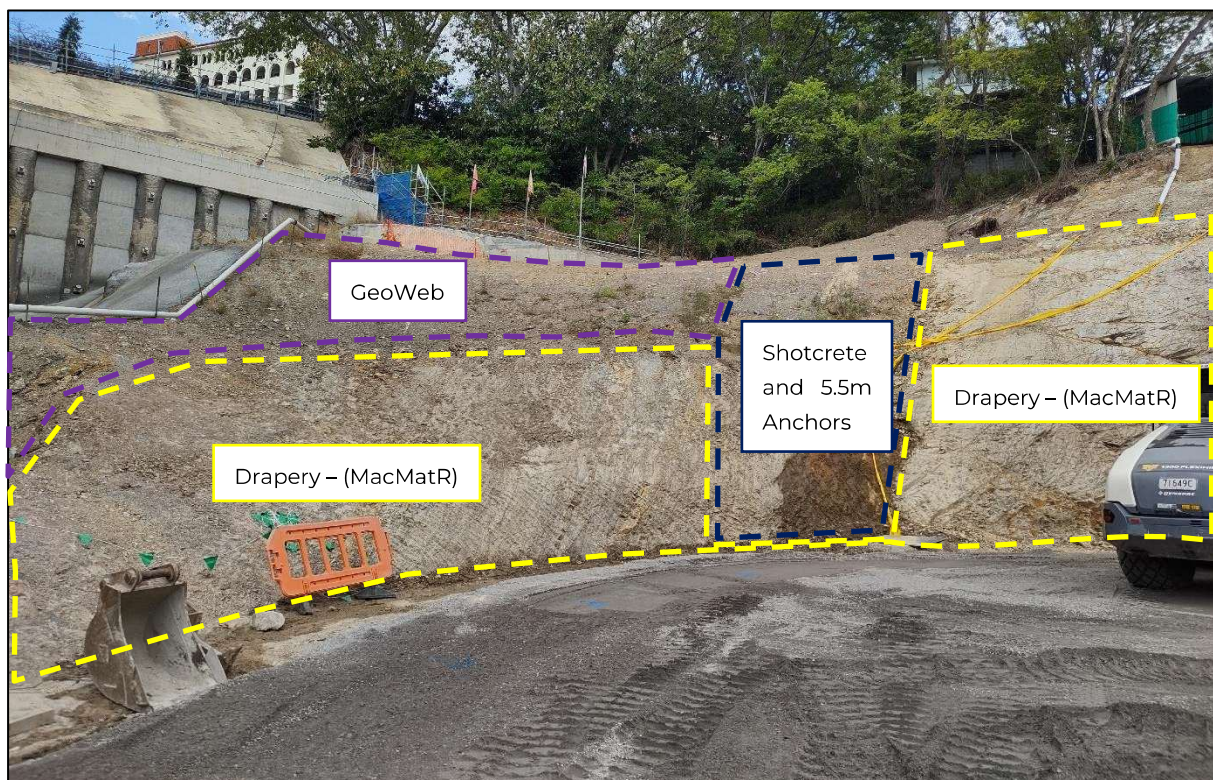


Figure 2: View of the batter looking approximately south with indicative retention treatment extent marked up.

In order to ensure slope stability and reduce the residual rockfall risk it is advised permanent stabilisation measures in the form of passive rock anchors, mesh reinforced shotcrete, rockfall drapery and a geocell system is adopted.

The stabilisation extent to be confirmed onsite by a Douglas engineering geologist, is indicatively presented in Figures 1 and 2 and in the attached Drawings.

A model was developed from site observations, geological field mapping, and client provided survey data for three critical cross-sections designated as Sections 1 to 3 as indicated on client provided drawing A080-SUR-WECR-ASC-0054 Rev B dated 24 September 2024. The analysis targeted factors of safety greater than 1.5 for standard permanent retention.

Rock mass defects measured during the field mapping were input into a stereographic plot and are presented in Figure 3.

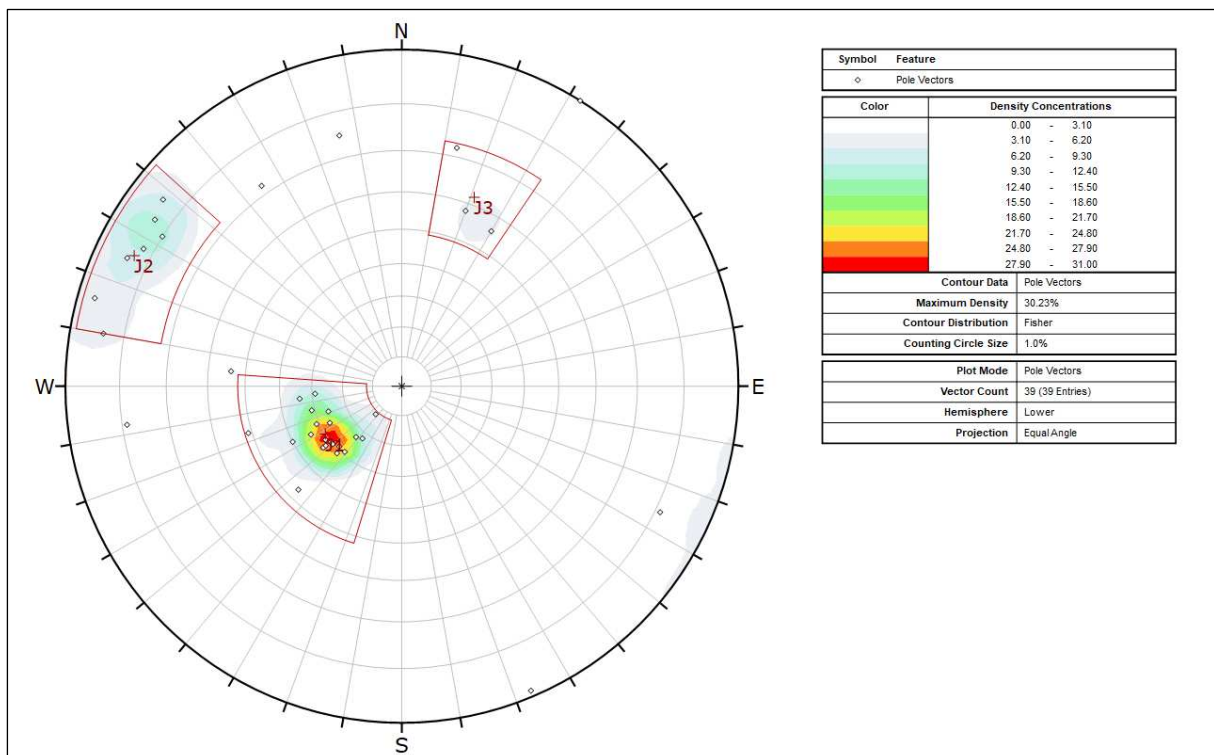


Figure 3: Stereographic plot of measured rock mass defects

Three joint sets were observed within the exposed rock mass which are detailed below in Table 1.

Table 1: Summary of Observed Rock Defects

Joint Set Number	Dip Angle (°)	Dip Direction	Joint Description
J1	30	058	Generally planar to undulating, rough to smooth, tight associated with foliation
J2	83	116	Generally planar, rough, iron stained and tight
J3	62	201	Generally planar, rough, iron stained and tight

Section 3 – Maximum height section, comprising low to medium strength phyllite

Dips and SWedge from Rocscience were used to kinematically assess the viable failure mechanisms for the orientation of the face. The kinematic analysis was undertaken with the assumption that the characteristics of the defects mapped at the exposed rock face are representative of the nature of the defects further within the rock mass. While a horizontal shear is present near the crest of the batter, the shear is observed to be dipping into the face and does not present a kinematically viable failure mechanism. The kinematic analysis identified planar sliding and wedge failure mechanism as being kinematically viable mechanisms particularly when facing north east, as analysed in Section 1.

The analysis was undertaken adopting joint strength shear strength parameters inferred from published information and local experience and are presented in Table 2 below.

Table 2: Adopted Rock Defect Properties

Material	Unit Weight, γ (kN/M ³) ¹	Cohesion, c' (kPa) ¹	Friction Angle ϕ' (°)
Low to medium strength Phyllite	27	5	26

Note: ¹: Cohesion and friction angles for the joint surfaces

Water pressure was considered within the wedges assuming groundwater may rise up to one third the height of the batter. A 5 kPa surcharge was applied to the crest to simulate light construction loads

The results of the analysis based on observations made during the field work indicate 1.57 as the lowest factor of safety against wedge failure which is greater than the 1.5 required for permanent civil engineered slopes. The analysis results are presented in Table 3 below.

Table 3: Rock Wedge Analysis Results

Critical Design Wedge	Wedge Volume / Mass	Factor of Safety
84°/128° (J2) and 29°/041° (J1)	70 m ³ / 190t	1.57

While the rock wedge analysis indicates a favourable factor of safety against instability the area above the shear as indicated on Figures 1 and 2 will require the installation of one row of passive rock anchors and mesh reinforced shotcrete to protect the material from deterioration at locations nominated by a Douglas engineering geologist as outlined in Table 4 below:

Table 4: Passive Rock Anchor Details – Material above shear

Anchor Diameter (mm)	Hole Diameter (mm)	Hole Length (m)	Inclination (°)	Indicative Horizontal Spacing (m)
28	125	4.0	25	3.0

Shotcrete should be extended across fractured zone above the shear, 1 m beyond the crest and 0.5 m below the competent rock/horizontal shear. It is understood a swale drain will be constructed along the crest and toe of the batter. The swale drain should be **concrete lined** to ensure no water infiltration into the batter.

The final locations and extent of the anchors and shotcrete are to be set out on-site by a Douglas engineering geologist. The rock anchors and shotcrete would also need to comply with the following requirements:

- GEWI Threadbar or similar;
- All retention elements to be galvanized for corrosion protection;
- Double corrosion protection for anchors (ie corrugated HDPE sheathing) and full grout encapsulation;
- anchors grouted full length (up to 150 mm of un-grouted length at front allowed, to be filled during shotcrete spray);
- drill holes advanced using air percussion methods with suitable casing if necessary;
- centralisers provided for all anchors at a maximum spacing of 750 mm. The first and last centralisers within 300 mm from ends;
- grout strength 32 MPa and grouting of anchors is carried out within 24 hours of drilling;
- vertical strip drains spaced at 3m centres (between columns of anchors), SD 200 type and 200 mm wide to exit face via weephole;

- SL81 galvanised steel reinforcing mesh of D500L grade or similar;
- reinforcing mesh (for shotcrete) secured to each anchor using minimum 200 mm square steel plate, with appropriate galvanised reinforcement bar nut;
- adequate reinforcement cover provided over strip drains;
- batter face cleared/lightly scraped of loose and organic material, and moistened prior to application of shotcrete;
- shotcrete strength minimum 32 MPa at 28 days curing time; and
- shotcrete thickness minimum 150 mm. and not greater than 250 mm where significant overbreak occurs it should be treated separately to ensure excessive load does not drag down the anchor head.

In addition to the shotcrete and anchors, drapery should be installed below the horizontal shear and across all areas of competent rock as indicated on Drawings attached to reduce the residual rockfall risk. The drapery should comprise Maccaferri MacMatR or similarly engineered mesh and geocomposite system.

The drapery should be suitably fixed to the slope by a 14 mm catenary wire supported by dowel pins at the toe and crest of the slope.

Catenary dowels shall comprise N28 GEWI Threadbar dowels that are 1.5m minimum in length with 200 mm square plates. The dowels along the crest and toe of the slope should be spaced at maximum 3 m horizontal centres. Drapery mesh and associated components should have adequate protection against corrosion, including as a minimum, galvanised and PVC coating or similar.

A geotechnical engineer or an engineering geologist experienced in anchor design and installation should frequently inspect the work.

Where the slope angle is less than 30 degrees hydromulching may be utilised in lieu of the drapery MacMatR system. The suitability of hydromulching the slope should be determined by suitably qualified personnel familiar with the limitations of hydromulching and the maximum slope angle at which it can be applied.

Section 1 and 2 – Fill overlying low to medium strength phyllite

The slope stability analysis for Sections 1 and 2 was undertaken using Slope/W with the Morgenstern-Price method to calculate slice forces and moment equilibrium. The sections are considered critical sections where the slope comprises fill underlain by phyllite rock. The slope was modelled with an elevated groundwater profile and a 5 kPa surcharge at the crest. The soil and rock parameters used for the analysis were inferred from published information and local experience and are presented in Table 5. A long term factor of safety of 1.5 was targeted for the stabilisation options of the batter. The diagrammatic results of the analysis including interpreted section profile is shown in Figures 4 and 5 and the results are presented in Table 6.

Table 5: Adopted Geotechnical Parameters

Soil Material	Unit Weight, γ (kN/m ³)	Cohesion, c' (kPa)	Friction Angle, ϕ' (°)
Cobble / Boulder Fill	19	0	34
Low to Medium Strength Phyllite	26	50	26

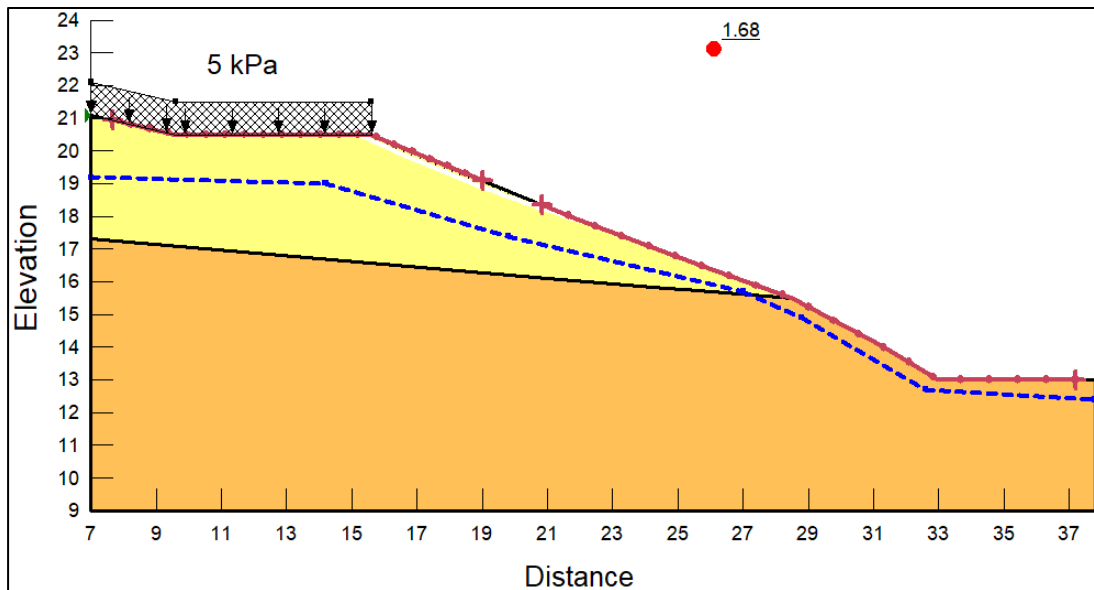


Figure 4: Section 1 - Stability Analysis

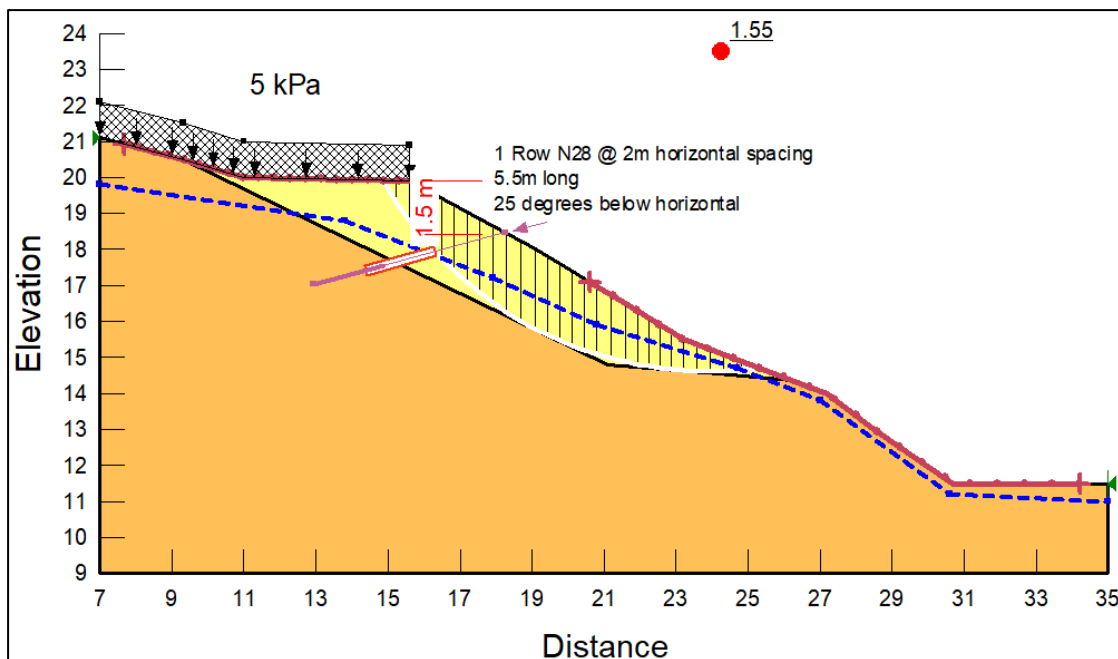


Figure 5: Section 2 Stability Analysis

Table 6: Results of Stability Analysis for Adopted Parameters

Analysis Case	Calculated Factor of Safety
Section 1	1.68
Section 2	1.55

Notes: (i) Rounded to the nearest two decimal places

Based on the results of the limit equilibrium analysis the batter indicates a theoretical factory of safety against failure of 1.5 or greater as required.

The results of the stability analysis for Section 2 outlined above were based on the stabilisation elements including the following elements:

- Single row of fully grouted N28 DYWIDAG threadbar or similar set out at 1.5 m below the crest;
- Hole length – 5.5 m
- Hole size – 125 mm
- Anchor inclination 25° below horizontal
- 2 m horizontal spacing;
- Nail and shotcrete allowable shear capacity not included in the assessment; and
- Allowable bond stress of 120 kPa in low strength phyllite with a 2.0 m bond length

Shotcrete and anchors should comply with requirements as outlined in report above addressing material above the shear.

Whilst limit equilibrium analysis indicates the slope at Section 1 to be permanently stable, a soil confinement geocomposite “geocell” system should be installed across the fill portion of the batter as indicated in Figure 1 to minimise effects of erosion.

The geocell system shall comprise GW40V 100mm Geoweb with TP-67 tendons or similar geocell system and installed as per the manufacturers guidelines and the comply with the following:

- A geotextile separator shall be placed between the slope and the Geoweb.
- The Geoweb shall be suitably fixed to the slope via fully grouted galvanised N12 anchors and proprietary fastening mechanisms .
- Surface anchors shall be installed at nominal 0.85 m horizontal (3 per Geoweb section) and 1 m vertical spacings.
- Following installation of the Geoweb the cell shall be filled with topsoil and vegetated as determined by the project landscaper.

A geotechnical engineer or an engineering geologist experienced in slope stabilisation should frequently inspect the works during installation to determine if there is any additional requirement for mesh, shotcrete and isolated spot bolting/anchoring.\

Safety in Design

The purpose of this Safety in Design section is to summarise the hazards, as far as can be reasonably identified, that are associated with the geotechnical components of the project design addressed in this report. This section is presented with particular reference to hazards and hazardous materials likely to affect construction workers, but also outlines any hazards which may also be relevant to the ongoing operation, maintenance and eventual demolition of the proposed structure or design element.

Controls of mitigation measures are also outlined against each identified hazard. These are required to be taken in order to either remove the hazard or reduce the risk level associated with the hazard to an acceptable value (generally 'low' or 'very low' risk) or to a level as low as reasonably practicable.

The list of hazards identified in this report, along with the controls required to remove or mitigate each hazard, are summarised in Table 7 below.

Table 7: Summary of the Safety in Design Considerations Addressed in this Report

Description of Hazard	Required Controls or Mitigation Measures
General hazards to site personnel during slope reinforcement and stressing and distressing works: - slips, trips and falls; - moving plant and equipment; - working in open excavation; - working below marginally stable cut slope.	These hazards should be controlled by the normal site safety procedures adopted by the contractor (such as Safety Management Plans and Safe Work Methods Statements). Guard rails should be installed around all open excavations. Geotechnical professional to inspect working faces prior to personnel access.
Significant water seepage	Geotechnical advice should be sought if significant seepage is encountered. There may be a requirement to re-assess drainage in the slope.
Additional surcharge loads greater than assumed in design	Where surcharge loads exceed the those adopted in the design, then Douglas should be contacted to reassess the slope stability.

This report should be read in conjunction with the attached notes "About this Inspection Report".

We trust the above is satisfactory for your current needs.

Yours faithfully

Douglas Partners Pty Ltd

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Geotechnical Engineer

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Senior Engineering Geologist

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Principal

Attachments:

About this Inspection Report
MacMatR Datasheet
MacMatR Installation Notes
Geoweb Installation Notes
Drawing - Site Plan



Introduction

These notes are provided to amplify DP's inspection report in regard to the limitations of carrying out inspection work. Not all notes are necessarily relevant to this report.

Standards

This inspection report has been prepared by qualified personnel to current engineering standards of interpretation and analysis.

Copyright and Limits of Use

This inspection report is the property of DP and is provided for the exclusive use of the client for the specific project and purpose as described in the report. It should not be used by a third party for any purpose other than to confirm that the construction works addressed in the report have been inspected as described. Use of the inspection report is limited in accordance with the Conditions of Engagement for the commission.

DP does not undertake to guarantee the works of the contractors or relieve them of their responsibility to produce a completed product conforming to the design.

Reports

This inspection report may include advice or opinion that is based on engineering and/or geological interpretation, information provided by the client or the client's agent, and information gained from:

- an investigation report for the project (if available to DP);
- inspection of the work, exposed ground conditions, excavation spoil and performance of excavating equipment while DP was on site;
- investigation and testing that was carried out during the site inspection;
- anecdotal information provided by authoritative site personnel; and
- DP's experience and knowledge of local geology.

Such information may be limited by the frequency of any inspection or testing that was able to be practically carried out, including possible site or cost constraints imposed by the client/ contractor(s). For these reasons, the reliability of this inspection report is limited by the scope of information on which it relies.

