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Nanumea Detailed Design Report

Tuvalu Coastal Adaptation Project

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1. INTRODUCTION

1.1 General

Consisting of nine islands and atolls spread over 750,000km^2, Tuvalu is the fourth smallest nation in the world in land area and has a population of just over 10,000. It is one of the most vulnerable countries in the world to the impacts of climate change and particularly sea-level rise and the possibility of intensifying storm events. Recent cyclones have caused population displacement, significant loss and damage of infrastructure as well as destruction of agricultural resources, contamination of ground water and changes in shoreline systems. Such impacts negatively affect the wellbeing of communities and long-term sustainable development aspirations. In response to this increasing challenge, the Government of Tuvalu (GoT) and the Green Climate Fund (GCF) have jointly committed US$38 million for the Tuvalu Coastal Adaptation Project (TCAP).

Three main islands have been selected for the proposed GCF project: Funafuti, Nanumea and Nanumaga. Nanumea was selected due to the severity of the damage incurred following the passage of Tropical Cyclone (TC) Pam in 2015. The funding application proposed that TCAP resources finance locally appropriate coastal protection measures along the high value zone (1330m) in Nanumea. The lack of a landing facility suitable for a large dredge or working vessels limits the coastal protection infrastructure that may be constructed on Nanumea. As such, a combination of both soft and smaller 'hard' measures including dune restoration, nearshore detached breakwaters and modular seawall construction have been recommended. Subsequent feasibility studies including hydrodynamic and coastal process modelling, ESIA, geotechnical investigations and stakeholder consultations led to the selection of the recommended coastal adaptation measures for Nanumea.

1.2 Project and report objectives

TCAP will build coastal resilience which is an urgent national priority. The project will address the financial and capacity constraints at all levels – from technical to community awareness. TCAP was approved in June 2016 and the project implementation commenced in September 2017. The project will run until September 2023. TCAP has 3 main outputs:

Output 1: Strengthening of institutions, human resources, awareness and knowledge for resilient coastal management.

Output 2: Vulnerability of key coastal infrastructure is reduced against wave induced damages in Funafuti, Nanumea and Nanumaga.

Output 3: A sustainable financing mechanism established for long-term adaptation efforts.

The following body of work progresses Output 2, which has two main task areas or Activities:

- Activity 2.1: Coastal protection design. Site-specific assessments and ESIA undertaken in all islands in a participatory manner.
- Activity 2.2: Coastal protection measures implemented.

The objective of this report is to provide detailed design parameters and present the finalised coastal protection measures on Nanumea ready for construction (implementation). This report is designed to be read in conjunction with the IFC drawings attached in Appendix A.

1.3 Report background

This report has brought together the findings of several investigations used to inform the design and implementation of the TCAP Nanumea coastal protection design, these investigations include, but are not limited to:

- TCAP Concept Design Report (UNDP, 2020)
- Nanumea Concept Design Report (Bluecoast, 2021)
- Nanumea Detailed Design Technical Note: Reeftop Barrier and Seabee Seawall Design for Nanumea (UNDP, 2021)
- Nanumea Environmental and Social Impact Assessment (SPC, 2020a)
- Nanumea Geotechnical Investigation (SPC, 2020b)

These investigations accompany extensive stakeholder consultation, site investigations and interviews with contractors working in the region to inform the detailed design presented herein.

1.4 Report outline

The structure of this report can be summarised as follows:

- Section 2 presents the design life, a brief description of the site as well as the basis of design
- Section 3 presents a description of the Nanumea coastal protection designs and associated aspects
- Section 4 presents an overview of the project's proposed implementation
- Section 5 provides a summary of the key findings of the Detailed Design and recommendations.

2. BASIS OF DESIGN

2.1 Design Life

The Australian Standard Guidelines for the design of maritime structures (AS 4997-2005) specifically excludes the design of “coastal engineering structures such as rock armoured walls, groynes, etc.”

The Berm Top Barrier design presented in the Concept Design Report adopts buried geosynthetic mega containers (GMC) for the core of the structure. Geotextile containers were originally expected to have a service life of at least 25 years in their earlier design iterations. Recent improvements in geosynthetics have been reported to increase design life to more than 40 years (Bettington, 2018). This has been adopted as the design life of the BTB structure.

The concrete reeftop barriers and Seabee seawall have been designed with a design life of 50 years.

2.2 Design event

A 100-year Average Recurrence Interval (ARI) value has been adopted for the stability of any structures. The return event for overtopping design of the BTB and Seabee seawall is a one-year ARI based on safe average overtopping volumes for pedestrian access behind the structure crest after EurOtop (2018).

2.3 Site

Nanumea is one of the nine atolls and islands within the Tuvalu archipelago. It is the most northerly atoll within the archipelago, located at approximately 5°40'S, 176° 6'E. Nanumea is a boomerang shaped atoll with a narrow central lagoon system, as shown in **Figure 1**. The atoll has three major sand islands named Nanumea, Temotufoliki and Lakena. Nanumea is the largest island and covers the south-east portion of the atoll forming a V-shape with two distinct limbs either side of a central lagoon.

Nanumea is located approximately 450km to the north west of Funafuti. The island has a an unprotected, 500m long, 25m wide boat channel (American Channel) cut at a depth of -1m to -4m below tide gauge zero (TGZ) into the reeftop midway along the western coast of the island connecting the ocean to the southern lagoon. There are several jetties and a small port within the lagoon that services smaller vessels capable of navigating the narrow channel.

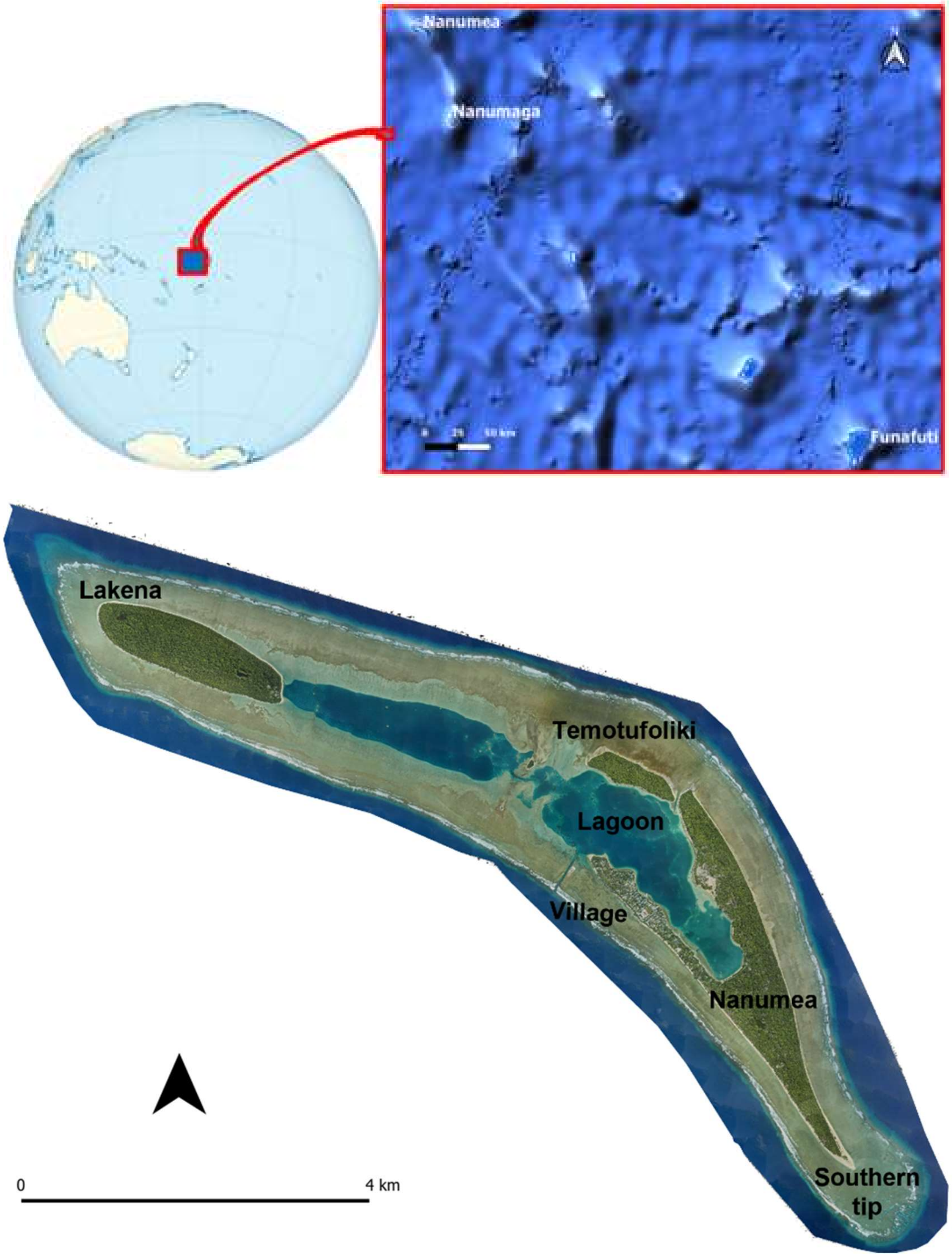


Figure 1: Tuvalu setting (top) and Nanumaga digital elevation model (bottom) with TCAP site marked by red polygon. Please note heights have been approximated with respect to Mean Sea Level (MSL). (source: Fugro, 2019).

2.3.1 Bathymetry and topography

A marine Light Detection and Ranging (LiDAR) survey was undertaken of all Tuvalu's nine islands in August 2019 (acquired by TCAP, 2019). The resultant dataset provided a high resolution topographic and bathymetric digital earth model (DEM) to a depth of approximately

40m, the bathymetry and topography at the project site on Nanumea's western coast is provided in Figure 2.

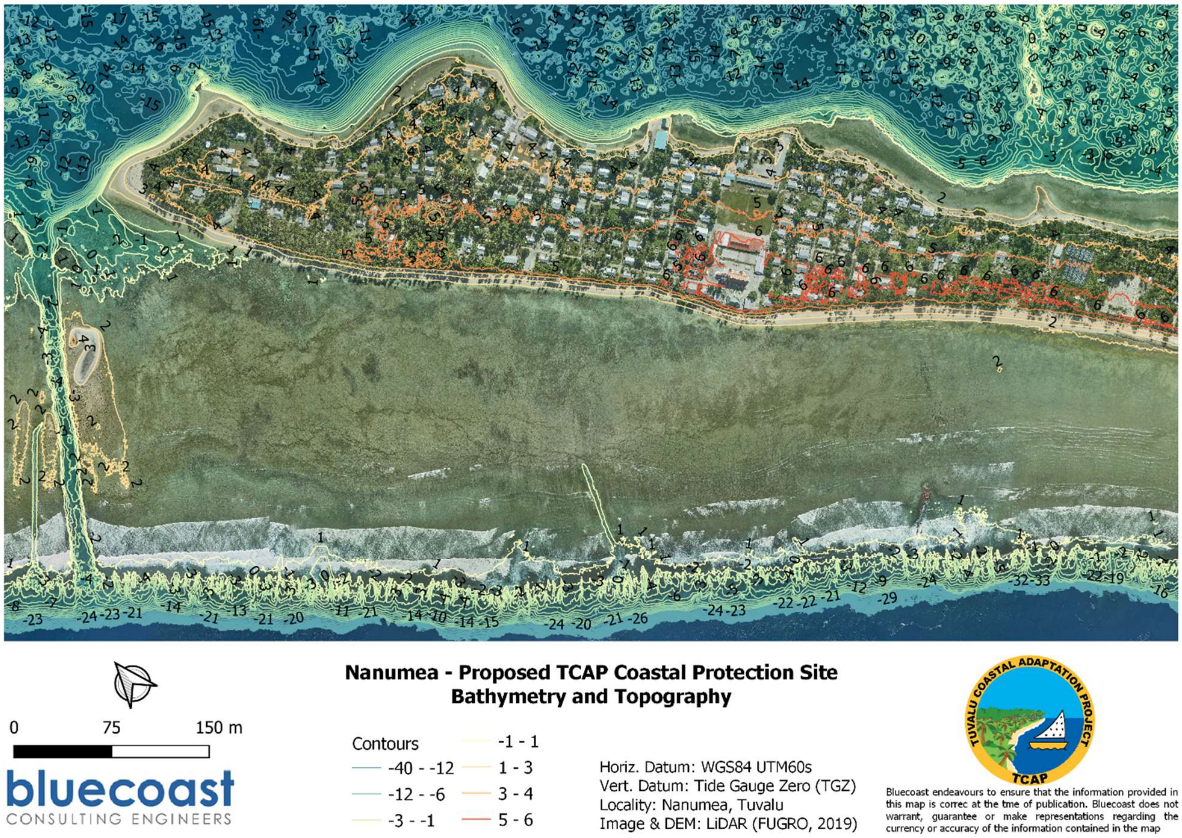


Figure 2: Topographic and bathymetric contour map of proposed TCAP coastal protection site on Nanumea's western coast taken from FUGRO Marine LiDAR survey, August 2019.

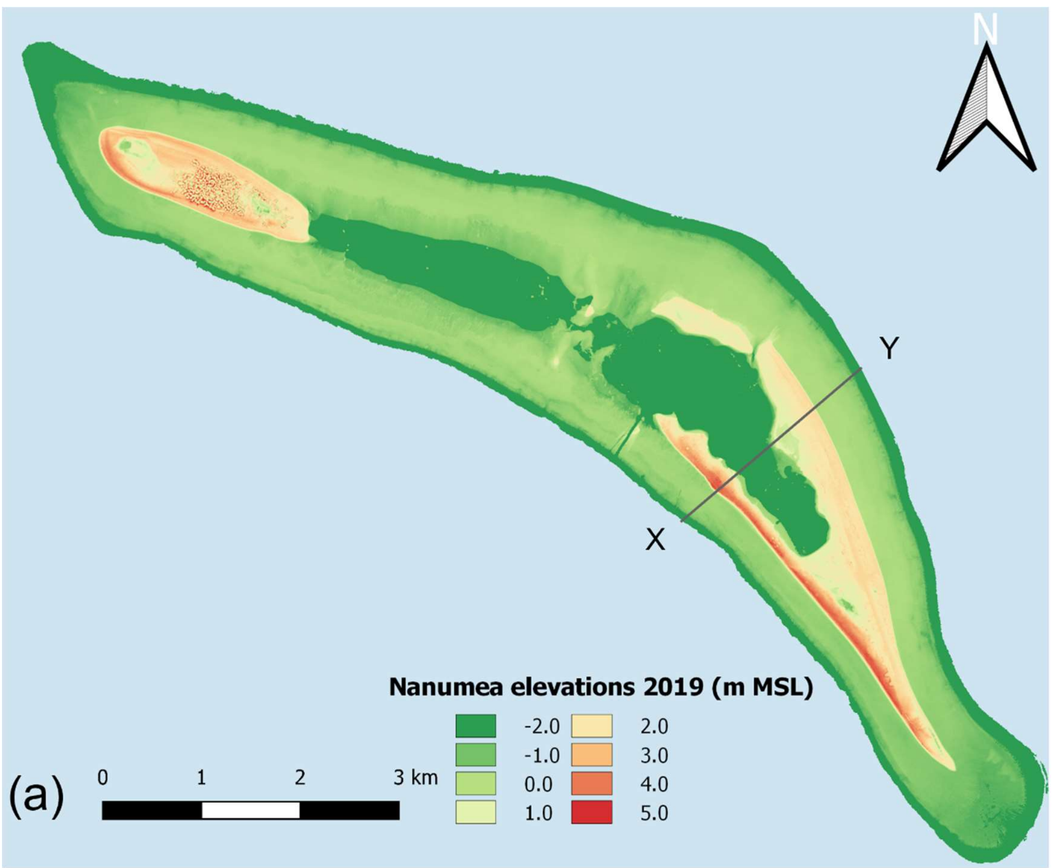
2.3.2 Geomorphology

The reef islands of Nanumea are comprised of unconsolidated biogenic sediments formed by the physical abrasion (under wave action) and biological breakdown of calcium carbonate–secreting organisms that dwell on the adjacent coral reef system. Waves and currents deposit the coral sand and rubble onto the islands. The location, planform configuration, size, and elevation of islands reflect both the interaction of oceanic swell with reef structures and the availability and grade of sediment for island building (Masselink et al ,2020).

Figure 3 shows a map of the topography (Figure 3a) and cross-sections through Nanumea Island (Figure 3b & c). Figure 4 shows a cross-section of a typical atoll to highlight the structural elements observed on Nanumea (Kench et. al., 2009). Major structural elements of the atoll's morphology include:

- lagoon (20–25 m) and reef rim with islands, reef flat, and reef crest
- sand aprons, depositional features created by unidirectional (reef to lagoon) sediment transport, are found on the lagoon-ward edge of the reef flats

- on the islands western coastline, reef flats are around 300 to 350m wide with a high ridge or berm (4-5m above MSL) on the ocean side (left) that gently grades down to the lagoon with no ridge present on the lagoon side (right)
- the islands eastern side has a beach ridge/berm that only rises 2-3m above MSL, the higher western berm (Figure 3a) is due to this coastline having a higher energy wave climate including longer period swells and cyclones (see Section 2.4.2).
- the inner stable areas of such islands are comprised of mainly unconsolidated carbonate sediments; sand, gravel and cobble with an upper layer of dark organic rich “topsoil”.
- The perimeter shoreline system of the islands are typically dynamic and subject to seasonal and event driven, wave, tide and longshore processes. On Nanumea, the majority of shores are comprised of coarse sands with outcrops of raised solidified “beach-rock” apparent in many areas.



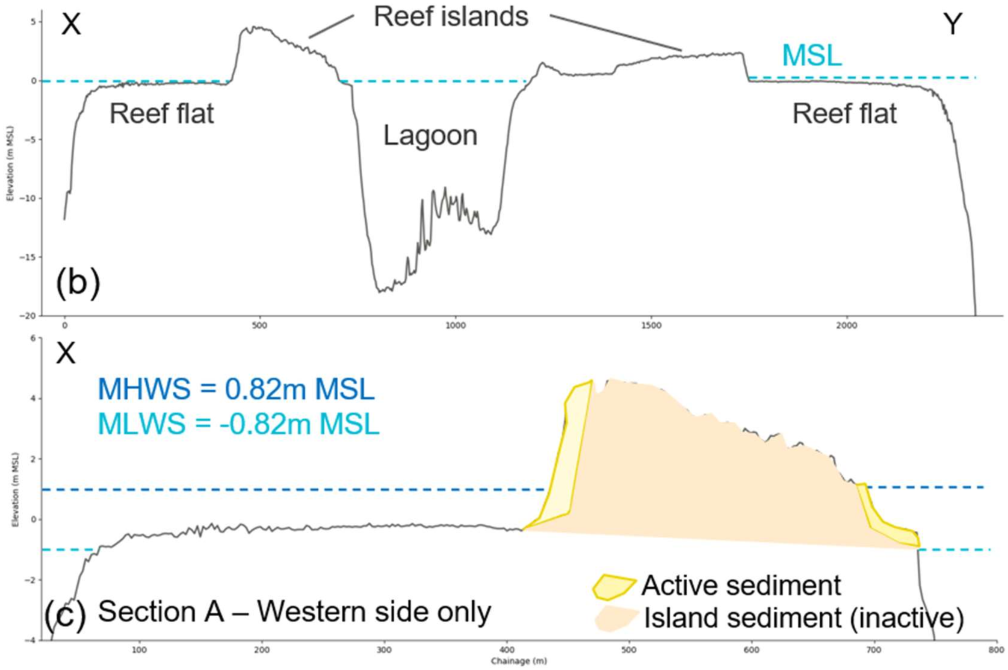


Figure 3: Atoll and reef island morphology and structure. (a) elevation maps of Nanumea showing the topography of the entire atoll. (b) Cross-section of Nanumea atoll showing major structural elements. (c) Western island (village) commonly 50–100m wide with a high ridge on the ocean side.

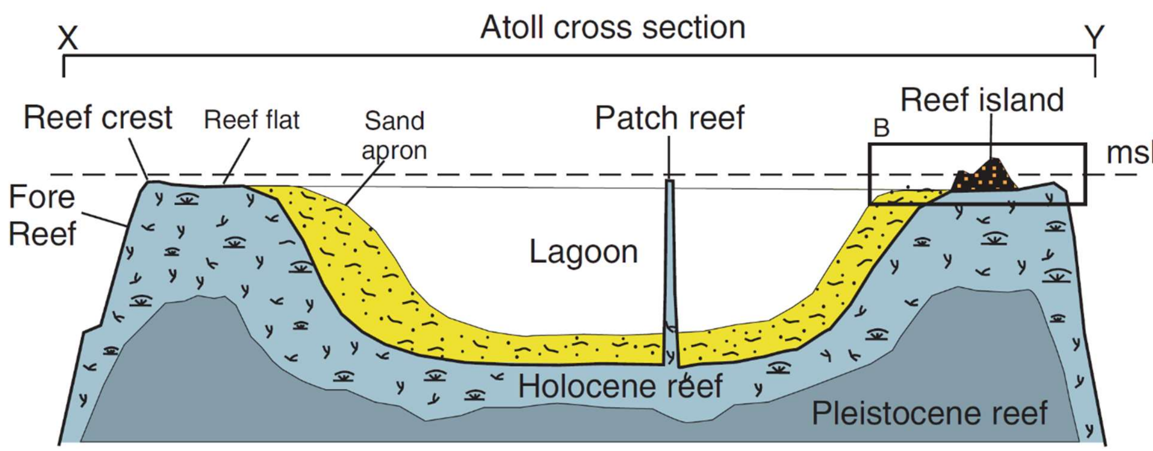


Figure 4: Cross-section of a typical atoll showing major structural elements including deep lagoon (20m) and reef rim with reef crest, reef flat, islands and sand apron identified (source: McLean and Kench, 2015)

Further geomorphological and geotechnical information on Nanumea is provided in the Geotechnical Report (SPC, 2020b).

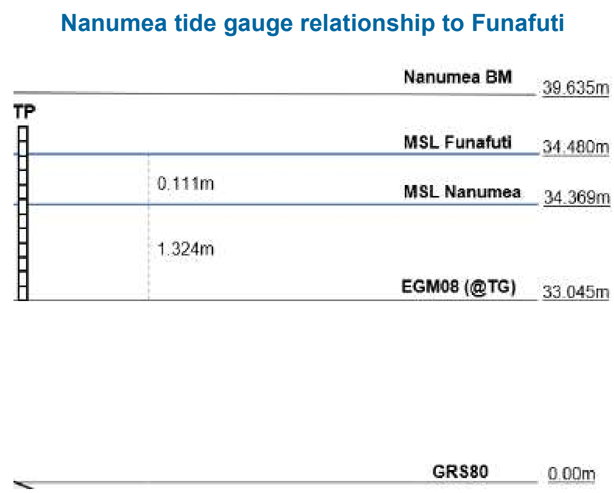
2.4 Design inputs

2.4.1 Water levels

Nanumea experiences a semidiurnal tidal regime. The mean tidal range is 0.7m during neap tides and 1.7m during spring tides, with a maximum range of 2.5m. No long-term water level measurements have been undertaken at Nanumea. The closest tide gauge is located around

460km to the south east at Tuvalu Port. Due to its relative proximity to Nanumea, similar orientation and geomorphology, the tidal regime at both locations is considered similar. Figure 5 presents tidal planes reduced to Tide Gauge Zero (TGZ) at Funafuti following the levelling program undertaken by Department of Lands and Survey Tuvalu associated with the 2019 lidar survey.

Figure 5: Tidal plane at Nanumea with respect to Tide Gauge Zero (TGZ) at Funafuti Port.



Tidal Plane	Recorded Height (m TGZ)
Highest Astronomical Tide (HAT)	3.27
Mean High Water Springs (MHWS)	2.80
Mean High Water Neap (MHWN)	2.27
Mean Sea Level (MSL)	1.94
Mean Low Water Neap (MLWN)	1.61
Mean Low Water Neap (MLWS)	1.09
Lowest Astronomical Tide (LAT)	0.74
Tide Gauge Zero (TGZ)	0.00

Table 1: Calculated design water levels for Nanumaga coast al protection works

Design parameter	Water level
2100 Sea Level Rise[1]	0.75m
Wave setup	0.97m
HAT Nanumea	3.27m TGZ
IBEmax[2]	0.28m
Design Water Level	**5.27m TGZ**

2.4.2 Waves

Deep water

There is no long-term recorded wave data for Nanumea. Wave climate information for Nanumea presented in Figure 6 and Table 2 has been determined based on a long-term regional model hindcast (Oceanum). Nanumea's wave climate is dominated by swell waves (wave periods above 8s). Locally generated seas (wave periods below 8s) only occur on average 5% of the time. The annual average significant wave height (Hs) is 1.7m, with a slight increase in the wet season. The dry season is dominated by easterly wind swells generated by the trade winds as

[1] IPCC 2019 upper limit of RCP8.5 range
[2] maximum recorded value of Inverse Barometric Effect (IBE)

well as intermittent and longer period south south-west swells. In the wet season the southerly swells are less frequent and of lower energy, with a greater frequency of waves generated in the northern sectors.

The largest waves primarily occur in the wet season and arrive from the west and/or the north-west and are the result of tropical cyclones action in the southern hemisphere (latitudes 8°-12°).

Table 2: Offshore wave climate statistics for Nanumea from Oceanum dataset.

Parameter	Statistic	Long term averages (42-years)		
		All seasons	Wet (Nov-Apr)	Dry (May-Oct)
Significant wave height (H_s) [m]	Mean	1.7	1.70	1.7
	20%ile	1.4	1.4	1.4
	50%ile	1.6	1.6	1.6
	75%ile	1.9	1.9	1.8
	90%ile	2.1	2.1	2.1
	99%ile	2.8	3.2	2.5
	99.5%ile	3.2	3.5	2.6
	Max	6.8	6.8	3.6
Peak wave period (Tp) [s]	Mean	10.7	10.9	10.5
	20%ile	8.8	9.3	8.5
	50%ile	9.9	10.3	9.3
	75%ile	12.2	12.2	12.2
	90%ile	14.4	13.9	14.8
	99%ile	17.8	16.9	18.1
	% of time sea (Tp < 8s)	5%	3%	7%
	% of time swell (Tp > 8s)	95%	97%	93%
Peak wave direction (Dp) [˚TN]	Weighted mean	109	31	145
	Standard deviation	60	55	49

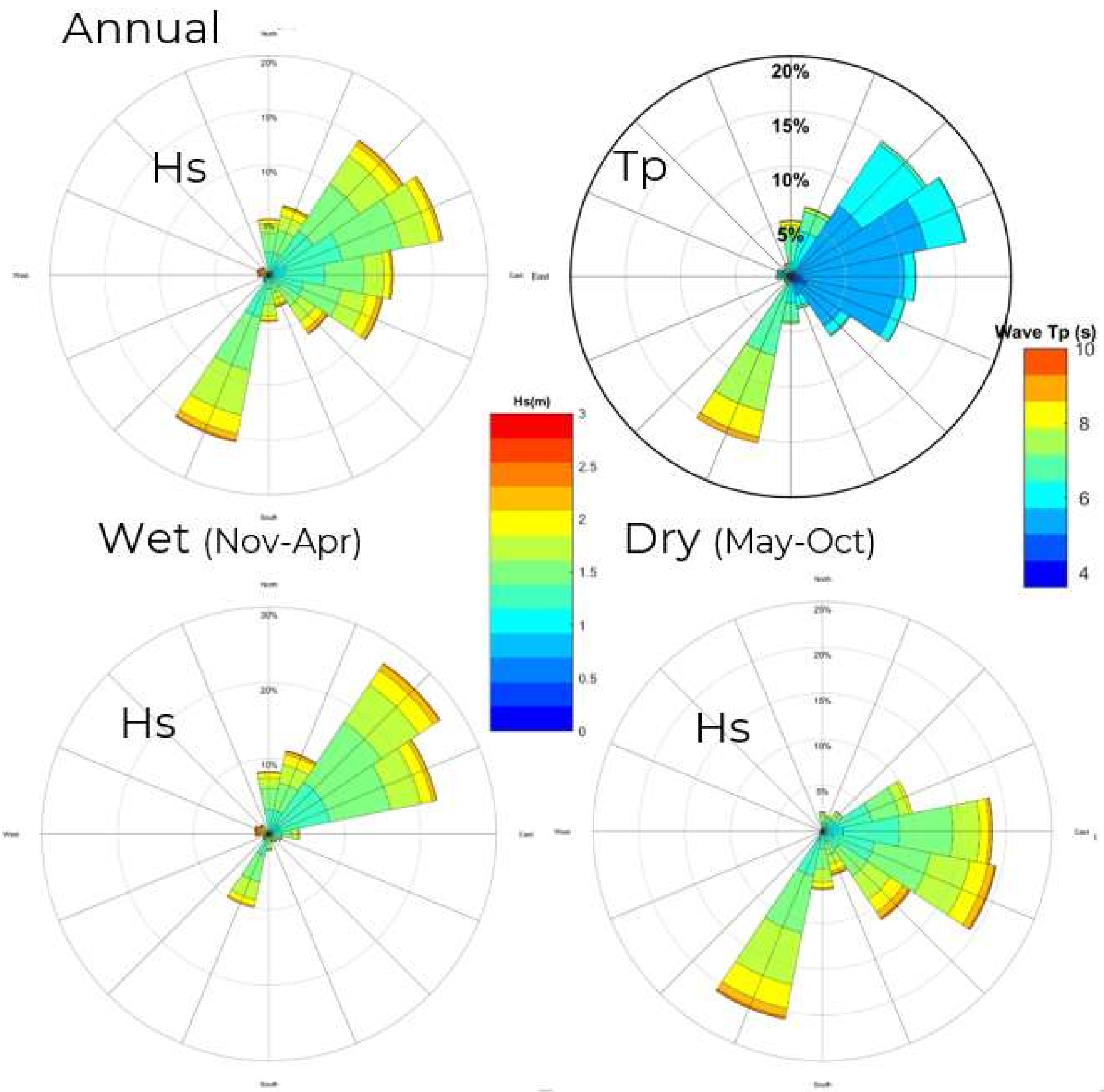


Figure 6: Offshore annual, wet season and dry season wave climate roses from the Oceanum hindcast dataset extracted offshore of Nanumea.

Village wave climate

The wave climate at the deep-water reef edge of the south-western village coast was determined through a process of wave transformation using the SWAN wave model. A full range of wave climate statistics for the village reef edge location are displayed in Table 3. The total wave climate wave rose and the overall and seasonal wave roses for swell waves (Tp>8s) are provided in Figure **7** The village wave climate is influenced by two key factors. The first component is moderate wave energy from south-east and south-west swells, which occur around 28% of the time.

The second component comprises high to extreme 'cyclonic' wave energy from the west which occurs less than 0.3% of the time annually and 7% of the time in the wet season. For these cases, the 50th and 90th percentile wave heights are 3.3m and 4.4m respectively, with peak wave periods typically between 10s and 16s. These large and extreme waves have been isolated and presented in Figure 8, showing their predominant origination from the west.

Table 3: Village wave climate statistics.

Parameter	Statistic	Long term averages (42-years)		
		All seasons	Wet (Nov- Apr)	Dry (May-Oct)
Significant wave height (H_s) [m]	Mean	0.76	0.59	0.89
	20%ile	0.03	0.01	0.16
	50%ile	0.45	0.06	0.74
	75%ile	1.47	1.31	1.54
	90%ile	1.87	1.86	1.88
	99%ile	2.78	3.26	2.40
	99.5%ile	3.18	3.68	2.52
	Max	6.77	6.77	3.56
	% calm (Hs <= 0.1m)	42%	67%	18%
Peak wave period (Tp) [s]	Mean	9.5	8.5	10.3
	20%ile	6.5	3.7	8.6
	50%ile	9.4	8.6	9.5
	75%ile	12.1	12.1	12.2
	90%ile	14.7	14.2	14.9
	99%ile	17.9	17.4	18.2
	% of time sea (Tp < 8s)	26%	47%	11%
	% of time swell (Tp > 8s)	74%	53%	89%
Peak wave direction (Dp) [°TN]	Weighted mean	204	232	188
	Standard deviation	40	51	27

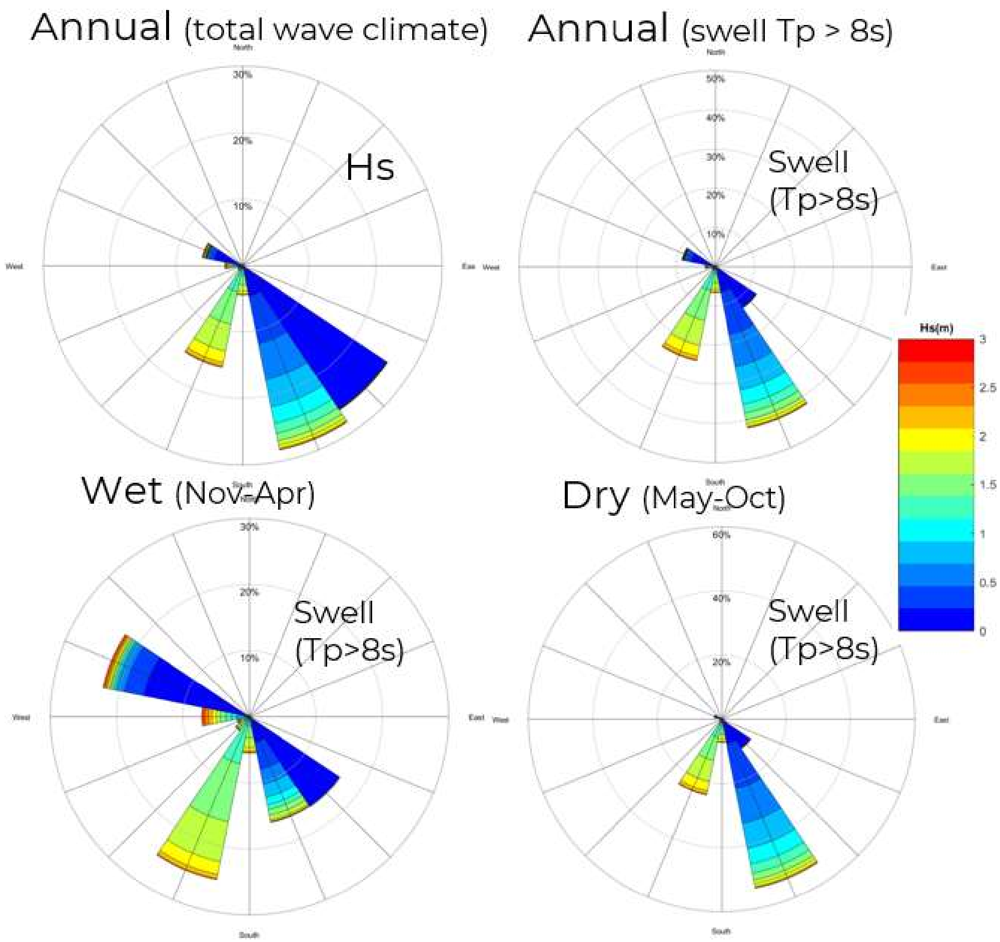


Figure 7: Annual wave rose and overall annual, wet season and dry season swell wave roses (Tp > 8s) and for the village Nanumea.

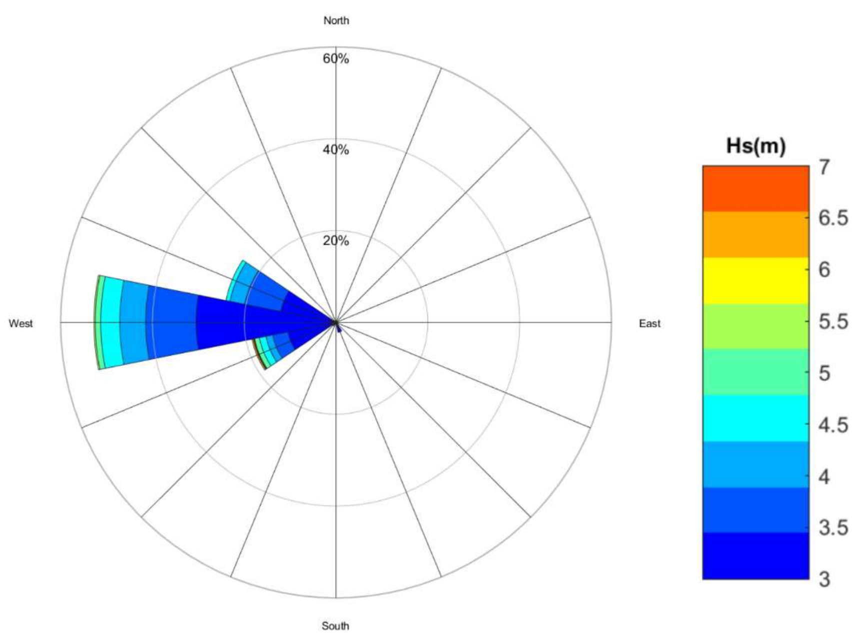


Figure 8: Wave rose showing large and extreme wave events at the village (> 3m Hs).

2.4.3 Currents

At the time of writing there has been no water current measurements in the vicinity of Nanumea. Offshore (deep water) currents are expected to be minimal (<1m/s) and are mostly associated with oceanic circulation or with surface currents being driven by the trade winds.