Every care is taken with the inspection report as it relates to interpretation of subsurface conditions and any recommendations or suggestions for construction or design. However, DP cannot anticipate or assume responsibility for:

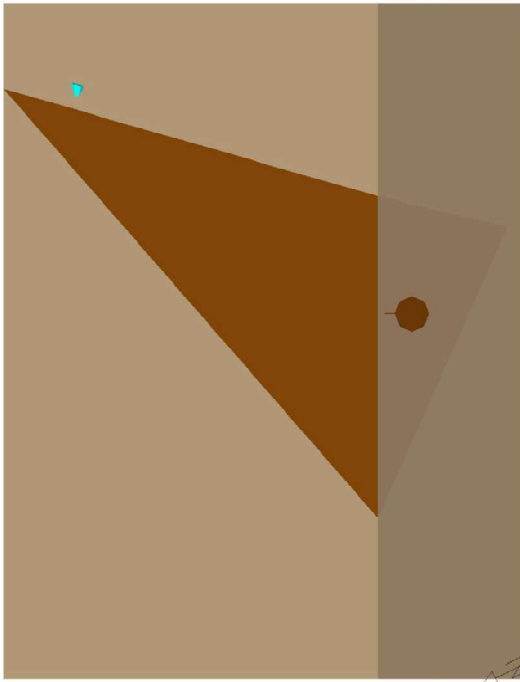
- unexpected variations in subsurface conditions that are not evident from the inspection; and
- the actions of contractors responding to commercial pressures.

Should these issues occur, then additional advice should be sought from DP and, if required, amendments made.

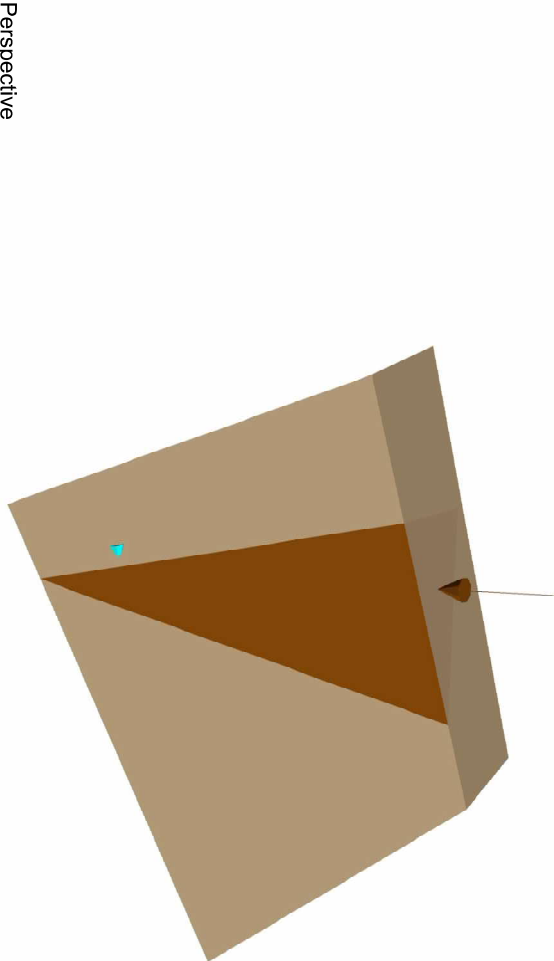
This inspection report must be read in conjunction with any attached information. This inspection report should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this inspection report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this inspection report.

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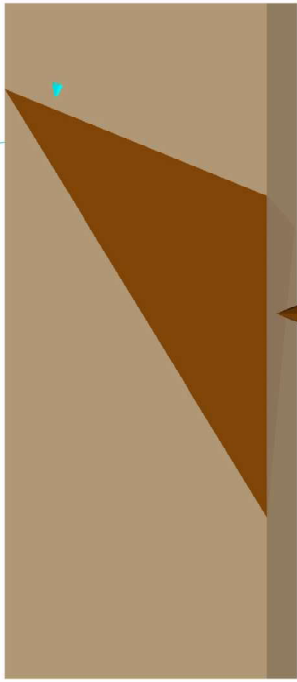
Factor of Safety: 1.57



Top



Perspective



Front



Side



SWEDGE 7.023

Project

Analysis Description

Drawn By

Date

Herston Quarter - Surface Wedge Stability Analysis

Turnaround Bay Stability

SV

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Company

File Name

Douglas Partners

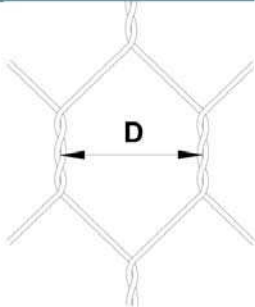
SWedge-Max Height.swd7

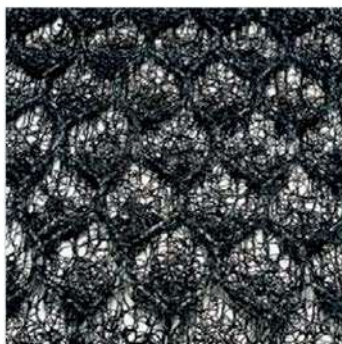
MACMAT-R

PVC GALFAN GALVANISED 6 / 2.2

SPECIFICATIONS

PROPERTIES

Type	Double twist hexagonal woven steel wire mesh onto which a 3D geomat matrix is extruded	 D = 60mm (Nominal)
Mesh Type	6 x 8	
Mesh Wire	2.2mm diameter (BS EN 10218-2 & BS EN 10223-3)	
Selvedge Wire	2.7mm diameter (BS EN 10218-2 & BS EN 10223-3)	
Corrosion Protection	Galfan galvanised (95% Zinc + 5% Aluminium Alloy + Mischmetals) coated to BS EN 10244-2 Class A (230 g/m ²) with an extruded grey PVC coating of mean wall thickness of 0.5mm	
Geomat Type	A three dimensional geomat of entangled polypropylene monofilaments, heat bonded at contact points, 10mm thick with a void space of 90%.	
Roll Size / Weight	2m x 25m (Roll Weight = 90 kg (Nominal))	
Jointing	All joints and connections shall be formed with continuous 2.2mm PVC Galfan coated lacing wire and/ or high tensile 3mm diameter Stainless Steel 'C' rings.	
BBA Approval	Maccaferri hexagonal wire mesh is BBA certified for up to 120 years design life. Agrément Certificate No. 95/3141	



Maccaferri reserves the right to alter specifications of its products without notice.
Please contact us for the most up to date specifications.

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Quality System AS/NZS ISO 9001:2000

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MACMAT® & MACMAT® R MULTI-FUNCTIONAL GEOCOMPOSITE FOR SURFACE STABILISATION

General

MacMat® and MacMat® R are three-dimensional erosion control mats composed of UV stabilised synthetic fibres. MacMat® R is additionally reinforced with double twisted steel wire mesh or with a synthetic geogrid (with a range of tensile strengths) within the polymer matrix.

The products are supplied in rolled form. MacMat® R, with steel mesh reinforcement, is manufactured with a rough and a smooth surface. In general, the smooth side is placed onto the surface to be protected, although in some situations it can be placed outermost if required. MacMat® R with synthetic geogrid reinforcement has the standard cusped matrix profile as unreinforced MacMat.

Surface Preparation:

1. Grade and lightly compact the slope to an even surface, filling in surface depressions as required.
2. Prepare a level anchorage zone and trench on firm subsoil around the perimeter of the installation.
3. Leave the last 25-50mm layer of top-soil loose to minimise soil pockets and allow the seed to take hold upon the embankment slope.
4. When used as an erosion control mat, it is suggested that the seed and fertilizer are applied either directly to the top soil prior to placing the MacMat®, or after the installation with hydro-seeding.
5. When used as a turf reinforcement, it is suggested that the top soil and seed (or hydro-seed) are applied after the MacMat® has been installed.

Tie-down trenching

1. A simple fold into the slope is normally sufficient to anchor the perimeter of the mat to the ground.
2. For erodible soils, excavate a trench approximately 300mm deep by 500mm wide, at least 0.5m back from the edge of the slope and anchor the mat along the bottom of the trench. Note that in the case of reinforced mats, the size of the trench must be properly designed to provide the required anchorage strength.
3. Backfill and compact the soil to an even surface.
4. Initially, lay mat loosely on the soil surface to prevent forming soil pockets. Pin the mat into larger impressions on the slope to limit voids between the mat and the slope.

Fixing:

Steel fixing pins are used to secure the MacMat® to the surface. Site trials are to be carried out to determine the most appropriate fixing and frequency. However, in most circumstances the following fixings have been found to be suitable;

- Unreinforced MacMat®: 4-8mm diameter steel pins with asymmetric 300mm / 100mm long legs
- Reinforced MacMat® R: 8mm diameter steel pins with asymmetric 300mm / 100mm long legs

The frequency of pinning is to be determined by the project engineer and is dependent upon slope angle, surface soil type and in the case of hydraulic applications, the shear stresses expected. The following is general guidance only:



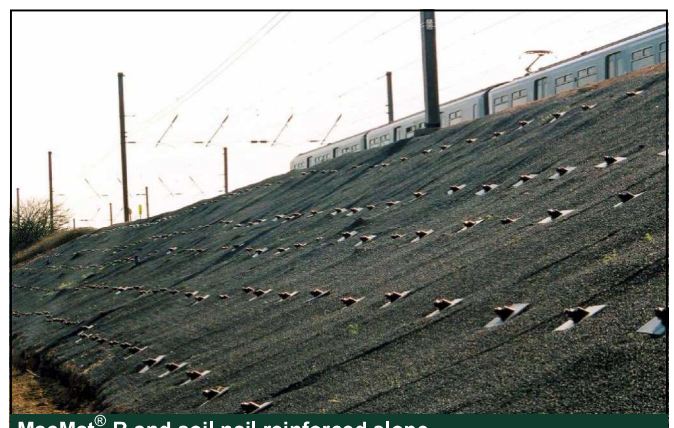
Fixing MacMat in trench



MacMat® R erosion protection on river bank



Connecting adjacent panels of MacMat® R with 'hog-rings'



MacMat® R and soil nail reinforced slope

1. Space anchor pins at 1m intervals along the top edge of the embankment slope and along the bottom of the anchor trench.
2. In most circumstances a pinning frequency of 1 pin/2m² for MacMat® and 1 pin/1.5-1.7m² for MacMat® R (excluding perimeter fixings) is suitable.
3. For slope angles of up to 1:1, and channel linings, use 1m anchor pin spacing for the direction perpendicular to the angle of slope and 1.2m interval spacing (staggered) for the direction parallel to the angle of slope.
4. Greater fixity will be required on slopes steeper than 1:1 (V:H). Comply with the project engineer's recommendations.
5. When MacMat® R (with steel mesh reinforcement) is used in conjunction with soil nails in reinforced slopes, additional fixing may not be required. Secure MacMat® R using anchor plates and nuts as required by the project.
6. Install fixing pins perpendicular to the mat (engaging the woven wire mesh within MacMat® R) and drive flush with the soil surface to provide the required pull-out resistance.
7. Adjacent panels of unreinforced MacMat® or MacMat® R reinforced with synthetic geogrid, are to be overlapped by 100mm (min.) and pinned.
8. Adjacent panels of MacMat® R (with steel mesh reinforcement) does not need to be overlapped. The integral steel wire mesh enables panels to be connected by a butt-joint using lacing wire, "fixing rings" or fixing pins, depending upon the application.

Channel linings

1. Lay the MacMat® parallel to the direction of the flow for smaller channels and perpendicular to the direction of flow for larger channels or channels with steeper slopes.
2. Overlap the edges of the mat by 300mm.
3. Always overlap so that the downstream edge is anchored below the upstream edge.

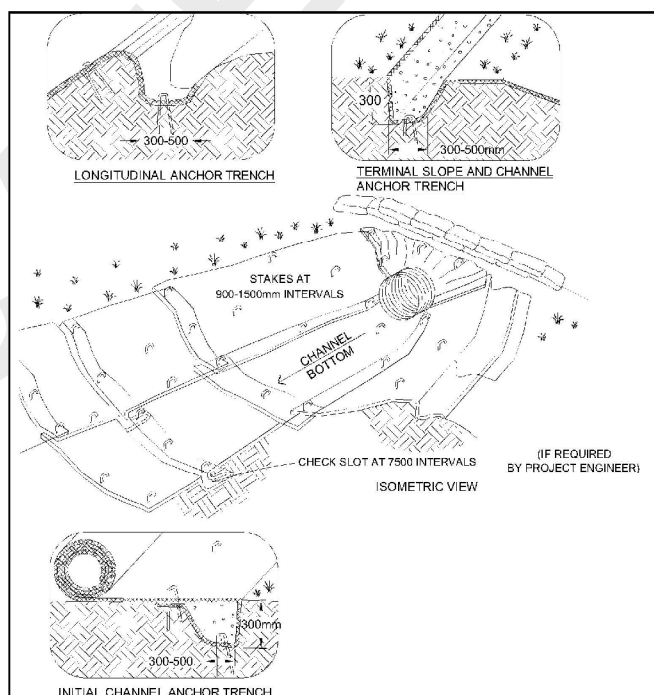
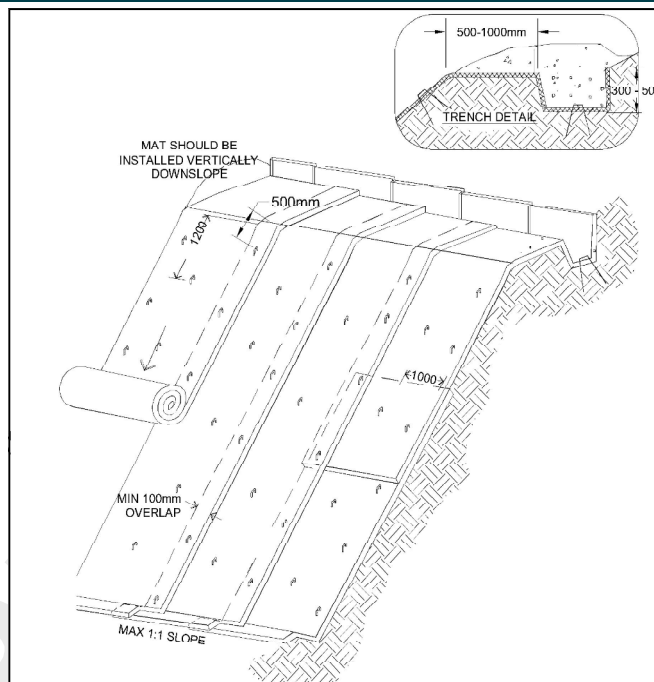
Fixing mats on membranes

When using reinforced MacMat on top of waterproofing synthetic membranes and geosynthetic clay liners, fixing pins should not be used as they will puncture the membrane. Mats are simply anchored in the top trench and, if necessary, in intermediate berm trenches. These applications may have specific technical and installation requirements.

Finishing

Brush topsoil to a depth of 20mm into the three-dimensional matrix of the MacMat® to cover the mat.

For further details, guidance and project specific assistance, please contact your local Maccaferri office.



Please note that these products cannot guarantee vegetation establishment. This is a function of numerous variables including the quality of topsoil, presence of nutrients, moisture, viable seeds and appropriate sunlight and oxygen. Please consult Maccaferri for further guidance.

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GEOWEB®

SLOPE PROTECTION SYSTEM

INSTALLATION GUIDELINE



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NOTE: The following installation techniques and recommendations may require an evaluation by Presto Geosystems to determine applicability of use for individual project requirements.

Site Preparation

- Remove existing vegetation from the proposed slopes.
- Excavate and shape the slope section.
- Place, compact and shape required earth fill.
- Dig toe-in trenches at the crest and perimeter of the slope as required.

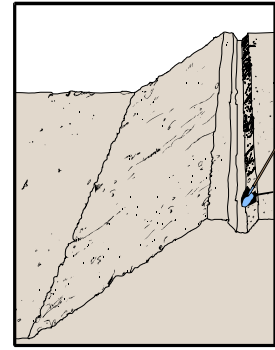


Figure 1 Slope Preparation

Geotextile Separation Layer

- Most non-vegetated slope applications involve a non-woven or woven geotextile separator layer at the sub grade surface. When required, this separation layer is critical to the performance of the slope system. Refer to Figure 2.
- Install geotextile separation layer in accordance with manufacturer's instructions and ensure that minimum overlaps are maintained.
- Ensure geotextile is placed in perimeter toe-in trenches.
- Anchor the edges of the geotextile separation layer in accordance with manufacturer instructions to prevent movement.

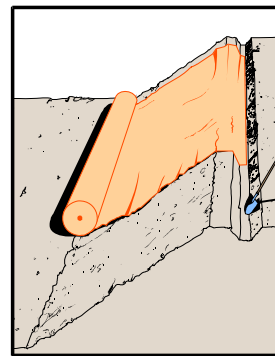


Figure 2 Geotextile Placement

Installation of Geoweb® Sections

- Drive a row of ATRA Stake Anchors along the upper edge of the proposed slope protection area. Space the stakes at pre-determined single cell centers. See Geoweb® Anchor Spacing Charts for guidance.
- Partially expand the Geoweb® section and place the end cell of the section over its corresponding edge stake. Ensure the ATRA® Stake Clip arm is hooked over the cell wall. Refer to Figure 3.

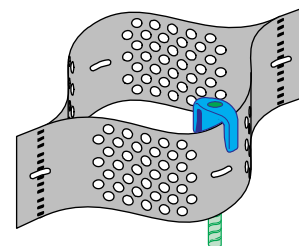


Figure 3 ATRA® Anchor Placement



- Expand the Geoweb® section down the slope to the section's specified length. Refer to Figure 4.
- Hold the fully expanded sections open using one of the following:
 - a) ATRA® Stake Anchors, straight stakes or J-Pins (permanent or temporary). Specialized driving tools are available through Presto Geosystems' authorized distributors and representatives to speed driving of ATRA® Stake Anchors. Refer to Figure 5.
 - b) Infill several peripheral cells.
- Other acceptable methods may be used.

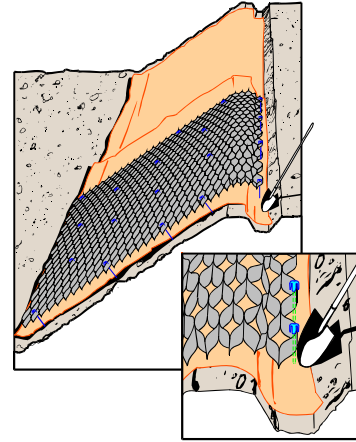


Figure 4 Placement of Geoweb® Section

- Align and interleaf edges of adjoining Geoweb® sections, ensuring that the upper surfaces of adjoining sections are flush.
- Fasten Geoweb® sections together with the ATRA® key connection device. Position the ATRA key through the slots of overlapping sections (side-to-side), or where cells connect (end-to-end), and turn key to "lock" position. Refer to Figure 6.
- When Geoweb sections are connected end-to-end, under-expand a few rows of the adjoining section to allow easy placement of the ATRA keys before fully expanding the connecting section. For easiest placement, insert the key completely through one cell before inserting through the adjoining cell. Adjoining sections should also be fully connected prior to infilling.
- The use of the ATRA key device will reduce construction time significantly and offer cost-savings compared to stapling operations.
- Geoweb sections may also be connected with pneumatic staplers either side-to-side or end-to-end. ATRA key is the recommended connection method.
- The ATRA key connection device and pneumatic staplers and staples are available through Presto Geosystems and their authorized distributors/representatives.

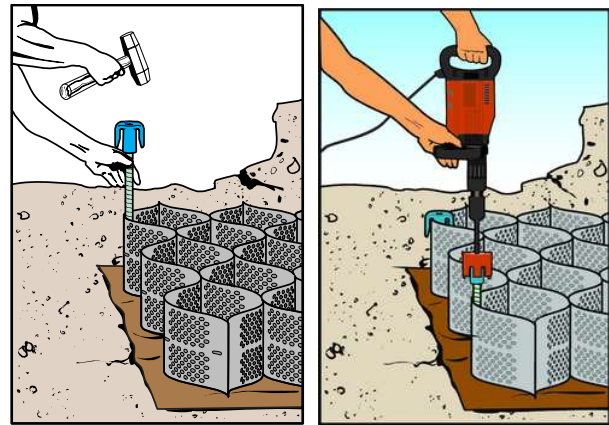


Figure 5 ATRA® Anchor Installation Methods



Figure 6 ATRA® Key Connection Device

Installation of Geoweb® Sections on Curved or Irregular Surfaces

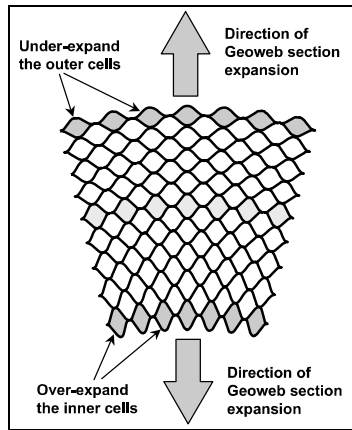


Figure 7 Tapered Expansion of Section

Method 1: Progressively vary the degree of cell expansion along the length of a section. Refer to Figure 7.

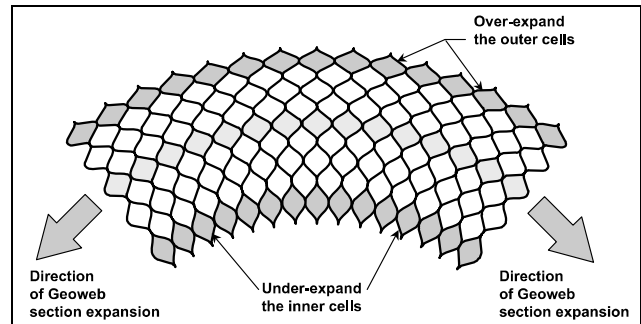


Figure 8 Curved Expansion of Section

Method 2: Geoweb® sections can be readily adapted to cover curved areas by varying the degree of cell expansion across the width of individual sections. This method is only used for installations with slope lengths less than one section in width (8.5 ft). Refer to Figure 8.

Method 3: Field cut an expanded section to give the required degree of taper. Refer to Figure 9.

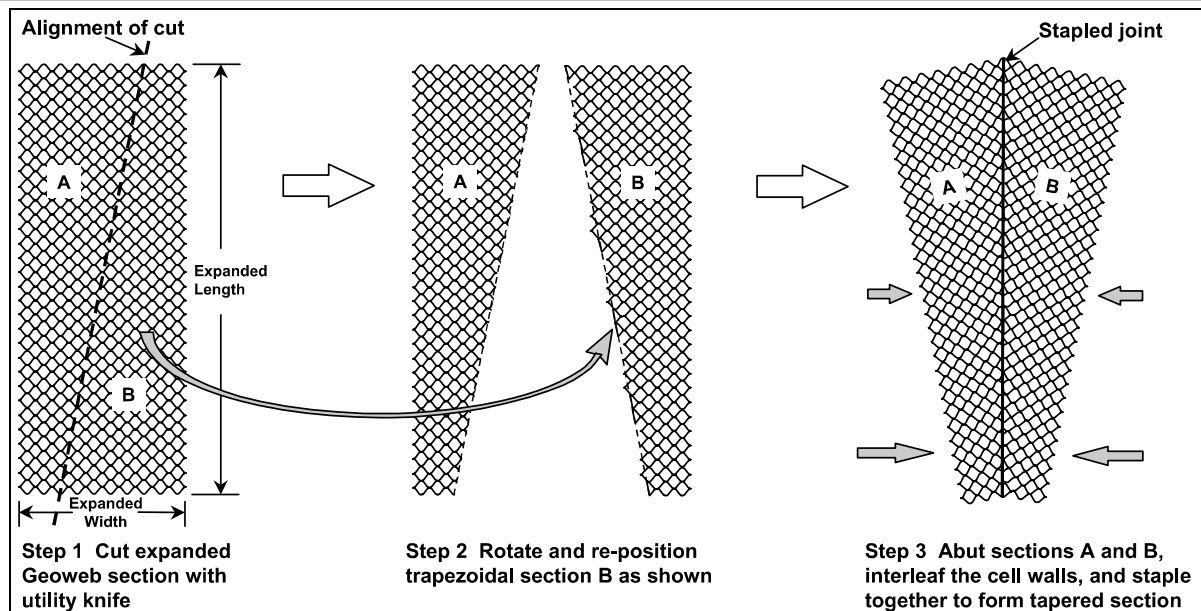


Figure 9 Field Cutting of Geoweb Section to Form Taper

Limiting Vertical Curvature of Geoweb® Sections

Table 1: Cell Depth vs. Limiting Radius of Curvature

Geoweb® Cell Depth	Minimum Radius Expansion Direction	Minimum Radius Cross Section Direction
3 in (75 mm)	16 in (400 mm)	24 in (600 mm)
4 in (100 mm)	24 in (600 mm)	40 in (1000 mm)
6 in (150 mm)	36 in (900 mm)	60 in (1500 mm)
8 in (200 mm)	48 in (1200 mm)	80 in (2000 mm)

Preparation of Tendon Geoweb® Sections

- Geoweb® sections are supplied with tendon I-slots. Tendons should be threaded through the appropriate cells that will provide the best distribution of the number of tendons per design.
- Individual tendons are typically precut to allow for efficient installation. The tendon length is determined based on Attachment 1 Tendon Marking Method.
- Feed individual tendons through tendon slots in the collapsed Geoweb® sections prior to section expansion. Refer to Figure 10.

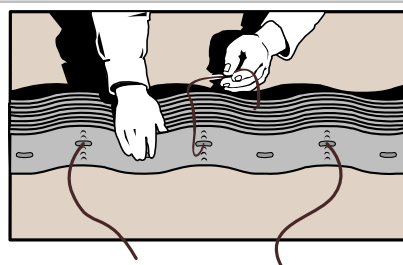


Figure 10 Tendon Insertion

Terminating and Anchoring Tendons

There are two standard methods of terminating tendons at an outer edge of Geoweb® sections.

1. Terminate tendon on ATRA Tendon Clip. Refer to Figure 11.

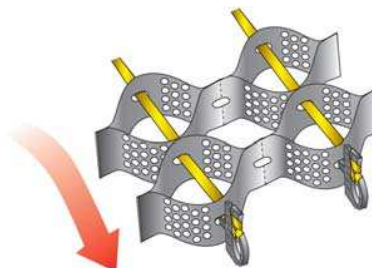


Figure 11 Termination of Integral Tendons

2. Knotted loop - used to attach tendons to a crest or toe anchor.

The ATRA® Stake Anchor and ATRA® Tendon Clip when used as a restraining device is recommended. Loop the tendon around and under the arms of the ATRA® Stake Clip. Refer to Figure 12.

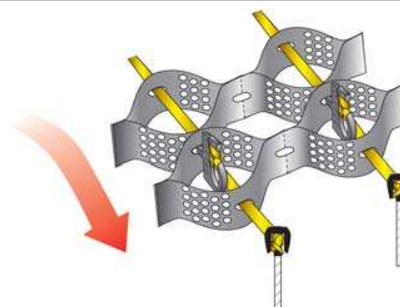


Figure 12 End Anchorage of Tendons

Internal Anchoring

- Drive additional ATRA® Stake Anchors within selected cells of the expanded Geoweb® section at the specified spacing. Refer to Figure 13.
- Ensure the tendon is under the arm of the ATRA® Stake Clip and drive the anchor flush with the base of the cell.
- Final driving of the anchors along a single tendon should progress in sequence from the initial edge anchor (generally at the crest). The trailing length of tendon should remain un-restrained to avoid over-tensioning of the tendon.
- The un-restrained tendon end should be terminated as illustrated above.

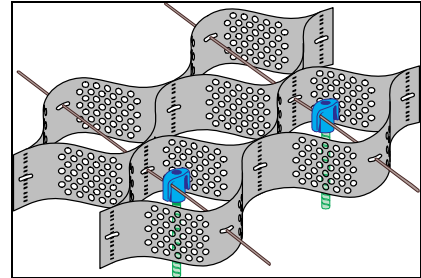


Figure 13 Internal Anchors

Non-Slip Tendon Internal Anchorage

- Geoweb® sections can be effectively supported on steep slopes with an array of internal anchors that are attached to the integral tendon system. Typical internal anchors include:
 - a) ATRA® Stake Anchors
 - b) J-pins
 - c) Steel reinforcing rods
 - d) Duckbill® cable anchors
 - e) Wooden stakes
- The recommended method of attachment uses the ATRA® Stake Anchor and Moore hitch knot. Refer to Figure 14.

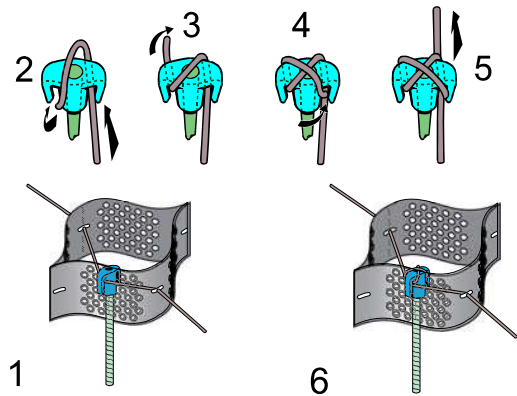


Figure 14 Moore Hitch Non-Slip Connection

Crest Anchorage of Tendon Geoweb® Systems

- Load transfer to crest anchorage is required when a driven anchor array is impractical (e.g. when a geomembrane or impervious material is present). Refer to Figure 15.
- ATRA® Tendon Clips transfer load from the Geoweb sections to the tendons in such cases. Refer to Figure 16.
- Prepare precut tendons in accordance with Preparation of Tendon Geoweb Sections on page 4.

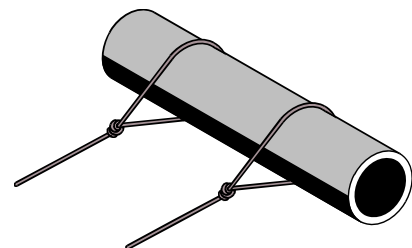


Figure 15 Deadman Crest Anchor



- Position the collapsed sections at the crest of the slope.
- Starting from the first tendon location, count the number of cells to the next ATRA Tendon Clip and repeat along that tendon row.
- Repeat this procedure for each additional tendon location.
- With all the ATRA Tendon Clips placed in the section, thread the tendons through the cell wall I-slots in the unexpanded section.
- Locate the corresponding mark on the tendon and position it in front of the cell wall. Hold the tendon and connect to the ATRA Tendon Clip.
- Refer to Attachment 2, ATRA Tendon Clip Installation Method for instructions on installing the ATRA Tendon Clip and tendon tie-off.
- Leave the trailing length of the tendon on the upslope side of the section to allow connection to the ATRA Tendon Clip.
- Repeat this procedure for each additional tendon location.
- Place the collapsed section in the anchor trench, secure with temporary stakes or ATRA Stake Anchors and expand down the slope.
- Adjust the section (i.e. a shake or two of the expanded section works well for this) so that the section and tendons are uniformly taut.
- Terminate the bottom of each tendon with an ATRA Tendon Clip.
- Note: Attaching ATRA® Tendon Clips at the required spacing can be accomplished while the Geoweb® section is pre-expanded on a flat surface. The section can then be re-collapsed, attached to crest anchorage, and deployed onto the slope. This method facilitates the installation of sections on extremely steep slopes. Refer to Figure 17.

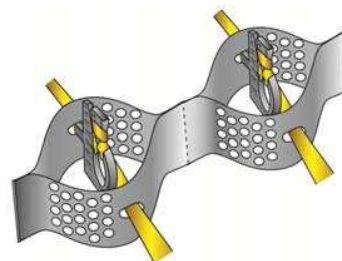


Figure 16 ATRA® Tendon Clips



Figure 17 Threading Tendon and Attaching ATRA Tendon Clips

Placement of Infill

- Infilling of Geoweb® sections can begin when anchoring work is complete.
- A range of equipment types can be used as illustrated in Figure 18– Figure 22.
 1. Hydraulic Excavator (Backhoe)
 2. Front-end Loader
 3. Conveyor
 4. Crane-mounted skip
 5. Mixer Chute
- Limit drop-height of infill material to 3 ft (1 m) maximum.
- Infill from the crest of the slope to the toe.
- Controlled overfilling of cells is required to allow for consolidation and compaction of the infill.
- Ensure that infill will be flush with the upper surface of the cells at the completion of the installation.

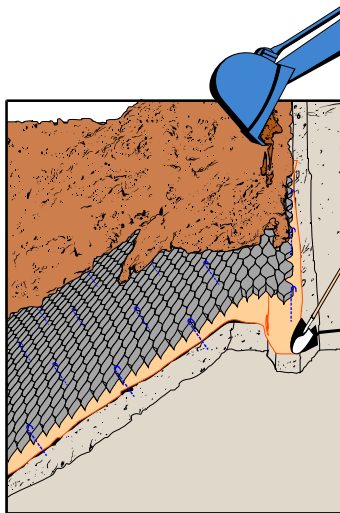


Figure 18 Excavator

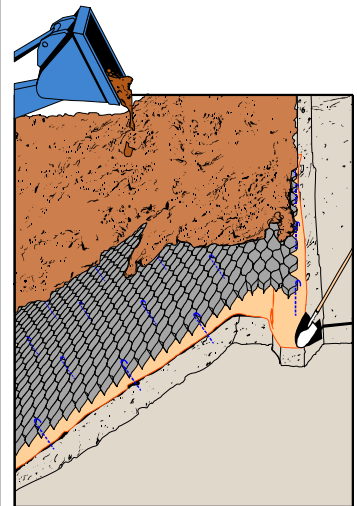


Figure 19 Loader

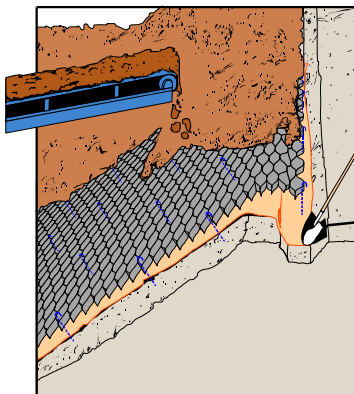


Figure 20 Mobile Conveyor

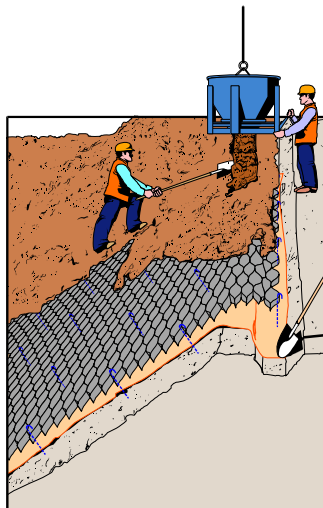


Figure 21 Skip

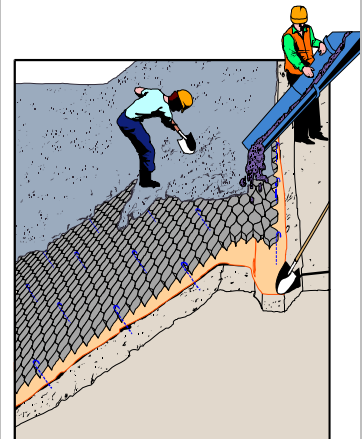


Figure 22 Chute

Dimensions and Weights of Palletized Geoweb® Sections

Geoweb® sections are normally tri-folded and palletized for shipment to the site. Table 2 provides typical pallet dimensions and weights for a range of section and cell sizes.

Table 2: V-Series Geoweb® Shipping Dimensions and Weights

Cell Depth	Pallet Dimensions	Minimum Weight	Maximum Weight
3 in (75 mm)	42 in x 42 in (1070 mm x 1070 mm)	860 lb (390 kg)	1,560 lb (710 kg)
4 in (100 mm)	42 in x 42 in (1070 mm x 1070 mm)	880 lb (400 kg)	1,600 lb (730 kg)
6 in (150 mm)	42 in x 42 in (1070 mm x 1070 mm)	800 lb (360 kg)	1,450 lb (660 kg)
8 in (200 mm)	42 in x 42 in (1070 mm x 1070 mm)	880 lb (400 kg)	1,600 lb (730 kg)

Infill Volumes

Table 3: Infill Volumes for Geoweb® Sections

Cell Depth	3 in (75 mm)	4 in (100 mm)	6 in (150 mm)	8 in (200 mm)
Volume (m³ / 100 m² of area)	7.5 m³	10.0 m³	15 m³	20.0 m³
Volume (yd³ / 100 yd² of area)	8.3 yd³	11.1 yd³	16.7 yd³	22.2 yd³

Tools and Equipment

Installation efficiency is greatly improved by the appropriate choice of construction equipment and tools. The following guidelines apply to most Geoweb® system applications. Non-standard tools and equipment may provide additional benefits in some situations.

Table 4: Standard Construction Tools for Installation of the Geoweb® System

Geoweb® Components	Power Tools	Concrete Finishing	Surveying Equipment
ATRA® Stake Clips/Anchors ATRA® Tendon Clips	Heavy-duty drill	Bull floats	Surveyor's auto-level
ATRA® Key Connection Device	Circular saw	Hand floats	Tripod and rod
Hand Tools	Percussion hammer	Steel trowels	Laser beacons
Shovels and spades	Stanley-Bostitch stapler	Poker vibrators	Audio target receiver
Rakes and screed bars	SB103020 wire staples	Tamping rods	Survey stakes
Sledge hammers	Gas generator		Markers + spray cans
Crowbars	Air compressor		String-lines + spirit level
Utility knives	Electric Impact Hammer ATRA® Anchor Driving Tool and Gad.		
Spikes, nails + lumber			
Templates			

Excavation and Materials Handling Equipment

Conventional excavators, front-end loaders, mini-excavators and skid-steer loaders, equipped with smooth-edged buckets, are normally employed for the installation of Geoweb® systems. Infilling of Geoweb® sections can also be carried out with conveyors, chutes and skips. As a rule, the overall rate of installation relates directly to the speed and efficiency of infill placement and compaction.

Compaction Equipment

Compaction of slope surfaces prior to installation of the Geoweb® system is normally carried out with: 1) vibratory plate compactor attachments for backhoes, 2) a mobile winch assembly at the slope crest to support a roller or plate compactor, or 3) manual tamping. Slope pre-compaction is primarily intended to minimize sloughing of loose surface topsoil or aggregate fill materials.

Limited Warranty

Presto Geosystems warrants each Geoweb® section which it ships to be free from defects in materials and workmanship at the time of manufacture. Presto's exclusive liability under this warranty or otherwise will be to furnish without charge to Presto's customer at the original f.o.b. point a replacement for any section which proves to be defective under normal use and service during the 10-year period which begins on the date of shipment by Presto. Presto reserves the right to inspect any allegedly defective section in order to verify the defect and ascertain its cause.

This warranty does not cover defects attributable to causes or occurrences beyond Presto's control and unrelated to the manufacturing process, including, but not limited to, abuse, misuse, mishandling, neglect, improper storage, improper installation, improper alteration or improper application.

PRESTO MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WRITTEN OR ORAL, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OR MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, IN CONNECTION WITH THE GEOWEB® SYSTEM. IN NO EVENT SHALL PRESTO BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR THE BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR FOR ANY OTHER REASON, INCLUDING NEGLIGENCE, IN CONNECTION WITH THE GEOWEB® SYSTEM.

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ATTACHMENT 1 -TENDON MARKING METHOD

ATRA® Tendon Clip Preassembly Layout Guide

To pre-assemble ATRA tendon clips to tendons with the Geoweb® slope or channel protection system:

1. Determine Total Tendon Length using Imperial or metric charts below.
2. Add to that length the tendon required to secure the system to anchor pipe, anchor stakes, helical anchors, etc., and use the "Distance between marks" charts to mark off the location for each ATRA tendon clip to be located.
3. After threading the tendon through the still collapsed Geoweb sections, align the first mark with the top cell and assure it remains properly located as the tendon is tied to the ATRA tendon clip.
4. Move to the next recipient cell (as per project design) and align the next mark with the cell and continue the process.
5. The bottom cell should receive its last clip AFTER expanding the Geoweb system down the slope.

Distance between marks		Cell Size	
INCHES		20V	40V
1	15.8	18.3	25.7
2	24.6	28.6	44.4
3	33.4	40.9	64.1
4	42.2	52.2	83.8
5	51.0	63.5	103.5
6	59.8	74.8	123.2
7	68.6	86.1	142.9
8	77.4	97.4	162.6
9	86.2	108.7	182.3
10	95.0	120.0	198.0

Distance between marks		Cell Size	
CENTIMETERS		20V	40V
1	40.3	46.9	65.3
2	60.5	75.2	111.8
3	80.8	103.9	160.3
4	107.2	132.6	207.8
5	129.5	161.3	255.3
6	151.9	190.0	302.8
7	174.2	218.7	350.3
8	196.6	247.4	397.8
9	219.0	276.1	445.3
10	241.3	304.8	492.8



Total Tendon Length		20V Cell Size Section	
[Does not include length at top of slope for anchor pipe]		Section length (feet)	
1	25.5	29.6	35.2
2	38.0	42.5	52.1
3	50.5	55.4	69.0
4	63.0	68.3	85.9
5	75.5	81.2	102.8
6	88.0	94.1	119.7
7	100.5	107.0	136.6
8	113.0	119.9	153.5
9	125.5	132.8	170.4
10	138.0	145.7	187.3

Total Tendon Length		30V Cell Size Section	
[Does not include length at top of slope for anchor pipe]		Section length (feet)	
1	29.4	34.2	40.0
2	43.2	51.4	59.5
3	56.9	68.6	81.4
4	70.7	85.8	103.3
5	84.4	103.0	125.2
6	98.2	120.2	147.1
7	111.9	137.4	169.0
8	125.7	154.6	190.9
9	139.4	171.8	212.8
10	153.2	189.0	234.7

Total Tendon Length		40V Cell Size Section	
[Does not include length at top of slope for anchor pipe]		Section length (feet)	
1	42.1	47.8	56.8
2	63.2	71.7	85.2
3	84.3	95.6	113.6
4	105.4	119.5	142.0
5	126.5	143.4	170.4
6	147.6	167.3	198.8
7	168.7	191.2	227.2
8	189.8	215.1	255.6
9	210.9	239.0	284.0
10	232.0	262.9	312.4

Total Tendon Length		20V Cell Size Section	
[Does not include length at top of slope for anchor pipe]		Section length (meters)	
1	7.27	8.04	10.42
2	6.09	7.17	8.48
3	5.53	6.42	7.73
4	5.34	6.24	7.35
5	5.16	6.06	6.99
6	4.97	5.88	6.63
7	4.78	5.69	6.27
8	4.59	5.51	5.91
9	4.40	5.32	5.55
10	4.21	5.14	5.19

Total Tendon Length		30V Cell Size Section	
[Does not include length at top of slope for anchor pipe]		Section length (meters)	
1	8.97	10.44	12.39
2	7.29	8.57	10.15
3	6.73	7.82	9.40
4	6.54	7.64	9.03
5	6.36	7.46	8.66
6	6.17	7.28	8.30
7	5.98	7.10	7.93
8	5.79	6.92	7.57
9	5.60	6.74	7.21
10	5.41	6.56	6.85

Total Tendon Length		40V Cell Size Section	
[Does not include length at top of slope for anchor pipe]		Section length (meters)	
1	12.52	14.58	17.42
2	10.64	12.71	15.08
3	10.28	11.97	14.34
4	10.10	11.78	14.06
5	9.91	11.59	13.77
6	9.72	11.41	13.49
7	9.53	11.22	13.21
8	9.34	11.04	12.93
9	9.15	10.85	12.65
10	8.96	10.66	12.37

Example shown as highlighted above: GW20V/4082SFT section is 25 cells in length. ATRA Tendon Clips to be placed every FOUR cells along the tendon beginning with cell to be located at top of slope.

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ATTACHMENT 2 -ATRA TENDON CLIP INSTALLATION METHOD



ATRA® Tendon Clip
LOAD TRANSFER DEVICE

ATRA Tendon Clips are load transfer devices to transfer slope gravity forces from the GEOWEB® cell wall to the tendon. The device engages securely with the GEOWEB cell wall, allowing hands-free connection while securing the tendon. ATRA Tendon Clips can be preassembled at the top of the slope on flat ground improving safety and efficiency.

5 EASY INSTALLATION STEPS...



STEP 1: Locate the cells where the ATRA Tendon Clips will be installed. Insert the locking member of the ATRA Tendon Clip through the slot in the GEOWEB cell wall. Turn the clip 90 degrees to lock.



STEP 2: Pull a few inches of the tendon through the circular opening in the ATRA Tendon clip.



STEP 3: Pull the tendon up and over the post of the ATRA Tendon Clip.

STEP 4. Twist the tendon to form a loop. Fold the tendon loop back down over the post.



STEP 5: Pull the tendon so the slack is eliminated and it is tightly secured to the clip.



COMPLETED. ATRA Tendon Clip load transfer connection.