Nearshore currents on the reef tops are expected to be associated with wave processes across the reef flats as well as tidal flows in and out of the small lagoon through the American Channel. When waves arrive perpendicular to the reef crest, wave breaking and wave setup over the reef drives currents towards the lagoon. When waves arrive at an oblique angle to the reef crests and island shorelines, longshore currents travel in both directions along the west coast of Nanumea. During south south-west swells, net northward longshore currents would be expected, ultimately slowing into the lagoon. This is expected to also drive a net northerly longshore transport of sand along the shoreline when wave heights are large enough. During the wet season when intermittent storms result in westerly wave events, these longshore processes are expected to reverse with currents and sediments flowing toward the islands southern tip.

2.4.4 Wind regime

The wind climate at Nanumea was assessed using data extracted from the CAWCR dataset . The wind roses in Figure 9 and wind climate statistics in Table 4 show prevailing winds are dominated by easterly trades of moderate strength. The range of wind directions is relatively larger during the wet season, with stronger wind speeds originating from the west. Relative to the predominant wind direction, the western coast of Nanumea is positioned on the leeward side of the island.

Table 4: Wind climate statistics for Nanumea.

Parameter	Statistic	Long term averages (41-years) - CAWCR		
		All seasons	Wet (Nov-Apr)	Dry (May-Oct)
Wind speed [m/s]	Mean	5.1	5.1	5.2
	20%ile	3.3	3.1	3.5
	50%ile	5.1	4.9	5.2
	75%ile	6.4	6.4	6.5
	90%ile	7.8	7.9	7.7
	99%ile	10.7	11.9	9.6
	99.5%ile	11.9	13.0	10.0
	Max	23.7	23.7	13.4
Wind direction	Weighted mean [°N]	101	128	86
	Standard deviation [°]	50	58	33

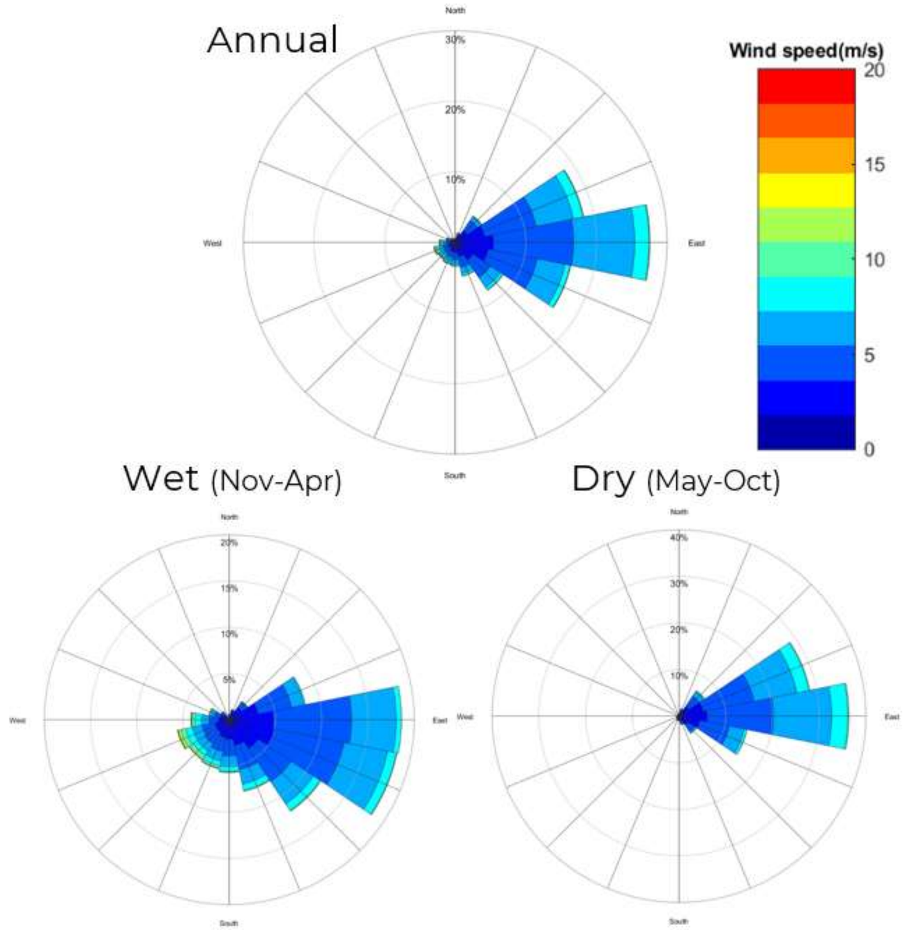


Figure 9: Annual, wet season and dry season wind roses for Nanumea.

3. COASTAL PROTECTION DESIGN

3.1 Overview

Full details on the design process and iterations of the Nanumea coastal protection can be found in the Nanumea Concept Design Report (Bluecoast, 2021) and is summarised in the following section. Appendix A: provides the IFC detailed design drawings. Table 5 provides an overview of the key parameters of the Nanumea coastal protection design.

Table 5: Overview of TCAP design parameters for Nanumaga coastal protection works

Design parameter	Design value
Berm Top Barrier design	1,330m total length 5.5-7.5m TGZ height at crest 37,100m^3 total volume (2019 DEM)
Seabee Revetment design	180m overall length 8.9m TGZ crest height
Reeftop Barrier design	Seven 25m long FRC concrete RTB 35m offshore of current shoreline

Figure 10: Site plan of the TCAP Nanumaga coastal protection design

3.2 Structure details

Berm Top barriers (BTB) are to be constructed of buried Geotextile Mega Containers (GMC) laid end to end. The GMC are to be 'keyed in' to the surface of the storm berm on Nanumea's west coast by excavating the topsoil layer by around 500mm. A layer of geotextile material is to be placed in the excavation footprint and pinned to the ground. The GMC is to be positioned and hydraulically filled from locally sourced (TYPE B) sediment. The whole structure is to be buried under replaced and locally sourced (TYPE A) sand at an angle of natural repose (30-35°) and revegetated with native vegetation and larger (palm or coconut) palms on the horizontal extremities of the works.

The BTBs are to be located at the crest of the natural storm berm, not in the usual active shoreline zone. The geosynthetic bags are intended to remain buried and will be vegetated to become a reasonably seamless raised part of the natural berm system. This means that should wave attack wash away the vegetated outer layer the geosynthetic bag will remain as an immovable line of defence. Thus, the BTB will augment natural berm height and if subject to damaging wave conditions will persist. Even in the highly unlikely event that a BTB inner geosynthetic bag was punctured, it contains beach sand. This will simply become additional volume to the natural berm.

A typical section of the BTB is shown in Figure 11.

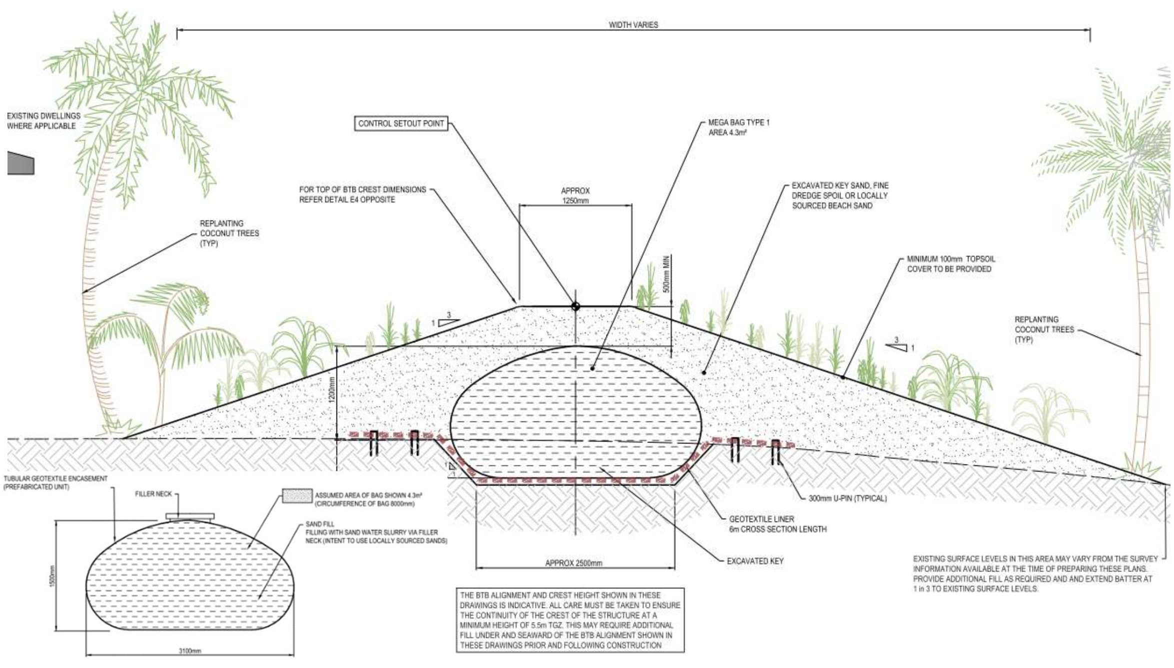


Figure 11: Typical section of Berm Top Barrier (top) and GMC detail (below)

Table 6: Geosynthetic container design sizes

Type	Height (mm)	Length (mm)	Width (mm)
GMC	1,500 – 2,100	20,000	1,500 – 4,800

3.2.1 Alignment and crest levels

Generally, the alignment of the BTB has been designed to follow the natural alignment of the storm berm on Nanumea's west coast. The alignment can be seen to meander along its length (Figure 10), this is to provide sufficient barrier from private and public infrastructure and roadways. The final alignment is expected to change during construction due to new infrastructure having been built since original design, however the objective of the design is to increase the level of the highest landform of the island (storm berm) by an additional 1500mm (minimum). The height of the finished BTB will be between 5.5-7.5m TGZ.

3.2.2 Durability and maintenance

There is potential that the BTB may be overtopped during extreme wave and water level events in excess of the design event. It is recommended that the BTB be inspected after any significant overtopping event or if any GMC units are exposed. In these instances, maintenance is to be undertaken to repair any tears or holes in the GMC unit and to fill any areas where erosion has occurred from approved borrow areas.

The geotextile used for the construction of the units will be designed to be vandal and UV-resistant, TEXCEL 1200R or similar. Full geotextile specifications are provided in the IFC drawings (Appendix A). Even though this design intendeds to bury the geotextile containers they are designed to withstand exposure to wave action, sunlight, high volumes of pedestrian traffic and recreational fishing, etc; however, there is potential for the bags to be damaged by impacts from large debris during very large events. Should units become exposed or damaged, the Government of Tuvalu Public Works department (PWD) will be trained in the repair of the units.

3.2.3 Drainage

The BTB has been designed to reduce inundation and overtopping events from the ocean. During rainfall events, drainage patters will be altered very little from their current arrangement, as the BTB will be placed atop the highest existing landform (storm berm). During construction, it is imperative that the excavation footprint is built such that water discharged through the hydraulic filling process of the GMC units runs to the ocean and not the village.

3.2.4 Borrow areas

The borrow area for the estimated 37,100m^3 of fill required for the Nanumea Coastal Protection works was identified in the morphological assessment undertaken in the Nanumea Concept Design Report (Bluecoast, 2021). Nourishment should not be taken from the active beach system on the island's shorelines. Likewise, material should not be taken from the islands core (inactive sediment), as this material is effectively providing the limited land resource available to the local community. Figure 12 provides an indication of approved sand sources based on identified depositional environments at the end of the sediment transport pathways. Final sand resource areas will be confirmed prior to construction nothing current island morphology and approval from UNDP.

Figure 12: Sand sources for beach nourishment and construction material (Priority 1 – orange).

Table 7: Prioritised sand sources for nourishment and construction material on Nanumea.

Sand source	Resource potentially available (m^3)
Priority 1: Depositional areas at the end of transport pathways that are unlikely to affect island stability	**1A. Lagoon sand aprons: 1,000,000m^3** (assuming 5m dredge depth with barge mounted excavator) **1B Lagoon deposit of eastern side of Nanumea: 100,000m^3** (assuming 4m excavation depth using land-based excavator)
Priority 2 Borrowing sand from the active beach system should only be considered in the event priority 1 sources cannot be obtained	**2A. Southern tip: 48,000m^3** (using land-based excavator)

Hydraulic dredges may present some mobilisation challenges at Nanumea Lagoon, therefore non-hydraulic dredging and excavation methods also need to be considered in this environment. The following is a list of extraction methods that have been used for the winning of sediments from depositional fans and sand aprons within atoll lagoons:

- An excavator mounted on a small, spudded barge can be used to source sand from the lagoon sand aprons
- land-based (hydraulic) excavators can be used where applicable.
- Drag-line or clamshell operated from a shore-based long-arm crane
- Pontoon-based cutter suction dredge
- Submersible drag flow pump with cutter head

Images of these extraction methods being used in atoll lagoon environments are provided in Figure 13.

Figure 13: Examples of sand extraction methods from atoll lagoon environments. Clockwise from top left: shore-based hydraulic excavator, pontoon cutter section dredge, submersible drag flow pump with cutter-suction head, drag line operated from shore-based crane. (Image sources: Smith (1995), www.sandredger.com)

Due to the actual volumes involved in on-going sand replenishment activities and the infrequent nature of these events, it is recommended that this is undertaken by non-hydraulic (i.e., no dredging) techniques by suitably skilled local workers, the Tuvalu Public Works Department or Kaupule. This would most likely be via small dump trucks loaded manually by excavator at the sand resource location and placed on the foreshore between the groynes and used to cover the BTBs in the first instance, with priority being placed on reburial of any exposed GMC units. Sediment size requirements for GMC, fill and nourishment purposes is defined in **Table 8**

Table 8: Sediment size requirements for the Nanumaga Coastal Protection works

Fill Type	Properties	Use
TYPE A	≥90% passing 75mm sieve 300mm maximum particle size	Fill over GMC units

Fill Type	Properties	Use
TYPE B	100% passing 26.5mm sieve	GSC, GMC unit fill

3.2.5 Unexploded Ordinance (UXO)

In 2015 Golden West Humanitarian Foundation under grant from United States Department of State conducted a joint mission with the Tuvalu Police Service to locate, recover and dispose of Explosive Remnants of War (ERW) throughout Tuvalu. The team located and destroyed two-thousand-five hundred Smalls Arms Ammunition and one 155mm High Explosive Projectile on Nanumea. The team also identified one 500-pound General Purpose Bomb in the Nanumea Lagoon, this ordnance was not destroyed and the survey team recommended all persons avoid the immediate area until such time the ordnance is removed or destroyed. The presence of ERW on Nanumea is a risk for construction works on Nanumea. It is recommended prior to any excavation or dredging work contractors undertake sufficient investigations to manage this risk appropriately.

As a standard safety precaution prior to conducting any excavation work, contractors should, as a minimum, investigate the construction or excavation footprint with a metal detector or magnetometer. The geotechnical investigations (SPC, 2020b) observed four empty artillery shells on the beach adjacent to the TCAP project site. Local knowledge of any burial or dump areas will be important to ascertain during construction.

3.3 Seabee revetment

A Seabee seawall has been proposed for the protection of the central portion of Nanumea' s western coast. The revetment will be founded on the site of a previous revetment structure and constructed from interlocking Seabee units which are concrete hexagonal blocks with a hollow core. The interlocked units act as a blanket with a high structural integrity to mass ratio compared to random placed concrete armour units. The approved layout of the Seabee revetment can be seen in Figure 14, showing the wall return design terminating landward of the BTB on the north and south revetment extents. Table 9 presents the finalised design parameters for the Seabee revetment and individual units, with Figure 15 showing typical section of the Seabee wall and schematic of individual units. It is recommended that each unit is precast off-site from high-strength concrete to the standards detailed in the Technical Specification.

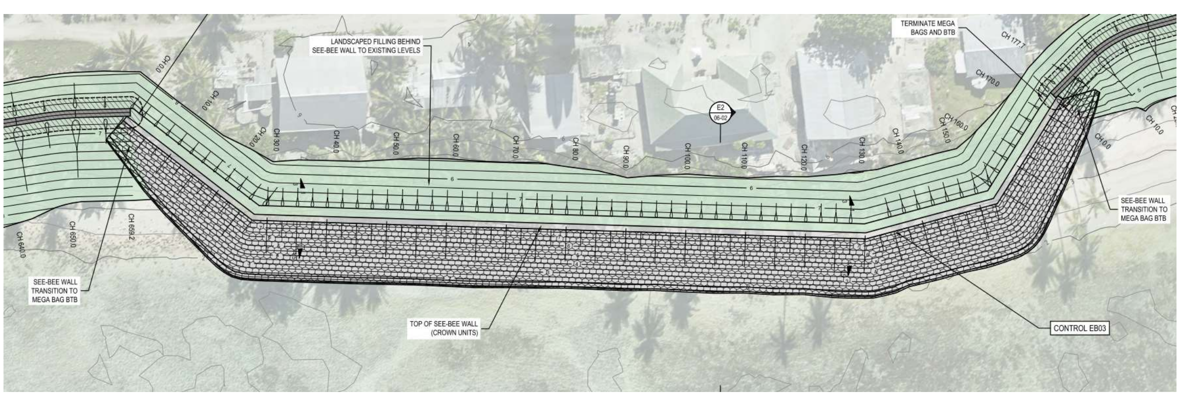
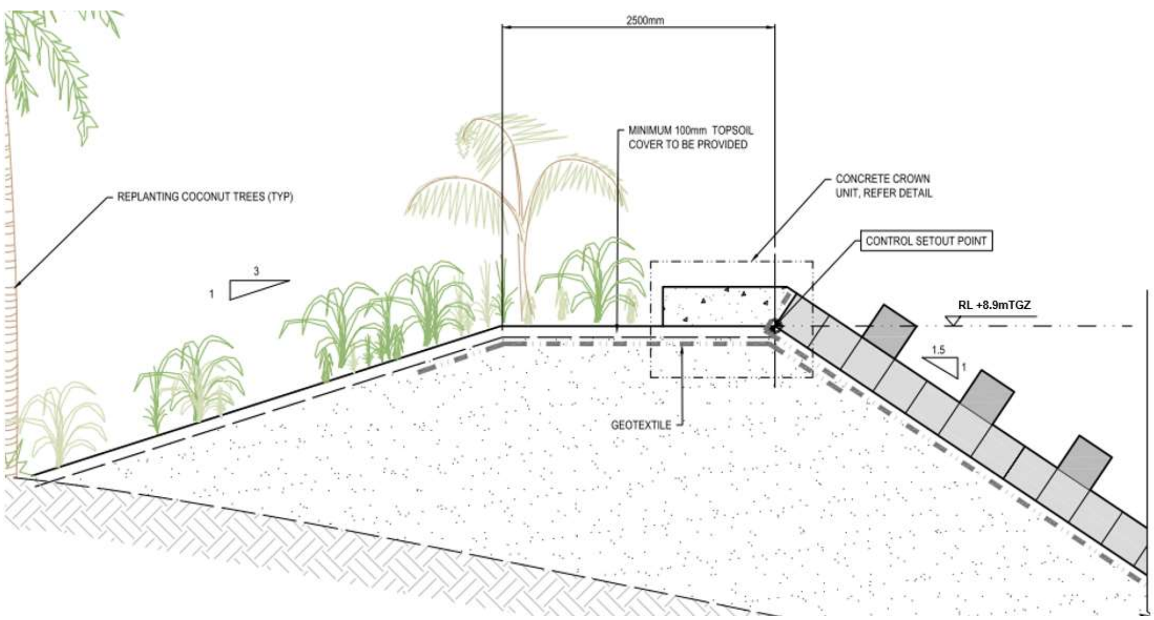


Figure 14: General arrangement plan of the Seabee revetment

Table 9: Design parameters for Nanumea Seabee revetment

Design Parameter	Value	Comment
Crest Height	6.86m MSL 8.80m TGZ	The crest heigh has been determined by allowing a maximum overtopping of 0.6 l/s/m during design events
Crest width	1m	Flat concrete capping beam
Seabee thickness, R	500mm	Length of unit
Seabee width, D	400mm	Outside diameter of unit
Seabee Inner diameter, d	200mm	Inner diameter of unit
Toe excavation depth, h_e	750mm	Concrete beam



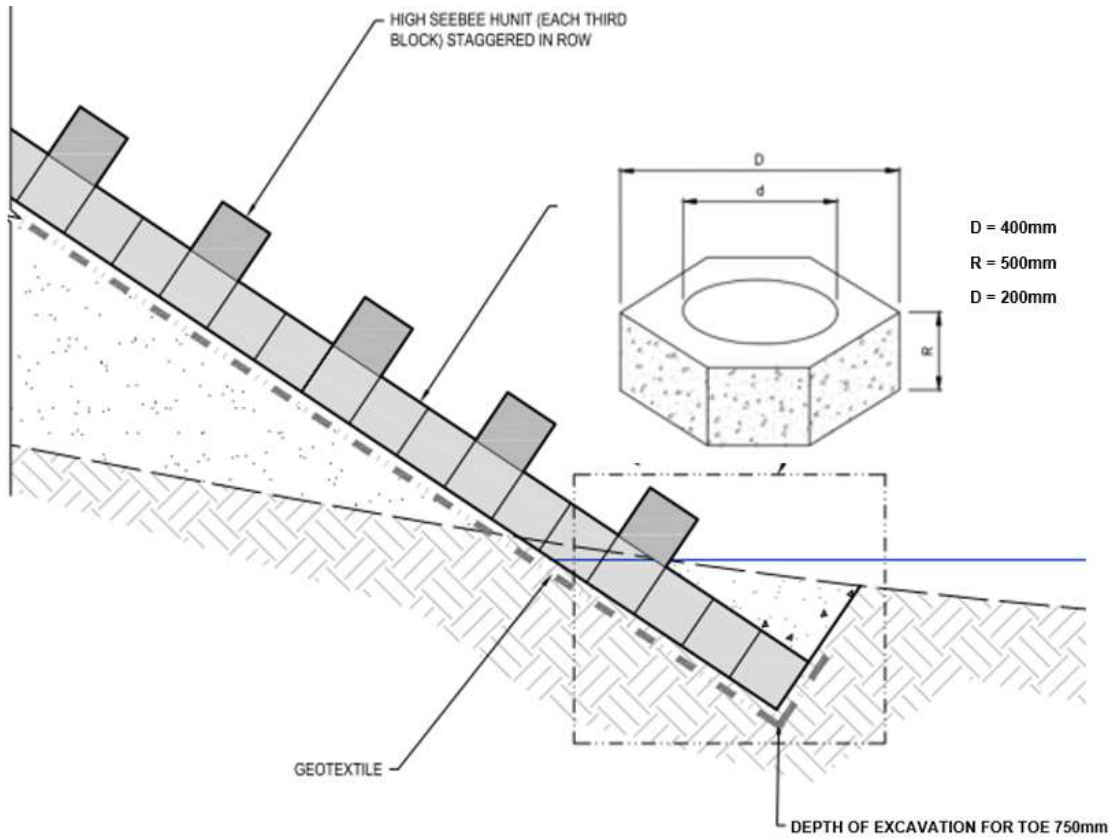


Figure 15: Typical section of Seabee revetment

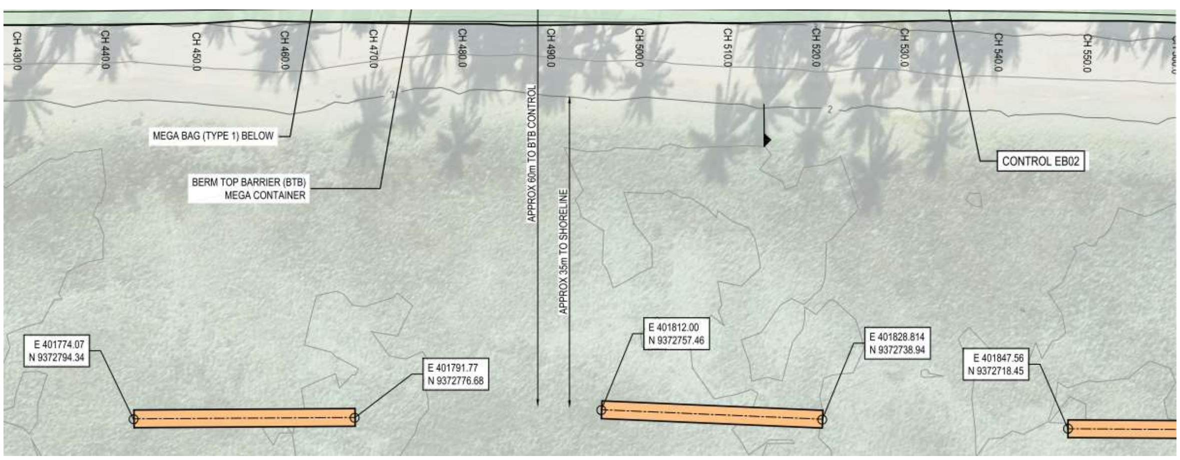
3.4 Reeftop barriers

Reeftop barriers (RTB) are a series of shore-parallel concrete structures to be installed in the nearshore of the western shoreline of Nanumea on the inter-tidal reeftop. The RTB can be classified as detached breakwaters, the general arrangement plan of the units is provided in Figure 16. The RTBs are to be constructed from a number of pre-cast Fibre Reinforced Cement (FRC) units in a controlled environment to the detail provided in the Technical Specification document. Each unit will be 'keyed-in' to the reeftop to a depth of 400mm. Each individual RTB unit will be connected via stainless steel reinforcing bars hammered through connecting lugs and driven through the reeftop. The joint recess and reinforced bars will then be grouted to form a continuous 25m long RTB structure. The surface of the structure will be scored during the casting process to produce interstices in the surface finish to promote marine growth. Table 10 presents the design parameters for the reeftop barriers and Figure 17 provides concept sketches and schematics of the units.

Table 10: Design parameters for Nanumea reeftop barriers (segmented detached breakwaters)

Design Parameter	Value	Comment
Distance offshore, X	35 m	Distance of breakwaters from shoreline (0m contour)

Design Parameter	Value	Comment
Salient width, X_s	25 m	Anticipated salient growth from shoreline (0m contour)
Depth at breakwater, d	-0.4 m MSL	Below Mean Sea Level (MSL)
	1.54 m TGZ	Tide Gauge Zero (Funafuti)
Length of breakwater, L_s / L_B	25 m	Length of each breakwater segment
Gab width, L_g	27.5 m	Distance between successive breakwaters
Height of Breakwater, H_B	0.6 m MSL	Mean Sea Level (MSL)
	2.54 TGZ	Tide Gauge Zero (Funafuti)
RTB dimensions	1250mm	Length
	1000mm	Structure radius
	400mm	Shear key



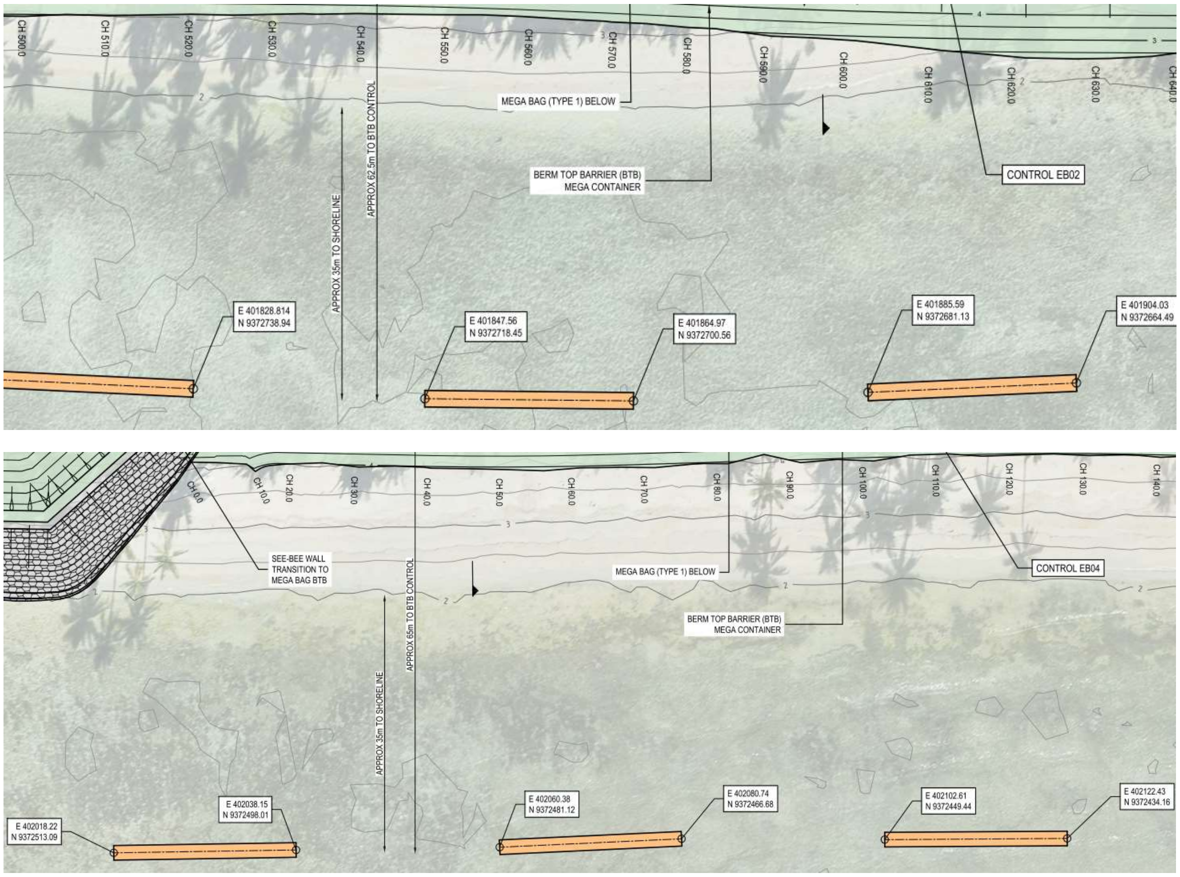


Figure 16: General arrangement plan of the Reeftop Barriers

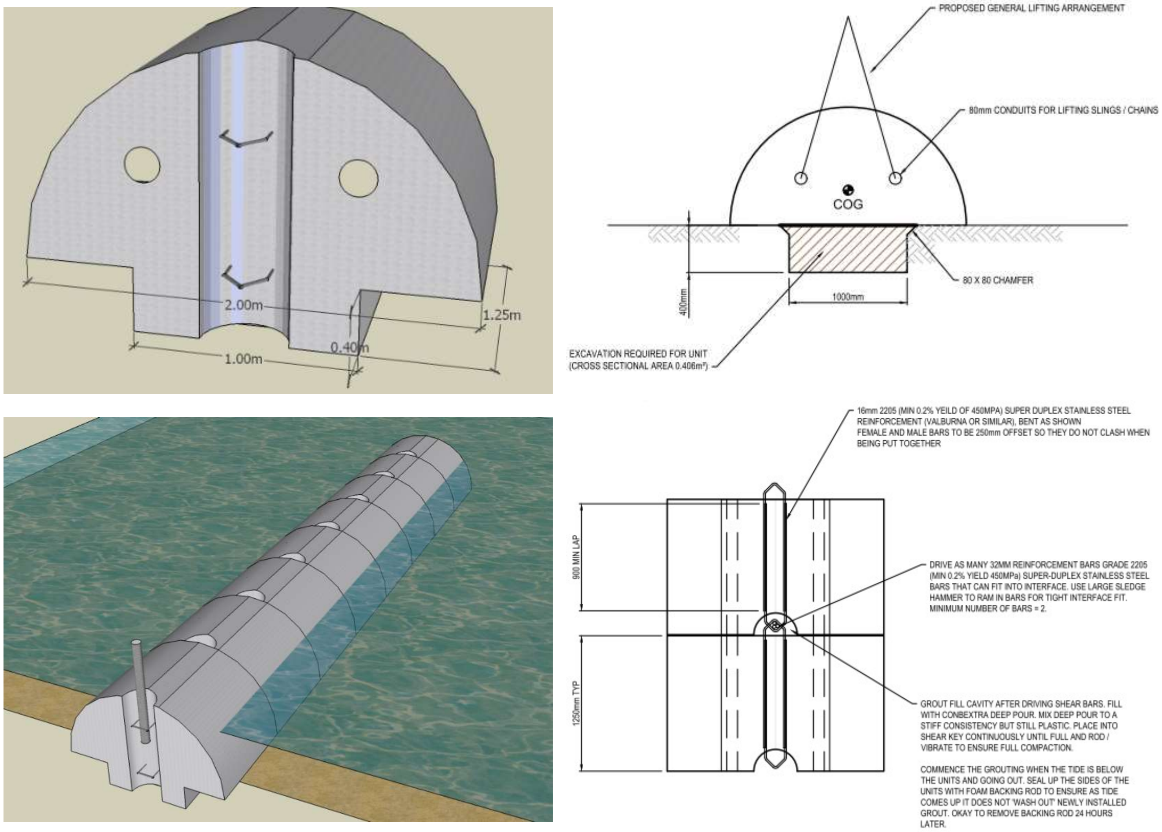


Figure 17: Left: Concept sketches of concrete RTB unit. Right: Schematic and RTB detail

4. PROJECT IMPLEMENTATION

4.1 General

The United Nations Development Programme (UNDP), Pacific Office in Fiji act as the Project Management Unit (PMU) for TCAP, implementing the project in partnership with the GoT. Assistance throughout the implementation phase has also been provided by the Pacific Community (SPC) has also been engaged by UNDP to conduct the ESIA, coastal vulnerability and geotechnical components.

The following section describes non-design related aspects of the project implementation.

4.2 Project governance and oversight

TCAP has been led at the highest political level by a Technical Working Group (TWG) comprising key government departments and Non-governmental Organisation (NGO) associations representing vulnerable communities. The GCF financing, through TCAP, will enable the GoT to address the financial and capacity constraints at all levels – from technical to community awareness – that have so far prevented a sustainable coastal protection solution.

TCAP will strengthen institutional and community capacity for sustaining and replicating project results. It is envisaged that the project will help to strengthen governmental capacity for coastal management and its legacy will be a Coastal Management Strategy for Tuvalu with internal agency capacity for its implementation.

4.3 Procurement strategy

Due to the works complexities stemming from the remote location of the project sites, the unique atoll environments and the nature of the construction works in Tuvalu, UNDP have proposed a 3-stage *Interactive Dialogue* Procurement Strategy. The construction works will be tendered as a complete package of works encompassing Funafuti, Nanumea and Nanumaga. The procurement stages are briefly described below:

- Pre-qualification (PREQ): The PREQ procedure is aimed at identifying qualified applicants for the next stage of the procurement process based upon their expertise, financial and technical capacity, and experience in construction in remote undeveloped atoll islands.
- Request for Proposal (RFP): A formal RFP will be issued to pre-qualified tenderers to provide both a formal technical and financial response to the tender. A pre-bid conference will be undertaken prior to the submission of the tenderer's RFP response.
- Interactive Dialogue (ID):The interactive dialogue allows UNDP and tenderers to discuss the scope and complexities around the project and for tenderers to understand better the RFP requirements. ID offers significant and clear benefits; enabling risk and assumptions to be thoroughly tested, innovative solutions to evolve and the foundations established for ensuring a successful contractual outcome of the tender. After completion of the ID sessions, the offerors are expected to submit their proposals within the stipulated deadline. The evaluation of the proposals including the contract award will follow the standard UNDP RFP process.

4.4 Contract delivery

The works contract will be delivered through UNDP's standard construction contract. Terms of the contract and any proposed departures by the tenderers will be discussed during the ID phase of procurement in the presence of the UNDP Legal and Procurement Teams as well as the PMU. Contractual discussions and verifications through the ID phase will minimise the risk of contractual disputes during construction as the ID sessions provide an opportunity for both parties to explore contingencies and project risks prior to signing and commencement of works.

4.5 Construction Environmental and Social Management Plan (C-ESMP)

The planned works on Nanumea have the potential to create a variety of impacts through their implementation. These impacts can be either positive (e.g., improved coastal protection for community members) or negative (e.g., loss of trees, impact to structures, impaired beach access or views) depending on the activity and receptors involved. The impact of this project on the physical, biological, and social environment has been assessed and is described in detail in the Environmental and Social impact Assessment Nanumaga and Nanumea undertaken by The Pacific Community – Geosciences, Energy and Maritime Division (SPC, 2020a). The key potential project impacts and risks have been identified as the following:

- Increased water turbidity from dredging works
- Changing access to, and use of, coastal marine environment
- Increased risk of traffic accidents
- Solid waste management
- Use of heavy machinery on the beach leading to increased sedimentation
- Fuel or other hazardous spills
- Noise and dust disturbance

This ESIA contains the recommended mitigation measures for Nanumea for pre-construction, construction, and operational phases to avoid, reduce, or mitigate all identified impacts. The Contractor for the TCAP works will be required to produce a Contractor's Environmental and Social Management Plan (C-ESMP). The C-ESMP will be the Contractor's governing document for the implementation of this ESIA's recommendations during works. The C-ESMP will be reviewed and approved by the TCAP Project Management Unit and disclosed prior to commencement of civil works. A summary of the key environmental and social indicators is provided in the table below.

Table 11: Environmental and Social Indicators and parameter considered under each indicator during the impact assessment (Source: SPC: 2020a)

Environmental and Social Indicator	Factors to be considered
Water Quality	• Water quality of coastal marine environment • Quantity and quality of surface water • Turbidity in marine environment

Environmental and Social Indicator	Factors to be considered
Erosion, Drainage and Sediment Control	• Sedimentation build up in coastal marine environment • Management of project site run off • Existing erosion and sediment deposition regimes in coastal zone
Air Quality	• Dust generation • Air quality
Noise and Vibration	• Noise nuisance in sensitive areas • Vulnerability of property to damage from vibration
Flora and Fauna	• Vegetation within the direct and indirect project footprint • Loss of native fauna • Degradation of marine habitats • Introduction of new invasive marine or terrestrial species • Spread of existing invasive species in project sites
Waste Management	• Excavation of household waste during construction • Disposal arrangements of solid project and construction waste • Management of hazardous waste • Treatment and disposal of wastewater (black and grey)
Chemical and Fuel Management	• Storage and handling of hazardous substances • Contamination of soils and water from spills
Community Services and Infrastructure	• Boat landing access (especially challenging on Nanumaga) • Water supply facilities • Island roads
Land and Resource Use	• Church location • Agriculture and food bearing trees • Changing land use • Utilisation of private, native land
Social Environment	• Gender and social inclusion • Community perceptions and expectations • Employment
Community Health and Safety	• Gender based violence • Worker safety

5. SUMMARY AND RECOMMENDATIONS

5.1 Summary

This report is the culmination of the design process for the Nanumea Coastal Protection works as part of the TCAP. It finalises the design narrative undertaken in the Nanumea Concept Design Report (Bluecoast, 2021) and draws on extensive stakeholder consultation, site investigations and interviews with contractors working in the region. The basis of design, structure parameters and the project implementation framework is presented herein. A safety in design (SiD) investigation which presents a design and construction risk assessment is provided in appendix C for reference.

The Nanumea Coastal Protection works can be summarised as follows:

- 1,330m of Berm Top Barrier (BTB) constructed on the western coast of Nanumea constructed from buried geotextile mega containers (GMC) approximately 20m long, the BTB will raise the height of the storm berm by around 1500mm. The GMC will be filled and buried under 37,100m^3 of sediment sourced from the southern tip and lagoon flanks of Nanumea located a maximum of 4,000m from the project site. The BTB will be planted with local vegetation on the crest of the BTB alignment.
- A 180m concrete Seabee revetment will be constructed in the Village centre to replace a file seawall in this location.
- Seven 25m long FRC reeftop barriers will be keyed into the reeftop 35m offshore of the western shoreline of Nanumea.

5.2 Recommendations

The following recommendations are included as the TCAP moves through the implementation stage:

- Any uncertainties or omissions within this Detailed Design Report and associated IFC drawings should be conveyed by the tenderers to UNDP during the ID phase of the procurement strategy
- The submitted C-ESMP should address as a minimum the risks presented in Table 11 and those detailed in the ESIA (SPC, 2021a).
- A post-construction monitoring and maintenance strategy should be established with clear tasks, roles, training and budget allocated to GoT.
- Wherever possible a UNDP representative engineer should be present during the construction phase to ensure the coastal protection works are constructed as to the specifications presented.

6. REFERENCES

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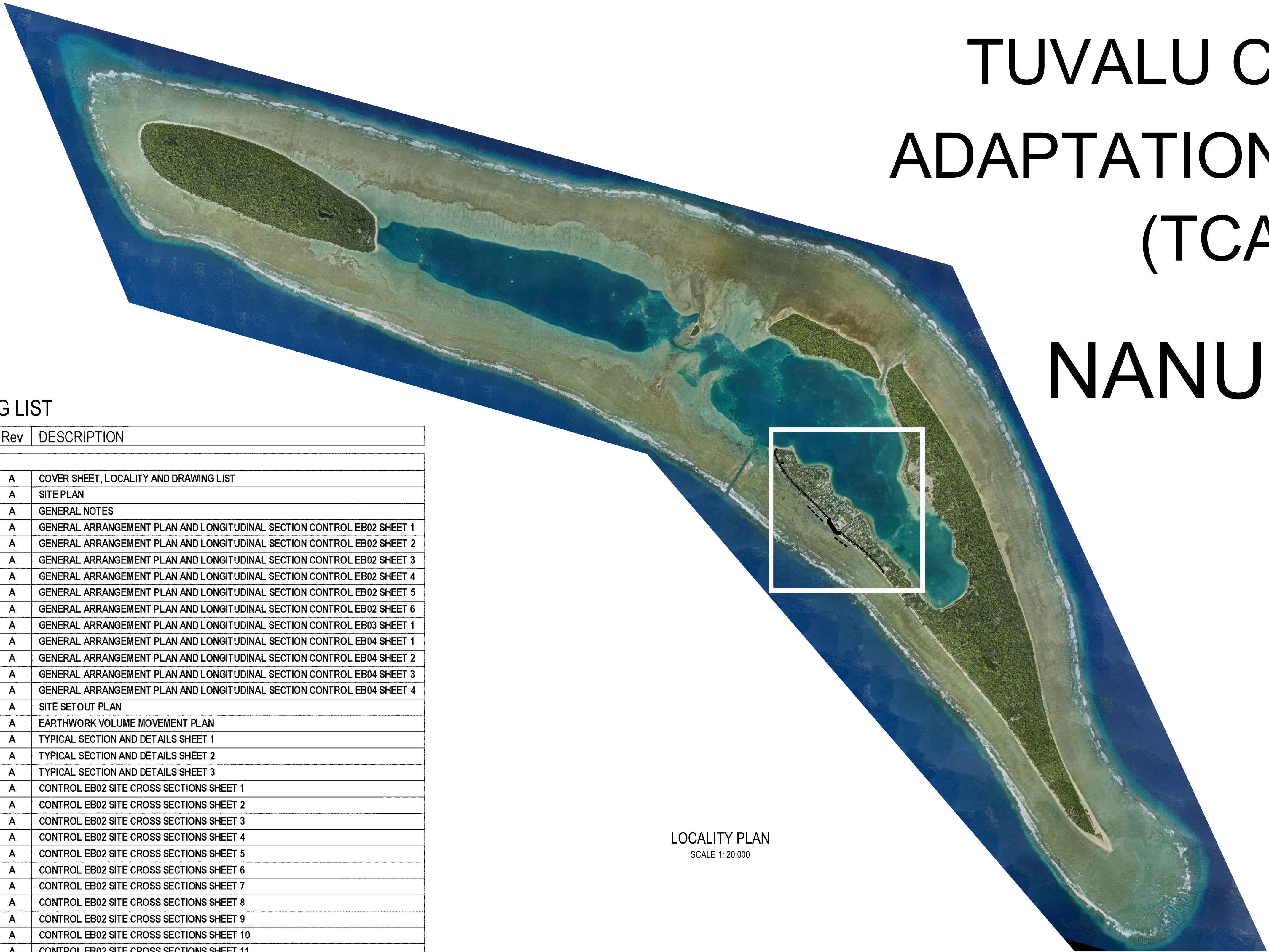
Appendix A: Nanumea Coastal Protection IFC Drawings

TUVALU COASTAL ADAPTATION PROJECT (TCAP)

NANUMEA



LOCALITY PLAN
SCALE 1: 20,000

NANUMEA DRAWING LIST

JOB No	PLAN No	Rev	DESCRIPTION
P19012			
P19012-ME-CV-	00-01	A	COVER SHEET, LOCALITY AND DRAWING LIST
	01-01	A	SITE PLAN
	02-01	A	GENERAL NOTES
	03-01	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 1
	03-02	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 2
	03-03	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 3
	03-04	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 4
	03-05	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 5
	03-06	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 6
	03-07	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB03 SHEET 1
	03-08	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 1
	03-09	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 2
	03-10	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 3
	03-11	A	GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 4
	04-01	A	SITE SETOUT PLAN
	05-01	A	EARTHWORK VOLUME MOVEMENT PLAN
	06-01	A	TYPICAL SECTION AND DETAILS SHEET 1
	06-02	A	TYPICAL SECTION AND DETAILS SHEET 2
	06-03	A	TYPICAL SECTION AND DETAILS SHEET 3
	08-01	A	CONTROL EB02 SITE CROSS SECTIONS SHEET 1
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	10-07	A	CONTROL EB04 SITE CROSS SECTIONS SHEET 7

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

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SCALE 1:20,000 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP — Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT — TCAP

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
COVER SHEET, LOCALITY AND DRAWING LIST

DRG NO.
P19012-ME-CV-00-01

REV
A

SITE PLAN

SCALE 1: 2,500

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
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UNFINISHED DRAWING

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SCALE 1:2500 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES

SURVEY PROVIDED BY

HORIZONTAL DATUM

UTM-WGS84 / UTSM60S EPSG32760

VERTICAL DATUM

CHART DATUM (CD) TGZ

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PLANS PREPARED FOR:

UNDP Empowered lives. Resilient nations.

GREEN CLIMATE FUND

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PROJECT NUMBER

P19012

DRAWING TITLE

SITE PLAN

DRG NO.

P19012-ME-CV-00-01

REV.

A

TECHNICAL SPECIFICATION

GENERAL CONSTRUCTION NOTES

1. THE WORKS SHALL BE PROTECTED AND/OR MANAGED TO ACCOUNT FOR HIGH WATER LEVELS WAVE ACTION AND STORMWATER.
2. THE WORKS SHALL BE COMPLETED IN A MANNER WHICH LIMITS THE EXTENT OF THE WORKS EXPOSED TO POSSIBLE DAMAGE FROM HIGH WATER LEVELS, WAVE ACTION AND STORMWATER AND ENSURE THAT IT DOES NOT ADVERSLEY AFFECT AREAS ADJACENT TO THE WORKS.
3. DEMOLITION AND EXCAVATION SHALL BE UNDERTAKEN IN A CAREFUL MANNER WITH A MINIMUM OF DISTURBANCE AND WITH EVERY POSSIBLE PRECAUTION TAKEN TO PREVENT DAMAGE TO PROPERTY AND INJURY TO PERSONNEL.
4. CARRY OUT ALL WORKS IN ACCORDANCE WITH THE APPROVED PROJECT DOCUMENTATION. RECORD AND HAVE AUTHORISED ANY CHANGES MADE TO THE WORKS UNDER THIS DOCUMENTATION IN ACCORDANCE WITH QUALITY PROCEDURES.
5. ALL DISCREPANCIES SHALL BE REFERRED TO THE UNDP ENGINEER FOR RESOLUTION BEFORE PROCEEDING.
6. DURING THE CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE WORKS INCLUDING ADJACENT STRUCTURES AND ROADS IN A STABLE CONDITION AND ENSURING NO PART IS OVERSTRESSED.
7. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS IN METRES RELATIVE TO CHART DATUM (CD).
8. ARRANGE TGZ SETOUT IN LIAISON WITH GOVERNMENT OF TUVALU LANDS AND SURVEY DEPARTMENT. NOTIFY SURVEY CO-ORDINATOR A MINIMUM OF 24 HOURS IN ADVANCE.
9. CATCHMENT BASED ON DIGITAL MODEL (DEM) PROVIDED BY FUGRO (2019).
10. ELEVATED PATHWAY TO BE HIGHEST POINT OF RECLAMATION TO ALLOW OVERLAND FLOWS FROM MAJOR STORM EVENTS TO BE CONVEYED OFF THE RECLAMATION. REFER DESIGN REPORT FOR DETAILS.
11. ALL DIMENSIONS RELATING TO EXISTING WORK, GROUND AND SEABED LEVELS, OR ITEMS SUPPLIED BY OTHERS, SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF ANY FABRICATION AND ERECTION WORKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR CORRECTNESS.
12. ALL PROPRIETARY ITEMS SHALL BE INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS/SUPPLIERS INSTRUCTIONS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY SITE DRAINAGE AND GENERAL MAINTENANCE OF THE AREA DURING CONSTRUCTION.
14. THE CONTRACTOR SHALL RECORD PHOTOGRAPHIC EVIDENCE OF ALL EXCAVATIONS PRIOR TO ANY BACKFILLING .

EXCAVATION AND FILL WORKS

1. THE UNDP CONSTRUCTION SUPERVISOR SHALL BE ADVISED WHEN DEMOLITION, EXCAVATION AND FILL WORKS ARE TO COMMENCE.
2. THE EXCAVATION ALIGNMENT AND BATTER SHALL BE IN ACCORDANCE WITH THE LEVELS AND SIDE SLOPES SHOWN ON THE DRAWINGS.
3. CARE MUST BE TAKEN WITH EXCAVATION BATTERS TO ENSURE THEY ARE NOT IMPEDEING ROAD AND SITE ACCESS.
4. APPROVAL MUST BE SOUGHT BY THE CONSTRUCTION SUPERVISOR FROM THE KAPULE IN REGARD TO THE REMOVAL OF TREES, OR COVERING OF LOCAL GARDENS OR INFRASTRUCTURE BY EXCAVATION BATTERS.
5. COVERING OF THE BERM TOP BARRIERS MUST BE IN ACCORDANCE WITH THE ALIGNMENT LEVELS, CREST ELEVATION AND SIDE SLOPES OF THOSE SPECIFIED IN THE DRAWINGS. ANY PROPOSED CHANGES TO THE DESIGNS MUST BE PROPOSED TO THE UNDP ENGINEER PRIOR TO CONSTRUCTION.
6. STOCKPILING OF SAND SHALL BE LIMITED TO THE MINIMUM EXTENT PRACTICAL FOR CONTINUITY OF THE WORKS.

GEOTEXTILE PLACEMENT

1. THE GEOTEXTILE SHALL BE TEXCEL 1200R OR APPROVED EQUIVALENT WHICH COMPLIES WITH THE FOLLOWING MINIMUM REQUIREMENTS:
   - UNIT WEIGHT TO AS3706.1
   - GRABTENSILE STRENGTH TO AS2001.2.3
   - TRAPEZOIDAL SPACES TEAR RESISTANCE ASTM D1117
   - WATER PERMEABILITY (10 CM HEAD)
   - 1000 g/m2
   - 1000N (MIN) IN ANY DIRECTION IN PLANE OF GEOTEXTILE
   - 600N (MIN) IN ANY DIRECTION
   - 30litres/m2/second (MIN)
2. THE PLACEMENT OF GEOTEXTILE FILTER SHALL SATISFY THE CRITERIA BELOW:
   - GROUND PREPARATION: SHARP-EDGED ROCKS, STUMPS AND THE LIKE ARE TO BE REMOVED PRIOR TO LAYING OF THE GEOTEXTILE
   - JOINING FABRIC ELEMENTS: FABRIC ELEMENTS MAY BE JOINED BY EITHER OVERLAPPING OR SEWING. OVERLAP WIDTHS SHALL BE NO LESS THAN 0.5M WITH THE DIRECTION OF OVERLAP TAKING INTO ACCOUNT THE OVERBURDEN MATERIAL SUPPLY DIRECTION. FOR SEWING ASSEMBLY 0.1m OVERLAP IS SUFFICIENT TO ENSURE CONTINUITY OR TO MANUFACTURERS INSTRUCTION.
   - LAYING IN WATER: RAPID IMMERSION REQUIRES BALLASTING OF FABRIC.
   - JOIN GEOTEXTILE AS TO RETAIN ADEQUATE FILTER FUNCTION.

FILL MATERIAL

1. ALL FILL MATERIALSHALL BE NON-COHESIVE GRANULAR MATERIAL COMPRISING HARD, DENSE AND DURABLE SPACE PARTICLES WHICH SHALL BE FREE FORM ORGANIC AND CARBONACEOUS MATERIALS.

   GRADING OF FILL MATERIAL SHALL COMPLY WITH THE FOLLOWING PROPERTIES:

   TYPE A: 300mm MAXIMUM PARTICLE SIZE
   ≥90% PASSING 75mm SIEVE

TYPE B: 100% PASSING 26.5mm SIEVE

GEOTEXTILE (MEGA) CONTAINERS

1. PLACEMENT OF THE CONTAINERS SHALL ACHIEVE THE FOLLOWING TOLERANCES:
   - A TOLERANCE OF 5º ALONG THE BUND OF INDIVIDUAL CONTAINERS
   - MAXIMUM 50mm HORIZONTAL OFFSET BETWEEN THE ENDS OF ADJACENT GEOSYNTHETIC SAND CONTAINERS.
   - MAXIMUM 50mm HORIZONTAL SEPARATION BETWEEN ADJACENT GEOSYNTHETIC SAND CONTAINERS.
2. CONTAINERS SHALL BE FILLED USING TYPE B FILL MATERIAL.
3. CONTAINERS SHALL BE FILLED AND SEALED IN ACCORDANCE WITH THAT PRESCRIBED BY THE MANUFACTURER AND IN ACCORDANCE WITH THE CONSTRUCTION PROCEDURE.
4. THE FILLING METHODS SHALL BE HYDRAULICALLY ASSISTED AND SHALL ACHIEVE CONTAINER DIMENSIONS WITHIN THE RANGE SPECIFIED BELOW:

TYPE	HEIGHT (mm)	LENGTH (mm)	WIDTH (mm)
CONTAINER	1,500	20,000	3,100

5. THE CONTAINERS SHALL BE PLACED ON A GEOTEXTILE TO PREVENT THE LOSS OF FINES THROUGH THE STRUCTURE, IN ACCORDANCE WITH THE DRAWINGS AND THIS SPECIFICATION.
6. THE CONTAINERS SHOULD BE PLACED USING SPECIALISED FILLING/PLACEMENT EQUIPMENT, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. THE AMOUNT OF HANDLING SHALL BE MINIMISED TO ENSURE THE GEOSYNTHETIC SAND CONTAINER RETAINS ITS FORM AND SHAPE, AND TO REDUCE THE STRAINS PUT ON THE GEOTEXTILE AND SEAMS. THE GEOSYNTHETIC MEGA CONTAINERS SHALL BE PLACED IN SUCH A WAY AS TO MINIMISE EXPOSURE OF THE ON-SITE CLOSURE SEAM.
8. THE CONTAINERS SHALL BE PLACED IN A STRETCHER BOND LAYOUT TO ENSURE EFFECTIVE INTERLOCK AND STABILITY.
9. IF VEHICULAR TRAFFICKING ATOP THE GEOSYNTHETIC SAND CONTAINERS IS REQUIRED DURING PLACEMENT, A MINIMUM SAND COVER OF 500mm IS REQUIRED OVER THE GEOSYNTHETIC SAND CONTAINERS.

REINSTATEMENT, SITE DISESTABLISHMENT AND CLEANUP

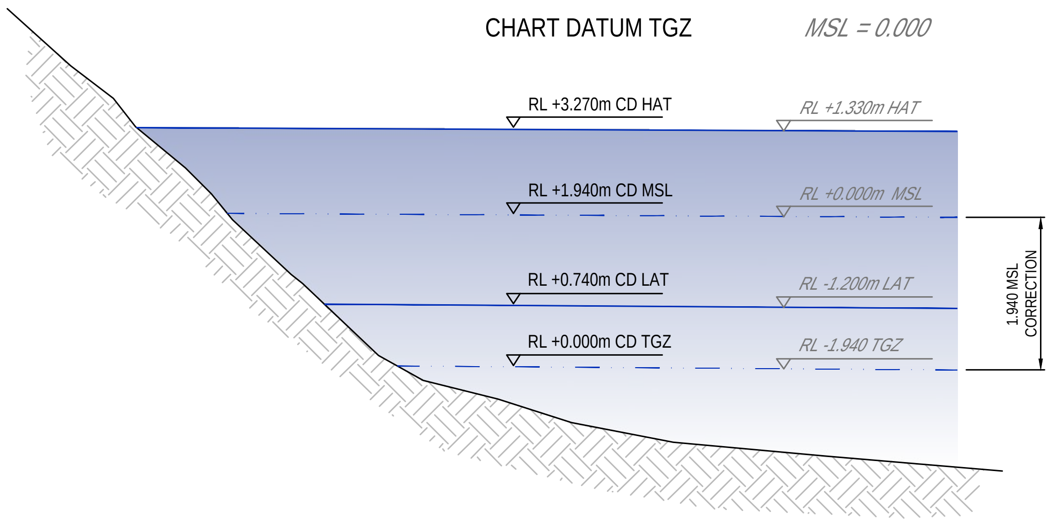
1. EXCEPT TO THE EXTENT THAT THE SITE HAS BEEN REPAIRED AND UPGRADED IN ACCORDANCE WITH THE WORKS, THE SITE SHALL BE REINSTATED TO ITS PRE-CONSTRUCTION CONDITION AND ANY STRUCTURES DAMAGED DURING THE COURSE OF THE WORKS.
2. UPON COMPLETION OF THE WORKS, THE SITE SHALL BE CLEARED OF ALL SURPLUS MATERIALS, PLANT, FENCING, SITE SHED, NOTICE BOARDS AND THE LIKE, TO THE SATISFACTION OF THE UNDP REPRESENTATIVE.
3. UPON COMPLETION OF THE WORKS, REMOVAL AND LAWFUL DISPOSAL OFF SITE OF ALL SURPLUS SPOIL, RUBBISH OR EXCESS MATERIAL, AND FOR THE FINAL CLEANING UP OF ALL AREAS COVERED BY THE CONTRACT SHALL BE LEFT CLEAN AND TIDY UPON COMPLETION.

SEABEE SEAWALL

1. AN APPROVED GROUT SHALL BE PLACED BETWEEN UNITS, IN JOINS AND ANY OTHER INCONSISTENCIES SUCH THAT CONNECTED RTBs FROM A CONTINOUS UNIT WHERE POSSIBLE.
2. SURFACE OF THE RTB UNITS ARE TO SOCURED OR MATTED TO CREATE INERSTICES TO PROMOTE BIOLOGICAL GROWTH
3. CONCRETE SHOULD HAVE DENSITY OF AT LEAST 2,300kg/m³
4. THE CONCRETE COMPRESSIVE STRENGTH SHOULD BE AT LEAST 25MPa AFTER 28 DAYS
5. CONCRETE SLUMP SHOULD BE 100mm
6. CEMENT SHALL BE TYPE GP: GENERAL PURPOSE PORTLAND CEMENT OR EQUIVALENT APPROVED. A MIX DESIGN SHOULD BE SUBMITTED FOR APPROVAL PRIOR TO CASTING
7. SEABEE UNITS SHOULD BE FREE OF DEFECTS, SUCH AS HONEYCOMBING AND CRACKS. THE SURFACE OF THE CONCRETE SHOULD BE SMOOTH AND DENSE
8. SEABEE UNITS SHALL BE WELL PACKED AND TIGHTLY FITTING TO THE ADJACENT UNITS. EACH SEABEE UNIT MUST BE IN CONTACT WITH OTHER UNITS.
9. A TOLERANCE OF 5% IN THE DIMENSION OF UNITS RELATIVE TO DESIGN IS A MINIMUM REQUIREMENT. IN ADDITION, THE FOLLOWING PLACEMENT TOLERANCES SHOULD ALSO BE ADHERED:
   a. ±30% NORMAL TO THE SLOPING SURFACE
   b. ±15% BETWEEN ADJACENT UNITS NORMAL TO THE SLOPE
10. WHERE THE STRUCTURE ALIGNMENT CHANGES DIRECTION, ADJACENT UNITS MAY BE HORIZONTALLY STAGGERED TO ACHIEVE THE REQUIRED SURFACE PROFILE PROVIDED, SUCH THAT THE DISTANCE BETWEEN ANY ADJACENT UNIT EDGES (GAP) DOES NOT EXCEED 100 mm. WHERE THIS CANNOT BE PRACTICALLY ACHIEVED, THE JOINT BETWEEN THE ADJACENT PLANES OF SEABEES SHALL BE FORMED BY IN SITU INFILL CONCRETE OF HALF SEABEE UNITS.
11. WHERE EXCESSIVE GAPS BETWEEN SEABEE UNITS IS UNAVOIDABLE, GROUTING IS RECOMMENDED.
12. GEOTEXTILE FILTER FABRIC SHALL BE TEXCELL 1200R (OR APPROVED EQUIVALENT)

REEFTOP BARRIERS

1. DURING FABRICATION, HANDLING, STORAGE AND ERECTION OF THE UNITS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE STABILITY OF THE WORKS AT ALL TIMES AND ENSURE THAT NO PART IS UNSTABLE OR OVERSTRESSED. THE CONTRACTOR IS TO ALSO ENSURE THE INTEGRITY AND STABILITY OF ADJACENT STRUCTURES AND SERVICES IS MAINTAINED. IF IN DOUBT ASK.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT SUFFICIENT TOLERANCES ARE PROVIDED AND INTEGRATED THROUGHOUT ALL ELEMENTS OF WORK.
3. PROPRIETARY ITEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
4. PROPRIETARY GROUTS SHALL BE STORED, MIXED, PLACED AND CURED IN ACCORDANCE WITH THE MANUFACTURES SPECIFICATION.
5. ALL WORKMANSHIP, MATERIALS, TESTING AND ASSESSMENT SHALL BE IN ACCORDANCE WITH AS 3600 CURRENT EDITIONS WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
6. CONCRETE USED IN THE WORKS SHALL BE MASS CONCRETE REINFORCED WITH MACRO FIBRE REINFORCEMENT AS NOTED ON THE DRAWINGS AND NOTES BELOW.
7. THE CONTRACTOR IS REQUIRED TO DETERMINE A CONCRETE MIX DESIGN FOR THE PROPOSED FIBRE REINFORCED PRECAST ELEMENTS THAT WILL MEET ALL THE PERFORMANCE REQUIREMENTS AS IDENTIFIED IN THE TECHNICAL SPECIFICATION AND DRAWINGS. THE PERFORMANCE OF THE MIX DESIGN SHALL BE TESTED AND PROVIDED TO THE UNDP ENGINEER FOR APPROVAL PRIOR TO PROCEED WITH FABRICATION.
8. NO HOLES, CHASES OR EMBEDMENT OF PIPES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR WRITTEN APPROVAL OF THE ENGINEER
9. NO CONSTRUCTION JOINTS ARE PERMITTED, THE BLOCKS SHALL BE MADE IN ONE HOMOGENOUS MASS.
10. EXCAVATION OF THE REEF TOP KEY SHALL BE LEVEL TO ENSURE RTB REST ON LARGEST SURFACE AREA OF UNIT AND NOT THE TOE.
11. AN APPROVED GROUT SHALL BE PLACED BETWEEN UNITS, IN JOINS AND ANY OTHER INCONSISTENCIES SUCH THAT CONNECTED RTBs FROM A CONTINOUS UNIT WHERE POSSIBLE.
12. SURFACE OF THE RTB UNITS ARE TO SOCURED OR MATTED TO CREATE INERSTICES TO PROMOTE BIOLOGICAL GROWTH.



Funafuti Tide Gauge Datum Relationships and MSL Correction" (source: Fugro, 2019). Source SPC, 2019

TIDE CHART - DATUMS

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m — SCALE 1:100 AT ORIGINAL SIZE

0 0.25 0.5 0.75 1.0 1.25m — SCALE 1:25 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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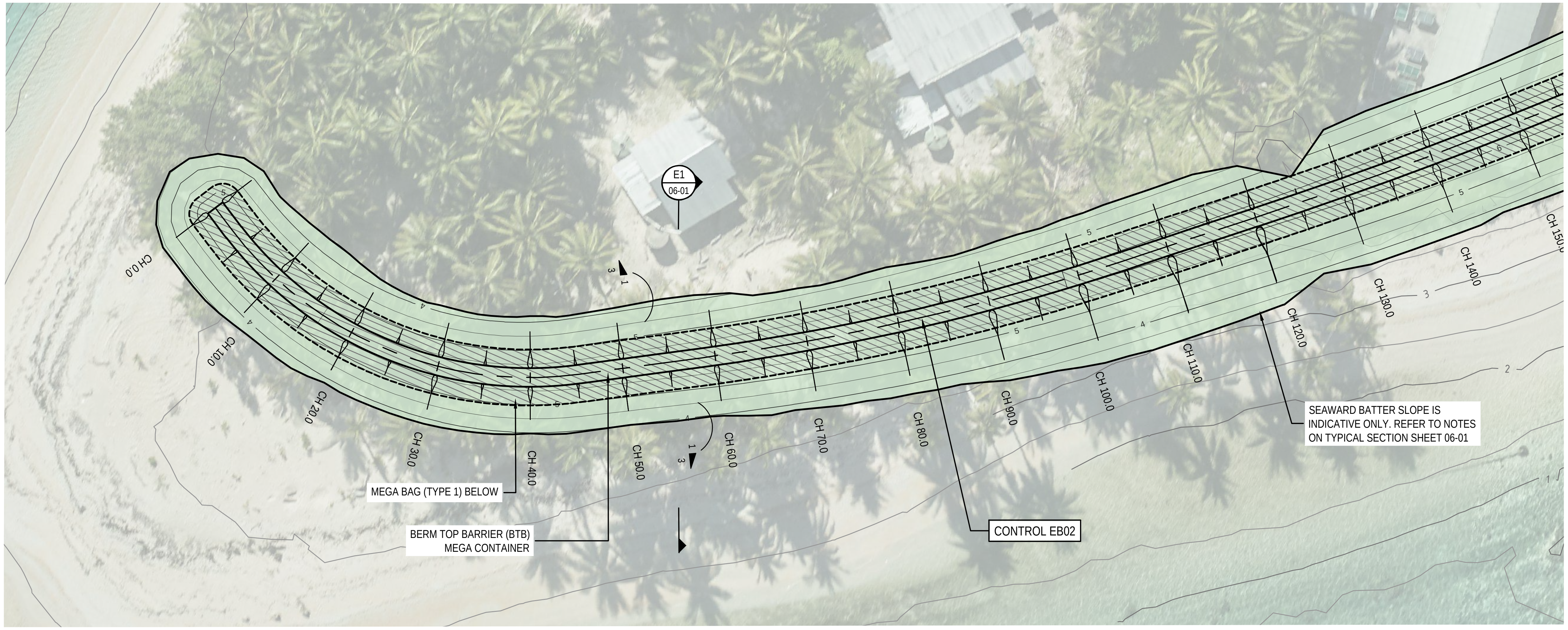
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL NOTES

DRG NO.
P19012-ME-CV-02-01

REV.
A



PLAN

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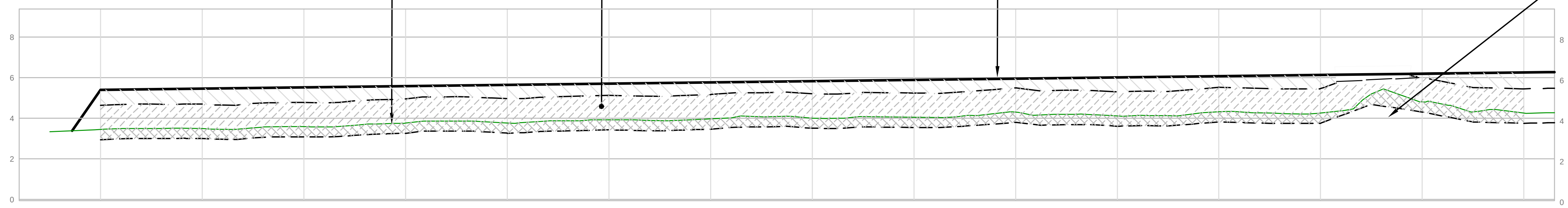

CONTROL S.O.P		5.40	5.42	5.46	5.52	5.58	5.64	5.68	5.70	5.76	5.77	5.83	5.89	5.95	6.01	6.04	6.07	6.13	6.13	6.19	6.25
EXISTING SURFACE	3.33	3.44	3.50	3.49	3.58	3.75	3.76	3.87	3.92	3.94	3.96	4.00	4.04	4.30	4.10	4.12	4.32	4.24	4.25	4.81	4.25
DEPTH TO EXISTING (m)		2	1.9	2	1.9	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.9	1.9	1.8	1.9	1.9	1.4	2
CHAINAGE	-5.00	0.00	2.97	10.00	20.00	30.00	40.00	45.20	50.00	58.63	60.00	70.00	80.00	90.00	100.00	104.90	110.00	119.84	120.00	130.00	140.00

LONGITUDINAL SECTION EB02

REV.	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 — SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m — SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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PLANS PREPARED FOR:
UNDP — Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT — TCAP

PLANS PREPARED BY:
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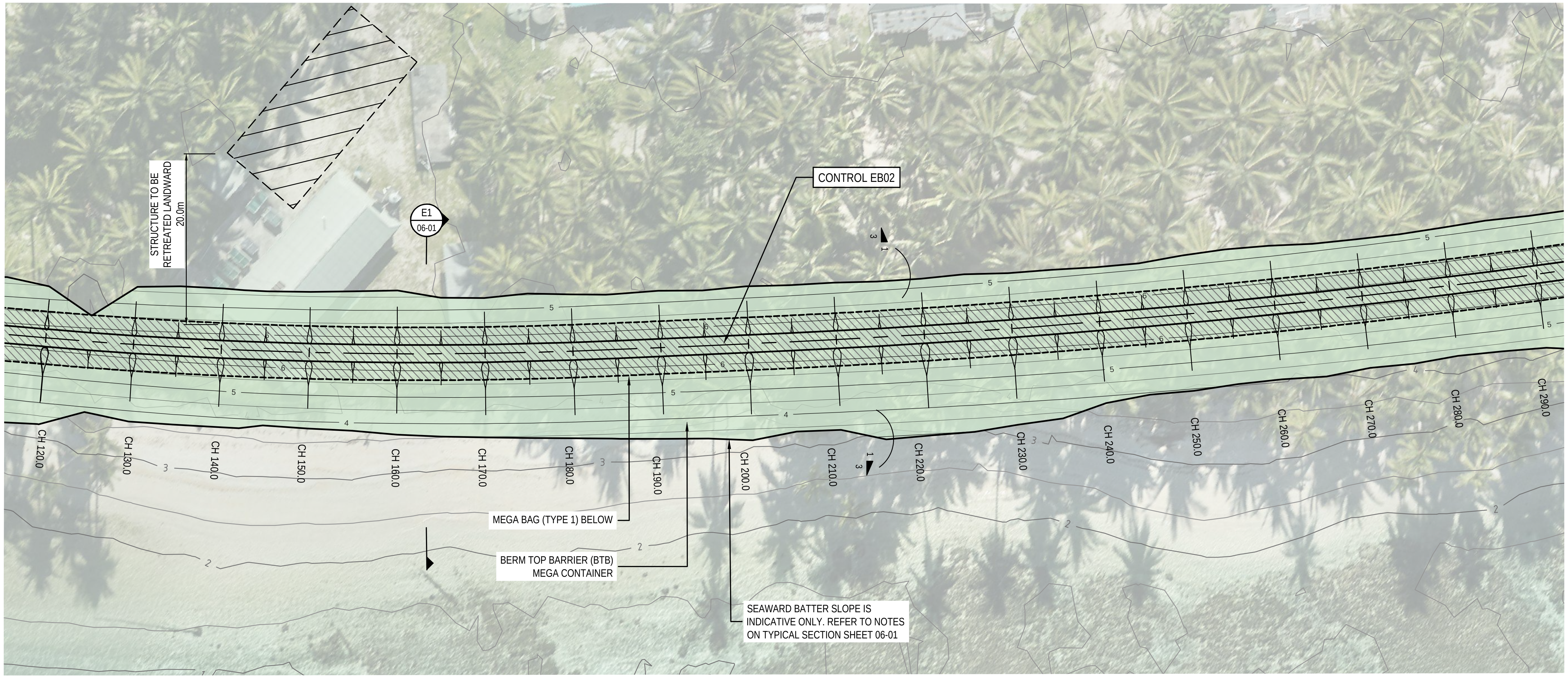
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 1

DRG NO.
P19012-ME-CV-03-01

REV.
A



PLAN

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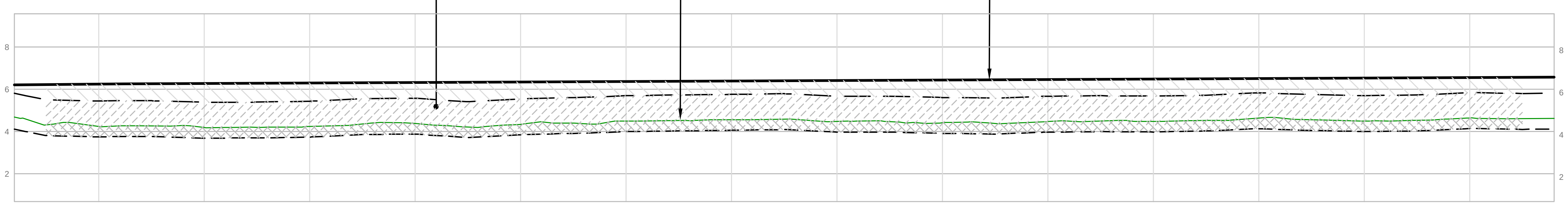

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EXISTING SURFACE	4.31	4.25	4.27	4.19	4.24	4.38	4.35	4.41	4.50	4.56	4.56	4.48	4.41	4.48	4.48	4.64	4.50	4.65	4.61
DEPTH TO EXISTING (m)	1.9	2	2	2.1	2.1	1.9	2	2	1.9	1.8	1.8	1.9	2	2	2	1.9	2	1.9	2
CHAINAGE	135.00	140.00	142.33	150.00	160.00	170.00	180.00	184.02	190.00	200.00	200.03	210.00	220.00	230.00	240.00	250.00	260.00	270.00	275.00