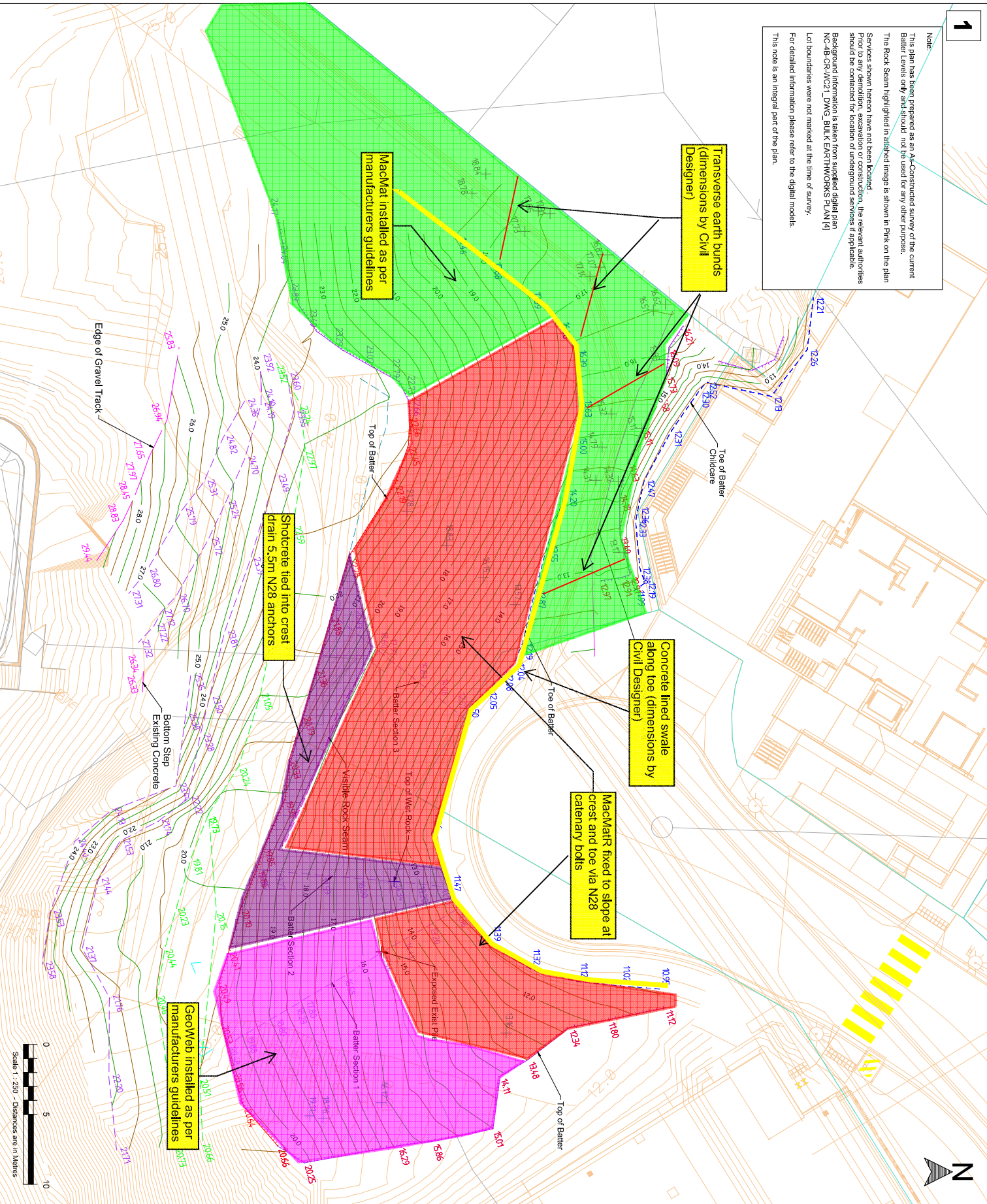
Use the QR Code to view our ATRA Tendon Clip videos.



PRESTO GEOSYSTEMS®, Appleton, Wisconsin, USA
Ph: 800-548-3424 | 1-920-738-1328 www.prestogeo.com

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Note:
This plan has been prepared as an As-Constructed survey of the current Batter Levels only and should not be used for any other purpose.
The Rock Seam highlighted in attached image is shown in Pink on the plan
Services shown hereon have not been located.
Prior to any demolition, excavation or construction, the relevant authorities should be contacted for location of underground services if applicable.
Background information is taken from supplied digital plan NC-4B-SUR-WCZ_L0VMS_BULK EARTHWORKS PLAN (1)
Lot boundaries were not marked at the time of survey.
For detailed information please refer to the digital models.
This note is an integral part of the plan.



Locality Map



Key Map



ISSUE/REVISION

B	24/06/24	Data Added
A	23/06/24	Issued to Client
Rev	Date	Revision Details



PROJECT
HERSTON QUARTERS
STAGE 4B AND 4C

300 Herston Road
Herston 4006

DESCRIPTION
As-Constructed Survey
Current Batter survey

PROJECT DATUM
Horizontal Datum: SITE
Detail Survey NC-4A-SU-0001
Level Datum: AHDD

Local Authority: B.C.C.

DRAWING INFORMATION	Surveyed: HP	Project No: A808
	Drawn: HP	Ref No: ASC-54
	Checked: HP	Date of Survey: 23/06/24
	Contours: 0.5	Scale @ A3: 1:250
	Minor: 1.0	Date: 18/06/24

DRAWING NUMBER
A0808-SUR-WECR-ASC-0054
Sheet No. 1 of 1
Revision: B

Investigation Summary Report

Client	J. Hutchinson Pty Ltd	Project No.	97105.12
Project	Proposed Carpark	Date	2 July 2024
Address	Research Rd, Herston QLD	Reference	R.041.Rev1

As requested by J. Hutchinson Pty Ltd (Hutchies), a senior engineering geologist and Principal geotechnical engineer from Douglas Partners Pty Ltd (Douglas) carried out inspections at the above site on 24 June 2024. The aim of the inspection was to assess the sediment and stability measures required for the western corridor.

Douglas has previously assessed the slope stability requirements of the batter along the western corridor, the results of which are presented in Douglas report 97105.12.R.038.Rev1. In summary the report outlined the requirement for retention treatments comprising a combination of localised mesh reinforced shotcrete, passive rock anchors and drapery. This report is supplementary to the above-mentioned report.

The following stability and sediment control measures should be installed across the western corridor boundary as indicated in Figure 1:

- Concrete lined swale drain running along the toe of the batter (sizing and frequency to be nominated by ADG Engineers (Aust) Pty Ltd [ADG]);
- Transverse earth check bunds to divert surface flows into concrete lined swale drain (dimensions and frequency to be nominated by ADG); and
- MacMat geocomposite matting across the batter, and over the earth bunds extending to the property boundary as highlighted green in Figure 1 below;

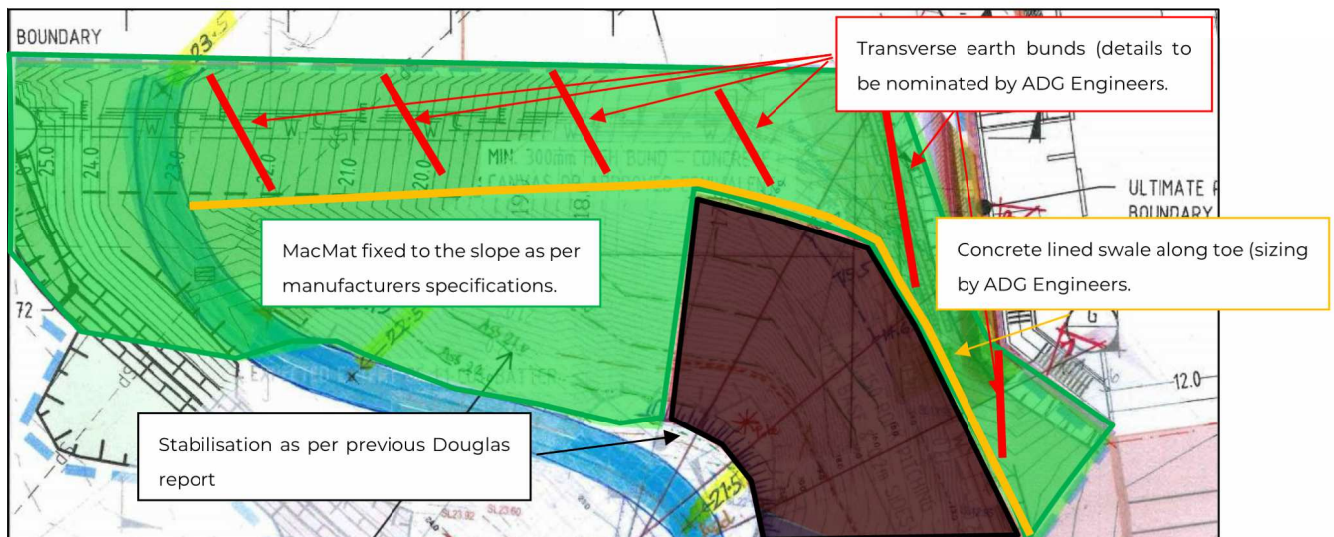


Figure 1: Plan view of stability and sediment control measures

The unreinforced geocomposite matting MacMat (which does not comprise stabilising wire mesh such as utilised in MacMatR) should extend across the batter and 1 m beyond the crest in the area highlighted green in Figure 1, including over the transverse earth bunds.

The MacMat should be installed as per the attached manufacturers specifications, using galvanised steel pins with a pinning frequency of 1 pin per 2 m² as specified for batter slopes less than 1V:1H. The edges of the matting should overlap at least 0.1 m between rolls and tie into the concrete lined swale drain along the toe of the batter.

The concrete lined swale drain should collect surface runoff from the batter and earth bunds and divert water into the permanent catch drain behind the kerb on Kauri Pine Road. The design and dimensions of the swale drain and earth bunds should be undertaken in consultation with the project civil engineer (ADG) to ensure they are adequately sized to accommodate surface runoff flows.

A geotechnical engineer or an engineering geologist experienced in slope stability remediation design and installation should frequently inspect the work.

This report should be read in conjunction with the attached notes "About this Inspection Report".

We trust the above is satisfactory for your current needs.

Yours faithfully

Douglas Partners Pty Ltd



Shan Vanderstukken
Geotechnical Engineer

Reviewed by



David Qualischefski
Principal



Robert Thomson
Senior Engineering Geologist

Attachments:

About this Inspection Report
MacMat Datasheet
MacMat Installation Notes
Drawing - Site Plan Markup



Introduction

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DP does not undertake to guarantee the works of the contractors or relieve them of their responsibility to produce a completed product conforming to the design.

Reports

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- an investigation report for the project (if available to DP);
- inspection of the work, exposed ground conditions, excavation spoil and performance of excavating equipment while DP was on site;
- investigation and testing that was carried out during the site inspection;
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MACMAT® & MACMAT® R MULTI-FUNCTIONAL GEOCOMPOSITE FOR SURFACE STABILISATION

General

MacMat® and MacMat® R are three-dimensional erosion control mats composed of UV stabilised synthetic fibres. MacMat® R is additionally reinforced with double twisted steel wire mesh or with a synthetic geogrid (with a range of tensile strengths) within the polymer matrix.

The products are supplied in rolled form. MacMat® R, with steel mesh reinforcement, is manufactured with a rough and a smooth surface. In general, the smooth side is placed onto the surface to be protected, although in some situations it can be placed outermost if required. MacMat® R with synthetic geogrid reinforcement has the standard cusped matrix profile as unreinforced MacMat.

Surface Preparation:

1. Grade and lightly compact the slope to an even surface, filling in surface depressions as required.
2. Prepare a level anchorage zone and trench on firm subsoil around the perimeter of the installation.
3. Leave the last 25-50mm layer of top-soil loose to minimise soil pockets and allow the seed to take hold upon the embankment slope.
4. When used as an erosion control mat, it is suggested that the seed and fertilizer are applied either directly to the top soil prior to placing the MacMat®, or after the installation with hydro-seeding.
5. When used as a turf reinforcement, it is suggested that the top soil and seed (or hydro-seed) are applied after the MacMat® has been installed.

Tie-down trenching

1. A simple fold into the slope is normally sufficient to anchor the perimeter of the mat to the ground.
2. For erodible soils, excavate a trench approximately 300mm deep by 500mm wide, at least 0.5m back from the edge of the slope and anchor the mat along the bottom of the trench. Note that in the case of reinforced mats, the size of the trench must be properly designed to provide the required anchorage strength.
3. Backfill and compact the soil to an even surface.
4. Initially, lay mat loosely on the soil surface to prevent forming soil pockets. Pin the mat into larger impressions on the slope to limit voids between the mat and the slope.

Fixing:

Steel fixing pins are used to secure the MacMat® to the surface. Site trials are to be carried out to determine the most appropriate fixing and frequency. However, in most circumstances the following fixings have been found to be suitable;

- Unreinforced MacMat®: 4-8mm diameter steel pins with asymmetric 300mm / 100mm long legs
- Reinforced MacMat® R: 8mm diameter steel pins with asymmetric 300mm / 100mm long legs

The frequency of pinning is to be determined by the project engineer and is dependent upon slope angle, surface soil type and in the case of hydraulic applications, the shear stresses expected. The following is general guidance only:



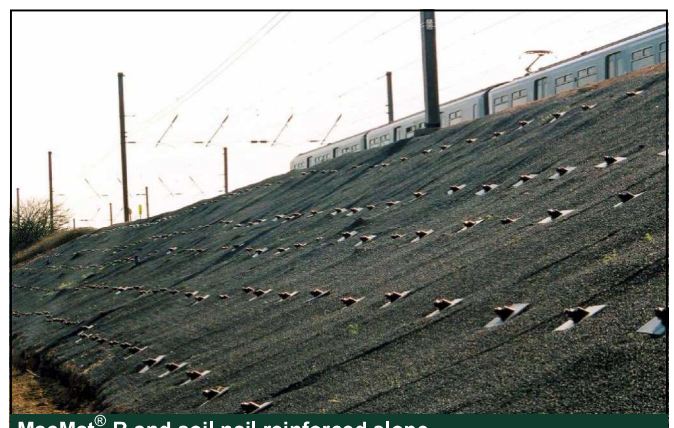
Fixing MacMat in trench



MacMat® R erosion protection on river bank



Connecting adjacent panels of MacMat® R with 'hog-rings'



MacMat® R and soil nail reinforced slope

1. Space anchor pins at 1m intervals along the top edge of the embankment slope and along the bottom of the anchor trench.
2. In most circumstances a pinning frequency of 1 pin/2m² for MacMat® and 1 pin/1.5-1.7m² for MacMat® R (excluding perimeter fixings) is suitable.
3. For slope angles of up to 1:1, and channel linings, use 1m anchor pin spacing for the direction perpendicular to the angle of slope and 1.2m interval spacing (staggered) for the direction parallel to the angle of slope.
4. Greater fixity will be required on slopes steeper than 1:1 (V:H). Comply with the project engineer's recommendations.
5. When MacMat® R (with steel mesh reinforcement) is used in conjunction with soil nails in reinforced slopes, additional fixing may not be required. Secure MacMat® R using anchor plates and nuts as required by the project.
6. Install fixing pins perpendicular to the mat (engaging the woven wire mesh within MacMat® R) and drive flush with the soil surface to provide the required pull-out resistance.
7. Adjacent panels of unreinforced MacMat® or MacMat® R reinforced with synthetic geogrid, are to be overlapped by 100mm (min.) and pinned.
8. Adjacent panels of MacMat® R (with steel mesh reinforcement) does not need to be overlapped. The integral steel wire mesh enables panels to be connected by a butt-joint using lacing wire, "fixing rings" or fixing pins, depending upon the application.

Channel linings

1. Lay the MacMat® parallel to the direction of the flow for smaller channels and perpendicular to the direction of flow for larger channels or channels with steeper slopes.
2. Overlap the edges of the mat by 300mm.
3. Always overlap so that the downstream edge is anchored below the upstream edge.

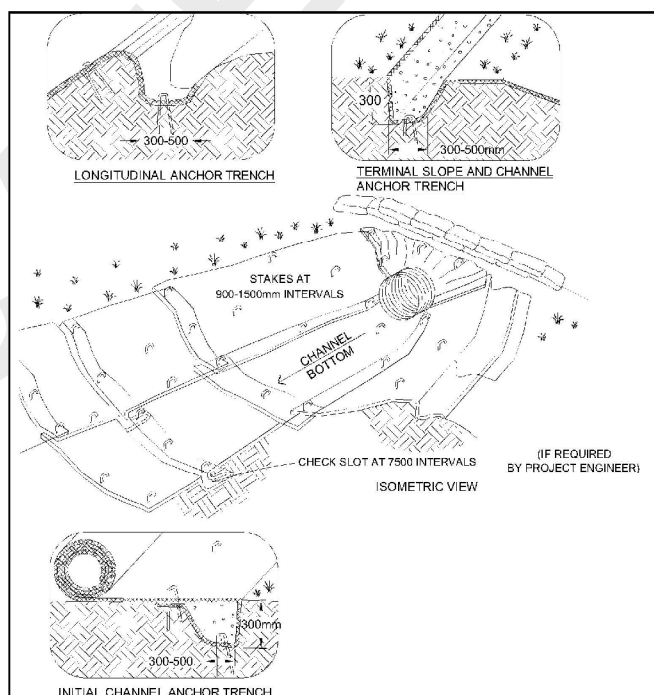
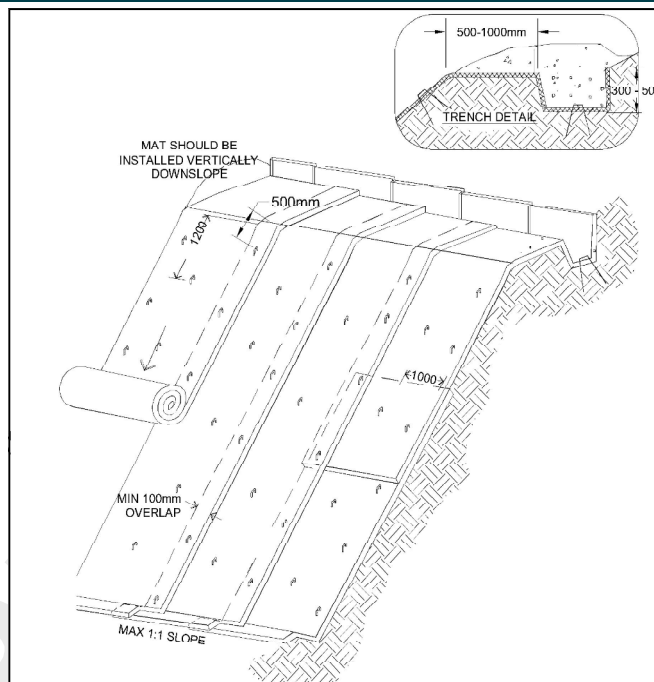
Fixing mats on membranes

When using reinforced MacMat on top of waterproofing synthetic membranes and geosynthetic clay liners, fixing pins should not be used as they will puncture the membrane. Mats are simply anchored in the top trench and, if necessary, in intermediate berm trenches. These applications may have specific technical and installation requirements.

Finishing

Brush topsoil to a depth of 20mm into the three-dimensional matrix of the MacMat® to cover the mat.

For further details, guidance and project specific assistance, please contact your local Maccaferri office.



Please note that these products cannot guarantee vegetation establishment. This is a function of numerous variables including the quality of topsoil, presence of nutrients, moisture, viable seeds and appropriate sunlight and oxygen. Please consult Maccaferri for further guidance.

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Bureau Veritas Certified Quality System Company
with SINCERT and UKAS accreditation.

LOCALLY GRADE TO FALL AWAY FROM ADJACENT PROPERTY (TOWARDS KAURI PINE STREET). LOCAL TREATMENT OF EXISTING EARTH KNOB TO BE ASSESSED AND DIRECTED BY GEOTECHNICAL ENGINEER ON SITE DURING CONSTRUCTION.

100mm
LONG
WORKS TO
CENT

Transverse earth bunds
(dimensions by Civil
Designer)

FUTURE CHILDCARE
CENTRE

ULTIMATE RETAINING WALL ON
BOUNDARY PART OF CHILDCARE WORKS

Concrete lined swale
along toe (dimensions by
Civil Designer)

MacMat Installed as per
manufactures
specifications

MacMatR fixed to slope at
crest and toe via N28
catenary bolts

Shotcrete tied into crest drain
6m N28 anchors 2.5V3H

Shotcrete across fill
1.5m N28 2.5V3H

MAINTAINED FROM TOP OF
FACTOR TO ENSURE FINAL SURFACE
ACCEPTABLE AND SUITABLE AS
QUALIFIED GEOTECHNICAL ENGINEER

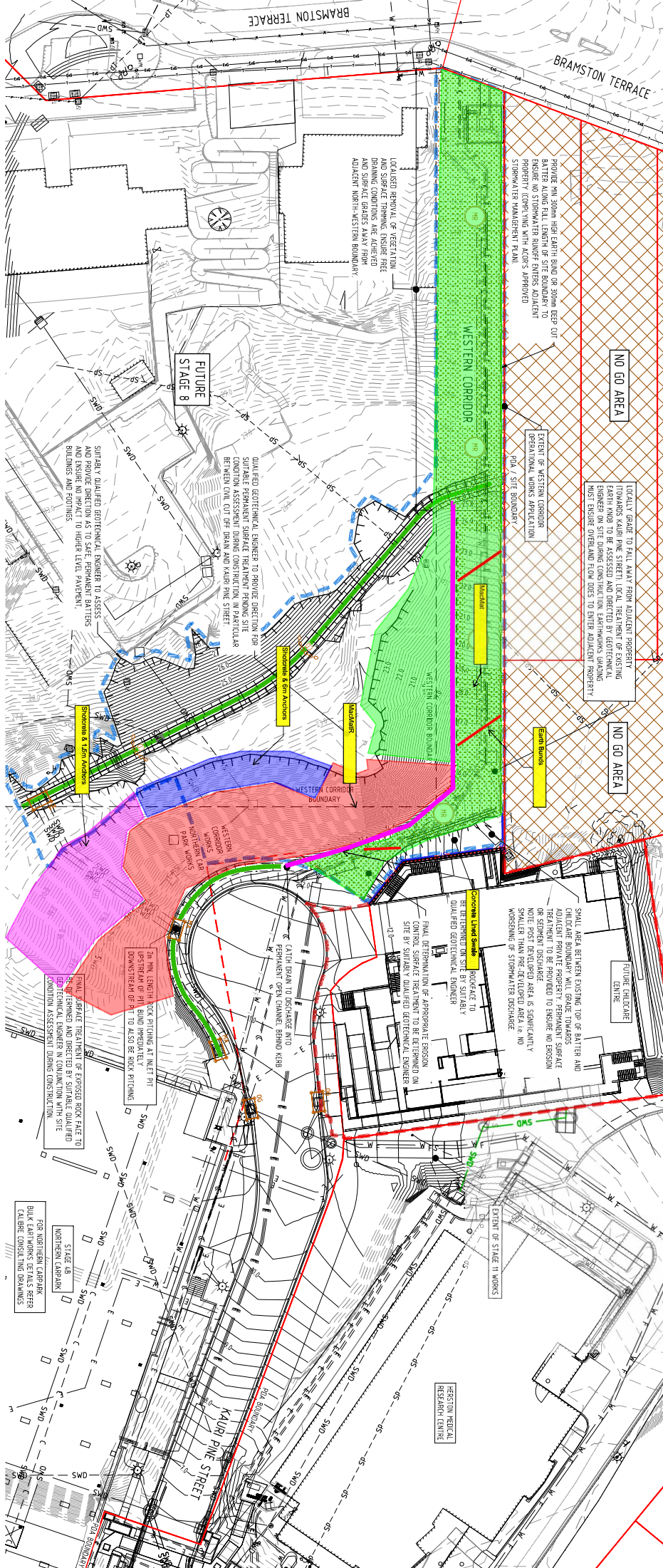
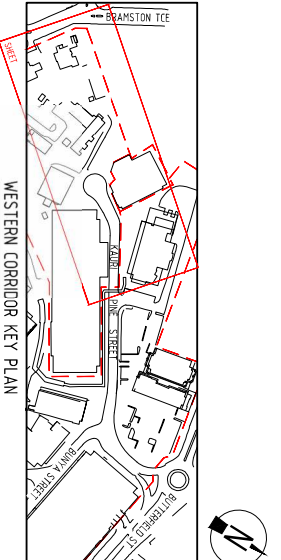
PROVIDE CUT-OFF DRAIN TO CONVEY
FLOWS FROM UPSTREAM CATCHMENT

ALL EARTHWORKS PROFILES ARE INDICATIVE, WITH FINAL PROFILES TO
BE CONFIRMED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER. FINAL
SUBSURFACE STRATA IS EXPOSED. FINAL LOCATION OF CUT-OFF DRAIN
SAG (COLLECTION OF RUNOFF) TO BE CONFIRMED, PENDING FINAL
EARTHWORKS GRADING, AS DIRECTED BY GEOTECHNICAL ENGINEER.

PROVIDE CUT-OFF DRAIN TO CONVEY Q100
FLOWS FROM UPSTREAM CATCHMENT.

REFER TO GEOTECHNICAL DETAILS FOR 1
(INCLUDING ANY ASSOCIATED SURFACE
ASSOCIATED WITH CUT BATTER AND BE
OF CIVIL CUT-OFF DRAIN.







 AT ORIGINAL SIZE (A4)

[illegible]

**PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL**Approval no: **DEV20219/1011**Date: **25 November 2024**

Investigation Summary Report

Client	J. Hutchinson Pty Ltd	Project No.	97105.12
Project	Proposed Carpark	Date	12 June 2024
Address	Research Rd, Herston QLD	Reference	R.038.Rev1

As requested by J. Hutchinson Pty Ltd (Hutchies), a senior engineering geologist and principal geotechnical engineer from Douglas Partners Pty Ltd (Douglas) carried out inspections at the above site on 12 April and 4 June 2024. The aim of the inspection was to assess the temporary stability of a cut batter at the above mentioned site.

At the time of the inspection, the excavated batter face was cut generally facing the east-northeast cut at a 40° - 50° angle above the horizontal reducing to 30° as the batter faced the north east. The batter was up to 12 m high. The material observed in the batter face generally comprised low to medium strength phyllite. A layer of fill increasing in depth up to 5 m thick as the batter approaches the south was observed. A horizontal shear was observed approximately 3 m from the crest of the batter. The material above the shear indicated signs of deterioration, understood to have been exasabated by vibratory methods used during compaction of the materials on the crest above. A power pole had been removed since Douglas' previous inspection on 12 April and the batter surrounding shaped marginally reducing its steepness.

Douglas advised site personnel to ensure no surcharge loads including equipment (such as vibratory rollers) and materials are to be placed in the zone behind the batter crest equal to the batter height.

It is understood that the timeframe for the batter remaining in the current configuration is currently unknown. Douglas is therefore assessing the batter as remaining in the current configuration for a semi-permanent timeframe (ie greater than one year).

Photographs of the batter taken at the time of the inspections and provided by the client are presented in Figures 1 and 2.

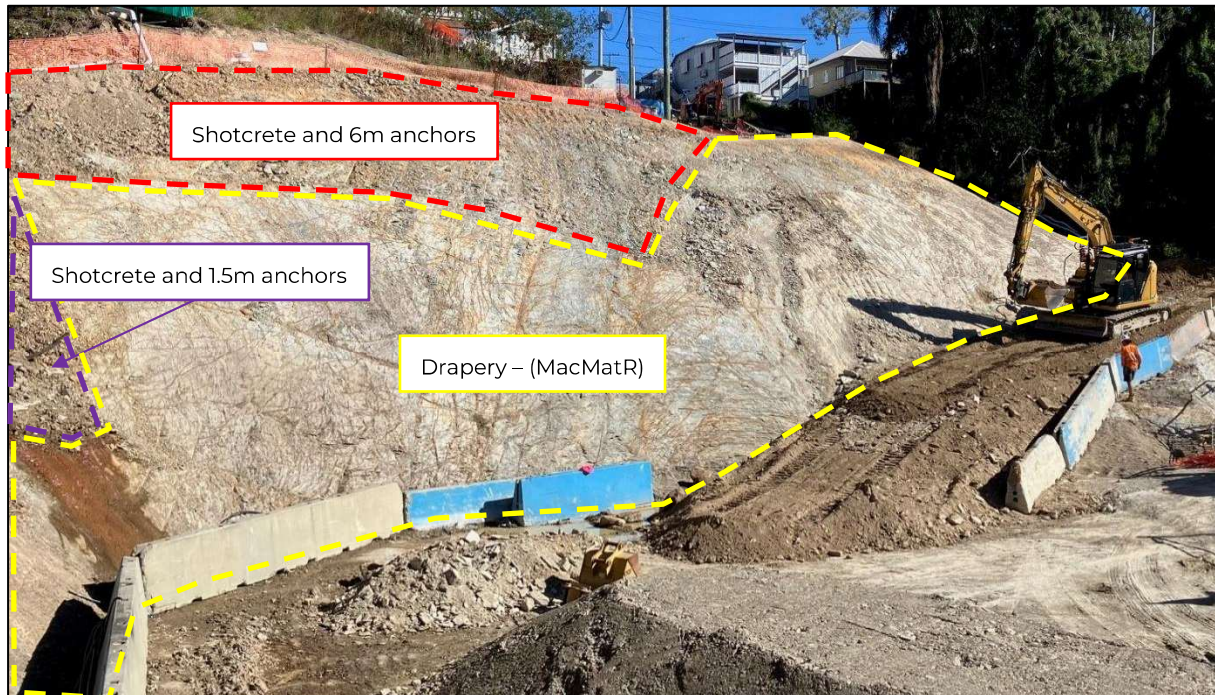


Figure 1: View of the batter looking approximately northeast with indicative retention treatment extent marked up.

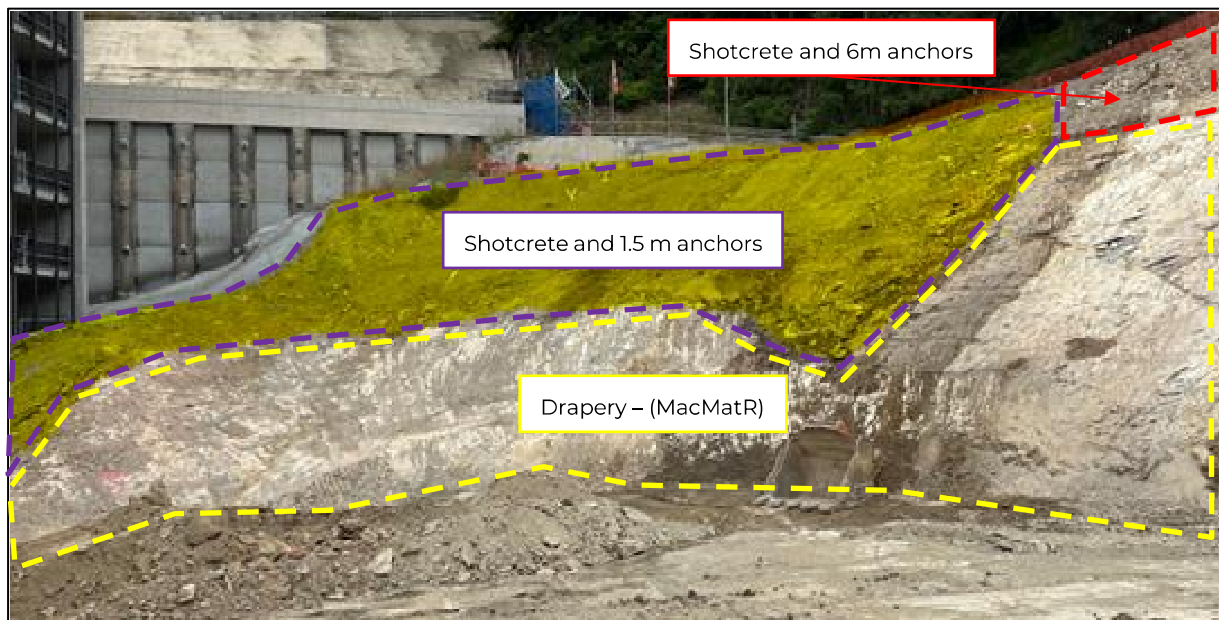


Figure 2: View of the batter looking approximately south with indicative retention treatment extent marked up.

In order to ensure slope stability and reduce the residual rockfall risk it is advised temporary stabilisation measures in the form of passive rock anchors, mesh reinforced shotcrete and rockfall drapery is adopted. The stabilisation extent to be confirmed onsite by a Douglas engineering geologist, is indicatively presented in Figure 1 and 2 and in the attached Drawings.

The area above the shear will require the installation of two rows of passive rock anchors at locations nominated by Douglas engineering geologist and mesh reinforced shotcrete as outlined in Table 1 below:

Table 1: Passive Rock Anchor Details – Material above shear

Anchor Diameter (mm)	Hole Diameter (mm)	Hole Length (m)	Inclination (°)	Indicative Horizontal Spacing (m)	Indicative Vertical Spacing (m)
28	125	6.0	25	3.0	2.5

Shotcrete should be extended across the fill and fractured zone above the shear, 1 m beyond the crest and 0.5 m below the competent rock/horizontal shear. It is understood a swale drain will be constructed along the crest of the batter. The swale drain should be concrete lined to ensure no water infiltration into the batter.

The shotcrete across the fill will also require the installation of dowels as outlined in Table 2.

Table 12: Passive Dowel Details – Shotcrete overlying fill

Anchor Diameter (mm)	Hole Diameter (mm)	Hole Length (m)	Inclination (°)	Horizontal Spacing (m)	Vertical Spacing (m)
28	125	1.5	25	3.0	2.5

The final locations and extent of the anchors and shotcrete are to be set out by a Douglas engineering geologist. The rock anchors and shotcrete would also need to comply with the following requirements:

- GEWI Threadbar or similar;
- All retention elements to be galvanized for corrosion protection;
- anchors grouted full length (up to 150 mm of un-grouted length at front allowed, to be filled during shotcrete spray);
- drill holes advanced using air percussion methods with suitable casing if necessary;
- centralisers provided for all anchors at a maximum spacing of 750 mm. The first and last centralisers within 300 mm from ends;
- grout strength 32 MPa and grouting of anchors is carried out within 24 hours of drilling;
- vertical strip drains spaced at 3m centres (between columns of anchors), SD 200 type and 200 mm wide to exit face via weephole;

- SL81 galvanised steel reinforcing mesh of D500L grade or similar;
- reinforcing mesh (for shotcrete) secured to each anchor using minimum 200 mm square steel plate, with appropriate galvanised reinforcement bar nut;
- adequate reinforcement cover provided over strip drains;
- batter face cleared/lightly scraped of loose and organic material, and moistened prior to application of shotcrete;
- shotcrete strength minimum 32 MPa at 28 days curing time; and
- shotcrete thickness minimum 150 mm. and not greater than 250 mm where significant overbreak occurs it should be treated separately to ensure excessive load does not drag down the anchor head.

In addition to the shotcrete and anchors, drapery should be installed below the horizontal shear to reduce the residual rockfall risk. The drapery should comprise Maccaferri MacMatR or similarly engineered mesh and geocomposite system.

The drapery should be suitably fixed to the slope by a 14 mm catenary wire supported by dowel pins at the toe and crest of the slope.

Catenary dowels shall comprise N28 GEWI Threadbar dowels that are 1.5m minimum in length with 200 mm square plates. The dowels along the crest and toe of the slope should be spaced at maximum 3 m horizontal centres. Drapery mesh and associated components should have adequate protection against corrosion, including as a minimum, galvanised and PVC coating or similar.

A geotechnical engineer or an engineering geologist experienced in anchor design and installation should frequently inspect the work.

Where the slope angle is less than 30 degrees hydromulching may be utilised in lieu of the drapery MacMatR system. The suitability of hydromulching the slope should be determined by suitably qualified personnel familiar with the limitations of hydromulching and the maximum slope angle at which it can be applied.

This report should be read in conjunction with the attached notes "About this Inspection Report".

We trust the above is satisfactory for your current needs.

Yours faithfully

Douglas Partners Pty Ltd

Shan Vanderstukken
Geotechnical Engineer



Robert Thomson
Senior Engineering Geologist

Reviewed by



David Qualischefski
Principal

Attachments:

About this Inspection Report
MacMatR Datasheet
MacMatR Installation Notes
Drawing - Site Plan
Drawing – Cross Sections

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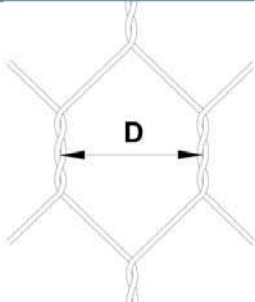
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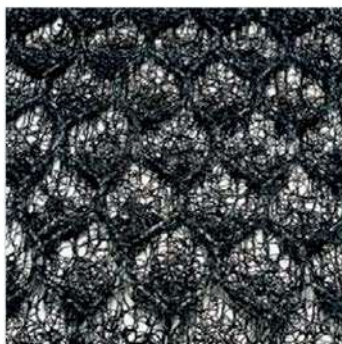
MACMAT-R

PVC GALFAN GALVANISED 6 / 2.2

SPECIFICATIONS

PROPERTIES

Type	Double twist hexagonal woven steel wire mesh onto which a 3D geomat matrix is extruded	 D = 60mm (Nominal)
Mesh Type	6 x 8	
Mesh Wire	2.2mm diameter (BS EN 10218-2 & BS EN 10223-3)	
Selvedge Wire	2.7mm diameter (BS EN 10218-2 & BS EN 10223-3)	
Corrosion Protection	Galfan galvanised (95% Zinc + 5% Aluminium Alloy + Mischmetals) coated to BS EN 10244-2 Class A (230 g/m ²) with an extruded grey PVC coating of mean wall thickness of 0.5mm	
Geomat Type	A three dimensional geomat of entangled polypropylene monofilaments, heat bonded at contact points, 10mm thick with a void space of 90%.	
Roll Size / Weight	2m x 25m (Roll Weight = 90 kg (Nominal))	
Jointing	All joints and connections shall be formed with continuous 2.2mm PVC Galfan coated lacing wire and/ or high tensile 3mm diameter Stainless Steel 'C' rings.	
BBA Approval	Maccaferri hexagonal wire mesh is BBA certified for up to 120 years design life. Agrément Certificate No. 95/3141	



Maccaferri reserves the right to alter specifications of its products without notice.
Please contact us for the most up to date specifications.

Maccaferri NZ Ltd

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Tel. (+64) 9 6346495 - Fax (+64) 9 6346492, FREEPHONE 0800 60 60 20
E-mail: sales@maccaferri.com - Web site: www.maccaferri.co.nz
Quality System AS/NZS ISO 9001:2000

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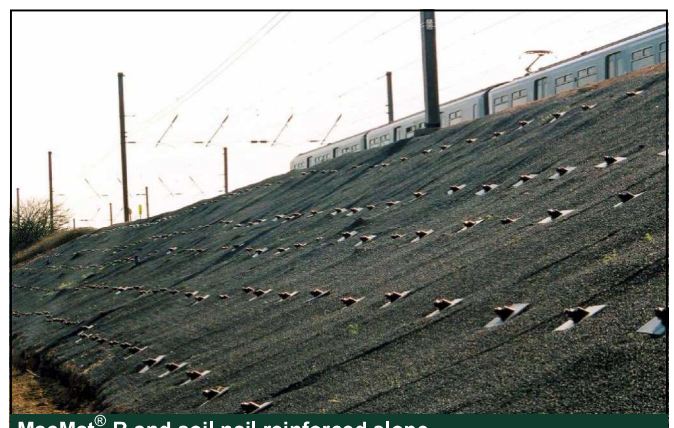
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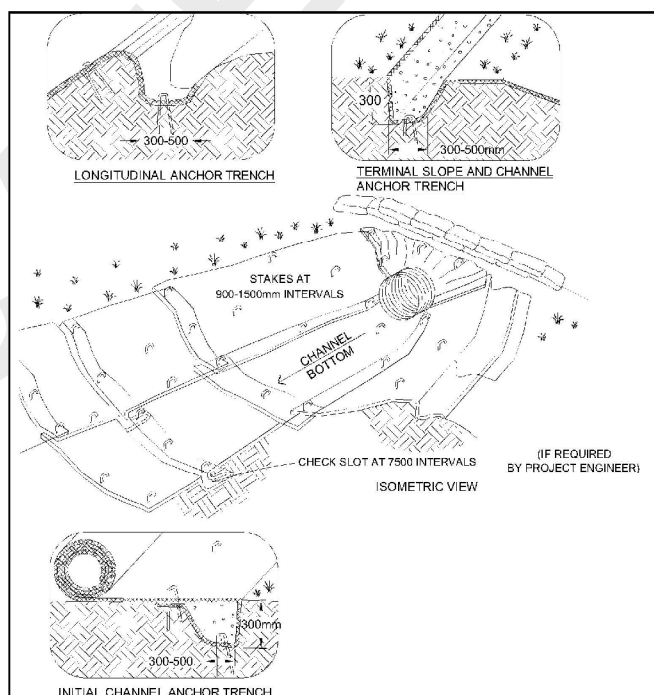
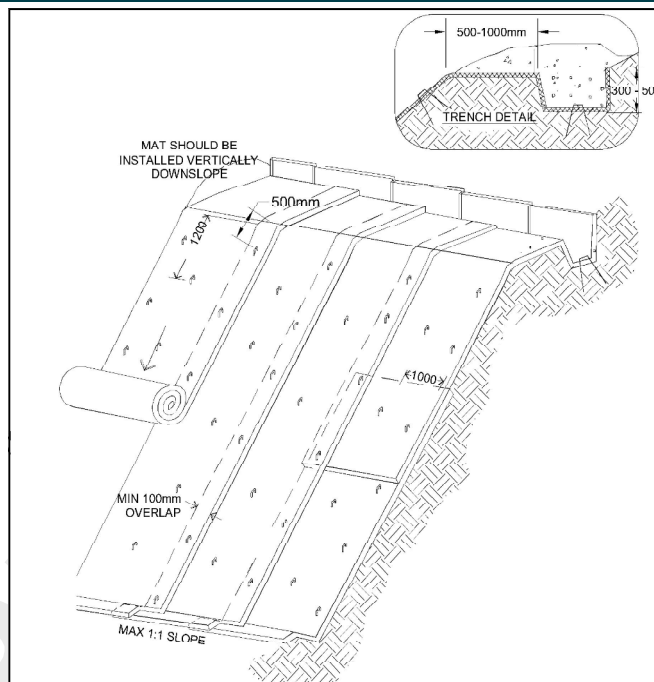
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100mm
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FUTURE CHILDCARE
CENTRE

BOUNDARY

ULTIMATE RETAINING WALL ON
BOUNDARY PART OF CHILDCARE WORKS

Potential to utilise
hydromulch instead of
MacMatR where slope
<30 degrees: Landscaper
should be consulted
regarding suitability

MacMatR fixed to slope at
crest and toe via N28
catenary bolts

Shotcrete tied into crest drain
6m N28 anchors 2.5V3H

Shotcrete across fill
1.5m N28 2.5V3H

MAINTAINED FROM TOP OF
ACTOR TO ENSURE FINAL SURFACE
ACCEPTABLE AND SUITABLE AS
QUALIFIED GEOTECHNICAL ENGINEER

PROVIDE CUT-OFF DRAIN TO CONVEY
FLOWS FROM UPSTREAM CATCHMENT

ALL EARTHWORKS PROFILES ARE INDICATIVE, WITH FINAL PROFILE TO
BE CONFIRMED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER. FINAL
SUBSURFACE STRATA IS EXPOSED. FINAL LOCATION OF CUT-OFF DRAIN
SAG (COLLECTION OF RUNOFF) TO BE CONFIRMED, PENDING FINAL
EARTHWORKS GRADING, AS DIRECTED BY GEOTECHNICAL ENGINEER.

PROVIDE CUT-OFF DRAIN TO CONVEY Q100
FLOWS FROM UPSTREAM CATCHMENT.

REFER TO GEOTECHNICAL DETAILS FOR 1
(INCLUDING ANY ASSOCIATED SURFACE
ASSOCIATED WITH CUT BATTER AND BE
OF CIVIL CUT-OFF DRAIN.