LONGITUDINAL SECTION EB02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

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SURVEY PROVIDED BY
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VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:

UNDP Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT TCAP

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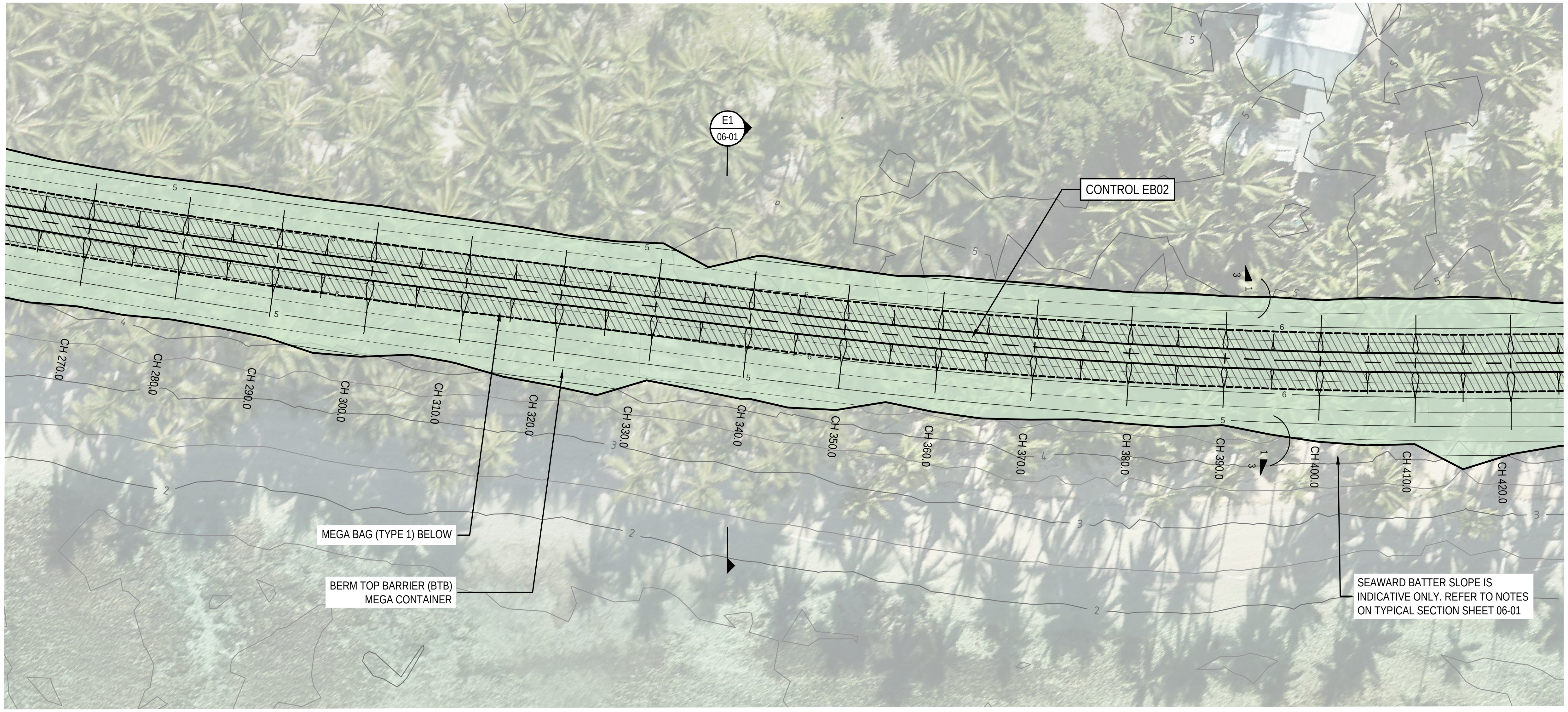
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 2

DRG NO.
P19012-ME-CV-03-02

REV.
A



PLAN

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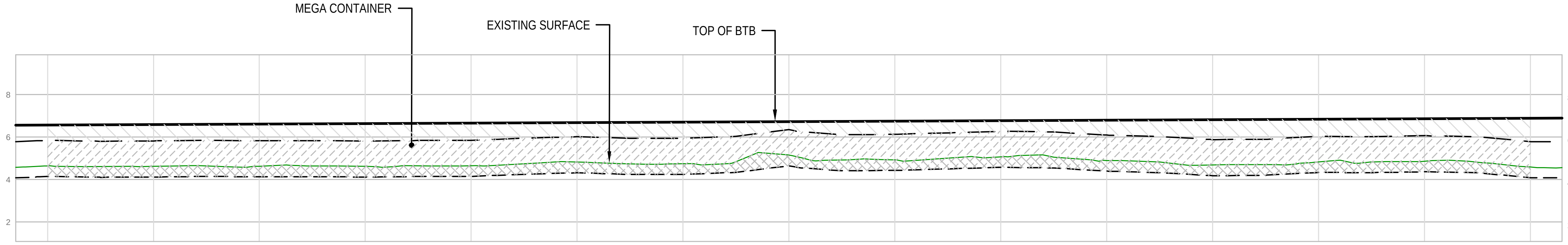

DATUM R.L. 0

CONTROL S.O.P	6.56	6.58	6.61	6.63	6.65	6.65	6.67	6.70	6.72	6.72	6.74	6.77	6.79	6.81	6.84	6.86	6.88
EXISTING SURFACE	4.65	4.62	4.63	4.62	4.65	4.65	4.82	4.74	5.15	5.06	4.93	5.08	4.89	4.68	4.83	4.87	4.59
DEPTH TO EXISTING (m)	1.9	2	2	2	2	2	1.9	2	1.6	1.7	1.8	1.7	1.9	2.1	2	2	2.3
CHAINAGE	270.00	280.00	290.00	300.00	309.15	310.00	320.00	330.00	340.00	340.94	350.00	360.00	370.00	380.00	390.00	400.00	410.00

LONGITUDINAL SECTION EB02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
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UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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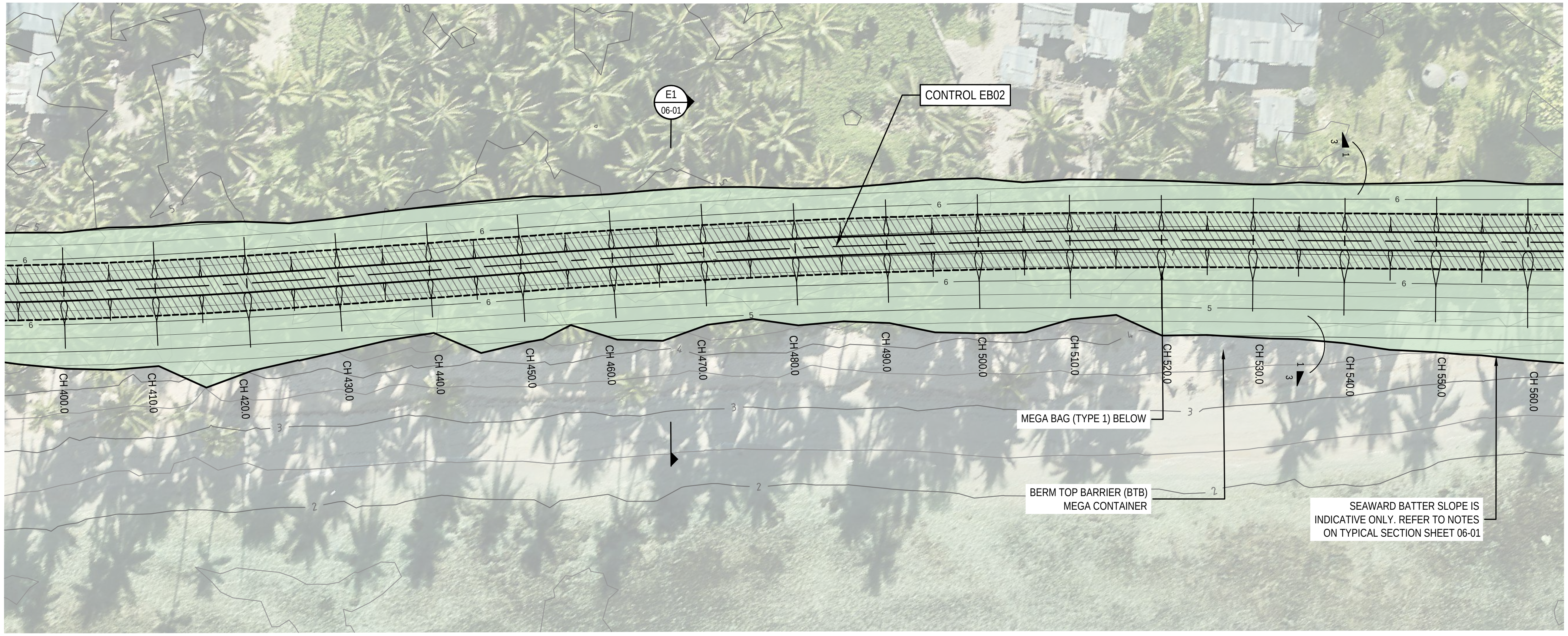
PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 3

DRG NO.
P19012-ME-CV-03-03

REV.
A



PLAN

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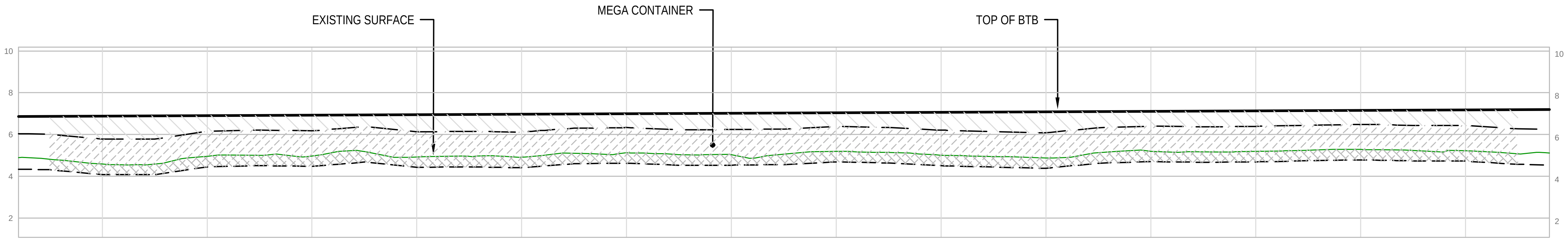

DATUM R.L. 0

CONTROL S.O.P	6.87	6.88	6.90	6.92	6.93	6.95	6.97	6.98	7.00	7.02
EXISTING SURFACE	4.82	4.59	4.96	5.01	4.98	4.93	4.92	4.99	5.13	5.04
DEPTH TO EXISTING (m)	2.1	2.3	1.9	1.9	1.9	2	2.1	2	1.9	2
CHAINAGE	405.00	410.00	420.00	425.12	430.00	440.00	450.00	451.80	460.00	470.00

CONTROL S.O.P	7.04	7.06	7.09	7.11	7.13	7.16	7.16	7.18	7.19
EXISTING SURFACE	5.19	5.01	4.89	5.21	5.19	5.29	5.28	5.23	5.08
DEPTH TO EXISTING (m)	1.8	2.1	2.2	1.9	1.9	1.9	1.9	1.9	2.1
CHAINAGE	480.00	490.00	500.00	510.00	520.00	530.00	531.85	540.00	545.00

LONGITUDINAL SECTION EB02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 — SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m — SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
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UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:

UNDP Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT TCAP

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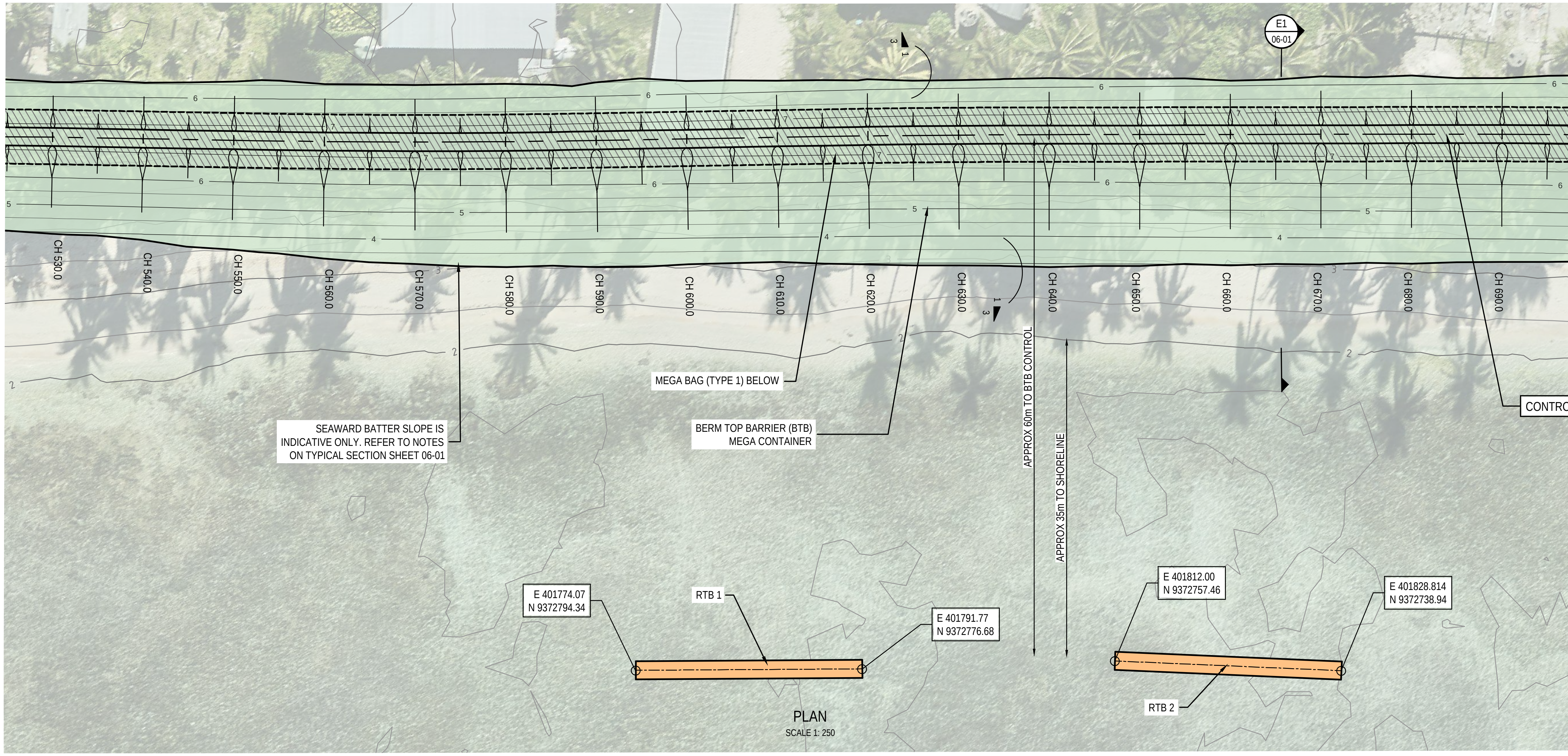
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 4

DRG NO.
P19012-ME-CV-03-04

REV.
A



PLAN

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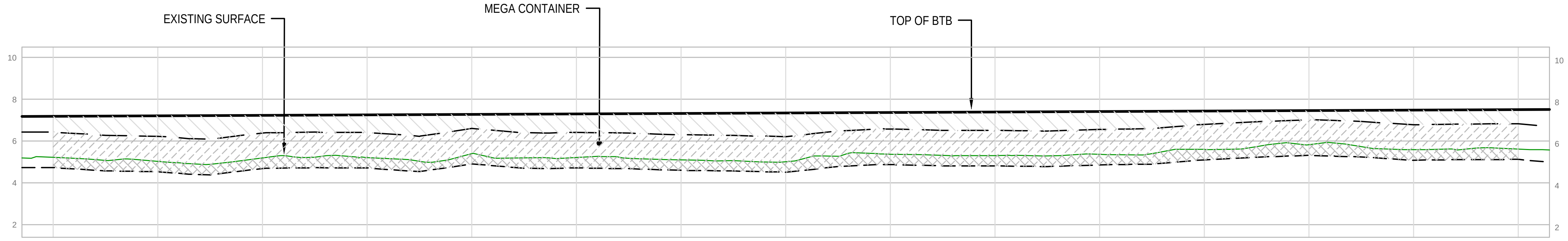

DATUM R.L. 0

CONTROL S.O.P	7.18	7.20	7.21	7.22	7.25	7.27	7.29	7.29	7.32	7.34	7.36	7.36	7.39	7.40	7.41	7.43	7.45	7.48	7.50
EXISTING SURFACE	5.23	5.03	4.92	5.19	5.21	5.41	5.19	5.22	5.10	5.01	5.39	5.37	5.31	5.28	5.36	5.60	5.82	5.58	5.62
DEPTH TO EXISTING (m)	1.9	2.2	2.3	2	2	1.9	2.1	2.1	2.2	2.3	2	2	2.1	2.1	2	1.8	1.6	1.9	1.9
CHAINAGE	540.00	550.00	552.94	560.00	570.00	580.00	587.43	590.00	600.00	610.00	618.98	620.00	630.00	634.55	640.00	650.00	660.00	670.00	680.00

LONGITUDINAL SECTION EB02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 — SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m — SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
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VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
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GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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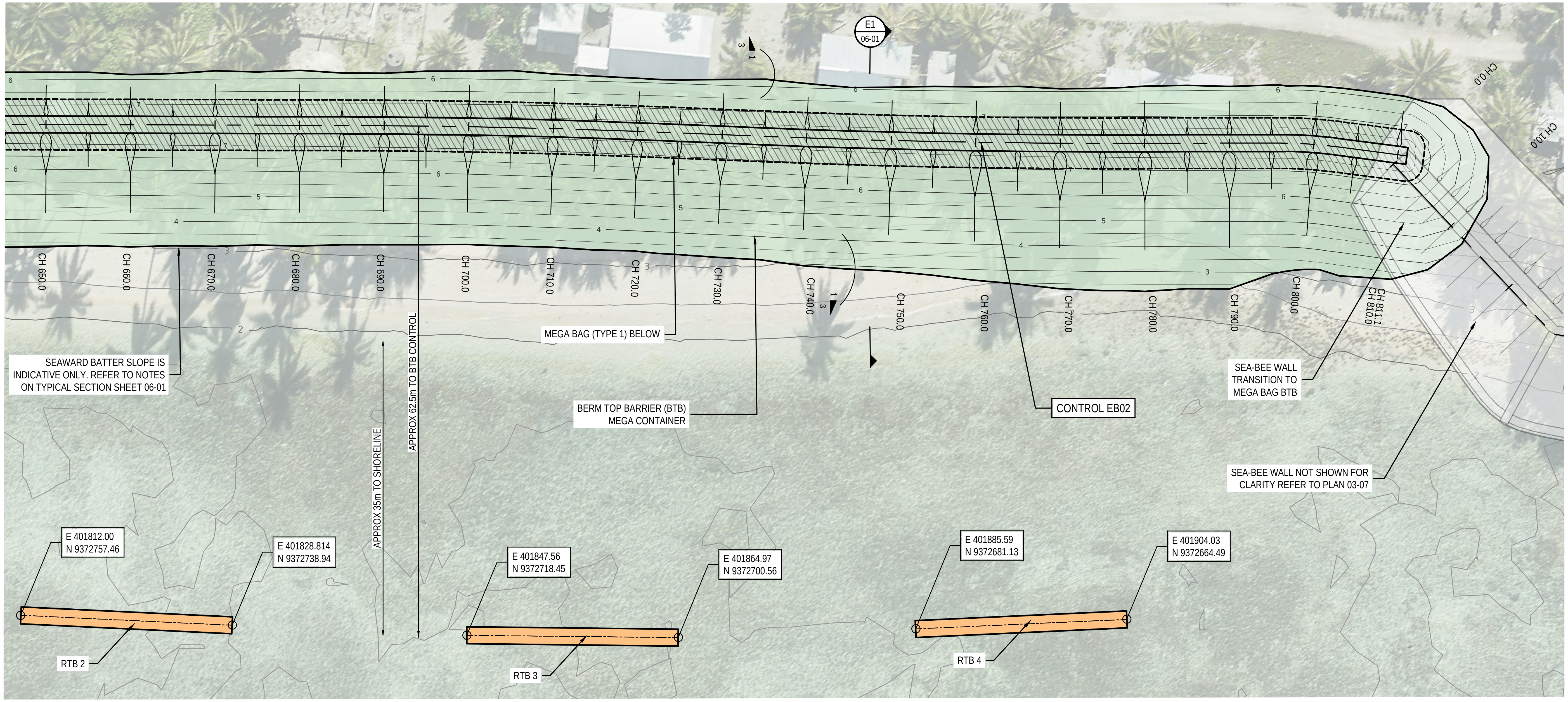
PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 5

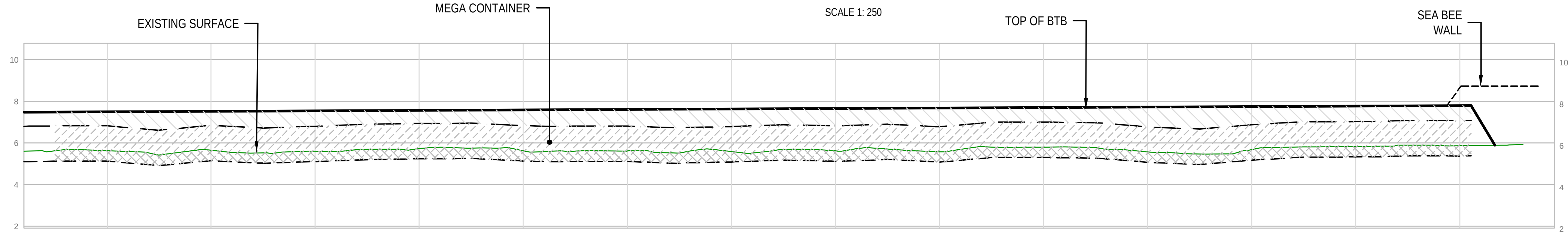
DRG NO.
P19012-ME-CV-03-05

REV.
A



PLAN

SCALE 1: 250



DATUM R.L. 1

CONTROL S.O.P	7.49	7.50	7.51	7.52	7.55	7.57	7.59	7.60	7.61	7.63	7.64
EXISTING SURFACE	5.62	5.62	5.42	5.64	5.60	5.73	5.63	5.60	5.61	5.54	5.58
DEPTH TO EXISTING (m)	1.9	1.9	2.1	1.9	1.9	1.8	2	2	2	2.1	2.1
CHAINAGE	675.00	680.00	685.17	690.00	700.00	710.00	720.00	722.76	730.00	735.29	740.00

CONTROL S.O.P	7.66	7.68	7.71	7.72	7.73	7.75	7.77	7.77	7.78	7.80	7.80	
EXISTING SURFACE	5.62	5.58	5.80	5.68	5.57	5.68	5.82	5.83	5.84	5.87	5.88	5.92
DEPTH TO EXISTING (m)	2	2.1	1.9	2	2.2	2.1	2	1.9	1.9	1.9	1.9	
CHAINAGE	750.00	760.00	770.00	777.52	780.00	790.00	796.00	800.00	802.55	810.00	811.07	816.07

LONGITUDINAL SECTION EB02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

1.25 1.25 2.5 3.75 5 6.25
SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

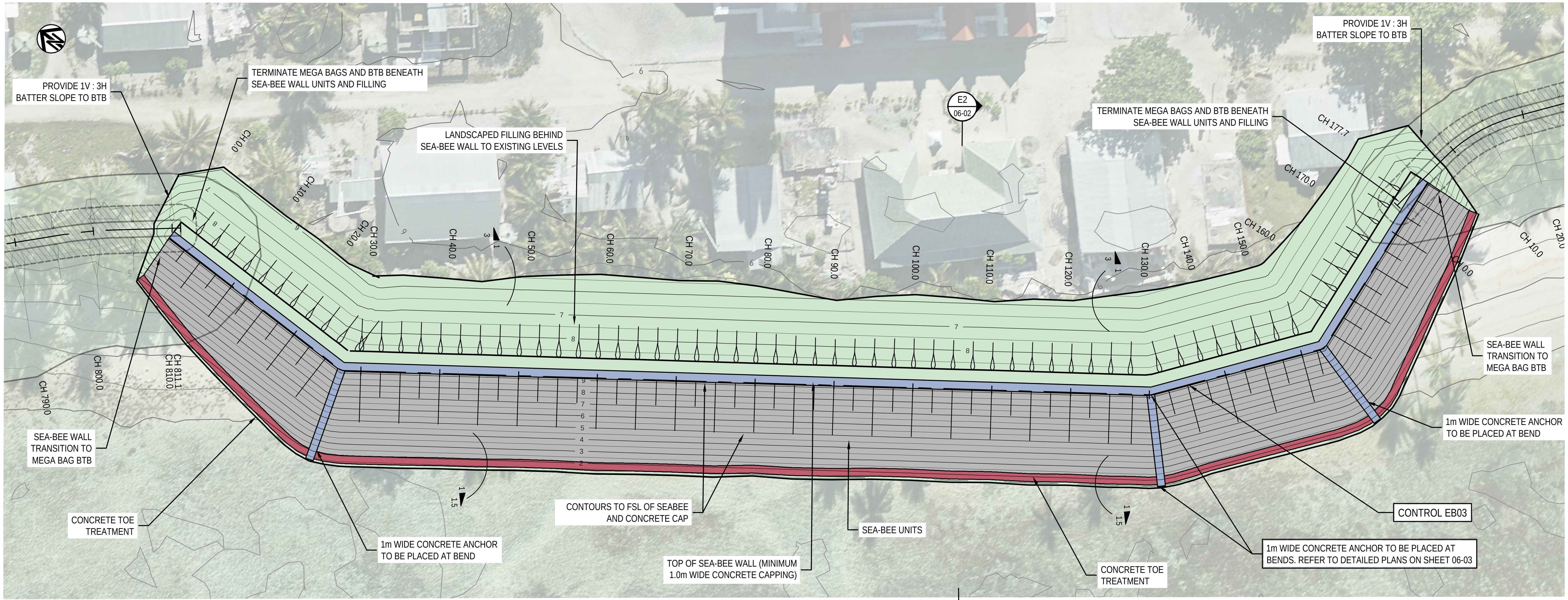
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB02 SHEET 6

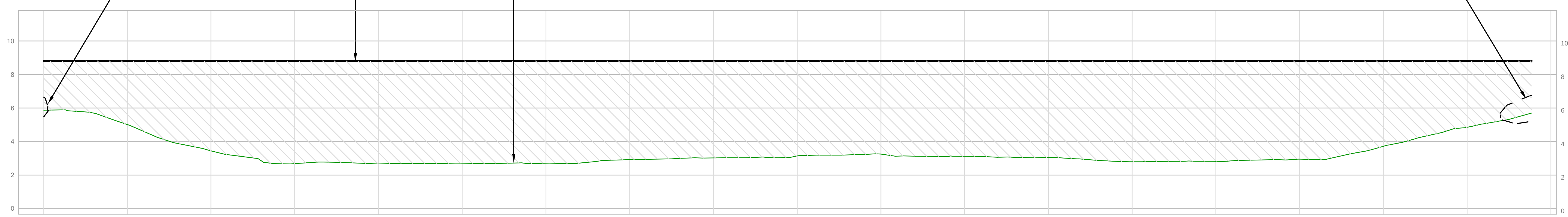
DRG NO.
P19012-ME-CV-03-06

REV.
A



PLAN

SCALE 1: 250



DATUM R.L. -1

CONTROL S.O.P	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80
EXISTING SURFACE	5.87	5.02	3.44	2.67	2.68	2.65	2.70	2.71	2.91	3.02	3.13
DEPTH TO EXISTING (m)	2.9	3.8	5.4	6.1	6.1	6.1	6.1	6.1	5.9	5.8	5.7
CHAINAGE	0.00	10.00	20.00	27.53	30.00	40.00	50.00	60.00	70.00	80.00	90.00

CONTROL S.O.P	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80
EXISTING SURFACE	3.24	3.12	3.05	2.79	2.78	2.82	2.95	2.91	3.71	4.84	5.70
DEPTH TO EXISTING (m)	5.6	5.7	5.8	6	6	6	5.9	5.9	5.1	4	3.1
CHAINAGE	100.00	110.00	120.00	130.00	130.20	140.00	150.00	152.87	160.00	170.00	177.71

LONGITUDINAL SECTION EB03

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 — SCALE 1:125 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m — SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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+61 (0) 412 393 703
www.bluecoastconsulting.com.au

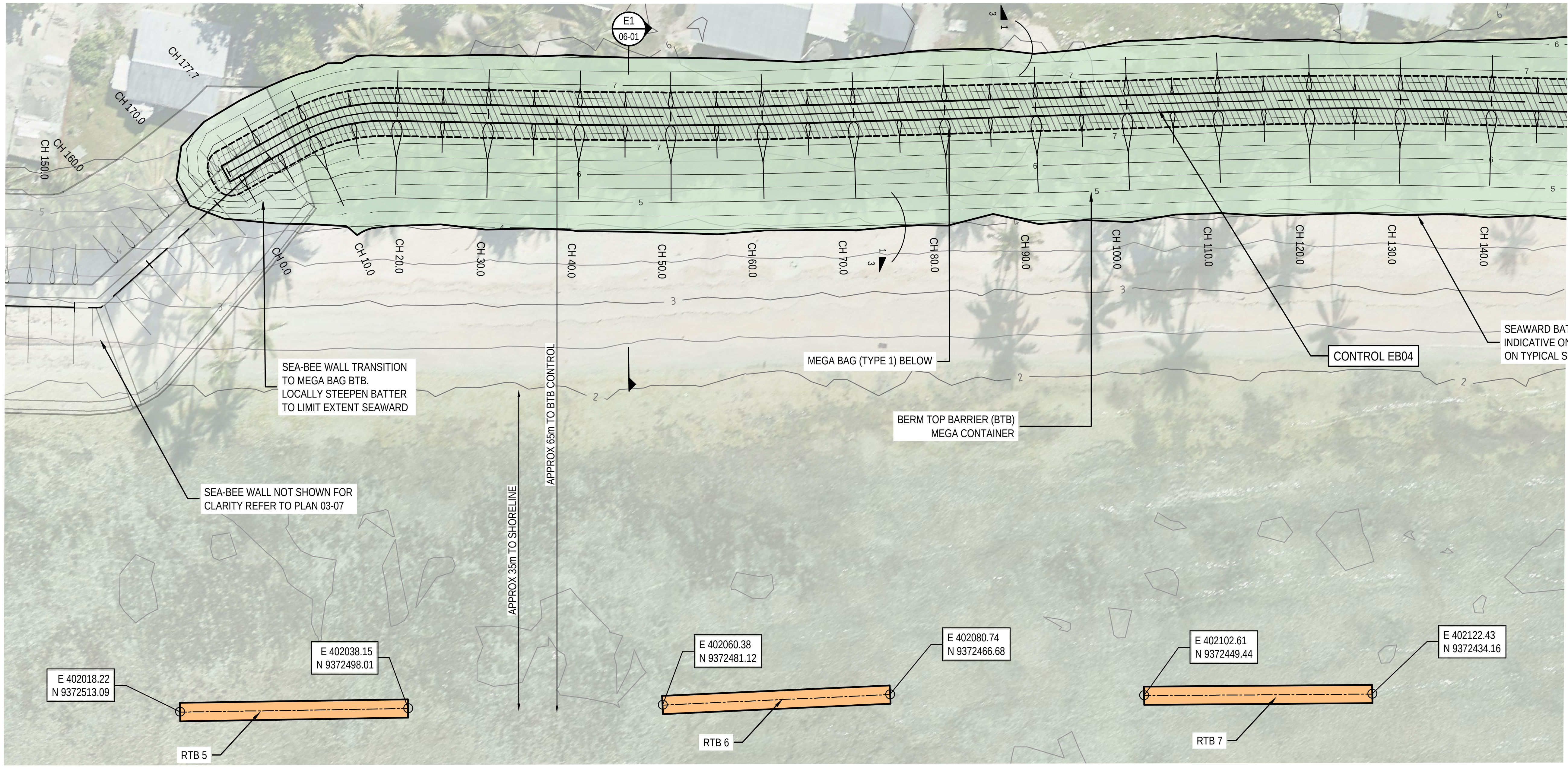
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB03 SHEET 1

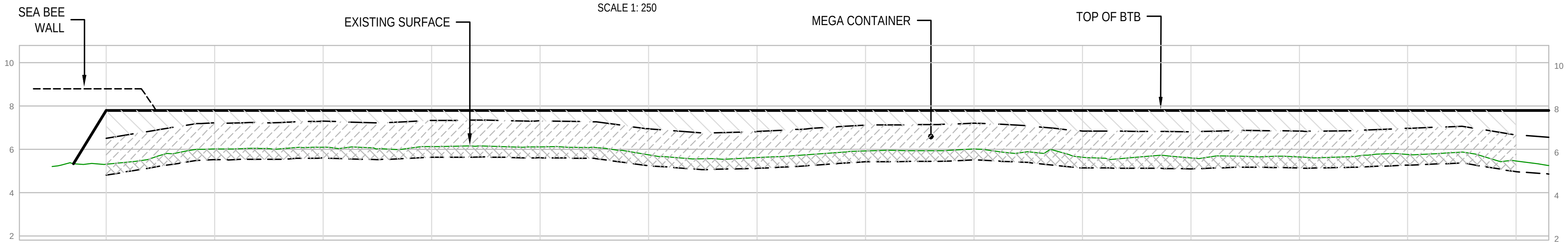
DRG NO.
P19012-ME-CV-03-07

REV.
A



PLAN

SCALE 1: 250



DATUM R.L. 1

CONTROL S.O.P		7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80
EXISTING SURFACE	5.20	5.31	6.00	6.02	6.09	6.10	6.13	6.11	6.11	5.75	5.62	5.73	5.93	6.02	5.64	5.61	5.65	5.63	5.77	5.47
DEPTH TO EXISTING (m)		2.5	1.8	1.8	1.7	1.7	1.7	1.7	1.7	2.1	2.2	2.1	1.9	1.8	2.2	2.2	2.2	2.2	2	2.3
CHAINAGE	-5.00	0.00	8.38	10.00	18.98	20.00	30.00	38.97	40.00	50.00	60.00	64.06	70.00	80.00	90.00	100.00	110.00	110.52	120.00	130.00

LONGITUDINAL SECTION EB04

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25
SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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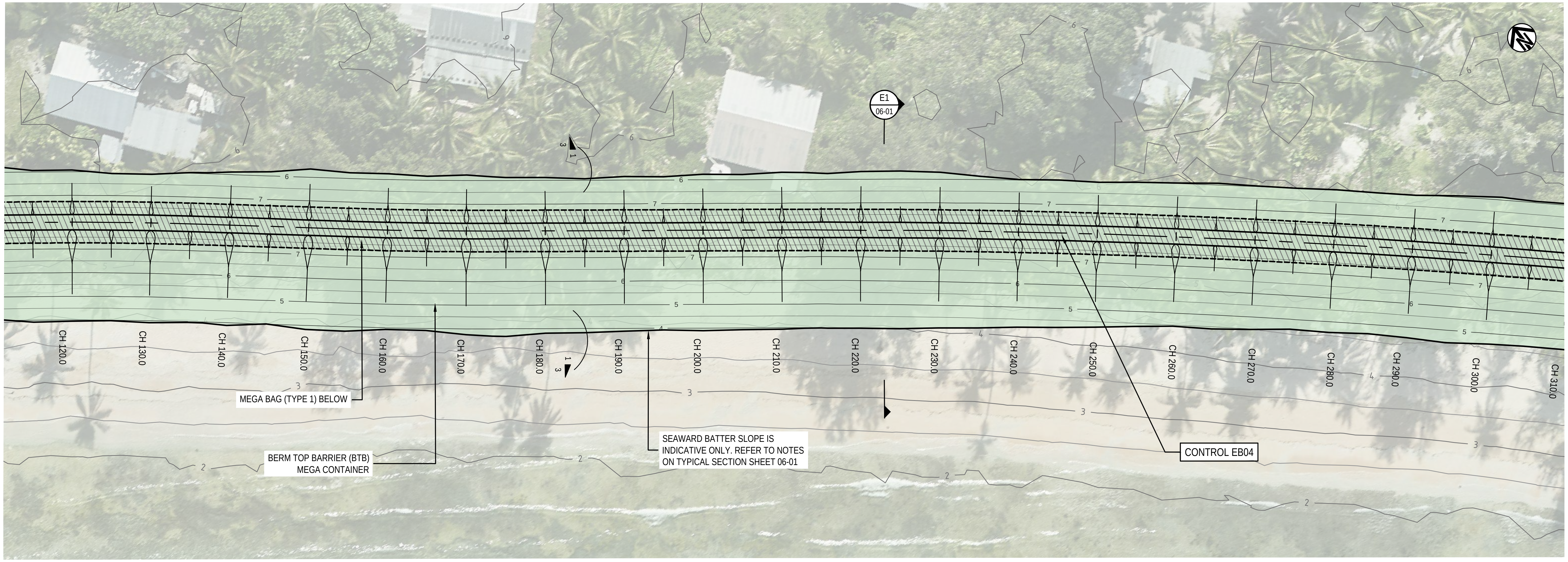
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