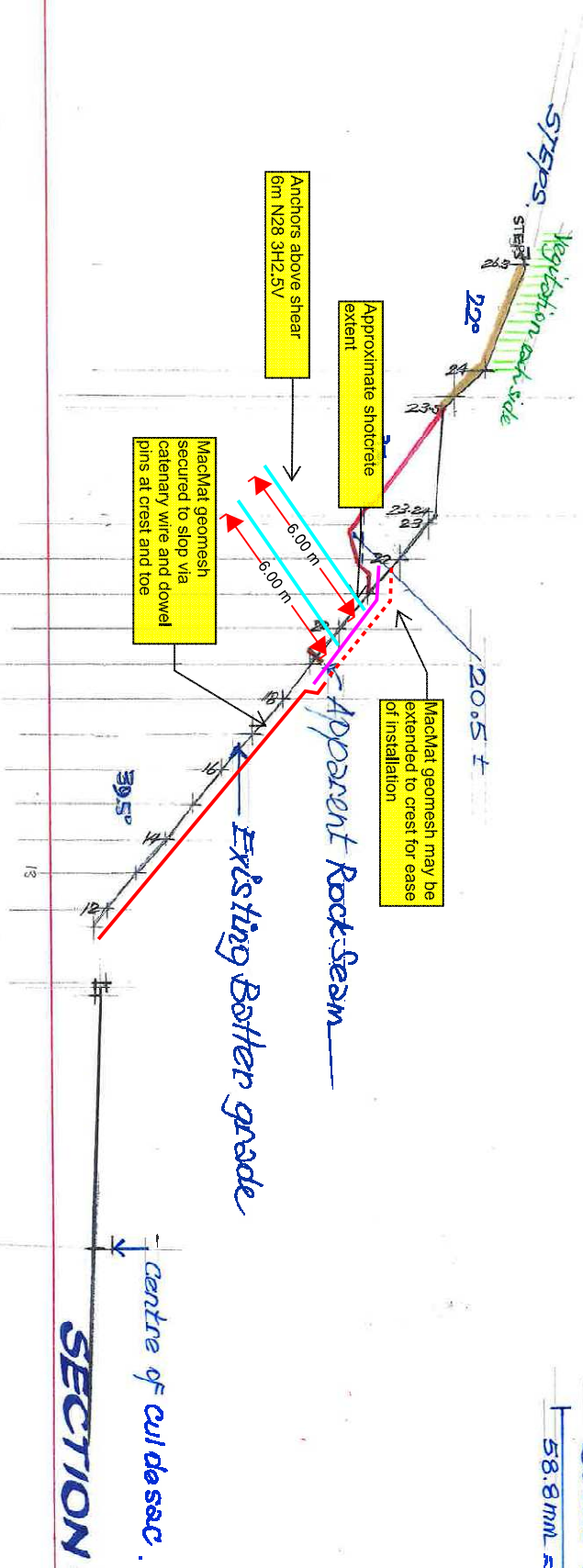
Scale 1:170 @ A3
58.8mm = 10m



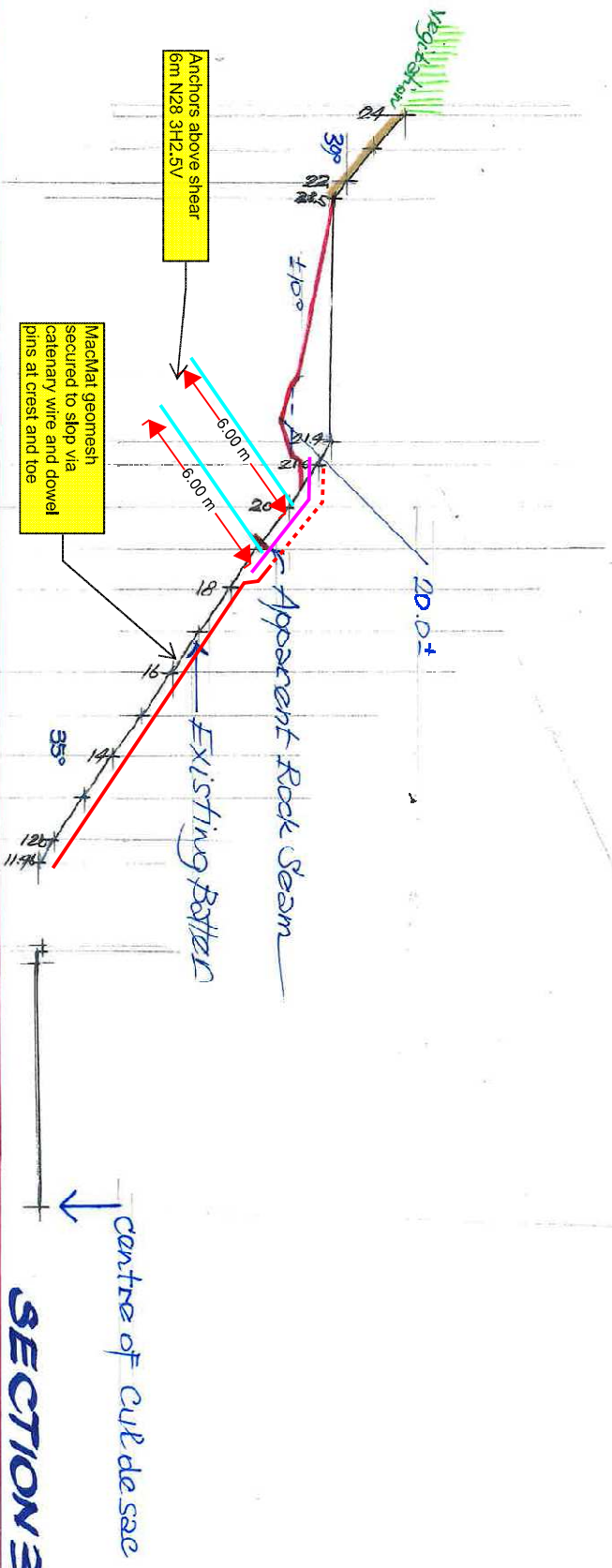
HERSTON QUARTER Batters West of Culdesac

SCALE 1:170 @ A3
58.8mm ± 10m

SECTION 4

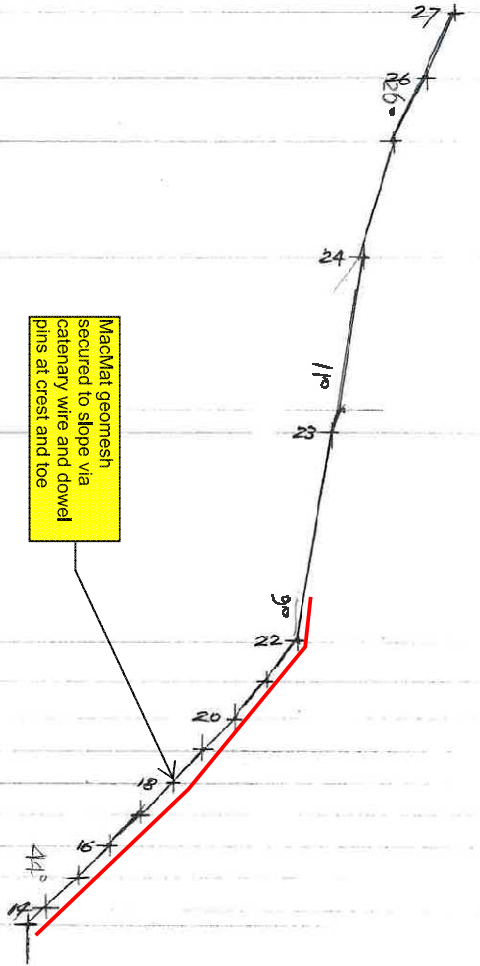


SECTION 3



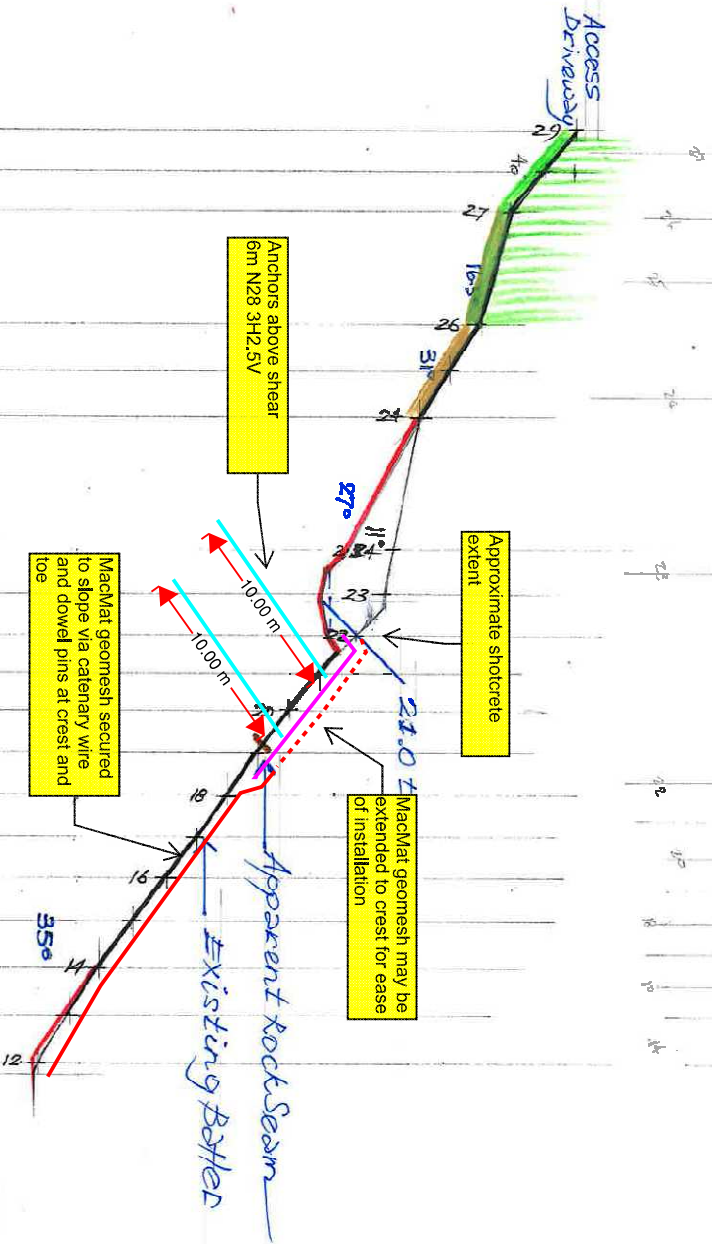
HERSTON QUARTER Batters West of Culdesac

Scale 1:170 @ A3
58.8mm = 10m



SECTION 6

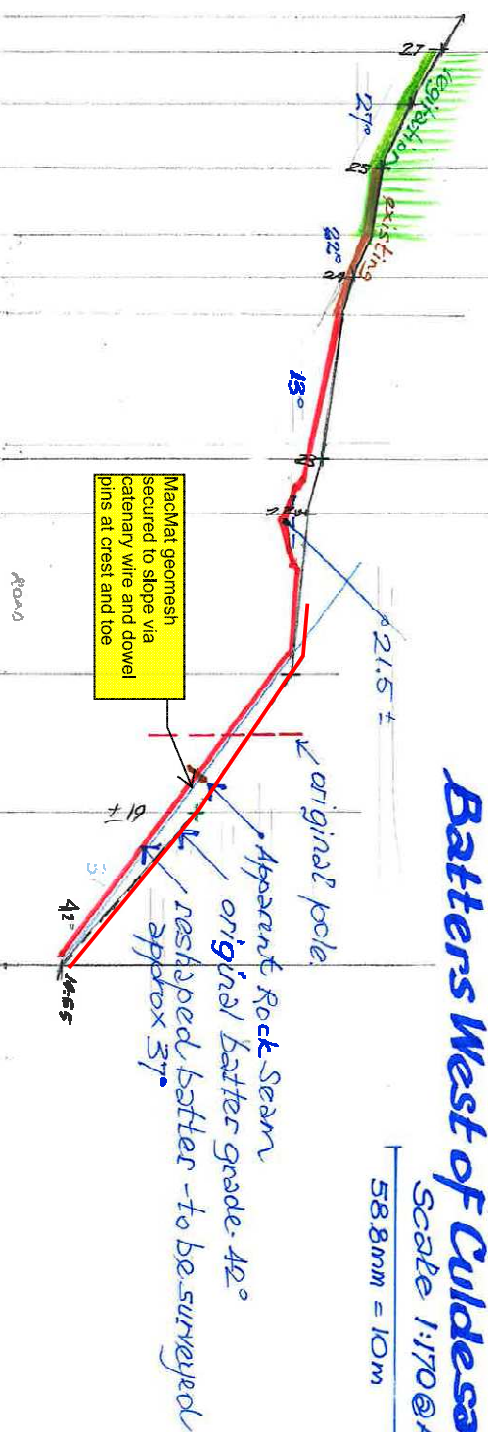
Similar to Section 7



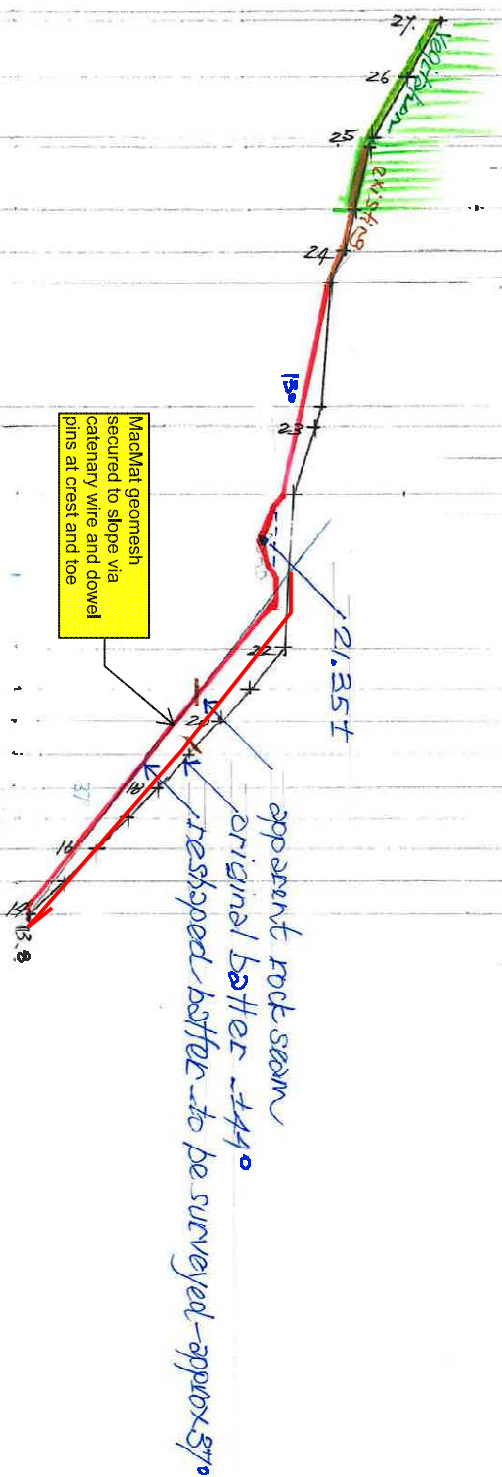
SECTION 5

HERSTON QUARTER Batters West of Cuddeasac

Scale 1:170 @ A3
58.8mm = 10m



SECTION 8



SECTION 7

NOTES:

SEDIMENT CONTROL

1. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE IN ACCORDANCE WITH INTERNATIONAL EROSION CONTROL ASSOCIATION (IECA) AUSTRALIA GUIDELINES AND THE SPECIFICATIONS.
2. EROSION AND SEDIMENT CONTROL DETAILS SHOWN ARE MINIMUM REQUIREMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL ADDITIONAL CONTROL MEASURES AS DEEMED NECESSARY THROUGHOUT CONSTRUCTION.
3. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN ALL SEDIMENT CONTROL DEVICES IN A FUNCTIONAL ORDER AND REPAIR ALL BLOCKED SEDIMENT DEVICES AS REQUIRED UNTIL SUCCESSFUL OFF MAINTENANCE OF WORKS.
4. CONSTRUCTION OF ALL SEDIMENT MANAGEMENT DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT SHALL BE COMPLETED AND EFFECTIVE PRIOR TO:
 - a. STRIPPING OF TOPSOIL AND GRASS
 - b. BULK EARTHWORKS TO THE SITE
 - c. SERVICES INSTALLATION
 - d. PAVEMENT CONSTRUCTION
5. ALL SEDIMENT MANAGEMENT MEASURES ARE TO REMAIN IN PLACE UNTIL INSTRUCTION IS RECEIVED IN WRITING FROM THE SUPERINTENDENT TO REMOVE ALL OR PART OF THE SILT CONTROL APPLICATIONS.
6. THE BULK EARTHWORKS AND SEDIMENT CONTROL LAYOUT PLAN SHALL BE READ IN CONJUNCTION WITH THE APPROVED DRAWINGS.
7. PRIOR TO COMMENCEMENT OF CONSTRUCTION APPROVAL IS TO BE OBTAINED FROM THE SUPERINTENDENT FOR THE LOCATION OF THE SITE ACCESS POINT AND WASH DOWN AREA WHICH ARE TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
8. IF EROSION AND SEDIMENT CONTROL DEVICES HAVE BEEN FOUND TO BE DEFICIENT OR FAILED IN SERVICE, CORRECTIVE ACTION IS TO BE UNDERTAKEN IMMEDIATELY WHICH MAY INCLUDE AMENDMENTS TO THE ORIGINAL APPROVED EROSION CONTROL PLANS. SUCH AMENDMENTS ARE TO BE APPROVED BY SUPERINTENDENT, IF DEEMED NECESSARY AND RELEVANT.

OVERALL

- a. TEMPORARY DRAINAGE CONTROL FLOW SHOULD BE DIVERTED AROUND THE WORK SITE WHERE POSSIBLE.
- b. ALL DRAINAGE, EROSION AND SEDIMENT CONTROLS TO BE INSTALLED AND BE OPERATIONAL BEFORE COMMENCEMENT OF SLOPE EARTHWORKS.
- c. EARTHWORKS ARE TO BE CONFINED TO THE CONTROLLED EXPOSED SURFACES TO BE CUT. WHEN COVERED WITH GEOTEXTILES OR TOWNS IF EARTHWORKS ARE EXPECTED TO BE DELAYED FOR MORE THAN 14 DAYS.

SEDIMENT FENCE

FOR SEDIMENT FENCE STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWINGS SP-01 AND SP-02 SEDIMENT FENCE.

TEMPORARY CONSTRUCTION ENTRY/EXIT

11. GIVEN THE SMALL SITE AND CONSTRAINED NATURE OF THE SITE, THE CONTRACTOR SHALL ARRANGE FOR APPROPRIATE ENTRY/EXIT FOR CONSTRUCTION PURPOSES. DETAIL AND SPECIFICATION SHOULD BE GENERALLY IN ACCORDANCE WITH INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES.

IECA STANDARD DRAWINGS REGISTER	
DRAWING NUMBER	DRAWINGS DESCRIPTION
CD-01	CATCH BASINS - GENERAL
CD-05	CATCH BASINS - ROCK LINER
MA-01	WESPA AND AGGREGATE FILTER NET PROTECTION
MA-02	WESPA AND AGGREGATE FILTER NET PROTECTION
R-01	REVEGETATION - GENERAL

REVEGETATION

12. FOR REVEGETATION STANDARD SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWING R-01 REVEGETATION GENERAL.

FIELD INLET

13. FOR FIELD INLET STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWING ES-02 GRATED STORMWATER FIELD INLET SEDIMENT TRAP.

OPERATION AND MAINTENANCE

14. IN ACCORDANCE WITH BCC ESC GUIDELINES, ALL ESC MEASURES SHALL BE INSPECTED:
 - AT LEAST DAILY (WHEN WORK IS OCCURRING ON SITE) OR WEEKLY (WHEN WORK IS NOT OCCURRING ON SITE) WITHIN 24 HOURS OF EXPECTED RAIN, AND WITHIN 18 HOURS OF A RAINFALL EVENT (IE. AN EVENT OF SUFFICIENT INTENSITY AND DURATION TO MOBILISE SEDIMENT ON SITE).
15. IN ACCORDANCE WITH BCC ESC GUIDELINES, MAINTENANCE OF ESC MEASURES SHALL OCCUR IN ACCORDANCE WITH THE FOLLOWING TABLE:

MAINTENANCE SCHEDULE			
ESC MEASURE	MAINTENANCE TRIGGER	TIMEFRAE FOR COMPLETION OF MAINTENANCE	
OTHER ESC MEASURES	MAINTENANCE	BY THE END OF THE DAY	
OPEN DRAIN	THE CAPACITY OF ESC MEASURES FALLS BELOW 75%	PRIOR TO THE NEXT STORM	
	IF LUNING HAS BEEN MAINTAINED / TOWN / DRAINAGE DEPT. HAS BEEN ADVISED	PRIOR TO THE NEXT STORM	
SEDIMENT FENCE	IF PROPOSED SEDIMENT HAS REDUCED CAPACITY OF BARRIN OR DEPTH OF SILT EXCEEDS 300MM	PRIOR TO THE NEXT STORM	
	IF FENCE IS DAMAGED OR HAS FALLEN DOWN	PRIOR TO THE NEXT STORM	
BUNDING	THE CAPACITY OF THE FENCE FALLS BELOW 75%	PRIOR TO THE NEXT STORM	
	IF FENCE OR BUNDING HAS BEEN DAMAGED	PRIOR TO THE NEXT STORM	

GENERAL

16. CIVIL CONTRACTOR IS TO PROVIDE AN UPDATED PROGRAM OF ESC MAINTENANCE AND CONTROL OF ALL STAGES OF WORK FOR APPROVAL BY THE SUPERINTENDENT.
- *DRAWINGS TO BE READ IN CONJUNCTION WITH INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWINGS AND SPECIFICATIONS.

ORDER OF CONSTRUCTION OF SEDIMENT AND EROSION CONTROL METHODS	
PRE CONSTRUCTION	DURING CONSTRUCTION
1. IDENTIFY THE EXTREMITIES OF SITE OF WORKS AND AREAS TO BE DISTURBED BY WORKS. 2. INSTALL PERIMETER SEDIMENT FENCE. 3. CLEAR AREAS OF VEGETATION AS NECESSARY IN ORDER TO CARRY OUT WORKS. 4. AFTER CLEARING RE-ASSESS AREAS OF DISTURBANCE AND INSTALL ADDITIONAL SEDIMENT CONTROL DEVICES AS NECESSARY TO SUIT SITE CONDITIONS.	1. DRAINAGE CONSTRUCTION PHASING AND IMPLEMENT AND MAINTAIN SEDIMENT AND EROSION CONTROL DEVICES AS DETAILLED ON THE DRAWINGS. 2. CARRY OUT INSPECTIONS TO ENSURE THE SEDIMENT AND EROSION CONTROL DEVICES ARE MAINTAINED IN WORKING ORDER. INSPECTIONS SHALL BE CARRIED OUT: - AT LEAST DAILY WHEN RAIN IS OCCURRING - AT LEAST WEEKLY EVEN IF WORK IS NOT BEING CARRIED OUT ON SITE 3. REPAIR, REINSTATE AND OR MODIFY INSTALLED EROSION AND SEDIMENT CONTROL DEVICES AS NECESSARY TO SUIT CHANGING SITE CONDITIONS. UNDER TAKE PROGRESSIVE REVEGETATION OF THE SITE AS STAGES OF THE WORKS ARE COMPLETED.
POST CONSTRUCTION	1. MONITOR THE PERFORMANCE OF THE DEVICES DURING THE MAINTENANCE PERIOD. 2. REMOVE EROSION AND SEDIMENT CONTROL DEVICES ONCE REVEGETATION OF THE SITE IS SUFFICIENT TO CONTROL EROSION AND SEDIMENT RUNOFF.