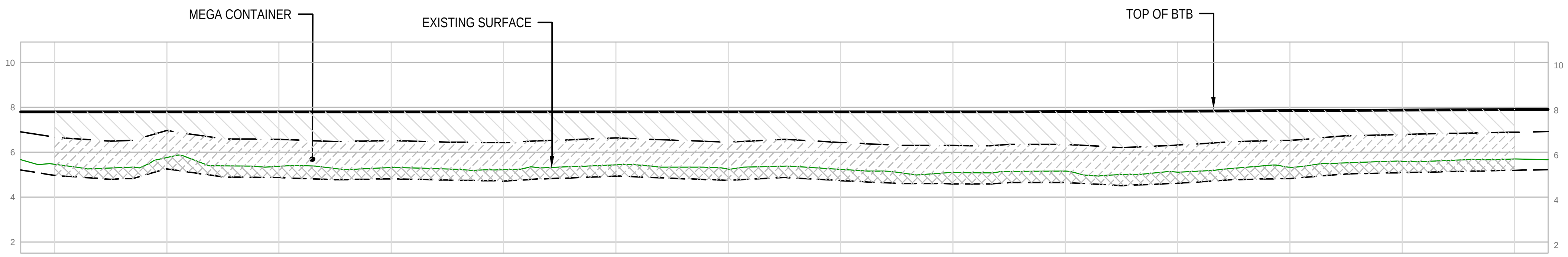
DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 1

DRG NO. P19012-ME-CV-03-08
REV. A



PLAN

SCALE 1: 250



DATUM R.L. 0

CONTROL S.O.P	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.81	7.83	7.86	7.88	7.90	
EXISTING SURFACE	5.47	5.33	5.76	5.37	5.27	5.32	5.22	5.31	5.44	5.25	5.23	5.09	5.08	5.14	5.15	5.11	5.33	5.59	5.69	
DEPTH TO EXISTING (m)	2.3	2.5	2	2.4	2.5	2.5	2.6	2.5	2.4	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.5	2.3	2.2	
CHAINAGE	130.00	136.97	140.00	150.00	155.05	160.00	170.00	173.26	180.00	190.00	200.00	210.00	212.89	215.79	220.00	230.00	240.00	250.00	260.00	

LONGITUDINAL SECTION EB04

REV.	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25 — SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m — SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES

SURVEY PROVIDED BY

HORIZONTAL DATUM

UTM-WGS84 / UTSM60S EPSG32760

VERTICAL DATUM

CHART DATUM (CD) TGZ

PLANS PREPARED FOR:

Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT — TCAP

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www.bluecoastconsulting.com.au

PROJECT

TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER

P19012

DRAWING TITLE

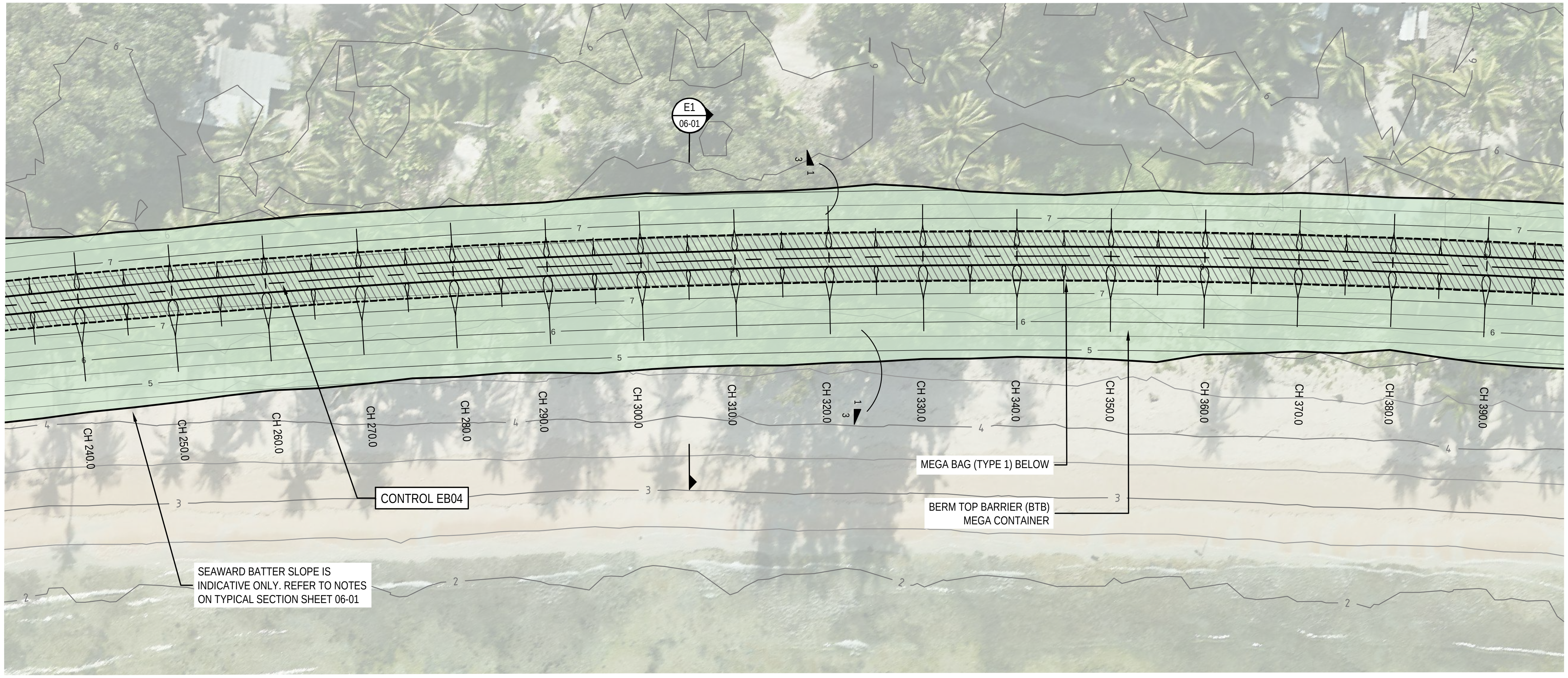
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 2

DRG NO.

P19012-ME-CV-03-09

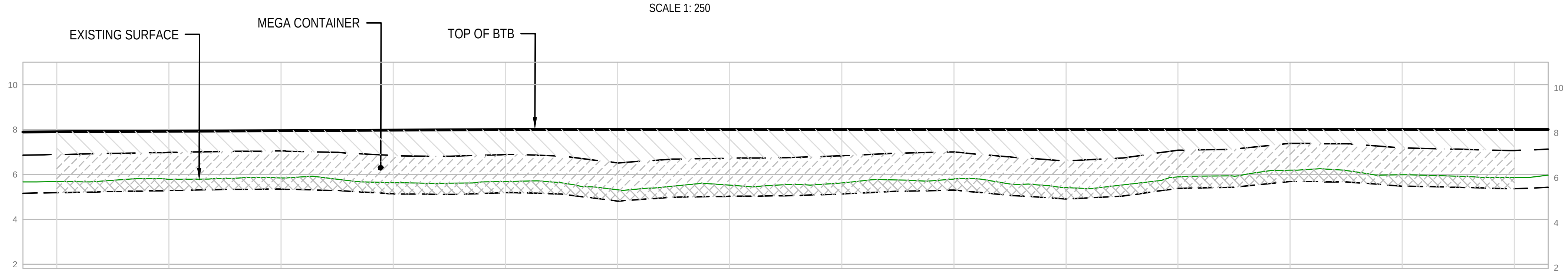
REV.

A



PLAN

SCALE 1: 250



DATUM R.L. 1

CONTROL S.O.P	7.90	7.93	7.95	7.97	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
EXISTING SURFACE	5.69	5.78	5.85	5.64	5.69	5.70	5.32	5.53	5.63	5.80	5.41	5.89	6.19	5.98	5.87
DEPTH TO EXISTING (m)	2.2	2.1	2.1	2.3	2.3	2.3	2.7	2.5	2.4	2.2	2.6	2.1	1.8	2	2.1
CHAINAGE	260.00	270.00	280.00	290.00	300.00	300.78	310.00	320.00	330.00	340.00	350.00	360.00	370.00	380.00	390.00

LONGITUDINAL SECTION EB04

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25
SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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UTM-WGS84 / UTSM60S EPSG32760
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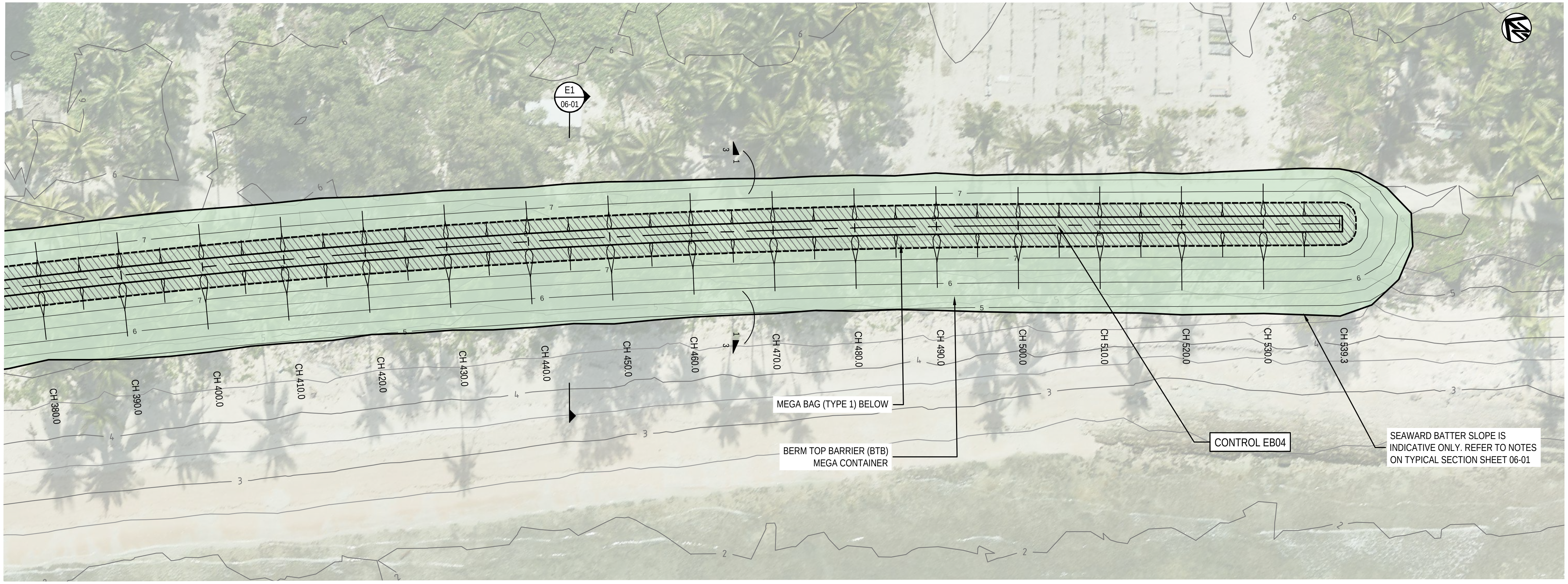
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 3

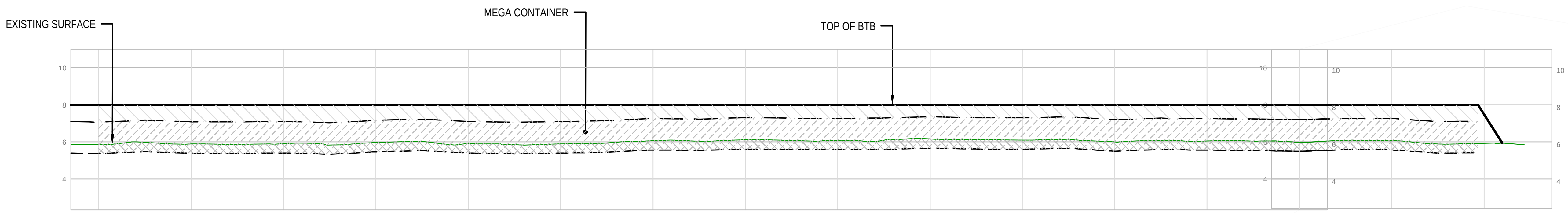
DRG NO.
P19012-ME-CV-03-10

REV.
A



PLAN

SCALE 1: 250



DATUM R.L. 1

CONTROL S.O.P	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	
EXISTING SURFACE	5.87	5.89	5.91	5.97	5.90	5.90	6.07	6.11	6.07	6.16	6.11	6.00	6.00	6.05	5.99	6.07	5.92	5.88
DEPTH TO EXISTING (m)	2.1	2.1	2.1	2	2.1	2.1	1.9	1.9	1.9	1.8	1.9	2	2	1.9	2	1.9	2.1	
CHAINAGE	390.00	400.00	410.00	420.00	430.00	440.00	450.00	460.00	470.00	480.00	490.00	499.98	500.00	510.00	520.00	530.00	539.33	544.33

LONGITUDINAL SECTION EB04

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1.25 2.5 3.75 5 6.25
SCALE 1:125 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY: JL
DRAWN BY: MLC
CHECKED BY: JL
APPROVED: AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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UNDP Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT TCAP

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN AND LONGITUDINAL SECTION CONTROL EB04 SHEET 4

DRG NO.
P19012-ME-CV-03-11

REV.
A

CONTROL EB02

CHAINAGE	EASTING	NORTHING	BEARING	LENGTH	RADIUS
0	401492.955	9373304.187	224°28'31.20"		
2.971	401490.873	9373302.067	224°28'31.20"		
24.086	401474.534	9373285.425		42.23	-40
45.201	401480.968	9373263.007	163°59'06.82"		
58.633	401484.674	9373250.097	163°59'06.82"		
81.765	401491.074	9373227.798		46.265	-250
100	401499.316	9373211.458	154°30'16.39"		
104.898	401501.468	9373207.058	153°22'55.23"		
119.843	401508.164	9373193.697	153°22'55.23"		
151.931	401522.56	9373164.971		64.175	-500
184.018	401540.515	9373138.323	146°01'40.98"		
200	401549.445	9373125.07	146°01'40.98"		
200.027	401549.46	9373125.048	146°01'40.98"		
254.586	401579.978	9373079.756		109.119	-1000
300	401609.372	9373045.067	140°18'00.00"		
309.146	401615.246	9373038.057	139°46'33.57"		
340.939	401635.777	9373013.782	139°46'33.57"		
383.03	401663.003	9372981.592		84.182	-600
400	401676.074	9372970.636	134°08'09.87"		
425.121	401694.464	9372953.525	131°44'13.90"		
451.798	401714.37	9372935.766	131°44'13.90"		
491.822	401744.252	9372909.107		80.049	1000
500	401749.552	9372902.822	134°29'56.33"		
531.846	401771.907	9372880.144	136°19'25.10"		
552.937	401786.472	9372864.89	136°19'25.10"		
570.184	401798.384	9372852.414		34.494	-1000
587.431	401810.719	9372840.357	134°20'50.14"		
600	401819.707	9372831.572	134°20'50.14"		
618.982	401833.281	9372818.303	134°20'50.14"		
626.765	401838.847	9372812.863		15.566	1000
634.548	401844.328	9372807.336	135°14'20.94"		
685.168	401879.972	9372771.393	135°14'20.94"		
700	401890.337	9372760.785	136°05'20.21"		
703.962	401893.207	9372758.047		37.588	1000
722.757	401905.932	9372744.212	137°23'34.11"		
735.293	401914.419	9372734.985	137°23'34.11"		
756.408	401928.715	9372719.442		42.229	-1000
777.523	401943.654	9372704.517	134°58'23.73"		
796.001	401956.727	9372691.456	134°58'23.73"		
799.277	401959.047	9372689.138		6.55	50
800	401959.44	9372688.52	139°33'19.16"		
802.552	401961.045	9372686.537	142°28'45.47"		
811.075	401966.236	9372679.777	142°28'45.47"		

CONTROL EB04

CHAINAGE	EASTING	NORTHING	BEARING	LENGTH	RADIUS
0	402058.811	9372556.406	98°47'09.05"		
8.383	402067.096	9372555.126	98°47'09.05"		
13.681	402072.458	9372554.297		10.597	20
18.98	402076.667	9372550.872	129°08'39.91"		
38.967	402092.167	9372538.254	129°08'39.91"		
51.513	402101.9	9372530.333		25.092	-500
64.059	402112.017	9372522.909	126°16'08.68"		
100	402140.995	9372501.647	126°16'08.68"		
110.517	402149.474	9372495.426	126°16'08.68"		
123.744	402160.14	9372487.599		26.454	500
136.971	402170.378	9372479.22	129°18'01.61"		
155.046	402184.365	9372467.771	129°18'01.61"		
164.154	402191.415	9372462.001		18.217	-500
173.263	402198.669	9372456.492	127°12'46.63"		
200	402219.963	9372440.322	127°12'46.63"		
212.895	402230.232	9372432.523	127°12'46.63"		
300	402297.445	9372377.154	131°45'00.08"		
356.439	402345.203	9372345.214		287.09	1100
400	402368.923	9372307.268	136°57'31.42"		
499.984	402433.752	9372231.195	142°09'59.86"		
500	402433.762	9372231.182	142°09'59.86"		
539.333	402457.887	9372200.118	142°09'59.86"		

CONTROL EB03

CHAINAGE	EASTING	NORTHING	RL	BEARING
0	401964.383	9372680.211	8.8	181°46'51.44"
27.531	401963.528	9372652.694	8.8	
100	402004.144	9372592.676	8.8	145°54'43.11"
130.196	402021.068	9372567.668	8.8	
152.872	402038.655	9372553.353	8.8	
177.707	402063.435	9372554.994	8.8	86°12'37.87"

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 20 40 60 80 100m
SCALE 1:2000 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
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UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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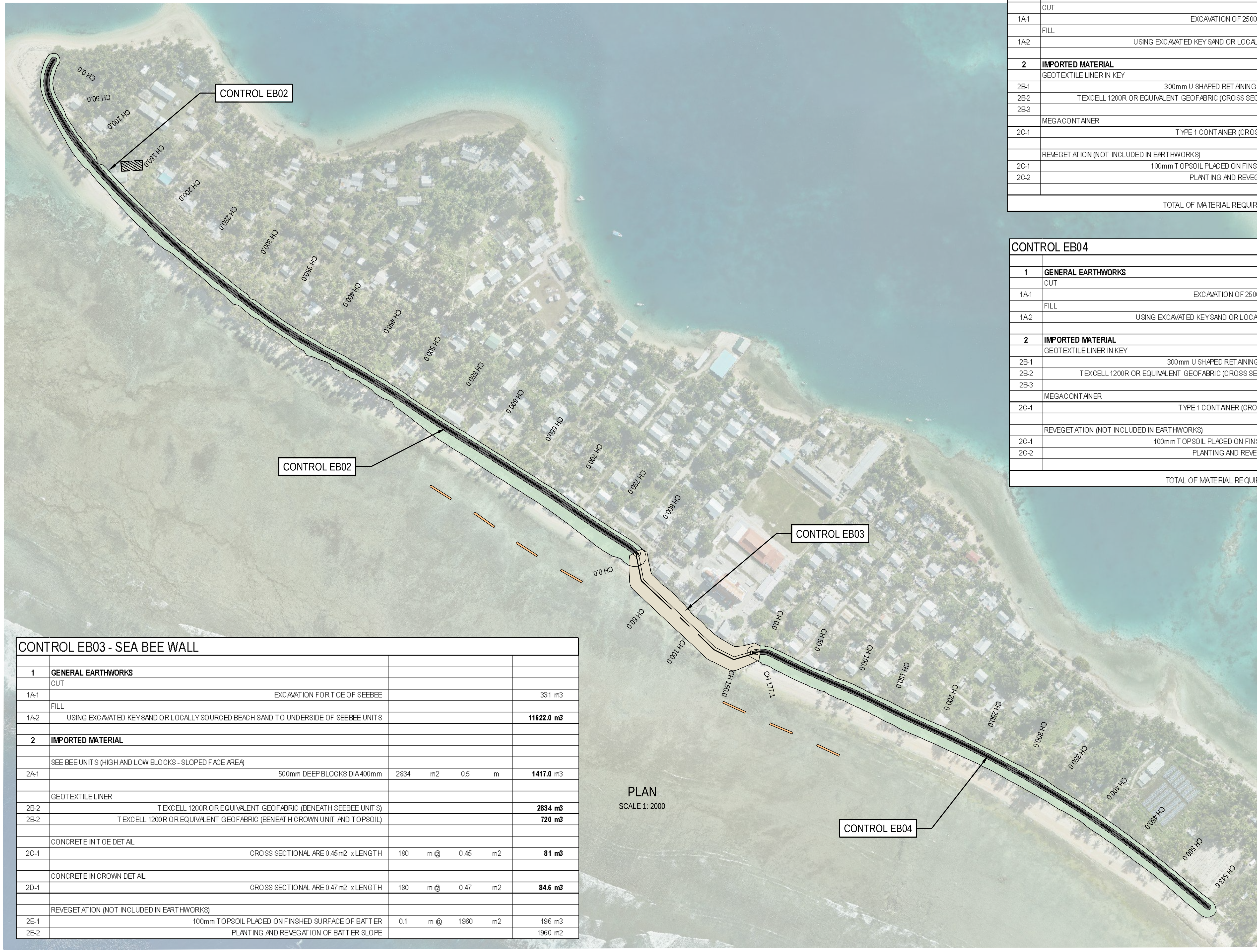
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
SITE SETOUT PLAN

DRG NO.
P19012-ME-CV-04-01

REV.
A



CONTROL EB02

1	**GENERAL EARTHWORKS**						
	CUT						
1A-1	EXCAVATION OF 2500 x 500 KEY AND STOCKPILE						882 m3
	FILL						
1A-2	USING EXCAVATED KEY SAND OR LOCALLY SOURCED BEACH SAND						**13121 m3**
2	**IMPORTED MATERIAL**						
	GEOTEXTILE LINER IN KEY						
2B-1	300mm U SHAPED RETAINING PINS @ 1000mm CENTRES	4	Each (m)	810	m		3240 Items
2B-2	TEXCELL 1200R OR EQUIVALENT GEOFABRIC (CROSS SECTIONAL LENGTH 6000mm)	810	m @	6	m		4860 m2
2B-3							
	MEGACONTAINER						
2C-1	TYPE 1 CONTAINER (CROSS SECTIONAL AREA 4.2m2)	810	m @	4.2	m2		**3402 m3**
	REVEGETATION (NOT INCLUDED IN EARTHWORKS)						
2C-1	100mm TOPSOIL PLACED ON FINISHED SURFACE OF BATTER	0.1	m @	12428	m2		1242.8 m3
2C-2	PLANTING AND REVEGATION OF BATTER SLOPE						12428 m2
	TOTAL OF MATERIAL REQUIRED FROM EXISTING (WITH KEY) TO FINISHED SURFACE LEVEL						**16523 m3**

CONTROL EB04

1	**GENERAL EARTHWORKS**						
	CUT						
1A-1	EXCAVATION OF 2500 x 500 KEY AND STOCKPILE						882 m3
	FILL						
1A-2	USING EXCAVATED KEY SAND OR LOCALLY SOURCED BEACH SAND						**10558 m3**
2	**IMPORTED MATERIAL**						
	GEOTEXTILE LINER IN KEY						
2B-1	300mm U SHAPED RETAINING PINS @ 1000mm CENTRES	4	Each (m)	540	m		2160 Items
2B-2	TEXCELL 1200R OR EQUIVALENT GEOFABRIC (CROSS SECTIONAL LENGTH 6000mm)	540	m @	6	m		3240 m2
2B-3							
	MEGACONTAINER						
2C-1	TYPE 1 CONTAINER (CROSS SECTIONAL AREA 4.2m2)	540	m @	4.2	m2		**2268 m3**
	REVEGETATION (NOT INCLUDED IN EARTHWORKS)						
2C-1	100mm TOPSOIL PLACED ON FINISHED SURFACE OF BATTER	0.1	m @	10391	m2		1039.1 m3
2C-2	PLANTING AND REVEGATION OF BATTER SLOPE						10391 m2
	TOTAL OF MATERIAL REQUIRED FROM EXISTING (WITH KEY) TO FINISHED SURFACE LEVEL						**12826 m3**

CONTROL EB03 - SEA BEE WALL

1	**GENERAL EARTHWORKS**					
	CUT					
1A-1	EXCAVATION FOR TOE OF SEEBEE					331 m3
	FILL					
1A-2	USING EXCAVATED KEY SAND OR LOCALLY SOURCED BEACH SAND TO UNDERSIDE OF SEEBEE UNITS					**11622.0 m3**
2	**IMPORTED MATERIAL**					
	SEE BEE UNITS (HIGH AND LOW BLOCKS - SLOPED FACE AREA)					
2A-1	500mm DEEP BLOCKS DIA 400mm	2834	m2	0.5	m	**1417.0** m3
	GEOTEXTILE LINER					
2B-2	TEXCELL 1200R OR EQUIVALENT GEOFABRIC (BENEATH SEEBEE UNITS)					**2834 m3**
2B-2	TEXCELL 1200R OR EQUIVALENT GEOFABRIC (BENEATH CROWN UNIT AND TOPSOIL)					**720 m3**
	CONCRETE IN TOE DETAIL					
2C-1	CROSS SECTIONAL ARE 0.45m2 x LENGTH	180	m @	0.45	m2	**81 m3**
	CONCRETE IN CROWN DETAIL					
2D-1	CROSS SECTIONAL ARE 0.47m2 x LENGTH	180	m @	0.47	m2	**84.6 m3**
	REVEGETATION (NOT INCLUDED IN EARTHWORKS)					
2E-1	100mm TOPSOIL PLACED ON FINISHED SURFACE OF BATTER	0.1	m @	1960	m2	196 m3
2E-2	PLANTING AND REVEGATION OF BATTER SLOPE					1960 m2

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 20 40 60 80 100m
SCALE 1:2000 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

Unless otherwise agreed in writing with Client or specified in this drawing, (a) UNDP does not accept and disclaims any and all liability or responsibility arising from any use of or reliance on this drawing by any third party or any modification or misuse of this drawing by Client, and (b) this drawing is confidential and all intellectual property rights embodied or referenced in this drawing remain the property of UNDP.

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

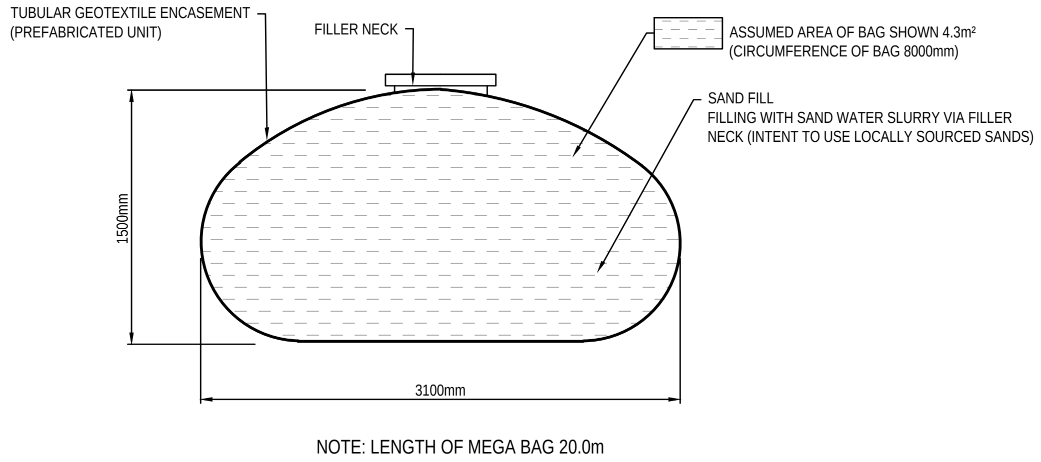
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
EARTHWORK VOLUME MOVEMENT PLAN

DRG NO.
P19012-ME-CV-05-01

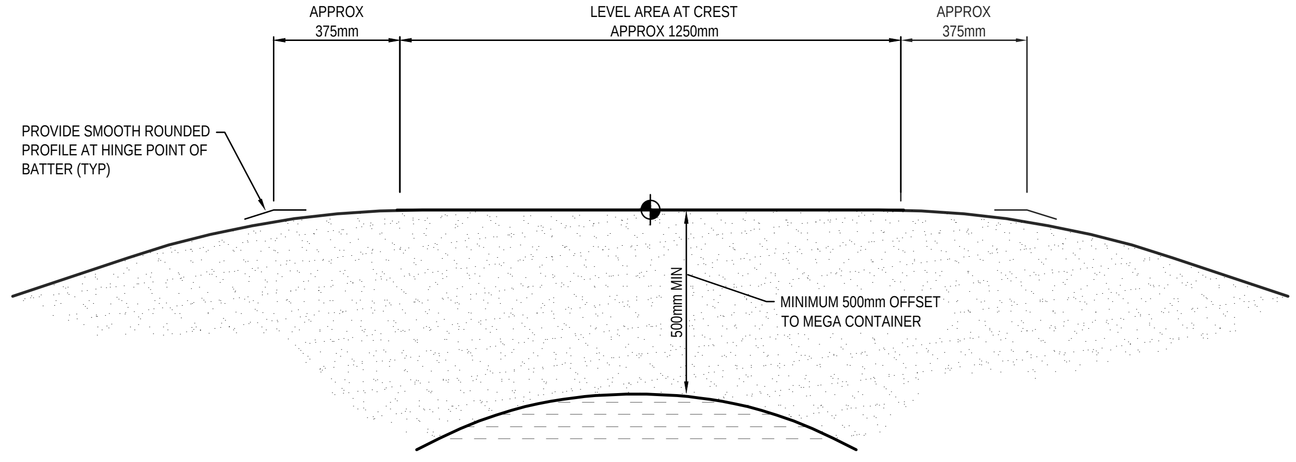
REV.
A



NOTE: LENGTH OF MEGA BAG 20.0m

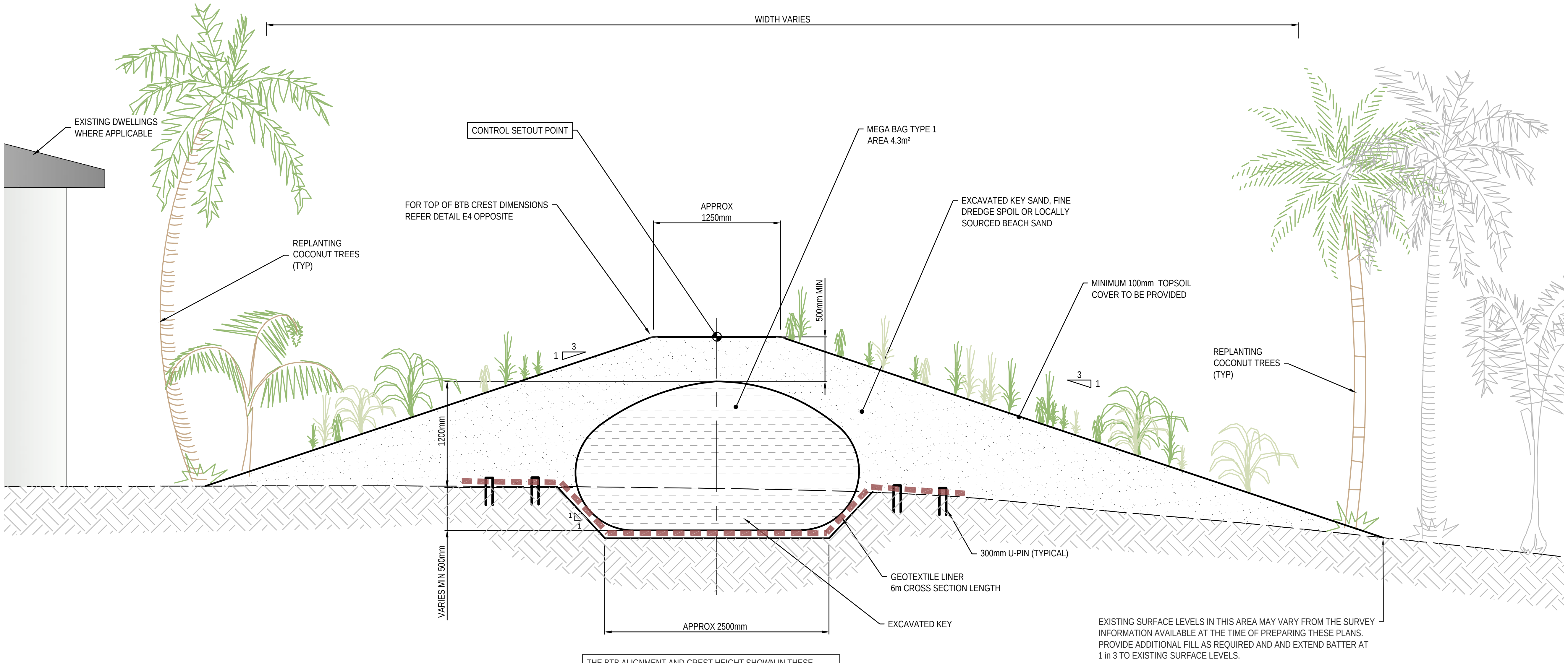
OPTION 2 - SAND (MEGA BAG) CONTAINER (TYPE T1) E3 -

SCALE 1:20



BTB CREST DETAIL E4 -

SCALE 1:10



THE BTB ALIGNMENT AND CREST HEIGHT SHOWN IN THESE DRAWINGS IS INDICATIVE. ALL CARE MUST BE TAKEN TO ENSURE THE CONTINUITY OF THE CREST OF THE STRUCTURE AT A MINIMUM HEIGHT OF 5.5m TGZ. THIS MAY REQUIRE ADDITIONAL FILL UNDER AND SEAWARD OF THE BTB ALIGNMENT SHOWN IN THESE DRAWINGS PRIOR AND FOLLOWING CONSTRUCTION

BERM TOP BARRIER (BTB) GEOTEXTILE MEGA CONTAINER E1 -

SCALE 1:25

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m SCALE 1:100 AT ORIGINAL SIZE

0 0.25 0.5 0.75 1.0 1.25m SCALE 1:25 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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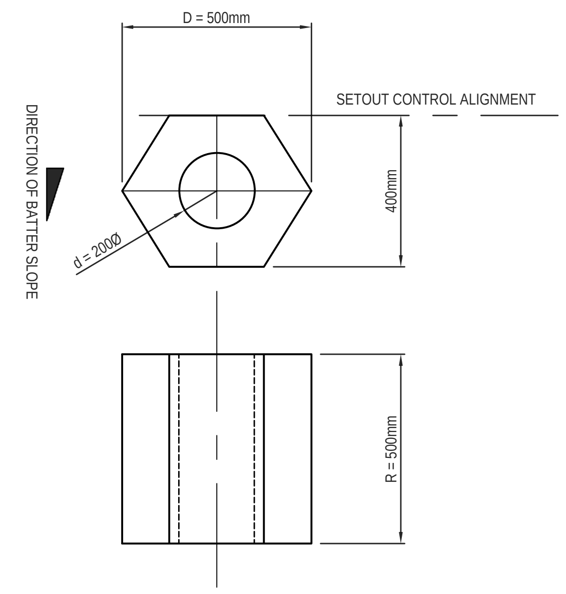
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

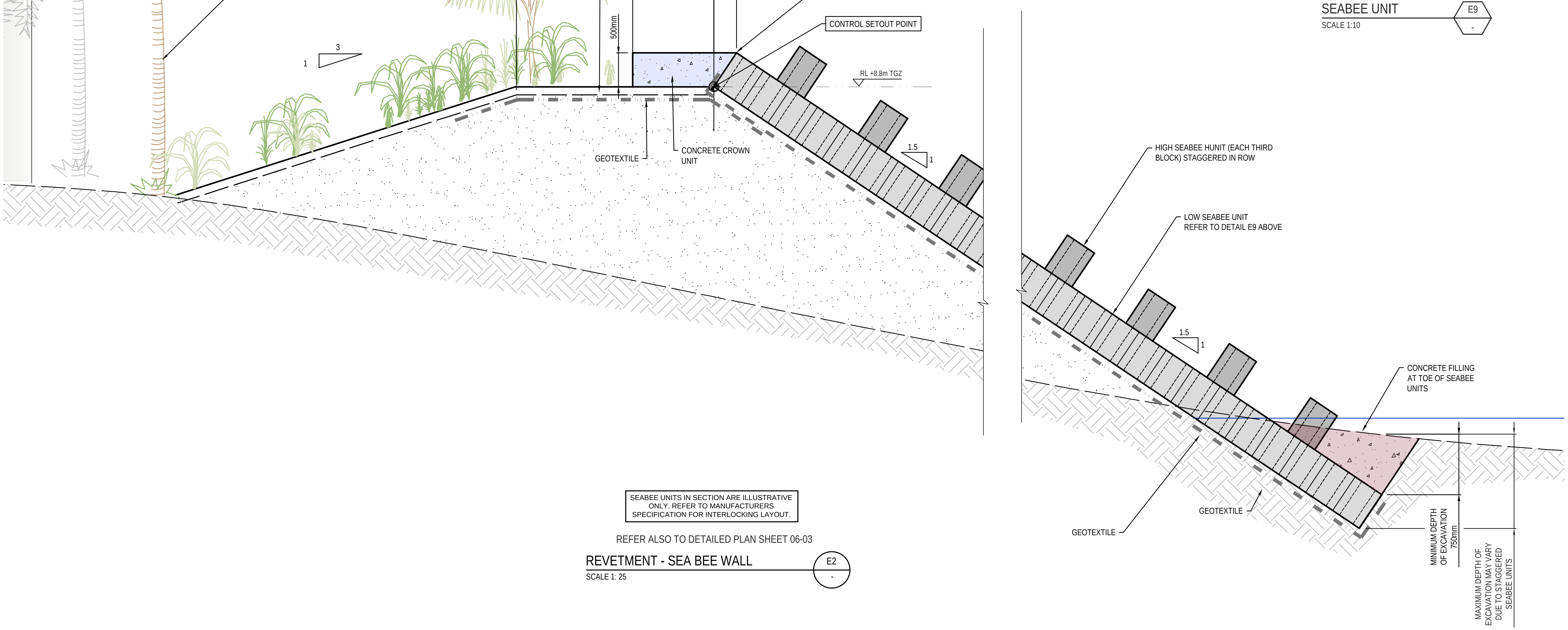
DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 1

DRG NO.
P19012-ME-CV-06-01

REV.
A



SEABEE UNIT
SCALE 1:10
E9
-



SEABEE UNITS IN SECTION ARE ILLUSTRATIVE ONLY. REFER TO MANUFACTURERS SPECIFICATION FOR INTERLOCKING LAYOUT.

REFER ALSO TO DETAILED PLAN SHEET 06-03

REVETMENT - SEA BEE WALL
SCALE 1: 25
E2
-

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 0.25 0.5 0.75 1.0 1.25m
SCALE 1:25 AT ORIGINAL SIZE

0 0.2 0.4 0.6 0.8 1.0m
SCALE 1:20 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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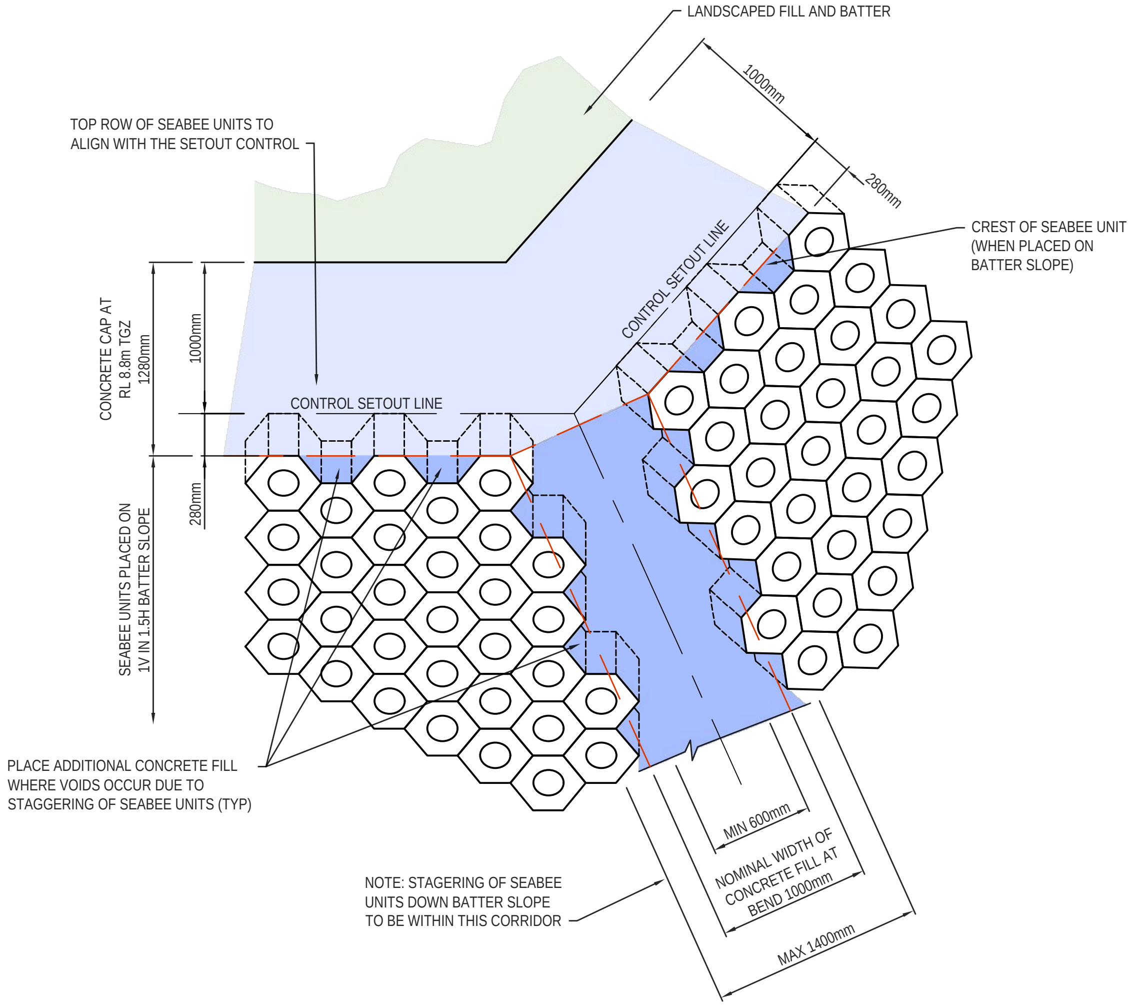
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 2

DRG NO.
P19012-ME-06-02

REV.
A

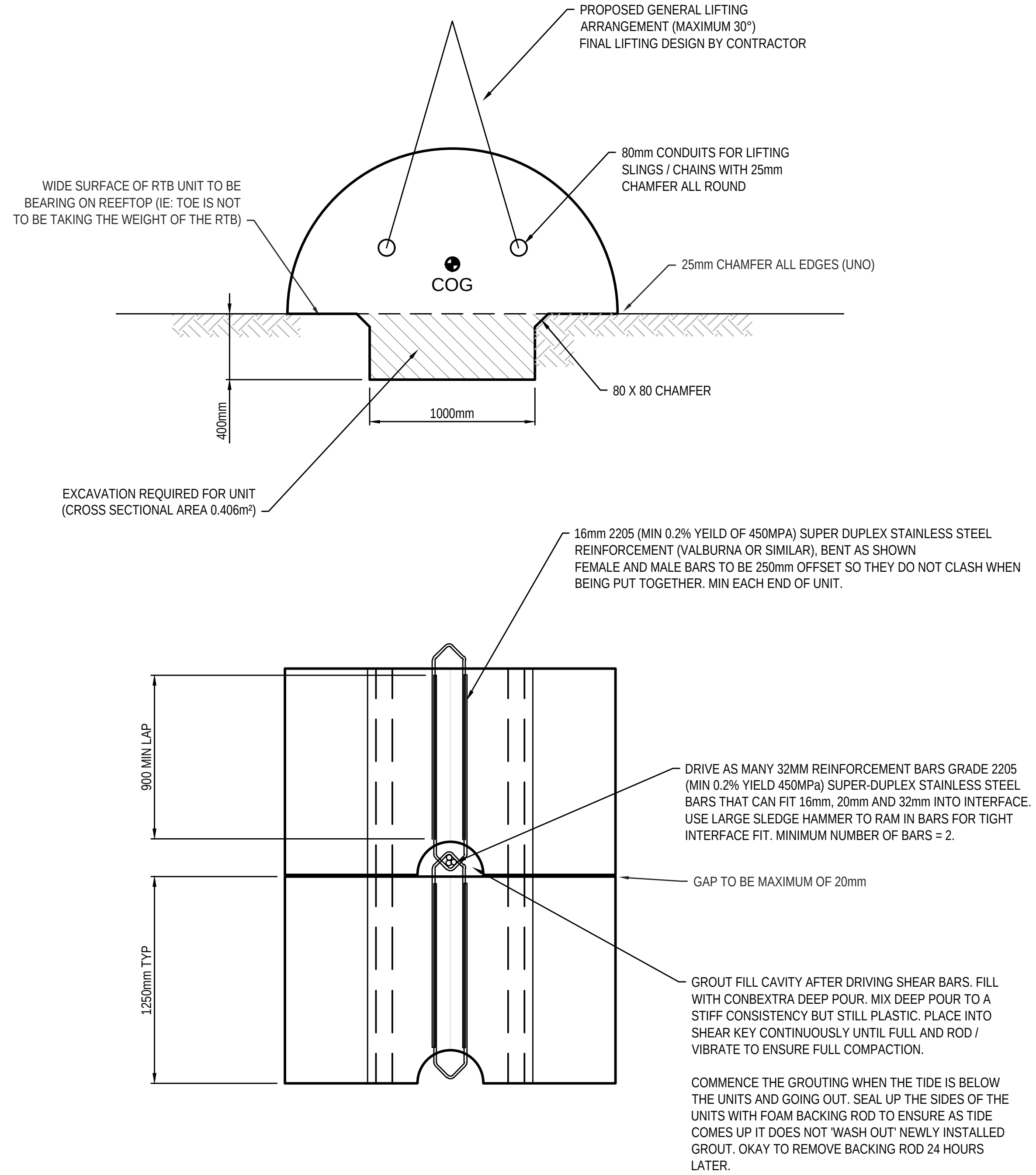


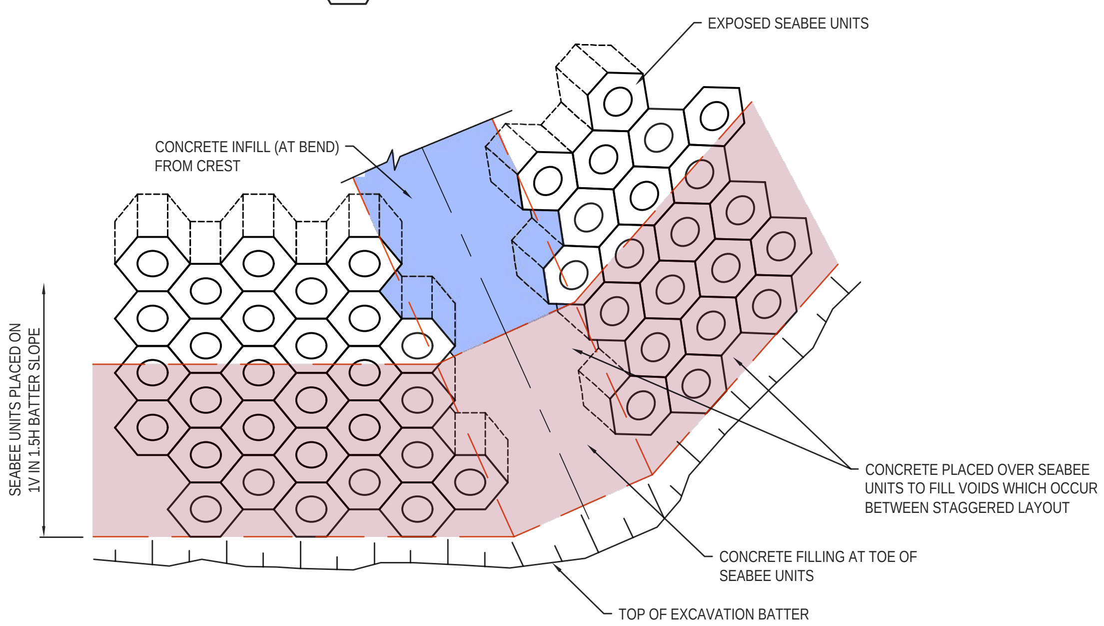
SEABEE WALL CREST DETAIL PLAN (AT BEND)

SCALE 1:25

E7

-





CONCRETE REEFTOP BARRIER (RTB)

SCALE 1: 20

R1

-

SEABEE WALL TOE DETAIL PLAN (AT BEND)

SCALE 1:25

E8

-

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 0.2 0.4 0.6 0.8 1.0m

SCALE 1:20 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES

SURVEY PROVIDED BY

HORIZONTAL DATUM

UTM-WGS84 / UTSM60S EPSG32760

VERTICAL DATUM

CHART DATUM (CD) TGZ

PLANS PREPARED FOR:

UNDP Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT TCAP

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PROJECT

TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER

P19012

DRAWING TITLE

TYPICAL SECTION AND DETAILS SHEET 3

DRG NO.

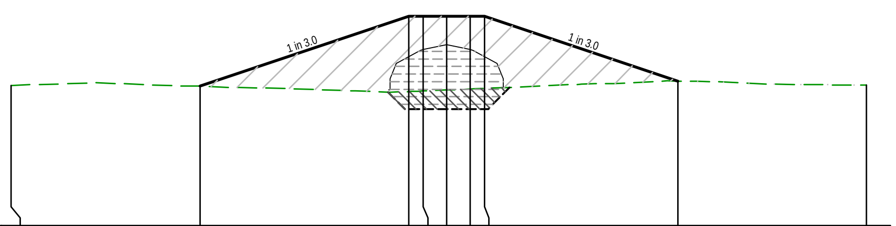
P19012-ME-06-03

REV.

A

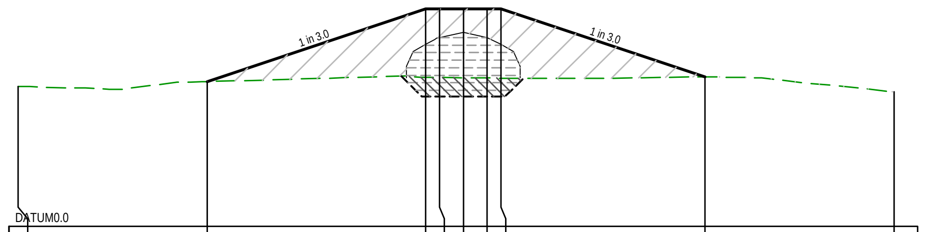
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



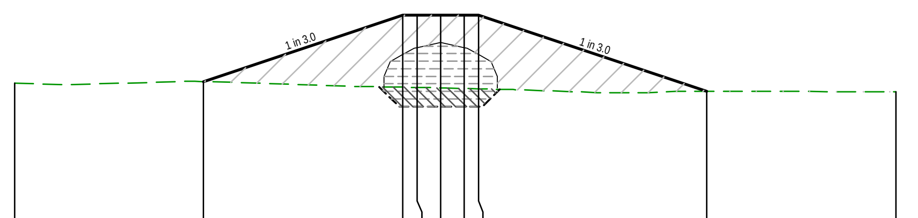
CONTROL EB02		3.68	5.52	5.52	5.52	5.52	5.52	3.82	
EXISTING SURFACE	3.70	3.68	3.54	3.55	3.58	3.61	3.62	3.82	3.71
OFFSET (-LHS/+RHS)	-11.53	-6.53	-1.00	-0.63	0.00	0.63	1.00	6.12	11.12

CH 20



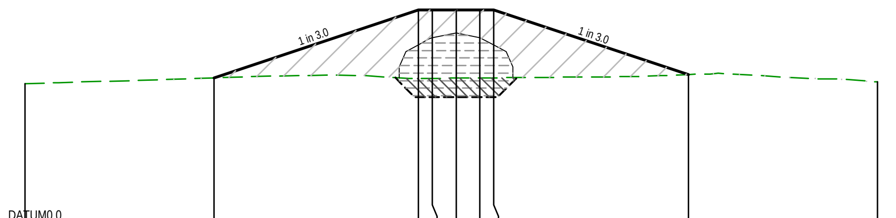
		3.83	5.76	5.76	5.76	5.76	5.76	3.96	
	3.70	3.83	3.95	3.94	3.94	3.93	3.92	3.96	3.56
	-11.78	-6.78	-1.00	-0.62	0.00	0.62	1.00	6.40	11.40

CH 59



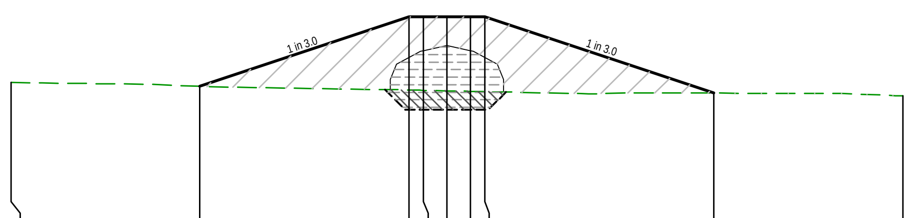
CONTROL EB02		3.66	5.42	5.42	5.42	5.42	5.42	3.40	
EXISTING SURFACE	3.62	3.66	3.51	3.51	3.50	3.48	3.47	3.40	3.39
OFFSET (-LHS/+RHS)	-11.27	-6.27	-1.00	-0.63	0.00	0.63	1.00	7.04	12.04

CH 3



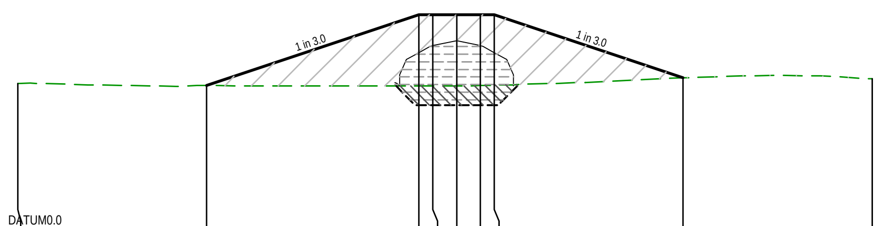
		3.87	5.68	5.68	5.68	5.68	5.68	3.96	
	3.72	3.87	3.86	3.86	3.87	3.87	3.87	3.96	3.77
	-11.41	-6.41	-1.00	-0.62	0.00	0.62	1.00	6.15	11.15

CH 45



CONTROL EB02		3.55	5.40	5.40	5.40	5.40	5.40	3.38	
EXISTING SURFACE	3.66	3.55	3.46	3.45	3.44	3.43	3.42	3.38	3.31
OFFSET (-LHS/+RHS)	-11.54	-6.54	-1.00	-0.63	0.00	0.63	1.00	7.07	12.07

CH 0



		3.77	5.64	5.64	5.64	5.64	5.64	3.98	
	3.82	3.77	3.76	3.76	3.76	3.77	3.78	3.98	3.95
	-11.61	-6.61	-1.00	-0.62	0.00	0.62	1.00	5.99	10.99

CH 40

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m SCALE 1:100 AT ORIGINAL SIZE

0 0.25 0.5 0.75 1.0 1.25m SCALE 1:25 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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Burleigh Heads
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+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

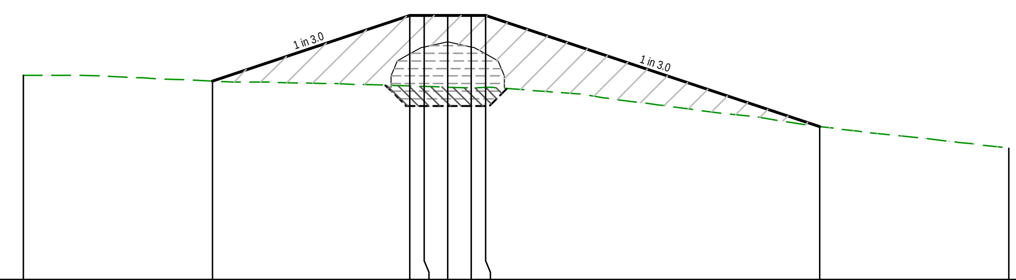
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 1

DRG NO.
P19012-AG-CV-08-01

REV.
A

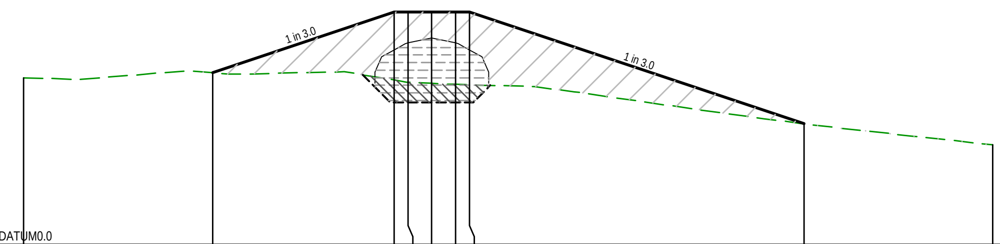
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



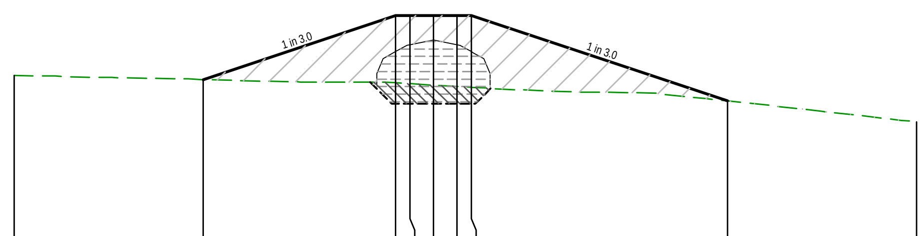
CONTROL EB02		4.27	6.01	6.01	6.01	6.01	6.01	3.06	
EXISTING SURFACE	4.42	4.27	4.14	4.12	4.10	4.08	4.09	3.06	2.49
OFFSET (-LHS/+RHS)	-11.23	-6.23	-1.00	-0.63	0.00	0.63	1.00	9.84	14.84

CH 100



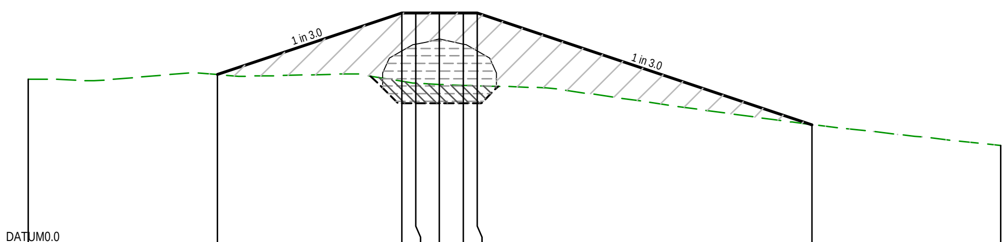
		4.53	6.13	6.13	6.13	6.13	6.13	3.18	
	4.39	4.53	4.34	4.28	4.25	4.23	4.22	3.18	2.63
	-10.80	-5.80	-1.00	-0.62	0.00	0.62	1.00	9.85	14.85

CH 120



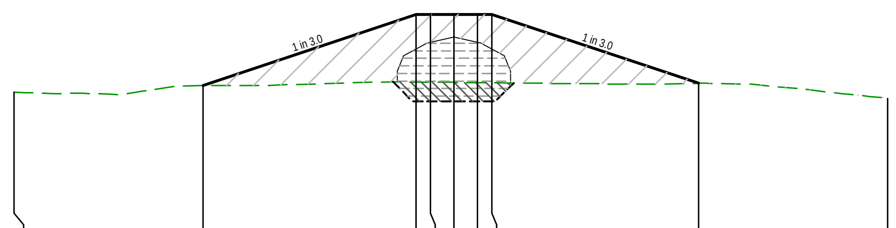
CONTROL EB02		4.19	5.89	5.89	5.89	5.89	5.89	3.62	
EXISTING SURFACE	4.30	4.19	4.10	4.08	4.04	4.01	3.98	3.62	3.07
OFFSET (-LHS/+RHS)	-11.10	-6.10	-1.00	-0.62	0.00	0.62	1.00	7.79	12.79

CH 80



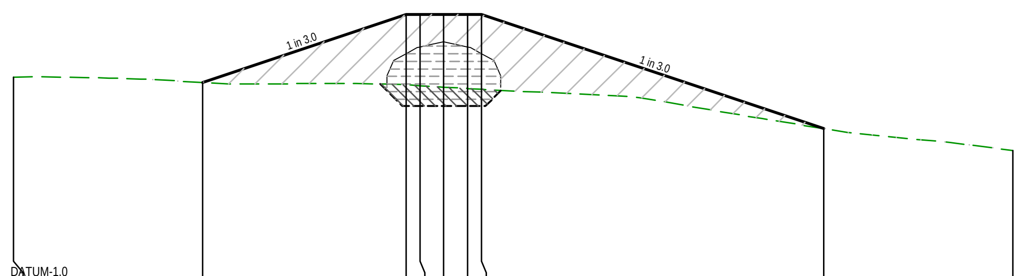
		4.51	6.13	6.13	6.13	6.13	6.13	3.18	
	4.39	4.51	4.33	4.28	4.24	4.22	4.21	3.18	2.63
	-10.87	-5.87	-1.00	-0.63	0.00	0.63	1.00	9.85	14.85

CH 120



CONTROL EB02		3.88	5.77	5.77	5.77	5.77	5.77	3.94	
EXISTING SURFACE	3.70	3.88	3.97	3.97	3.96	3.96	3.95	3.94	3.54
OFFSET (-LHS/+RHS)	-11.65	-6.65	-1.00	-0.62	0.00	0.62	1.00	6.48	11.48

CH 60



		4.24	6.04	6.04	6.04	6.04	6.04	3.02	
	4.38	4.24	4.18	4.16	4.12	4.08	4.06	3.02	2.44
	-11.38	-6.38	-1.00	-0.63	0.00	0.63	1.00	10.06	15.06

CH 105

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

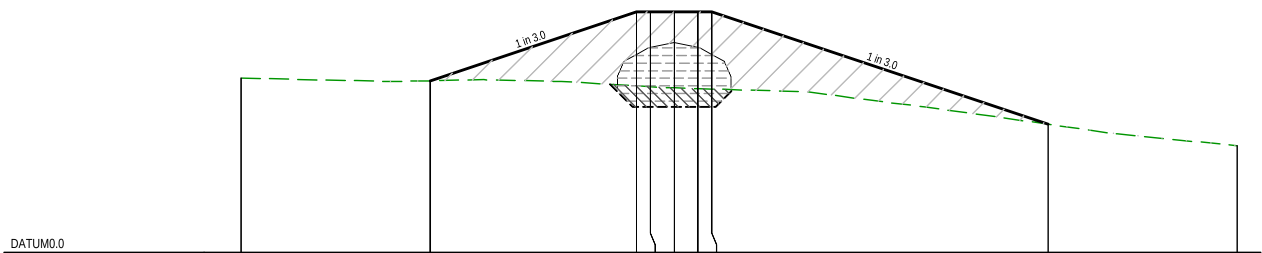
PROJECT NUMBER
P19012

DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 2

DRG NO. P19012-AG-CV-08-02
REV. A

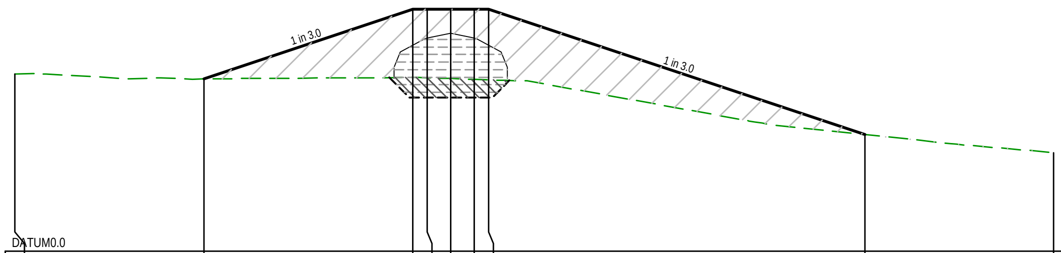
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



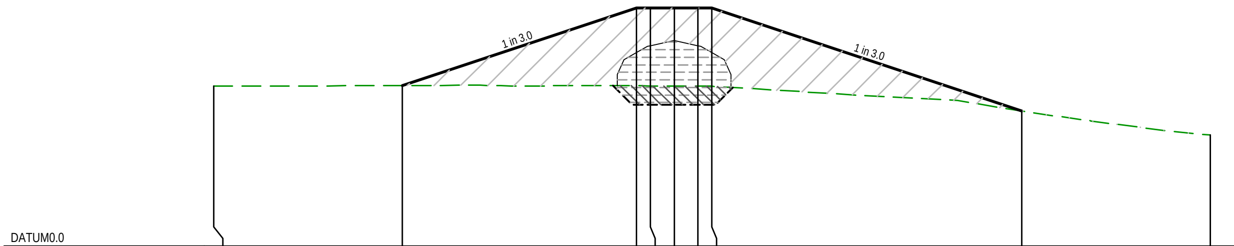
CONTROL EB02		4.53	6.35	6.35	6.35	6.35	6.35	3.39	
EXISTING SURFACE	4.60	4.53	4.40	4.38	4.35	4.33	4.32	3.39	2.82
OFFSET (-LHS/+RHS)	-11.46	-6.46	-1.00	-0.62	0.00	0.62	1.00	9.90	14.90

CH 180



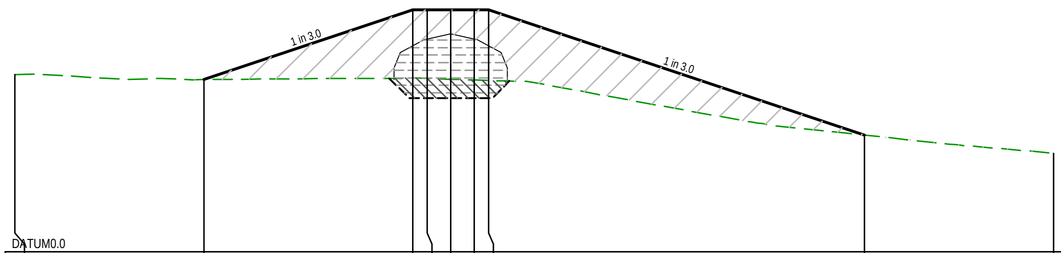
CONTROL EB02		4.56	6.40	6.40	6.40	6.40	6.40	3.08	
EXISTING SURFACE	4.69	4.56	4.59	4.58	4.56	4.54	4.53	3.08	2.61
OFFSET (-LHS/+RHS)	-11.53	-6.53	-1.00	-0.62	0.00	0.62	1.00	10.96	15.96

CH 200



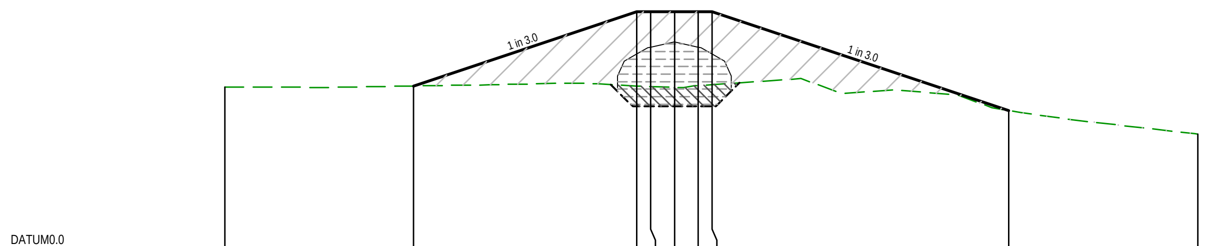
CONTROL EB02		4.24	6.31	6.31	6.31	6.31	6.31	3.58	
EXISTING SURFACE	4.24	4.24	4.25	4.24	4.24	4.24	4.23	3.58	2.94
OFFSET (-LHS/+RHS)	-12.19	-7.19	-1.00	-0.63	0.00	0.63	1.00	9.20	14.20

CH 160



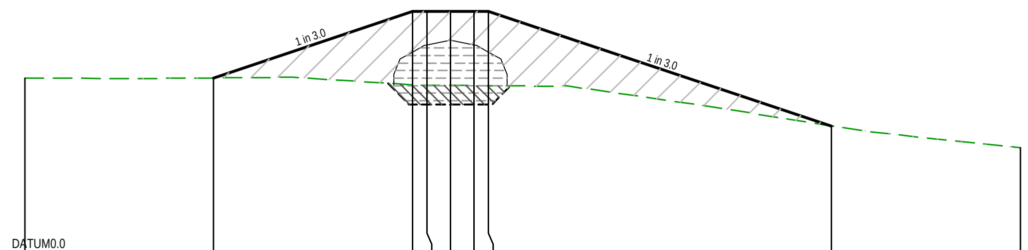
CONTROL EB02		4.56	6.40	6.40	6.40	6.40	6.40	3.08	
EXISTING SURFACE	4.69	4.56	4.59	4.58	4.56	4.54	4.53	3.08	2.61
OFFSET (-LHS/+RHS)	-11.53	-6.53	-1.00	-0.62	0.00	0.62	1.00	10.95	15.95

CH 200



CONTROL EB02		4.29	6.25	6.25	6.25	6.25	6.25	3.64	
EXISTING SURFACE	4.25	4.29	4.29	4.27	4.25	4.30	4.32	3.64	3.01
OFFSET (-LHS/+RHS)	-11.90	-6.90	-1.00	-0.63	0.00	0.63	1.00	8.85	13.85

CH 140



CONTROL EB02		4.61	6.36	6.36	6.36	6.36	6.36	3.33	
EXISTING SURFACE	4.60	4.61	4.42	4.41	4.41	4.40	4.40	3.33	2.76
OFFSET (-LHS/+RHS)	-11.27	-6.27	-1.00	-0.62	0.00	0.62	1.00	10.08	15.08

CH 184

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

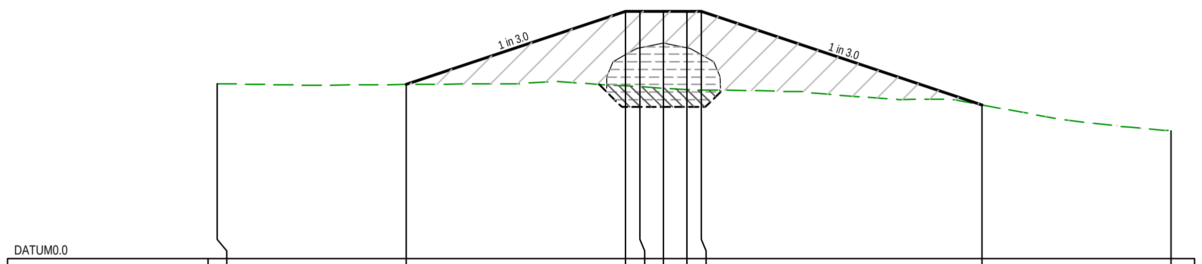
PROJECT NUMBER
P19012

DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 3

DRG NO. P19012-AG-CV-08-03
REV. A

LEGEND

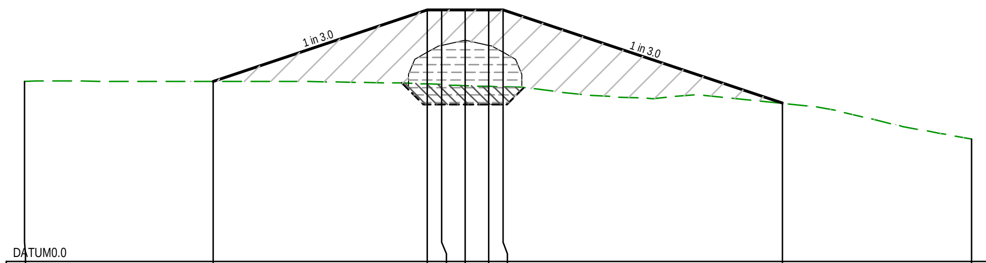
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM0.0

CONTROL EB02		4.60	6.54	6.54	6.54	6.54	6.54	4.06	
EXISTING SURFACE	4.62	4.60	4.56	4.54	4.50	4.47	4.46	4.06	3.37
OFFSET (-LHS/+RHS)	-11.81	-6.81	-1.00	-0.62	0.00	0.62	1.00	8.43	13.43

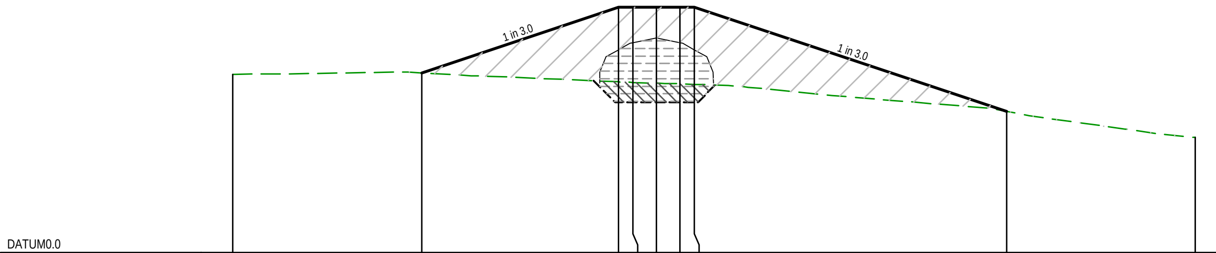
CH 260



DATUM0.0

CONTROL EB02		4.76	6.65	6.65	6.65	6.65	6.65	4.18	
EXISTING SURFACE	4.76	4.76	4.70	4.68	4.65	4.63	4.62	4.18	3.24
OFFSET (-LHS/+RHS)	-11.66	-6.66	-1.00	-0.62	0.00	0.62	1.00	8.40	13.40