Item	Drawn	Checked	By	Chk
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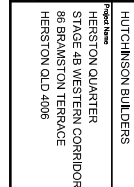
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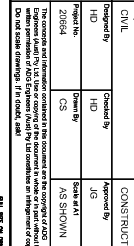
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Australian Unity



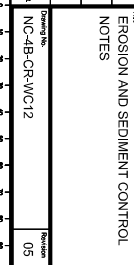
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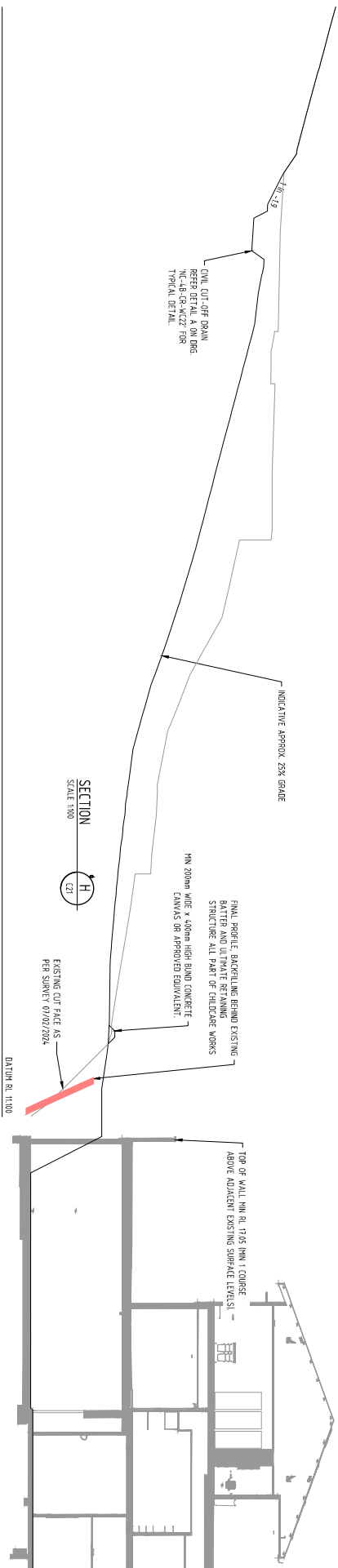
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PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: **DEV20219/1011**

Date: **25 November 2024**


Queensland
GOVERNMENT

AT ORIGINAL SIZE (A1)

[illegible]

KAURI PINE STREET



KAURI PINE STREET

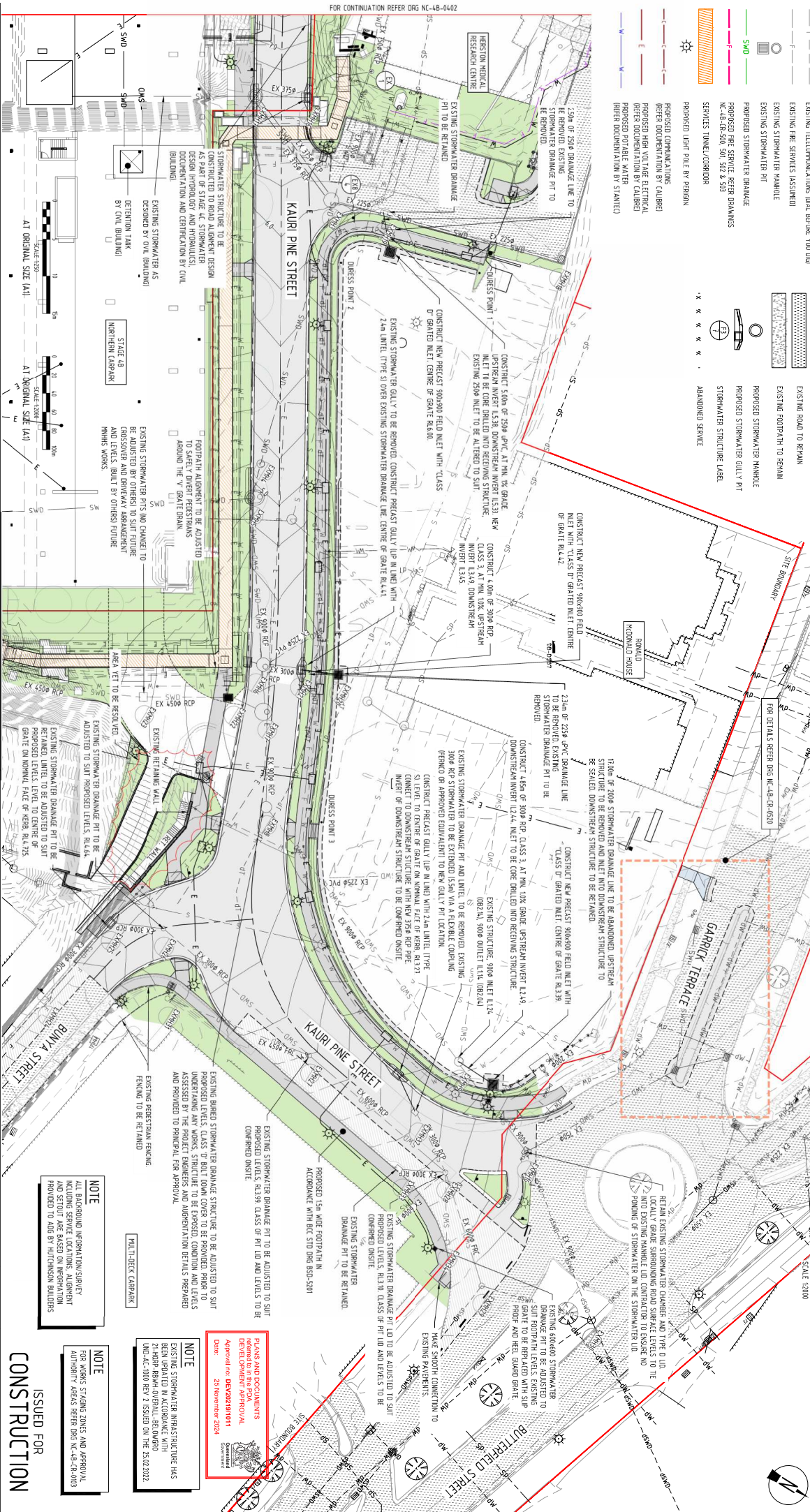


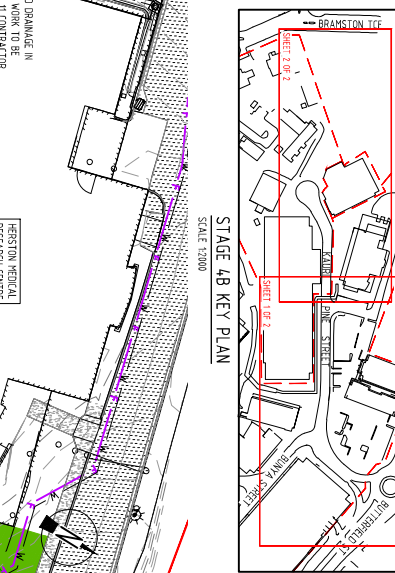
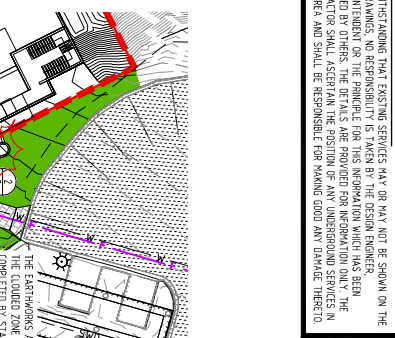
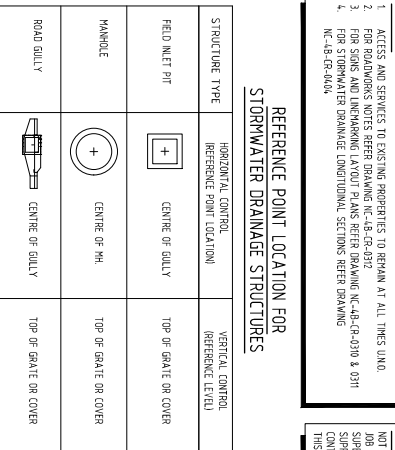
AT ORIGINAL SIZE (A1)

ISSUED FOR
CONSTRUCTION

 HERSTON Australian Unity		 ADG Bulk Earthworks		Client FULCHINSON BUILDERS HERSTON QUARTER STAGE 4B WESTERN CORRIDOR 86 BRAMSTON TERRACE HERSTON QLD 4006	
 ADG Bulk Earthworks		Discipline CIVIL		Initials CONSTRUCTION	
Project Name HERSTON QUARTER STAGE 4B WESTERN CORRIDOR 86 BRAMSTON TERRACE HERSTON QLD 4006		Designed by JR		Approved by JG	
Project No. Z0044		Drawn by CS		Scale AS SHOWN	
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Do not scale drawings if in colour, take		Do not scale drawings if in colour, take		Do not scale drawings if in colour, take	
Full size of drawing: 0		Full size of drawing: 0		Full size of drawing: 0	
NC-4B-CR-WC24		NC-4B-CR-WC24		NC-4B-CR-WC24	
02		02		02	

STORMWATER DRAINAGE PLAN LAYOUT SHEET 1 OF 2	Revision H
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[illegible]

[illegible]

STRUCTURE NAME	1-1	2-1	3-1	4-1	5-1	6-1	EX-1	7-1
STRUCTURE DESCRIPTION	FIELD INLET (SAG) TYPE 1 900x900 REFER BCC BSD-8091 PIT TO HAVE OCEANGUARD INSTALLED	FIELD INLET (SAG) TYPE 1 1200x1200 REFER BCC BSD-8091 PIT TO HAVE OCEANGUARD INSTALLED	GULLY PIT KERB IN LINE 2.4m LINTEL OVER 1050 DIA MANHOLE PIT TO HAVE OCEANGUARD INSTALLED	MAINTENANCE HOLE 1200mm DIA REFER BCC BSD-8021	MAINTENANCE HOLE 1050mm DIA REFER BCC BSD-8021	CUSTOM FIELD INLET (SAG) WITH 1200x1200 DOME TOP GRATE REFER DETAIL	EXISTING STRUCTURE	EXISTING STRUCTURE

STRUCTURE NAME	1-2	4-1	1-3	2-3	3-3	6-1
STRUCTURE DESCRIPTION	GULLY PIT KERB IN LINE 2.4m LINTEL REFER BCC BSD-8052, BSD-8079 PIT TO HAVE OCEANGUARD INSTALLED	MAINTENANCE HOLE 1200mm DIA REFER BCC BSD-8021	HEADWALL	JUNCTION PIT REFER DETAIL	MAINTENANCE HOLE 1050mm DIA REFER BCC BSD-8021	FIELD INLET (SAG) 1200x1200 DOME GRATE REFER DETAIL

STRUCTURE NAME	4-1	SQID	5-1
STRUCTURE DESCRIPTION	MAINTENANCE HOLE 1200mm DIA REFER BCC BSD-8021	STORMWATER QUALITY IMPROVEMENT DEVICE - REFER MANUFACTURERS SPEC	MAINTENANCE HOLE 1050mm DIA REFER BCC BSD-8021

CONTRACTORS NOTE:

THE PIPE CLASSES HAVE BEEN DESIGNED FOR SERVICE LOADS ONLY. THE CONTRACTOR SHALL ASSESS ANTICIPATED CONSTRUCTION LOADINGS AND UPGRADE PIPE CLASSES AS REQUIRED IN ACCORDANCE WITH AS3795-2007.

GENERAL NOTES:

- GULLY ARE TO BE CONSTRUCTED IN ACCORDANCE WITH B.C.C. STANDARD DRAINING BSD-8051
- GULLY PIT GRATE AND FRAME ARE TO BE CONSTRUCTED IN ACCORDANCE WITH B.C.C. STANDARD DRAINING BSD-8053 AND BSD-8054
- ACCESS CHAMBERS TO BE CONSTRUCTED IN ACCORDANCE WITH B.C.C. STANDARD DRAINING BSD-8021
- STEP RIGGS TO BE INSTALLED IN ALL PITS AND ACCESS CHAMBERS IN EXCESS OF 1.2m DEEP
- ALL RCP'S TO BE A MINIMUM CLASS '3' UNLESS NOTED OTHERWISE
- ALL GULLY PITS DEEPER THAN 1.5m TO BE CONSTRUCTED IN ACCORDANCE WITH OTHER STANDARD DRAINING NOTATION UNLESS NOTED OTHERWISE

CONSTRUCTION HOLD POINT:

ONCE THE BASE OF MANHOLE, INSPECTION PITS, CHAMBERS AND ACCESS CHAMBERS ARE COMPLETED, THE CONTRACTOR SHALL SUBMIT A CONSTRUCTION HOLD POINT REQUEST TO THE SUPERINTENDENT AND/OR ENGINEER HAVE INSPECTED THE WORKS FOR FINISHED LEVELS AND APPROVED CONSTRUCTION TO CONTINUE.

HYDRAULIC GRADE LINE:

GIVEN THE COMPLEX NATURE OF THE STORMWATER REGION, INCLUDING OVERLAPPING SAGS, MULTIPLE DISCHARGES, LOW PIPES, LOW SLOPES, AND SLOPES TO OVERLAP, THIS DESIGN HAS BEEN DEVELOPED FOR MAJOR DOW EVENT.

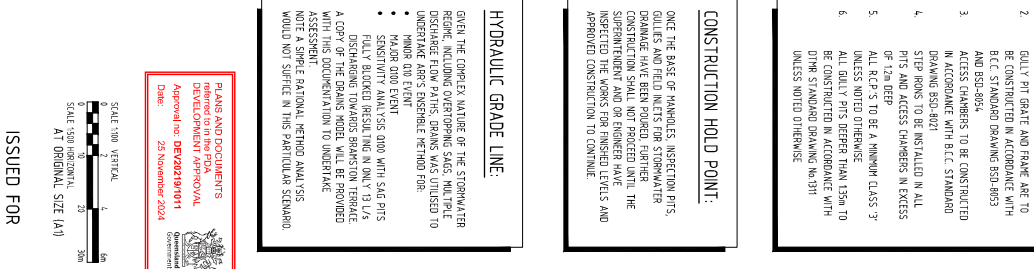
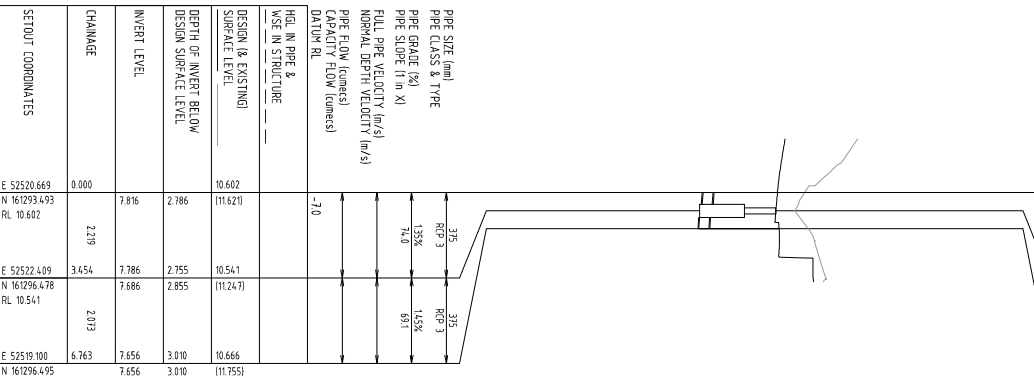
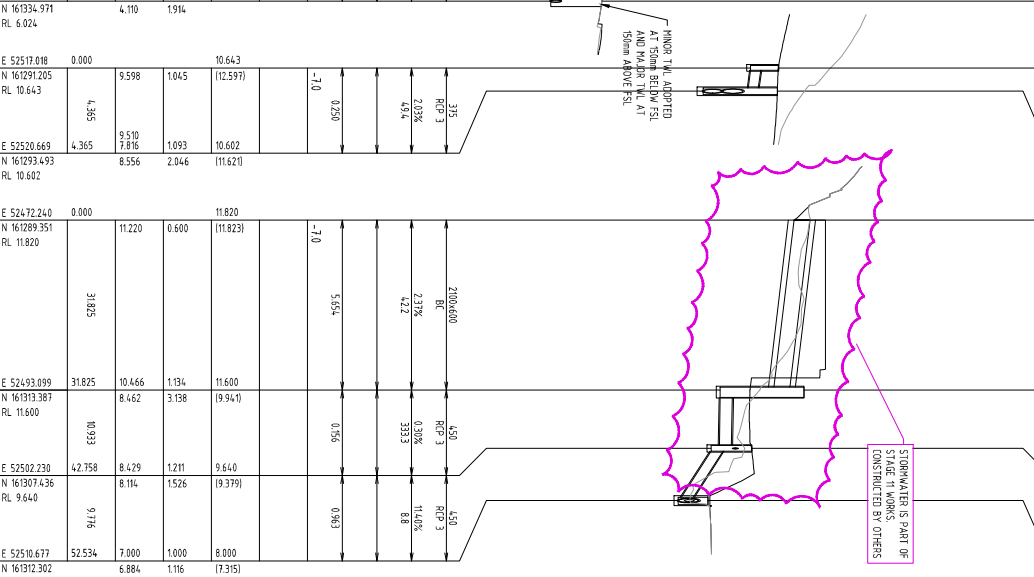
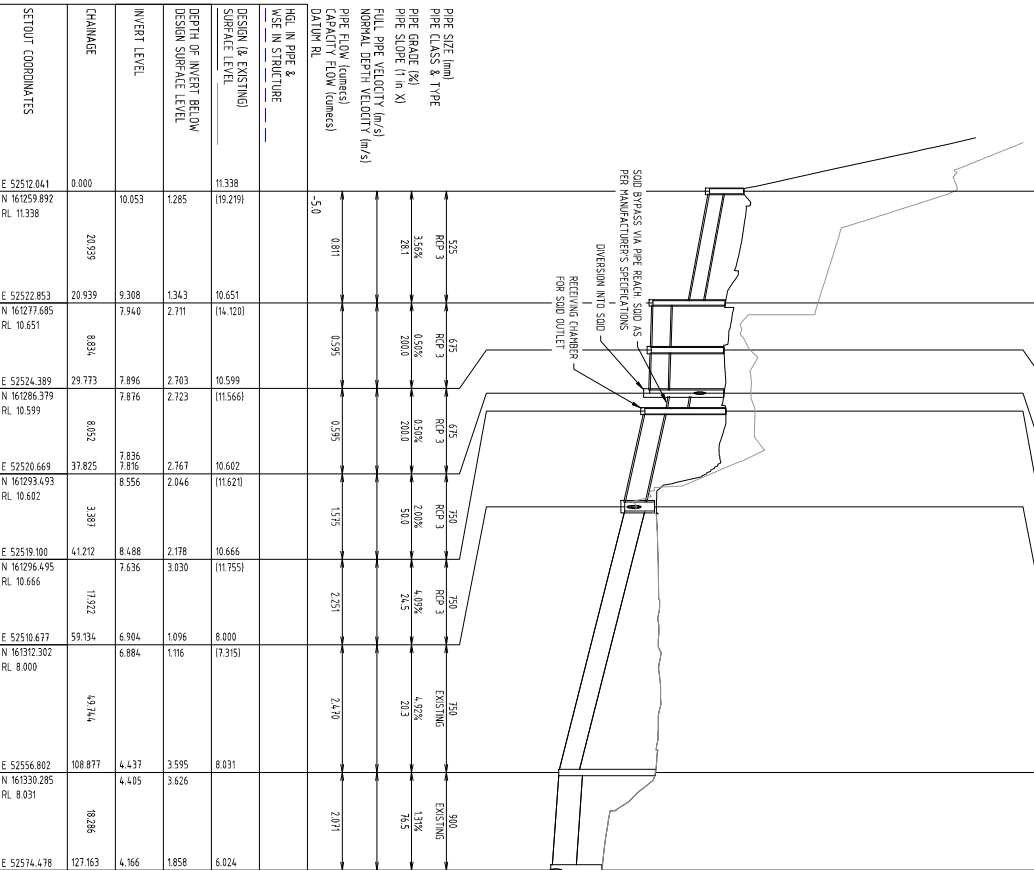
- SENSITIVITY ANALYSIS DONE WITH SAG PITS FULLY BLOCKED RESULTING IN ONLY 13 L/S
- DISCHARGING THROUGH BRANCH OFF TERRACE
- A COMPLEX HYDRAULIC ANALYSIS WAS CONDUCTED WITH THIS DOCUMENTATION TO UNDERSTAND THE ASSESSMENT
- NOTE A SIMPLE RATIONAL METHOD ANALYSIS WOULD NOT SUFFICE IN THIS PARTICULAR SCENARIO.