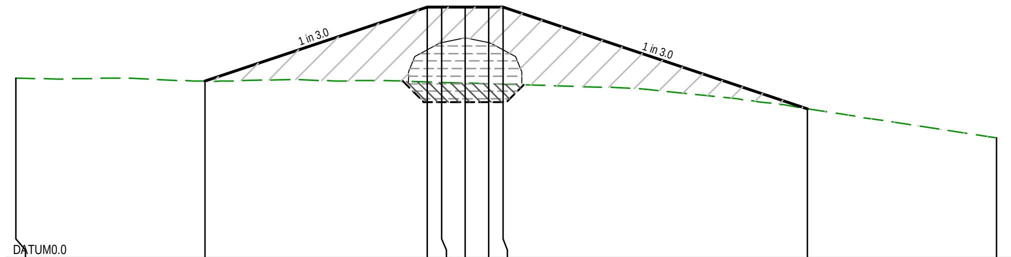
CH 309



DATUM0.0

CONTROL EB02		4.75	6.49	6.49	6.49	6.49	6.49	3.74	
EXISTING SURFACE	4.72	4.75	4.52	4.50	4.48	4.46	4.45	3.74	3.04
OFFSET (-LHS/+RHS)	-11.22	-6.22	-1.00	-0.63	0.00	0.63	1.00	9.26	14.26

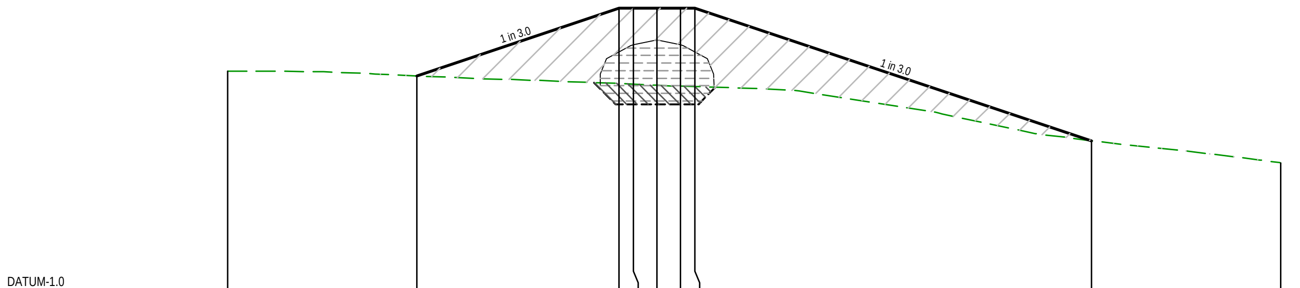
CH 240



DATUM0.0

CONTROL EB02		4.67	6.63	6.63	6.63	6.63	6.63	3.94	
EXISTING SURFACE	4.75	4.67	4.65	4.64	4.62	4.60	4.59	3.94	3.17
OFFSET (-LHS/+RHS)	-11.88	-6.88	-1.00	-0.63	0.00	0.63	1.00	9.06	14.06

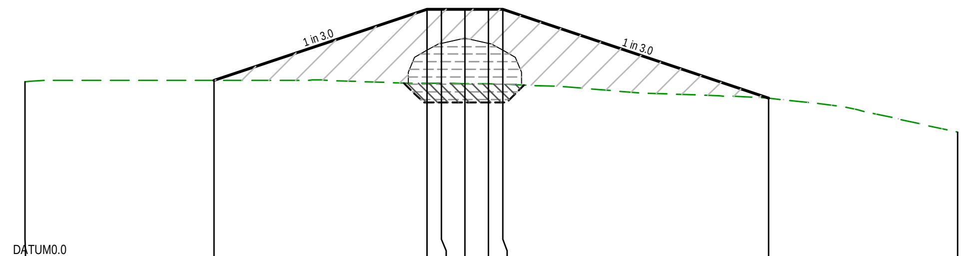
CH 300



DATUM-1.0

CONTROL EB02		4.66	6.45	6.45	6.45	6.45	6.45	2.95	
EXISTING SURFACE	4.78	4.66	4.46	4.44	4.41	4.39	4.38	2.95	2.37
OFFSET (-LHS/+RHS)	-11.35	-6.35	-1.00	-0.63	0.00	0.63	1.00	11.49	16.49

CH 220



DATUM0.0

CONTROL EB02		4.70	6.58	6.58	6.58	6.58	6.58	4.24	
EXISTING SURFACE	4.67	4.70	4.63	4.63	4.62	4.61	4.60	4.24	3.34
OFFSET (-LHS/+RHS)	-11.64	-6.64	-1.00	-0.62	0.00	0.62	1.00	8.04	13.04

CH 280

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
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GREEN CLIMATE FUND

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QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

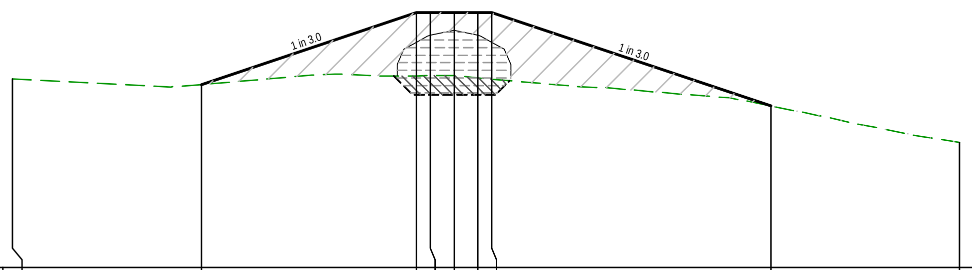
PROJECT NUMBER
P19012

DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 4

DRG NO. P19012-AG-CV-08-04
REV. A

LEGEND

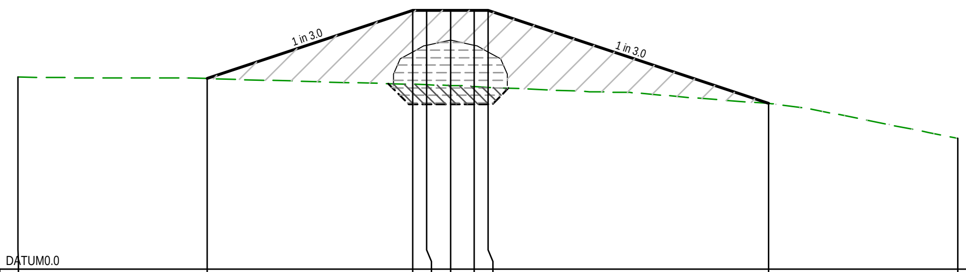
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM0.0

CONTROL EB02		4.82	6.72	6.72	6.72	6.72	6.72	4.26	
EXISTING SURFACE	4.97	4.82	5.05	5.06	5.06	5.00	4.97	4.26	3.30
OFFSET (-LHS/+RHS)	-11.69	-6.69	-1.00	-0.62	0.00	0.62	1.00	8.38	13.38

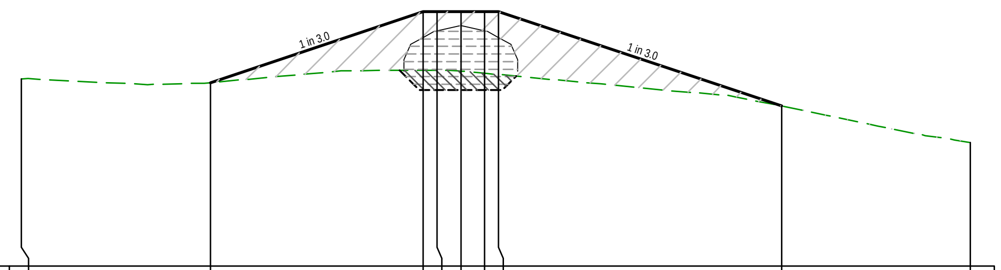
CH 341



DATUM0.0

		5.04	6.86	6.86	6.86	6.86	6.86	4.39	
	5.09	5.04	4.89	4.88	4.87	4.84	4.81	4.39	3.46
	-11.44	-6.44	-1.00	-0.62	0.00	0.62	1.00	8.42	13.42

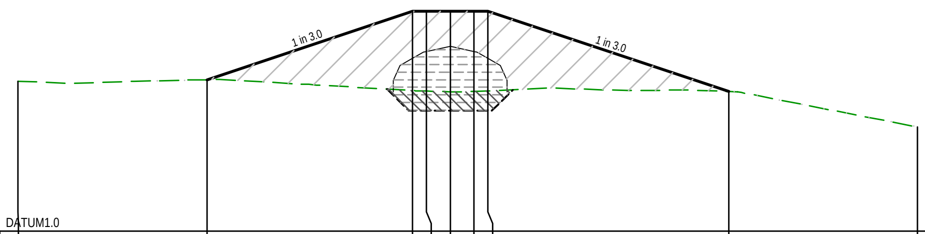
CH 400



DATUM0.0

CONTROL EB02		4.84	6.72	6.72	6.72	6.72	6.72	4.22	
EXISTING SURFACE	4.94	4.84	5.17	5.17	5.15	5.09	5.06	4.22	3.26
OFFSET (-LHS/+RHS)	-11.63	-6.63	-1.00	-0.62	0.00	0.62	1.00	8.49	13.49

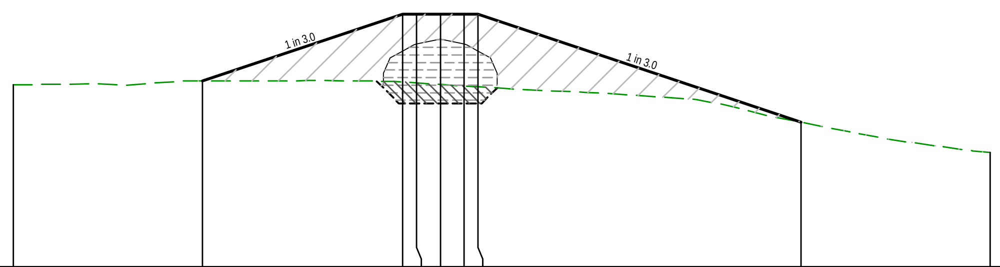
CH 340



DATUM1.0

		5.00	6.81	6.81	6.81	6.81	6.81	4.69	
	4.96	5.00	4.71	4.70	4.68	4.69	4.70	4.69	3.75
	-11.44	-6.44	-1.00	-0.63	0.00	0.63	1.00	7.37	12.37

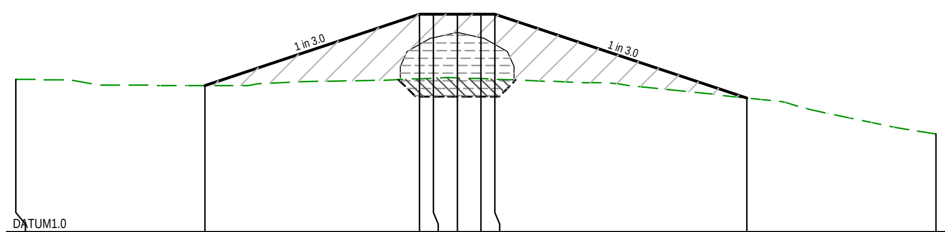
CH 380



DATUM0.0

CONTROL EB02		4.91	6.67	6.67	6.67	6.67	6.67	3.82	
EXISTING SURFACE	4.81	4.91	4.89	4.86	4.82	4.78	4.76	3.82	3.02
OFFSET (-LHS/+RHS)	-11.30	-6.30	-1.00	-0.62	0.00	0.62	1.00	9.55	14.55

CH 320



DATUM1.0

		4.87	6.77	6.77	6.77	6.77	6.77	4.54	
	5.03	4.87	5.05	5.07	5.08	5.06	5.04	4.54	3.59
	-11.67	-6.67	-1.00	-0.63	0.00	0.63	1.00	7.67	12.67

CH 360

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

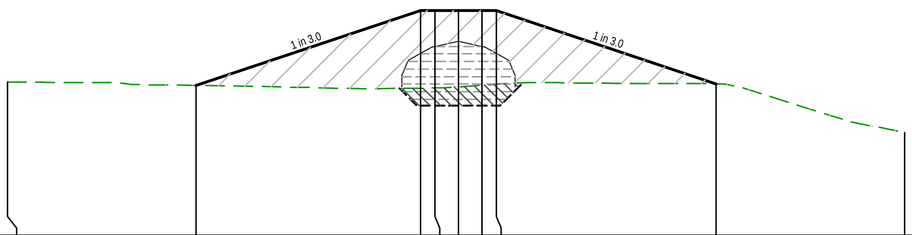
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 5

DRG NO.
P19012-AG-CV-08-05

REV.
A

LEGEND

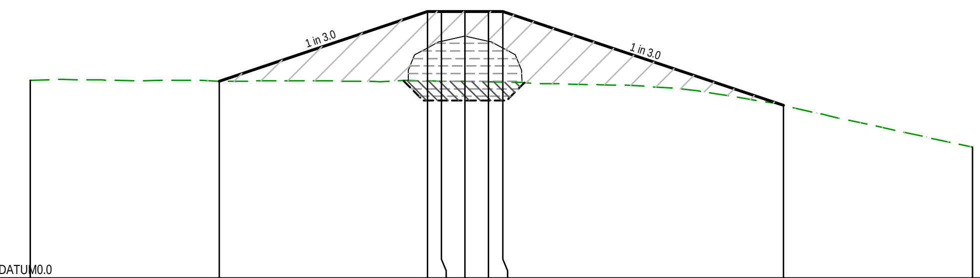
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM1.0

CONTROL EB02		4.97	6.95	6.95	6.95	6.95	6.95	5.01	
EXISTING SURFACE	5.05	4.97	4.90	4.90	4.93	4.97	5.00	5.01	3.73
OFFSET (-LHS/+RHS)	-11.94	-6.94	-1.00	-0.62	0.00	0.62	1.00	6.82	11.82

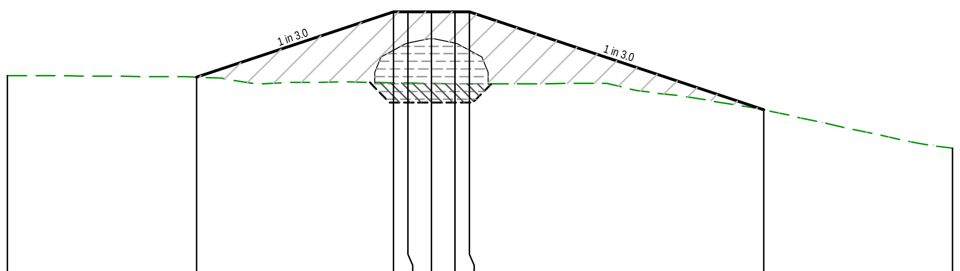
CH 440



DATUM0.0

CONTROL EB02		5.20	7.04	7.04	7.04	7.04	7.04	4.56	
EXISTING SURFACE	5.22	5.20	5.21	5.20	5.19	5.18	5.18	4.56	3.46
OFFSET (-LHS/+RHS)	-11.51	-6.51	-1.00	-0.63	0.00	0.63	1.00	8.44	13.44

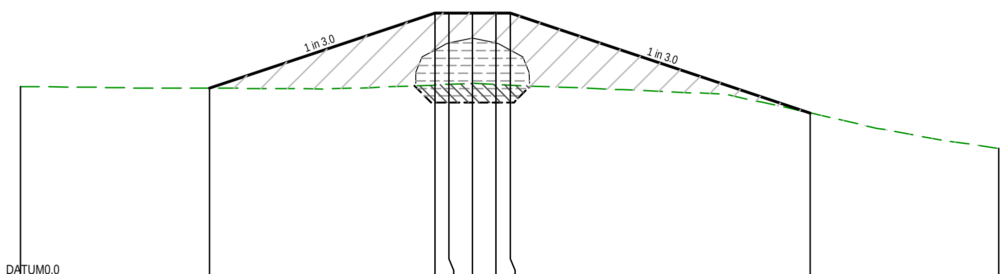
CH 480



DATUM0.0

CONTROL EB02		5.18	6.92	6.92	6.92	6.92	6.92	4.32	
EXISTING SURFACE	5.23	5.18	5.03	5.03	5.01	5.00	5.00	4.32	3.30
OFFSET (-LHS/+RHS)	-11.21	-6.21	-1.00	-0.62	0.00	0.62	1.00	8.79	13.79

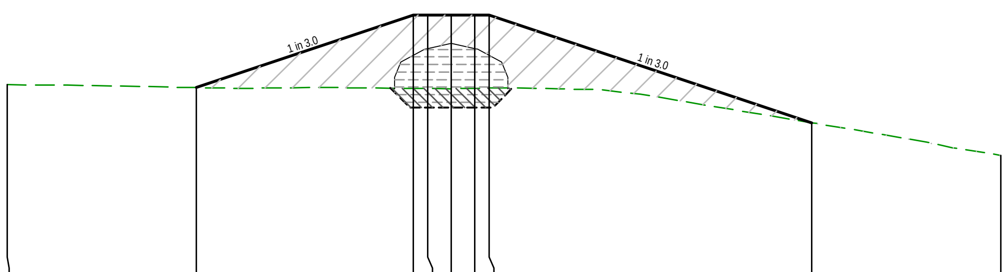
CH 425



DATUM0.0

CONTROL EB02		5.01	7.00	7.00	7.00	7.00	7.00	4.35	
EXISTING SURFACE	5.05	5.01	5.09	5.11	5.13	5.10	5.09	4.35	3.42
OFFSET (-LHS/+RHS)	-11.97	-6.97	-1.00	-0.62	0.00	0.62	1.00	8.93	13.93

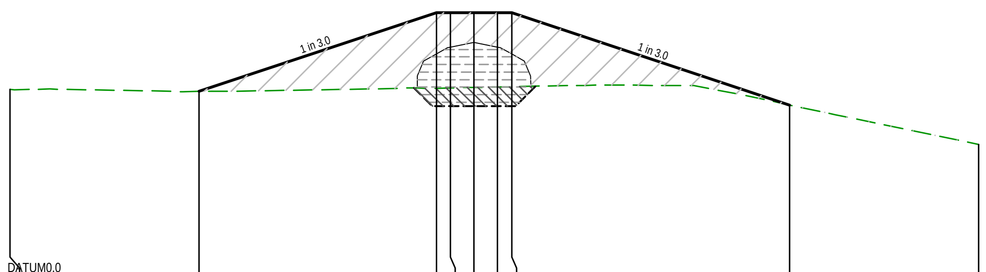
CH 460



DATUM0.0

CONTROL EB02		4.99	6.90	6.90	6.90	6.90	6.90	4.06	
EXISTING SURFACE	5.07	4.99	4.97	4.96	4.96	4.97	4.97	4.06	3.19
OFFSET (-LHS/+RHS)	-11.75	-6.75	-1.00	-0.63	0.00	0.63	1.00	9.54	14.54

CH 420



DATUM0.0

CONTROL EB02		4.88	6.98	6.98	6.98	6.98	6.98	4.52	
EXISTING SURFACE	4.94	4.88	4.97	4.98	4.99	5.00	5.01	4.52	3.48
OFFSET (-LHS/+RHS)	-12.28	-7.28	-1.00	-0.62	0.00	0.62	1.00	8.36	13.36

CH 452

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
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GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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QLD, 4220. Australia
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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

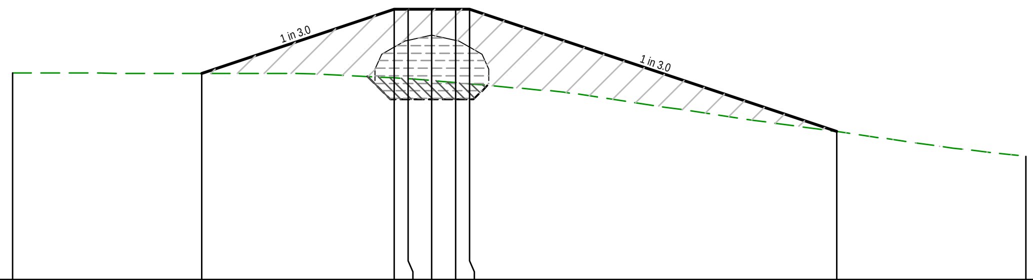
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 6

DRG NO.
P19012-AG-CV-08-06

REV.
A

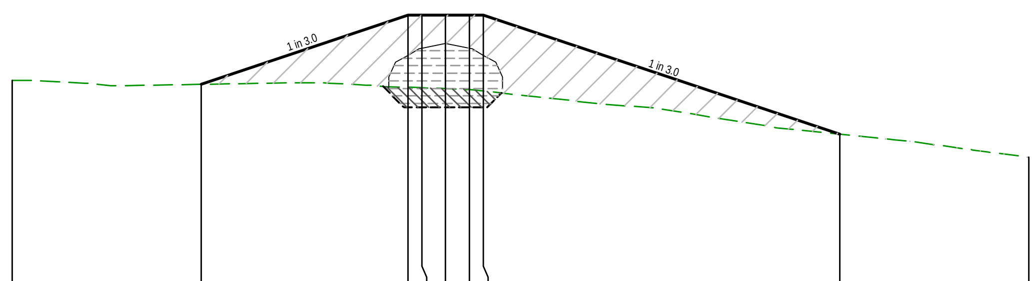
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



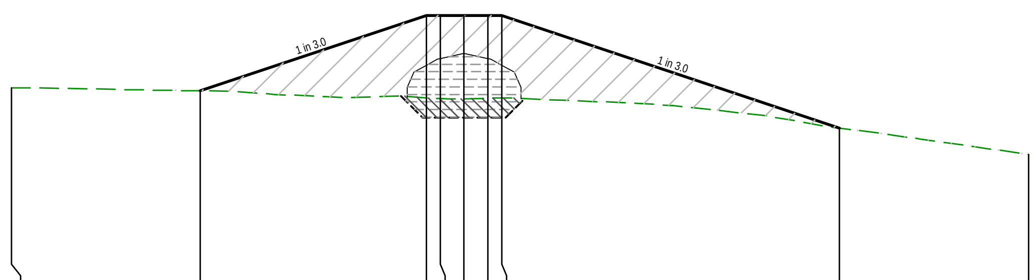
CONTROL EB02		5.46	7.16	7.16	7.16	7.16	7.16	3.92	
EXISTING SURFACE	5.47	5.46	5.35	5.32	5.28	5.22	5.19	3.92	3.26
OFFSET (-LHS/+RHS)	-11.09	-6.09	-1.00	-0.63	0.00	0.63	1.00	10.72	15.72

CH 532



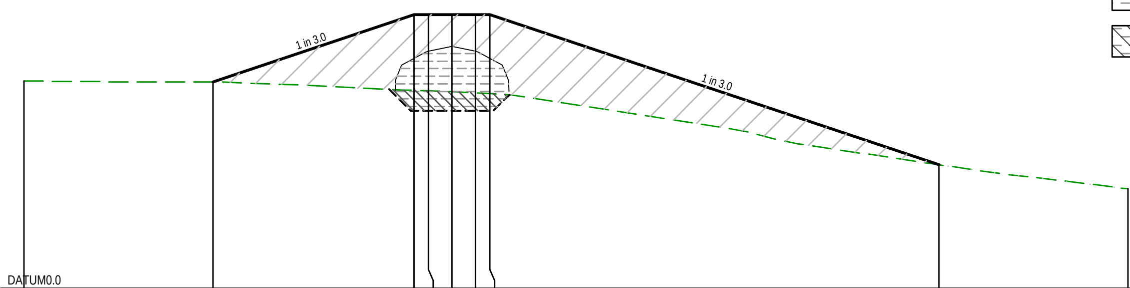
CONTROL EB02		5.31	7.13	7.13	7.13	7.13	7.13	3.99	
EXISTING SURFACE	5.41	5.31	5.23	5.22	5.19	5.17	5.13	3.99	3.38
OFFSET (-LHS/+RHS)	-11.47	-6.47	-1.00	-0.62	0.00	0.62	1.00	10.44	15.44

CH 520



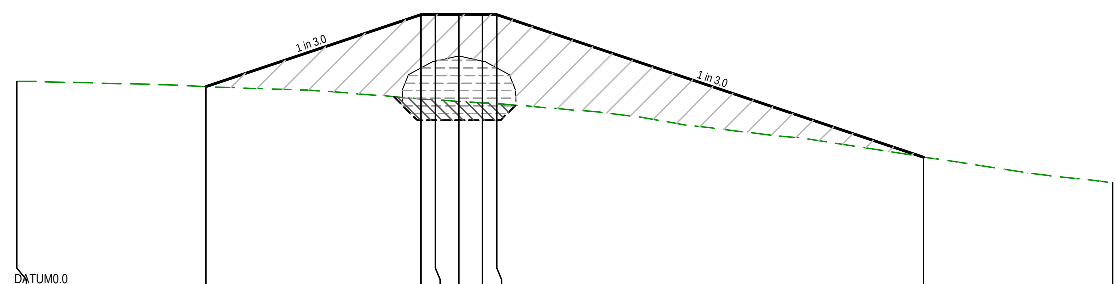
CONTROL EB02		5.10	7.09	7.09	7.09	7.09	7.09	4.11	
EXISTING SURFACE	5.18	5.10	4.91	4.89	4.89	4.90	4.91	4.11	3.41
OFFSET (-LHS/+RHS)	-11.97	-6.97	-1.00	-0.63	0.00	0.63	1.00	9.93	14.93

CH 500



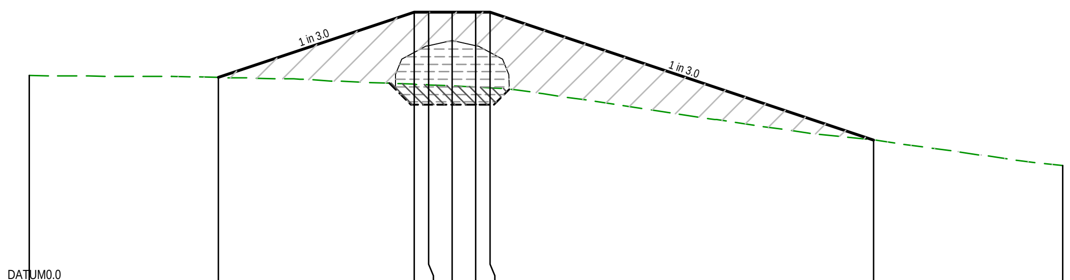
		5.45	7.22	7.22	7.22	7.22	7.22	3.26	
	5.47	5.45	5.23	5.22	5.19	5.16	5.14	3.26	2.62
	-11.33	-6.33	-1.00	-0.62	0.00	0.62	1.00	12.89	17.89

CH 560



		5.31	7.21	7.21	7.21	7.21	7.21	3.44	
	5.45	5.31	4.98	4.96	4.92	4.88	4.86	3.44	2.77
	-11.69	-6.69	-1.00	-0.63	0.00	0.63	1.00	12.29	17.29

CH 553



		5.45	7.18	7.18	7.18	7.18	7.18	3.79	
	5.50	5.45	5.27	5.26	5.23	5.20	5.18	3.79	3.11
	-11.19	-6.19	-1.00	-0.63	0.00	0.63	1.00	11.15	16.15

CH 540

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

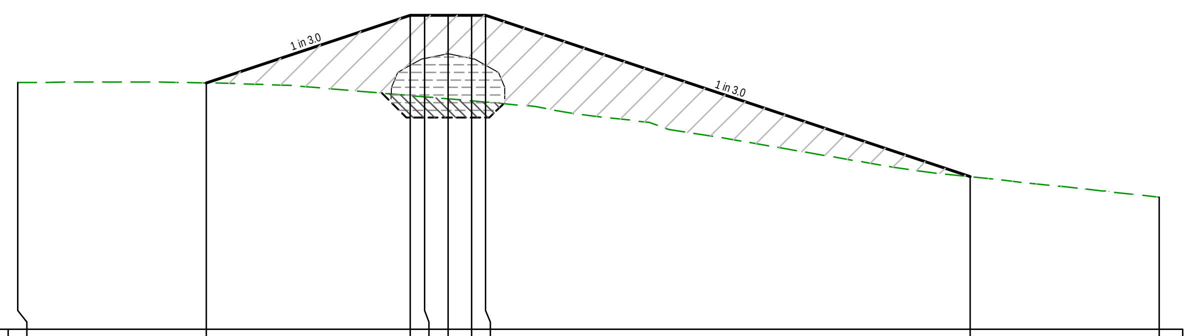
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 7

DRG NO.
P19012-AG-CV-08-07

REV.
A

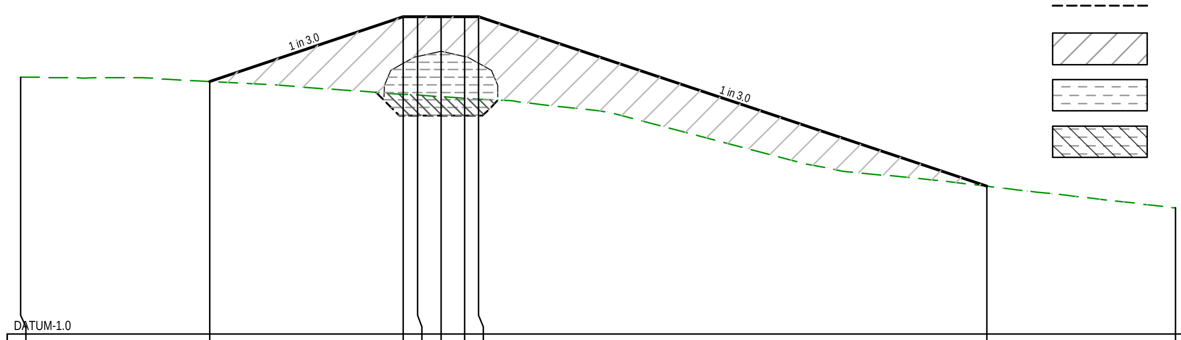
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



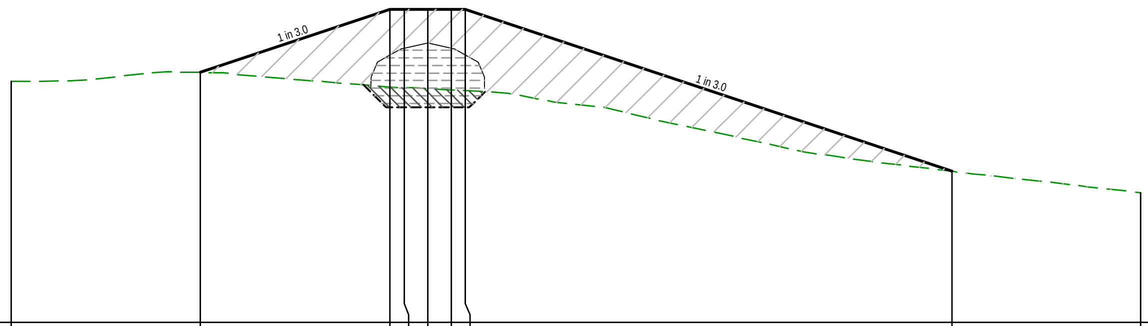
CONTROL EB02		5.52	7.32	7.32	7.32	7.32	7.32	3.04	
EXISTING SURFACE	5.53	5.52	5.19	5.15	5.10	5.05	5.01	3.04	2.50
OFFSET (-LHS/+RHS)	-11.39	-6.39	-1.00	-0.63	0.00	0.63	1.00	13.83	18.83

CH 600



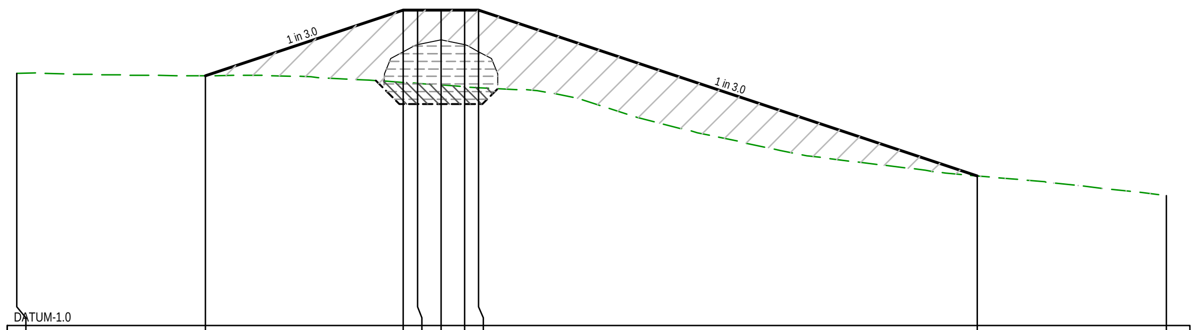
CONTROL EB02		5.69	7.40	7.40	7.40	7.40	7.40	2.92	
EXISTING SURFACE	5.80	5.69	5.35	5.33	5.28	5.24	5.22	2.92	2.34
OFFSET (-LHS/+RHS)	-11.12	-6.12	-1.00	-0.62	0.00	0.62	1.00	14.44	19.44

CH 635



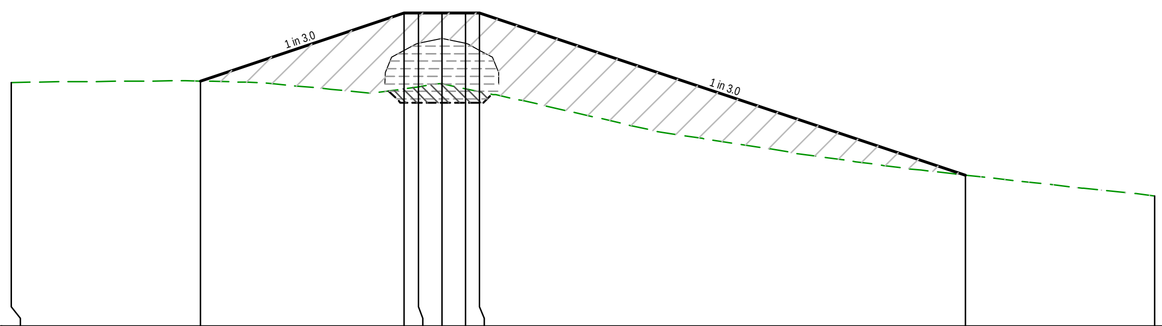
CONTROL EB02		5.61	7.29	7.29	7.29	7.29	7.29	3.00	
EXISTING SURFACE	5.38	5.61	5.23	5.21	5.19	5.15	5.13	3.00	2.43
OFFSET (-LHS/+RHS)	-11.02	-6.02	-1.00	-0.63	0.00	0.63	1.00	13.87	18.87

CH 587



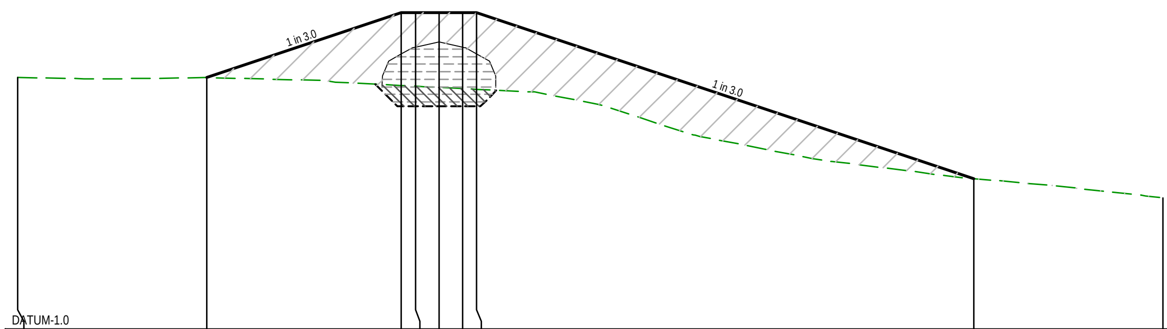
CONTROL EB02		5.62	7.36	7.36	7.36	7.36	7.36	2.97	
EXISTING SURFACE	5.68	5.62	5.45	5.42	5.37	5.33	5.31	2.97	2.44
OFFSET (-LHS/+RHS)	-11.23	-6.23	-1.00	-0.63	0.00	0.63	1.00	14.19	19.19

CH 620



CONTROL EB02		5.47	7.27	7.27	7.27	7.27	7.27	2.99	
EXISTING SURFACE	5.43	5.47	5.27	5.32	5.41	5.27	5.19	2.99	2.43
OFFSET (-LHS/+RHS)	-11.39	-6.39	-1.00	-0.63	0.00	0.63	1.00	13.85	18.85

CH 580



CONTROL EB02		5.65	7.36	7.36	7.36	7.36	7.36	2.97	
EXISTING SURFACE	5.65	5.65	5.44	5.42	5.39	5.36	5.34	2.97	2.46
OFFSET (-LHS/+RHS)	-11.14	-6.14	-1.00	-0.63	0.00	0.63	1.00	14.16	19.16

CH 619

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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GREEN CLIMATE FUND

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

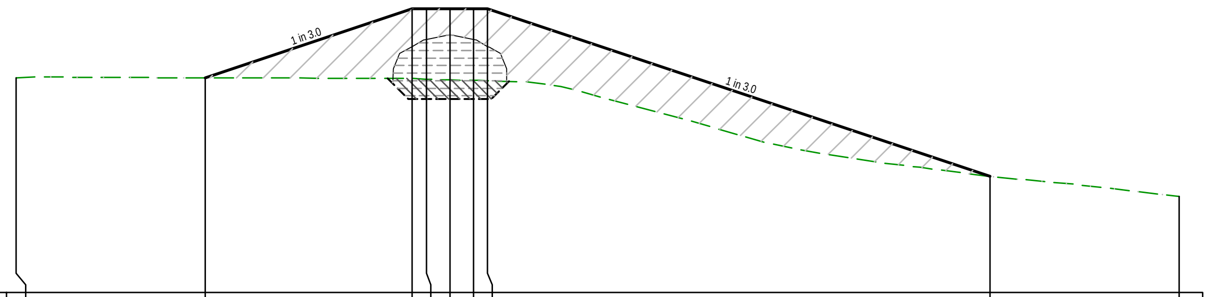
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 8