PLANS AND DOCUMENTS
Referenced to the PCA
DETENTION APPROVAL
Approval no: DE/2022/19/111
Date: 22 November 2024



SCALE 1:500 VERTICAL
0 5 10 15 20 25 30m
SCALE 1:500 HORIZONTAL
0 10 20 30m
AT ORIGINAL SIZE (A1)

ISSUED FOR CONSTRUCTION



LINE	1	2	3
SETOUT COORDINATES	E 52512.041 N 161259.892 RL 11.338	E 52517.018 N 161291.205 RL 10.643	E 52472.240 N 161289.351 RL 11.820
CHAMGE	0.000 20.939 8.834 8.052 3.8825 4.1212 59.134 11.922 4.9114	0.000 9.598 4.355 9.510 8.556 4.365	0.000 3.825 31.825 10.333 42.758 9.716 52.534
INVERT LEVEL	10.053 9.308 7.940 7.896 7.816 2.703 2.723 2.046 8.488 7.636 6.904 1.096 4.301	10.045 1.093 2.046 11.620	11.820 11.823 11.600 9.941 1.134 3.138 1.211 1.526 1.000 1.116
DEPTH OF INVERT BELOW DESIGN SURFACE LEVEL	1.285 1.343 2.711 2.703 2.723 2.767 2.046 2.178 3.030 1.096 1.116	10.643 11.620	11.600 9.941 9.640 9.379 8.000 7.315
SETOUT COORDINATES	E 52512.041 N 161259.892 RL 11.338	E 52517.018 N 161291.205 RL 10.643	E 52472.240 N 161289.351 RL 11.820

LINE	SQID
SETOUT COORDINATES	E 52520.669 N 161293.493 RL 10.602
CHAMGE	0.000 2.719 3.455 2.073 9.743
INVERT LEVEL	7.816 7.786 7.686 3.010 7.456
DEPTH OF INVERT BELOW DESIGN SURFACE LEVEL	2.786 2.755 2.855 3.010 3.010
SETOUT COORDINATES	E 52520.669 N 161293.493 RL 10.602

LINE	CONSTRUCTION
SETOUT COORDINATES	E 52520.669 N 161293.493 RL 10.602
CHAMGE	0.000 2.719 3.455 2.073 9.743
INVERT LEVEL	7.816 7.786 7.686 3.010 7.456
DEPTH OF INVERT BELOW DESIGN SURFACE LEVEL	2.786 2.755 2.855 3.010 3.010
SETOUT COORDINATES	E 52520.669 N 161293.493 RL 10.602

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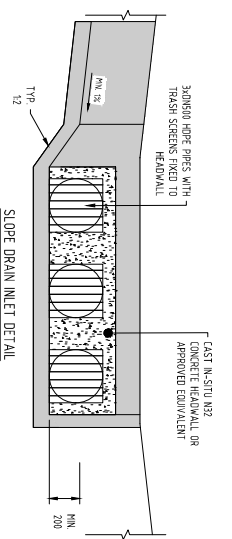
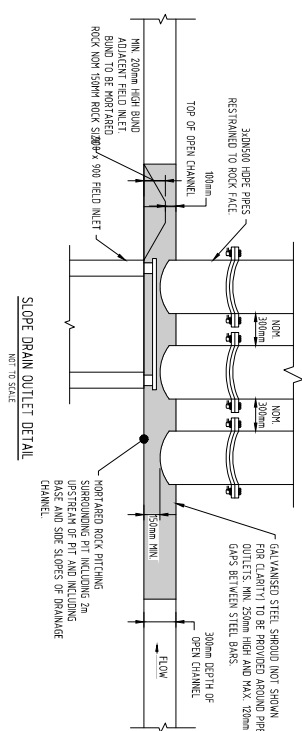
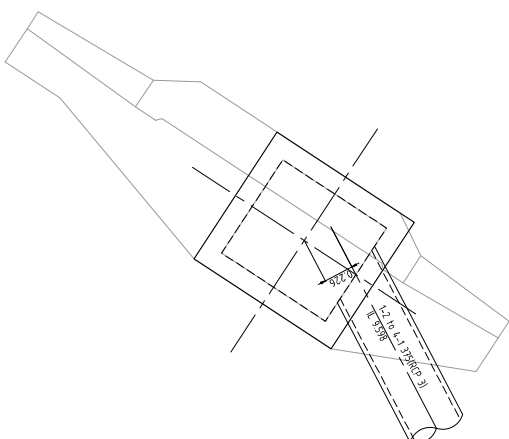
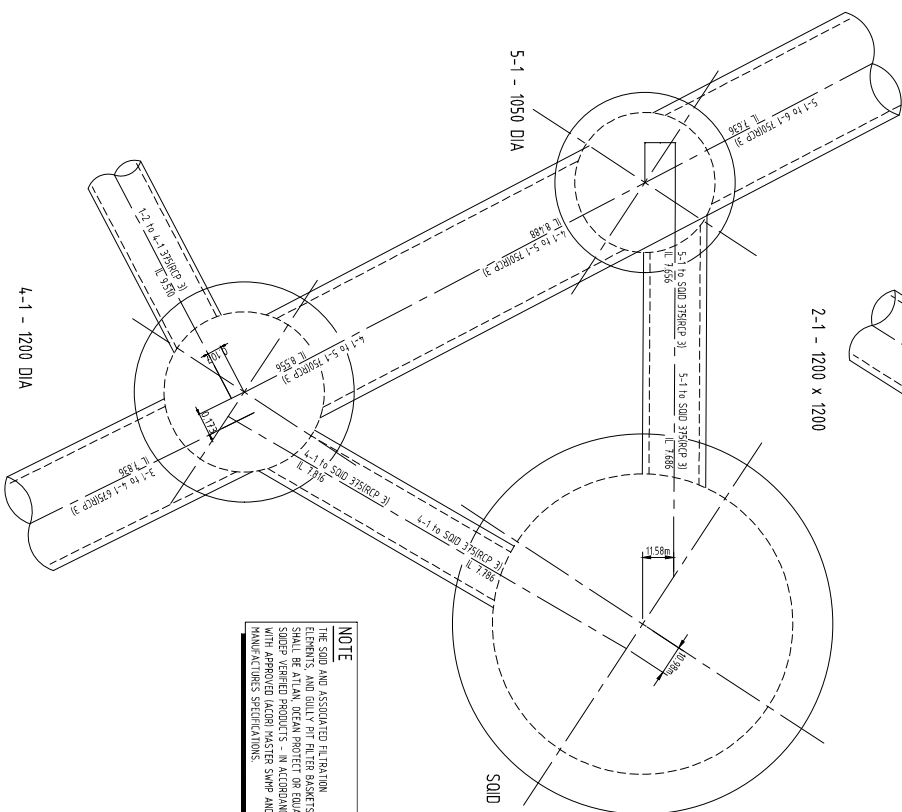
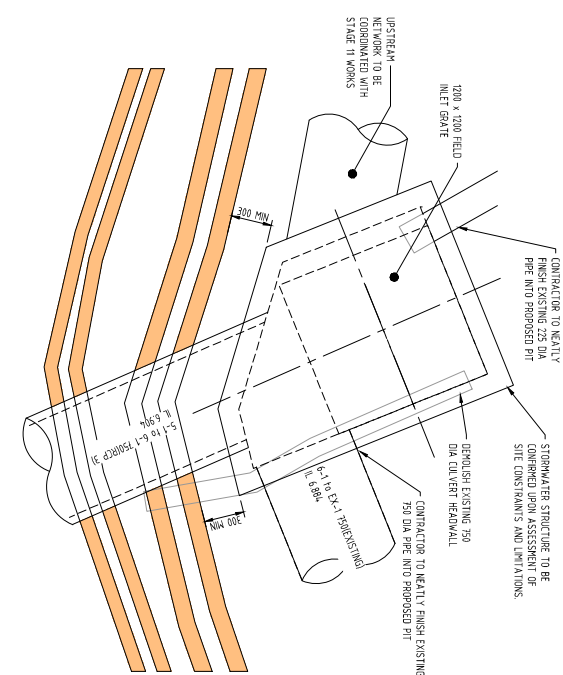
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DEPTH OF INVERT BELOW DESIGN SURFACE LEVEL	1.285 1.3		



NOTE
THE SOID AND ASSOCIATED FILTRATION ELEMENTS, AND GUILTY PIT FILTER BASKETS, SHALL BE ATLAN, OCEAN PROTECT OR EQUAL SOIDP VERIFIED PRODUCTS - IN ACCORDANCE WITH APPROVED (ACOR) MASTER SWMP AND MANUFACTURES SPECIFICATIONS.

 RPED CERTIFICATION		
1	1043.4	ISSUED FOR CONSTRUCTION
H	1043.4	ISSUED FOR CONSTRUCTION
G	3155.4	ISSUED FOR CONSTRUCTION
F	2444.4	ISSUED FOR CONSTRUCTION
E	3022.4	ISSUED FOR CONSTRUCTION
D	1042.4	ISSUED FOR CONSTRUCTION
C	1042.4	ISSUED FOR CONSTRUCTION
B	30	
A	30	

 RPED CERTIFICATION PROJECT NUMBER: 2164 PROJECT NAME: 48 HERSTON DATE: 19.6.21 CERTIFIED BY: JOHN GIBBARD RPED NUMBER: 07954 SIGNATURE:	2164 48 19.6.21 JOHN GIBBARD 07954
--	--



1-2 - 930 x 835

Client	Discipline	Revision	Drawn by	Project Name	Project No.	Scale in A1	Sheet in A1
HUTCHINSON BUILDERS	CIVIL	CONSTRUCTION		HERNSTON QUARTER STAGE 4B	20084	1:5	AS SHOWN
86 BRAMSTON TERRACE							
HERNSTON, QLD 4030							

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NC-48-CR-0406
 NC-48-CR-0406

1

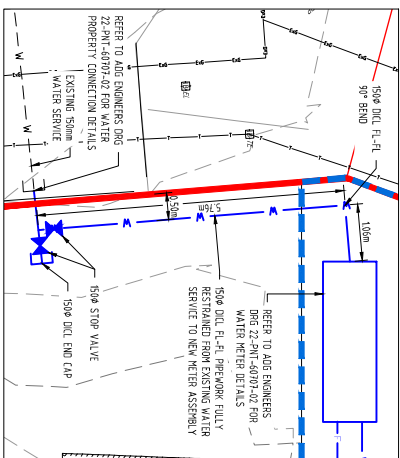
ISSUED FOR
CONSTRUCTION

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL
Approval no: **DEV20219/1011**
Date: **25 November 2024**


Queen's Standard
Government

0 0.5
SCALE 1:20
AT ORIGINAL SIZE (A1)

-----	PROPERTY BOUNDARY
-----	EXISTING EDGE OF BUILDING
-----	PROPOSED RETAINING WALL
-----	EXISTING STORMWATER DRAINAGE (SLOPE/FIT)
-----	EXISTING STORMWATER DRAINAGE (DUAL BEFORE YOU DO)
-----	EXISTING STORMWATER DRAINAGE (DUAL BEFORE YOU DO)
-----	EXISTING WASTE WATER (NOT LOCATED)
-----	EXISTING WASTE WATER (DUAL BEFORE YOU DO)
-----	EXISTING WASTE WATER (DUAL BEFORE YOU DO)
-----	EXISTING ELECTRICAL
-----	EXISTING TELECOMMUNICATIONS (DUAL BEFORE YOU DO)
-----	EXISTING FIRE SERVICES
-----	PROPOSED COMMUNICATIONS
-----	PROPOSED DRAINAGE BY CARRIAGE
-----	PROPOSED HIGH VOLTAGE ELECTRICAL
-----	PROPOSED LOW VOLTAGE ELECTRICAL
-----	PROPOSED SERVICES CONTRIBUTION AS PART OF
-----	STAGE 1A WORKS CONTRACT
-----	PROPOSED FIRE MAIN
-----	PROPOSED WATER MAIN
-----	PROPOSED STORMWATER DRAINAGE
-----	PROPOSED COWNS BY PERIOD



REFER TO HYDRAULIC DESIGN DRAWINGS PREPARED BY SJM HYDRAULICS FOR FINAL PIPE MATERIAL, FITTINGS AND HYDRANT REQUIREMENTS WITHIN THE CARPARK.

ASSET REGISTER - WATER INFRASTRUCTURE					
ESTIMATE/JOB	STAGE 4B WESTERN CORRIDOR				
SITE ADDRESS	86 BARNSTON TIE, WHEATON QLD 4066				
D.A. No.	EOD-2017-020-098				
BIDDICATS APP DATE	09/06/2021				
CLIENT	AUSTRALIAN UNITY				
DRAWING/PLAN No.					
	DIAMETER	MATERIAL	CONST	LENGTH	CONST
	DN 800mm	Pc 500mm	75mm	75mm	
	DN 800mm	Pc 500mm	75mm	75mm	
	DN 800mm	DCL	5m	5m	

CAUTION ⚠ EXISTING LIVE, HOT, ELECTRICAL & TELECOM CABLES MAY EXIST IN THE WALLS OF REMOVED WORKS. FOR ALL WORK WITHIN 25.0' OF MAJOR VERTICAL CABLES, THE CONTRACTOR IS REQUIRED TO TIE-INS ALL PENETRATIONS AND EXPOSE THE FIBER/JUNCTION BEFORE WORK CAN PROCEED. ON-SITE LOCATION SHOULD BE SUGGEST FROM AN ACCREDITED PLANT LOCATOR.

CAUTION EXISTING WATER MAIN CONTAINS ASBESTOS CEMENT MATERIAL. CONTRACTOR SHALL ENSURE APPROPRIATE HEALTH AND SAFETY MEASURES ARE CARRIED OUT IN THE HANDING, CUTTING AND REMOVAL OF THE MATERIAL IN ACCORDANCE WITH RELEVANT GUIDELINES AND COMPLIANT HEALTH AND SAFETY LEGISLATION.

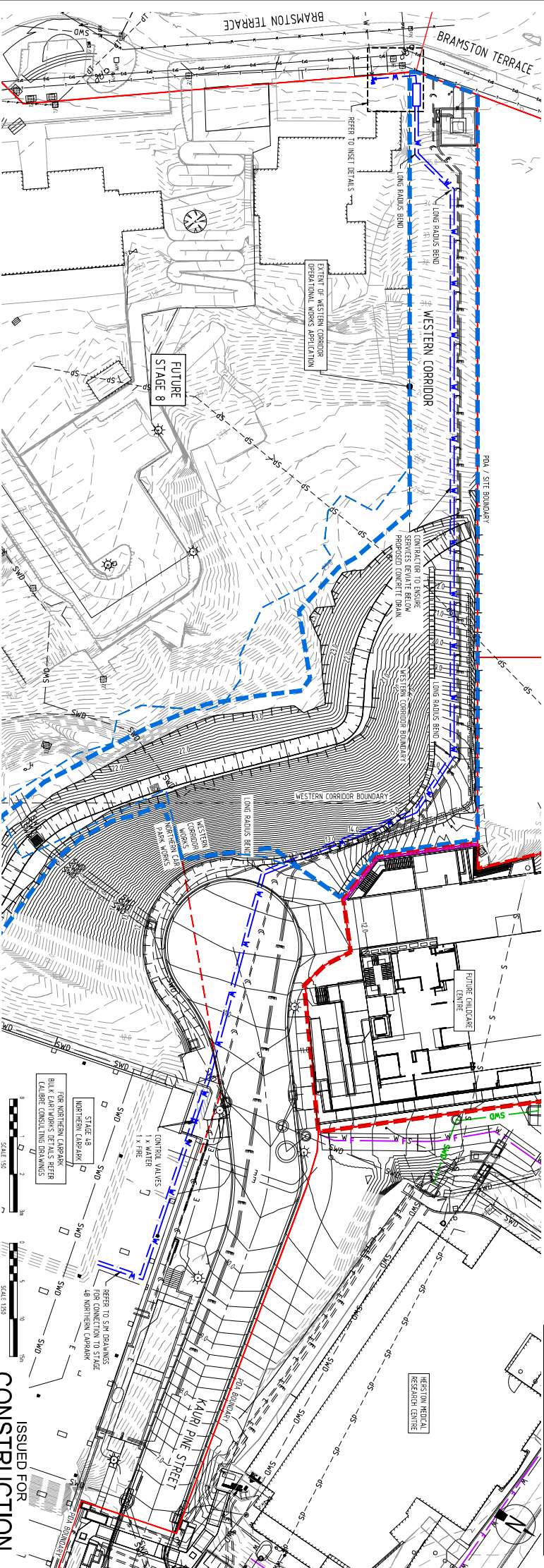
DISCLAIMER

WHILE EVERY EFFORT HAS BEEN MADE TO ENSURE THAT THE INFORMATION PROVIDED IN THIS DRAWING/DESIGN WAS ACCURATE AT THE TIME IT WAS COMPILED, IT REMAINS THE RESPONSIBILITY OF PROPERTY OWNERS AND THEIR CONTRACTORS, SUB-CONTRACTORS, EMPLOYEES, SERVANTS AND AGENTS, AS APPROPRIATE IN THE CIRCUMSTANCES, TO MAKE ALL REASONABLE EFFORT TO DETERMINE THE PRECISE LOCATION OF EXISTING INFRASTRUCTURE, INCLUDING WATER MAINS, SEWERS AND DRAIN BEFORE UNDERTAKING EXCAVATION OR CONSTRUCTION WORK.

USERS OF THE INFORMATION SHOULD BE AWARE THAT SINCE THE ORIGINAL RECORDING OF THE DEPTHS IN RELATION TO GROUND LEVELS, CHAOS MAY HAVE OCCURRED AS A RESULT OF SUBSEQUENT WORK ACTIVITIES INVOLVING FILLING OR EXCAVATION. CONSEQUENTLY, AIG ENGINEERING TAKES NO RESPONSIBILITY FOR ANY APPARENT ERROR OR INACCURACIES THAT ARE SHOWN TO EXISTING AS AT THE DATE INFORMATION WAS PROVIDED OR AT A LATER DATE.

THE ABOVE ALSO APPLIES TO LOCATION AND DEPTH OF OTHER PUBLIC UTILITIES.

ALL WATER CONSTRUCTION WORK SHALL COMPLY WITH THE REQUIREMENTS OF QUEENSLAND WORK HEALTH AND SAFETY ACT 2011. CONTACT THE DIVISION OF WORKPLACE HEALTH AND SAFETY FOR INFORMATION. PHONE 1300 362 178.



ISSUED FOR
CONSTRUCTION

01	2016.34	RESULT FOR CONSTRUCTION	CS	50
02	2424.54	RESULT FOR CONSTRUCTION	CS	50
03	7015.34	RESULT FOR CONSTRUCTION	CS	50
04	00.00	RESULT FOR CONSTRUCTION	HR	-

ADG **RPEQ CERTIFICATION**

PROJECT NUMBER: 20564

PROJECT NAME: STAGE 4B HERTON

DATE: 02.08.24

CERTIFIED BY: JOHN GHOBRAL

RPEQ NUMBER: 07956

SIGNATURE: 



PLANS AND DOCUMENTS REFERRED to in the PDA

Approval no. DEV2023W1011

Date: 25 November 2024

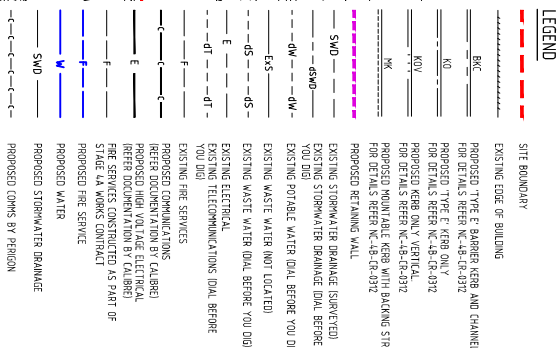
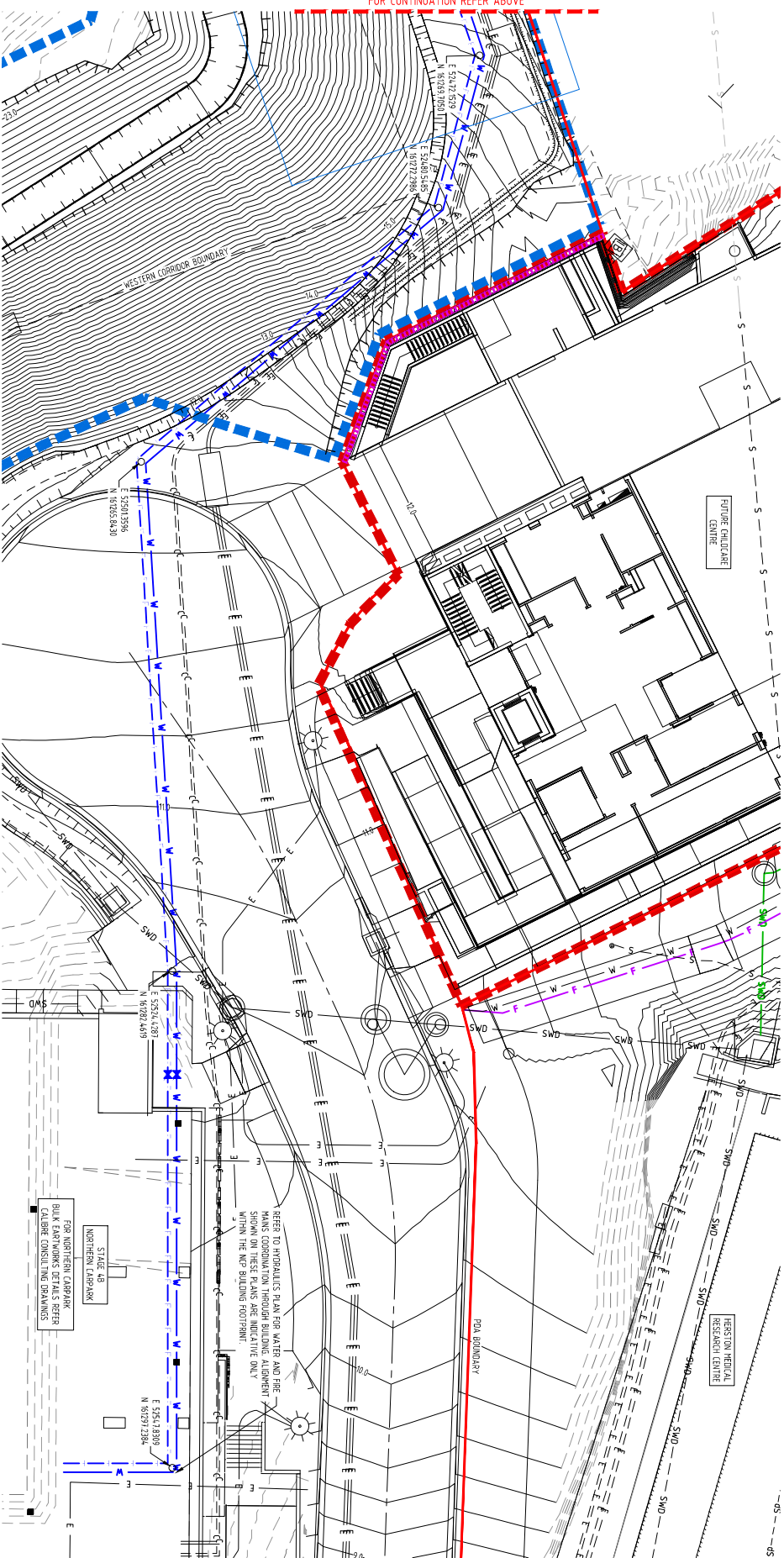
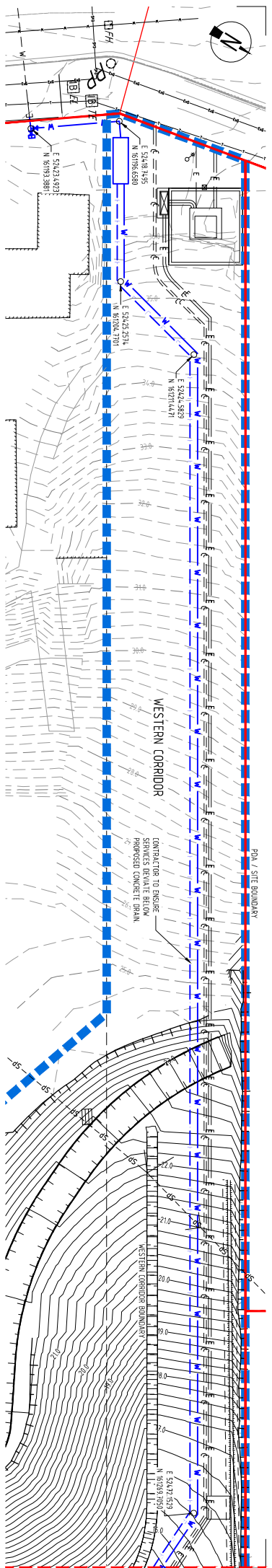


T 1300 657 402 F +617 3671 2266
E info@adga.com W www.adga.com

SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client	Site/Location	Status	THE
HUTCHINSON BUILDERS		CONSTRUCTION	POTABLE WATER AND FIRE MAIN LAYOUT PLAN
HERSTON QUARTER	Proposed by	Approved by	Drawn by
STAGE 48 WESTERN CORRIDOR	HR	JG	NO. 48 CP LAYOUT 4
86 BRANSTON TERRACE	Drawn by	Scale as I	04
HERSTON QLD 4006	20664	CS	
		AS SHOWN	

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90



ISSUED FOR
CONSTRUCTION

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: **DEV2024/19/1011**

Date: **25 November 2024**


Queensland
Government

[illegible]