DRG NO.
P19012-AG-CV-08-08

REV.
A

LEGEND

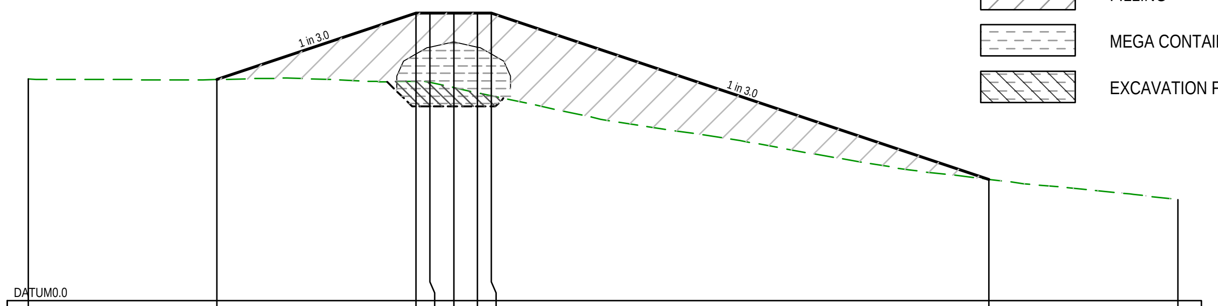
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM0.0

CONTROL EB02		5.67	7.50	7.50	7.50	7.50	7.50	3.07	
EXISTING SURFACE	5.68	5.67	5.66	5.64	5.62	5.61	5.60	3.07	2.54
OFFSET (-LHS/+RHS)	-11.48	-6.48	-1.00	-0.62	0.00	0.62	1.00	14.29	19.29

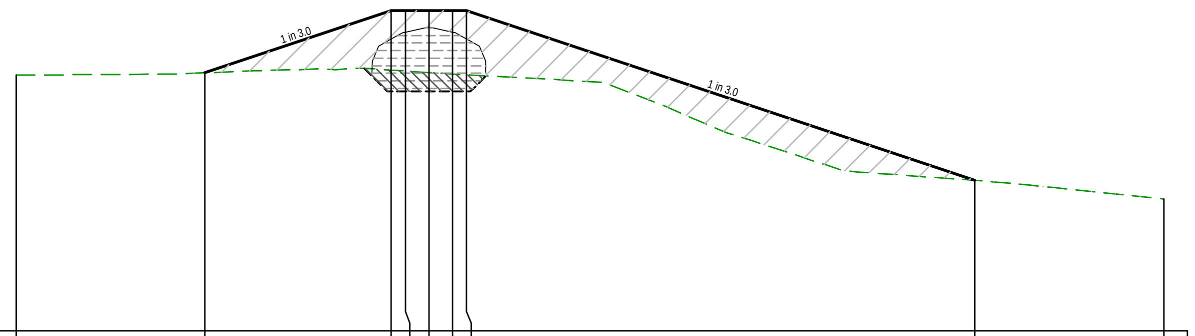
CH 680



DATUM0.0

CONTROL EB02		5.84	7.59	7.59	7.59	7.59	7.59	3.20	
EXISTING SURFACE	5.85	5.84	5.79	5.76	5.63	5.49	5.41	3.20	2.66
OFFSET (-LHS/+RHS)	-11.26	-6.26	-1.00	-0.62	0.00	0.62	1.00	14.17	19.17

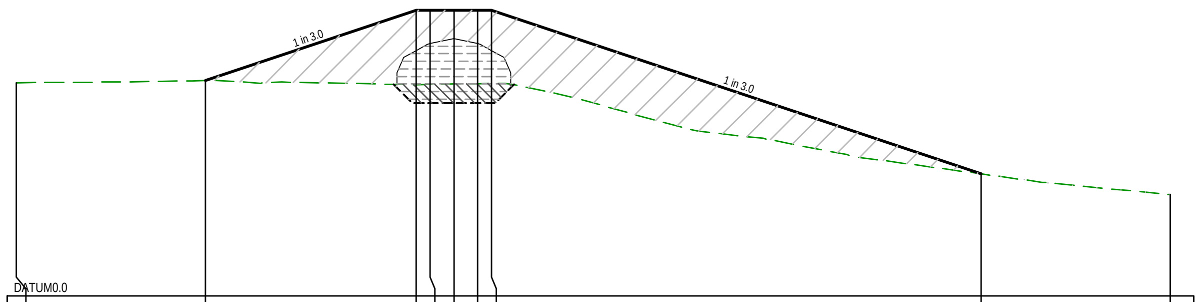
CH 720



DATUM-1.0

CONTROL EB02		5.81	7.45	7.45	7.45	7.45	7.45	2.97	
EXISTING SURFACE	5.75	5.81	5.89	5.86	5.82	5.78	5.75	2.97	2.48
OFFSET (-LHS/+RHS)	-10.92	-5.92	-1.00	-0.62	0.00	0.62	1.00	14.45	19.45

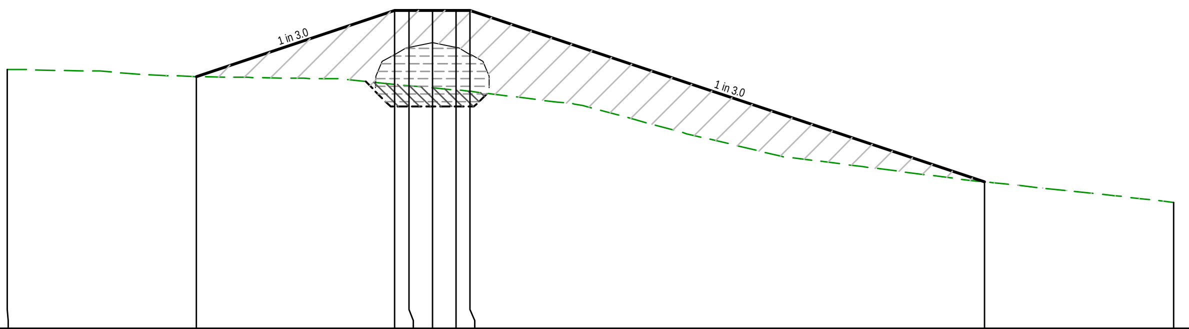
CH 660



DATUM0.0

CONTROL EB02		5.69	7.55	7.55	7.55	7.55	7.55	3.23	
EXISTING SURFACE	5.64	5.69	5.58	5.59	5.60	5.61	5.62	3.23	2.68
OFFSET (-LHS/+RHS)	-11.57	-6.57	-1.00	-0.63	0.00	0.63	1.00	13.96	18.96

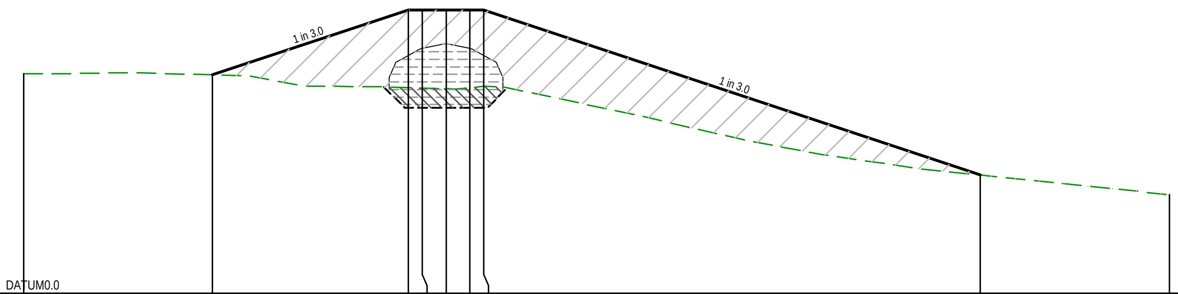
CH 700



DATUM-1.0

CONTROL EB02		5.66	7.41	7.41	7.41	7.41	7.41	2.87	
EXISTING SURFACE	5.85	5.66	5.45	5.42	5.36	5.30	5.27	2.87	2.33
OFFSET (-LHS/+RHS)	-11.24	-6.24	-1.00	-0.62	0.00	0.62	1.00	14.61	19.61

CH 640



DATUM0.0

CONTROL EB02		5.79	7.51	7.51	7.51	7.51	7.51	3.13	
EXISTING SURFACE	5.82	5.79	5.45	5.44	5.42	5.45	5.49	3.13	2.61
OFFSET (-LHS/+RHS)	-11.18	-6.18	-1.00	-0.62	0.00	0.62	1.00	14.13	19.13

CH 685

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

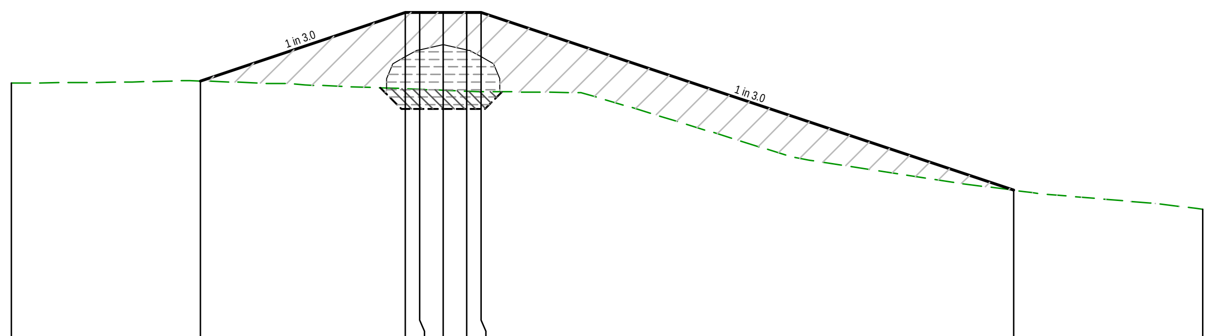
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 9

DRG NO.
P19012-AG-CV-08-09

REV.
A

LEGEND

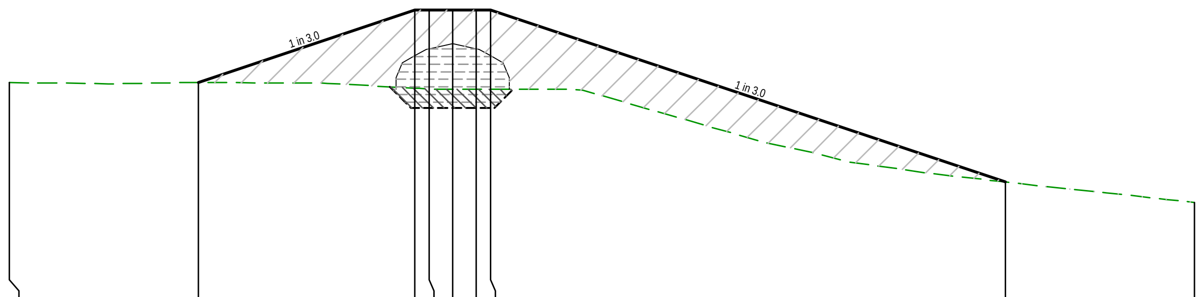
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM-1.0

CONTROL EB02		5.83	7.64	7.64	7.64	7.64	7.64	2.94		
EXISTING SURFACE	5.77	5.83	5.62	5.61	5.58	5.56	5.55	2.94	2.44	
OFFSET (-LHS/+RHS)	-11.43	-6.43	-1.00	-0.63	0.00	0.63	1.00	15.10	20.10	

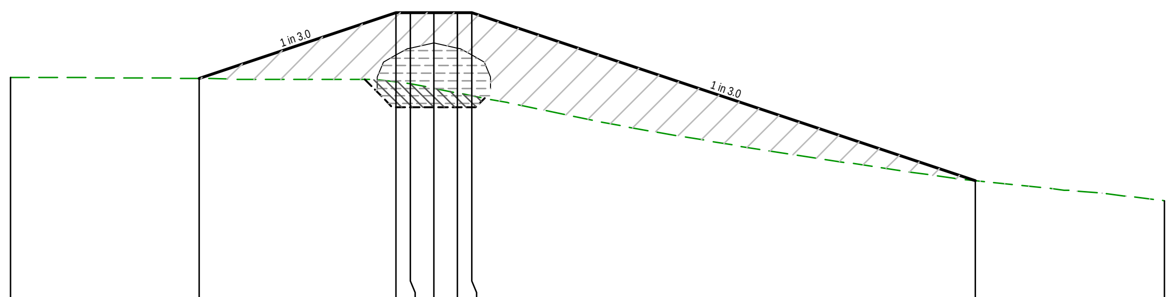
CH 740



DATUM0.0

CONTROL EB02		5.72	7.63	7.63	7.63	7.63	7.63	3.08		
EXISTING SURFACE	5.71	5.72	5.57	5.54	5.54	5.54	5.54	3.08	2.54	
OFFSET (-LHS/+RHS)	-11.73	-6.73	-1.00	-0.63	0.00	0.63	1.00	14.63	19.63	

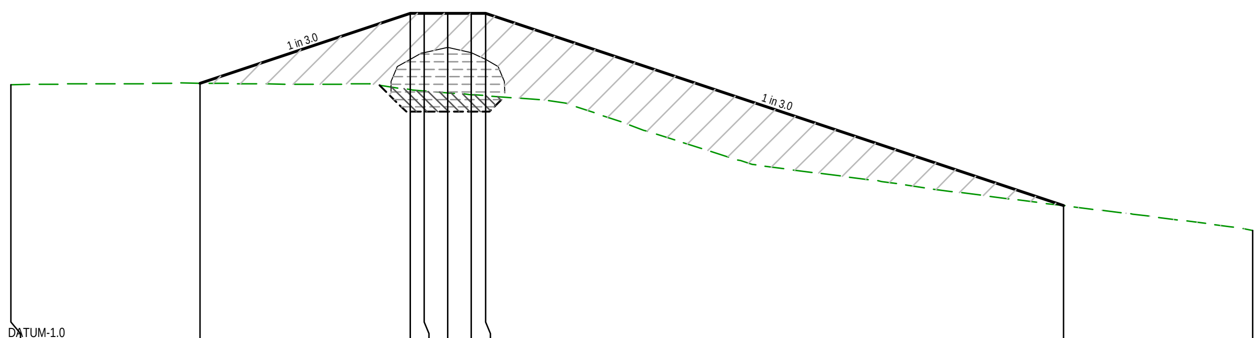
CH 735



DATUM0.0

CONTROL EB02		5.86	7.60	7.60	7.60	7.60	7.60	3.16		
EXISTING SURFACE	5.89	5.86	5.77	5.72	5.60	5.48	5.40	3.16	2.62	
OFFSET (-LHS/+RHS)	-11.21	-6.21	-1.00	-0.63	0.00	0.63	1.00	14.33	19.33	

CH 723



DATUM-1.0

		5.83	7.68	7.68	7.68	7.68	7.68	2.59		
	5.79	5.83	5.66	5.62	5.58	5.53	5.50	2.59	1.93	
	-11.56	-6.56	-1.00	-0.62	0.00	0.62	1.00	16.29	21.29	

CH 760

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast
CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220. Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

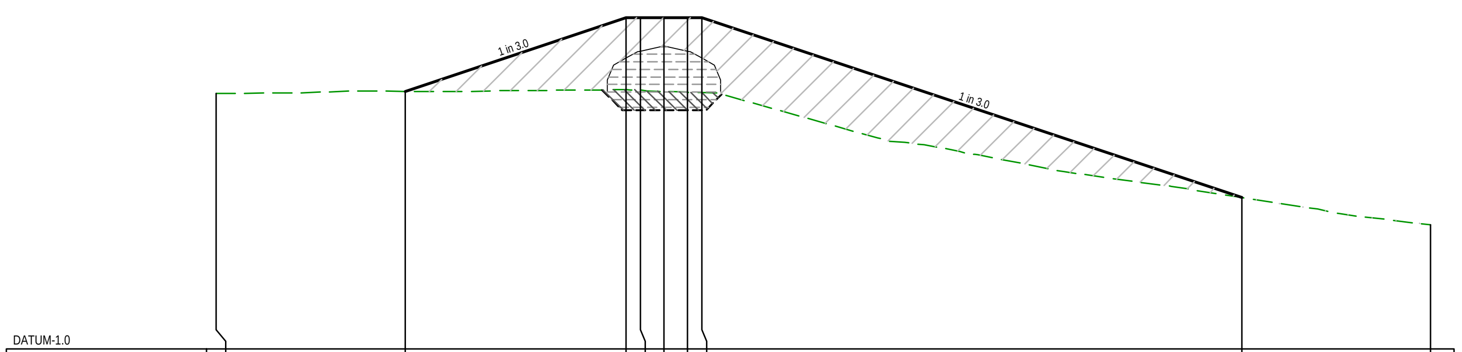
PROJECT NUMBER
P19012

DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 10

DRG NO. P19012-AG-CV-08-10
REV. A

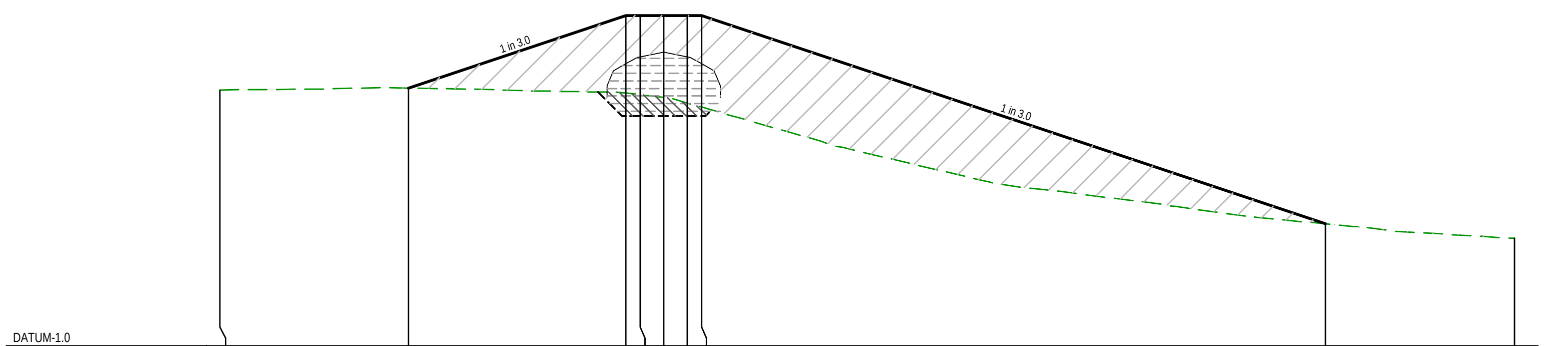
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



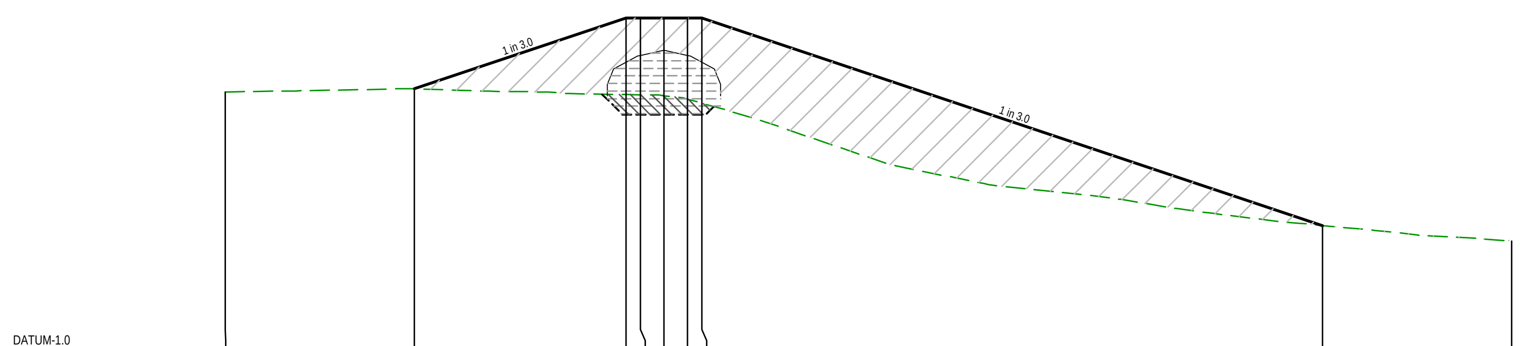
CONTROL EB02		5.82	7.77	7.77	7.77	7.77	7.77	3.00	
EXISTING SURFACE	5.76	5.82	5.86	5.85	5.82	5.80	5.78	3.00	2.28
OFFSET (-LHS/+RHS)	-11.85	-6.85	-1.00	-0.62	0.00	0.62	1.00	15.28	20.28

CH 796



CONTROL EB02		5.81	7.73	7.73	7.73	7.73	7.73	2.22	
EXISTING SURFACE	5.76	5.81	5.68	5.64	5.57	5.42	5.31	2.22	1.84
OFFSET (-LHS/+RHS)	-11.75	-6.75	-1.00	-0.62	0.00	0.62	1.00	17.51	22.51

CH 780



CONTROL EB02		5.85	7.72	7.72	7.72	7.72	7.72	2.25	
EXISTING SURFACE	5.78	5.85	5.70	5.70	5.68	5.59	5.48	2.25	1.84
OFFSET (-LHS/+RHS)	-11.60	-6.60	-1.00	-0.62	0.00	0.62	1.00	17.43	22.43

CH 778

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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Burleigh Heads
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www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

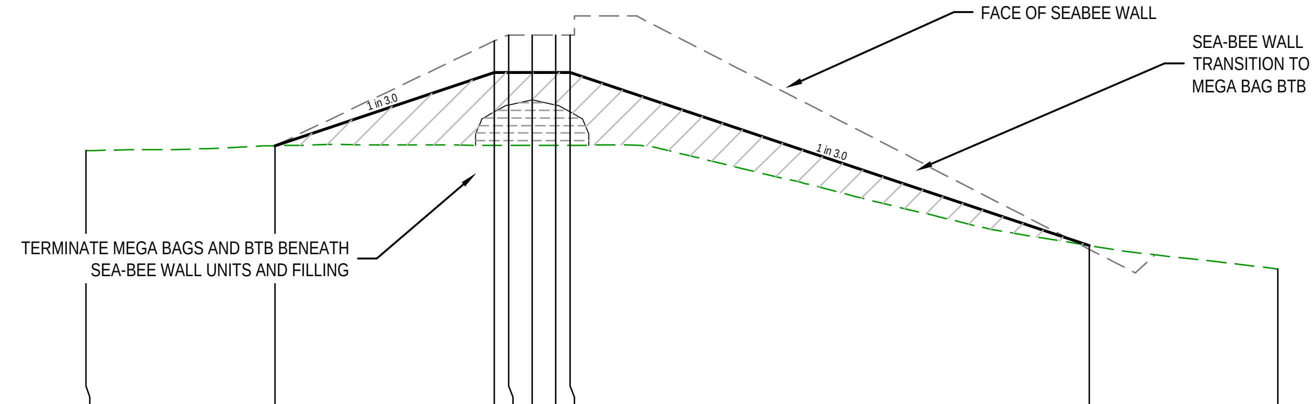
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 11

DRG NO.
P19012-AG-CV-08-11

REV.
A

LEGEND

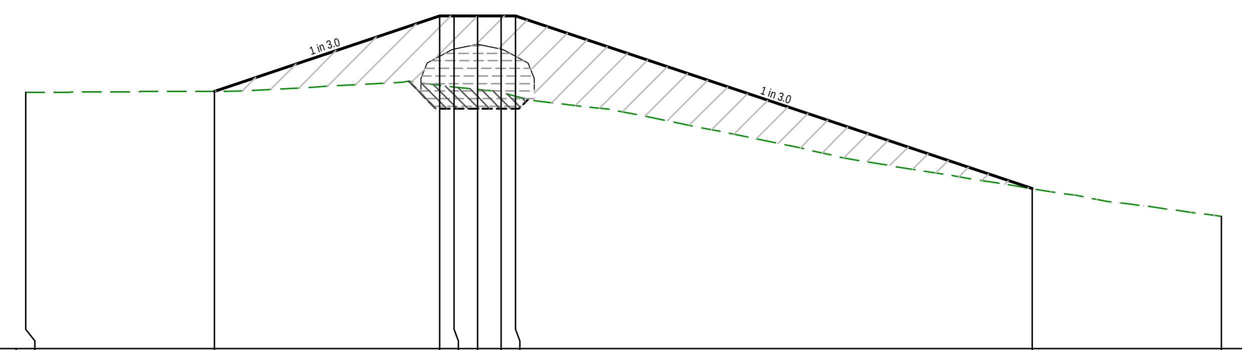
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM-1.0

CONTROL EB02		5.87	7.80	7.80	7.80	7.80	7.80	3.22	
EXISTING SURFACE	5.74	5.87	5.88	5.88	5.88	5.87	5.88	3.22	2.59
OFFSET (-LHS/+RHS)	-11.80	-6.80	-1.00	-0.63	0.00	0.63	1.00	14.74	19.74

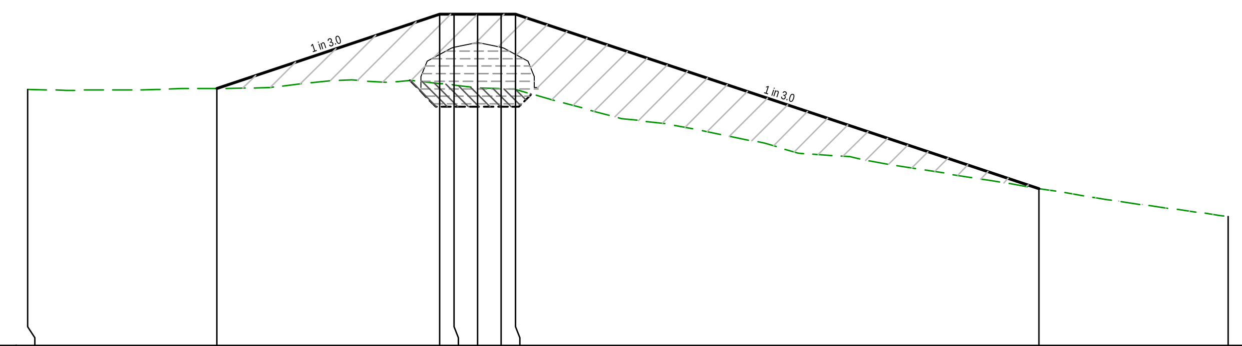
CH 811



DATUM-1.0

CONTROL EB02		5.80	7.78	7.78	7.78	7.78	7.78	3.22	
EXISTING SURFACE	5.77	5.80	5.95	5.91	5.84	5.77	5.67	3.22	2.49
OFFSET (-LHS/+RHS)	-11.95	-6.95	-1.00	-0.63	0.00	0.63	1.00	14.67	19.67

CH 803



DATUM-1.0

CONTROL EB02		5.81	7.77	7.77	7.77	7.77	7.77	3.16	
EXISTING SURFACE	5.79	5.81	5.94	5.90	5.83	5.80	5.78	3.16	2.42
OFFSET (-LHS/+RHS)	-11.90	-6.90	-1.00	-0.63	0.00	0.63	1.00	14.85	19.85

CH 800

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY: JL
DRAWN BY: MLC
CHECKED BY: JL
APPROVED: AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

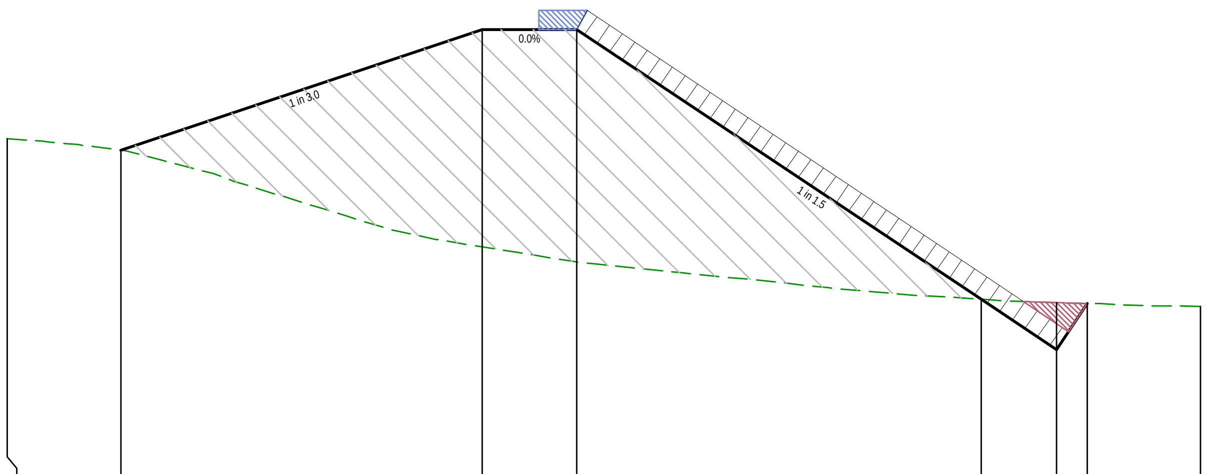
DRAWING TITLE
CONTROL EB02
SITE CROSS SECTIONS
SHEET 12

DRG NO.
P19012-AG-CV-08-12

REV.
A

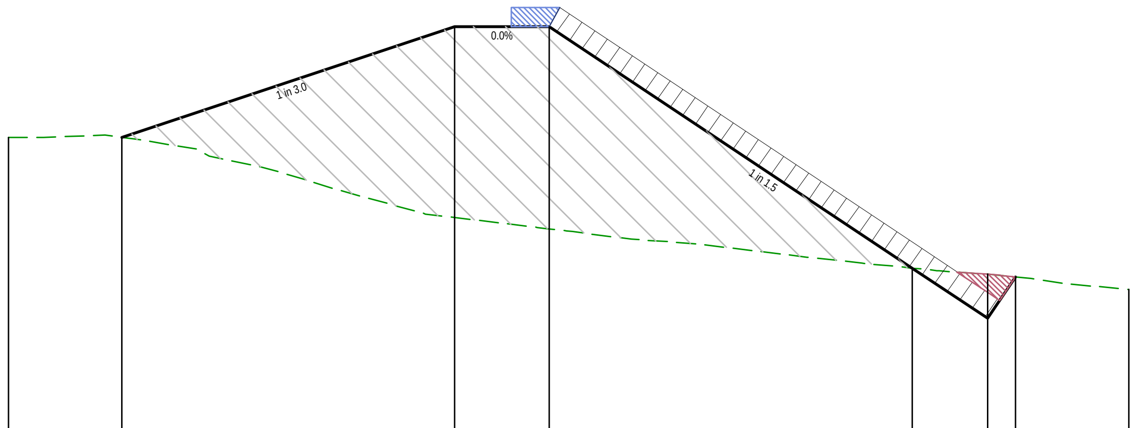
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- CONCRETE CROWN UNIT
- CONCRETE TOE BACKFILLING
- GENERAL (CORE) FILLING
- SEE BEE UNIT (HIGH CELLS NOT SHOWN)



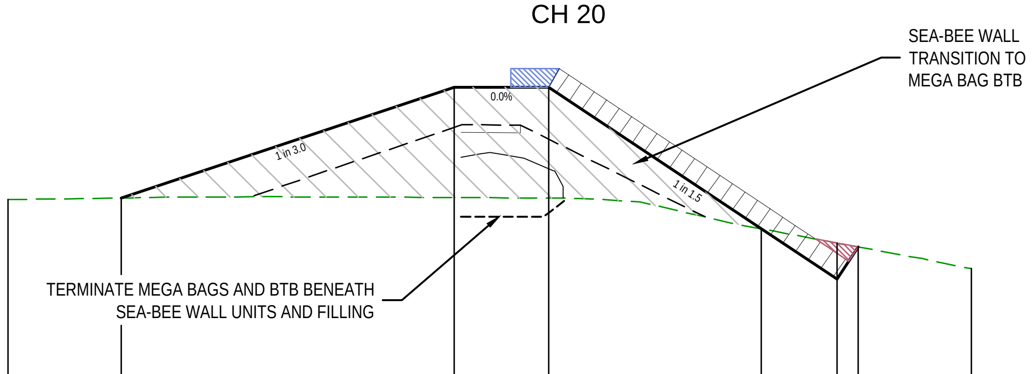
CONTROL EB03		5.61	8.80	8.80	1.67	0.33	1.56	
EXISTING SURFACE	5.91	5.61	3.05	2.65	1.67	1.58	1.56	1.49
OFFSET (-LHS/+RHS)	-15.07	-12.07	-2.50	0.00	10.70	12.70	13.51	16.51

CH 40



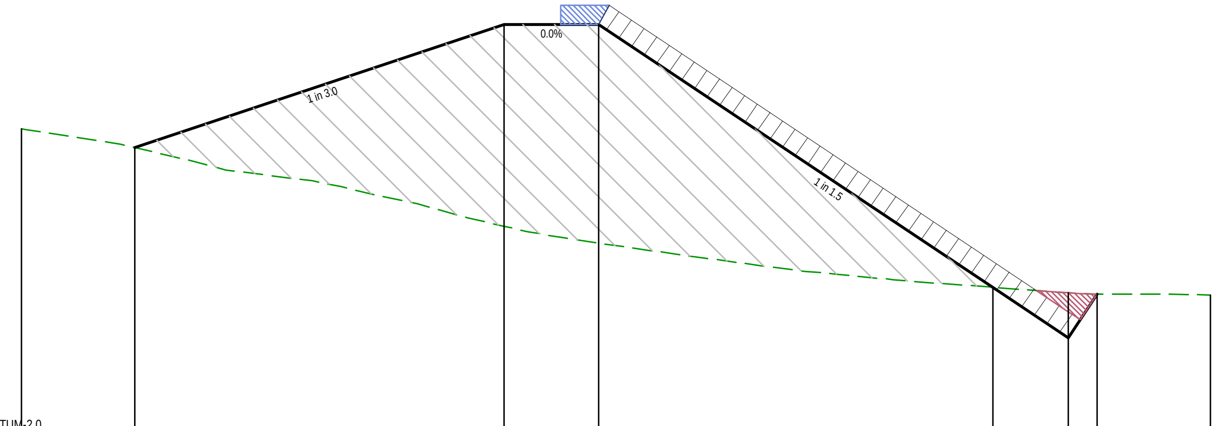
CONTROL EB03		5.87	8.80	8.80	2.40	1.07	2.17	
EXISTING SURFACE	5.86	5.87	3.74	3.44	2.40	2.24	2.17	1.83
OFFSET (-LHS/+RHS)	-14.30	-11.30	-2.50	0.00	9.60	11.60	12.33	15.33

CH 20



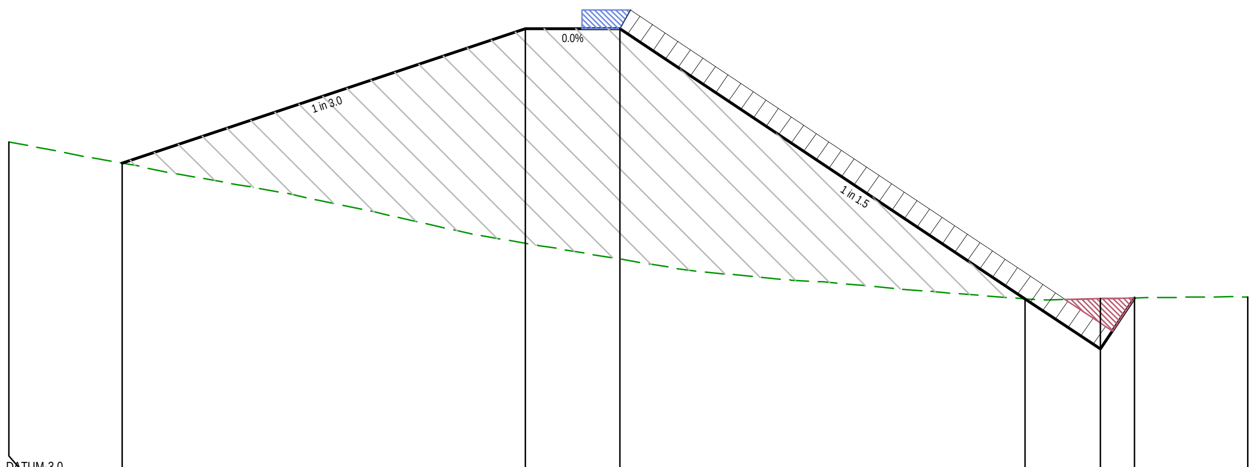
CONTROL EB03		5.86	8.80	8.80	5.05	3.72	4.57	
EXISTING SURFACE	5.83	5.86	5.88	5.87	5.05	4.67	4.57	4.00
OFFSET (-LHS/+RHS)	-14.31	-11.31	-2.50	0.00	5.63	7.63	8.19	11.19

CH 0



CONTROL EB03		5.54	8.80	8.80	1.85	0.52	1.67	
EXISTING SURFACE	6.04	5.54	3.46	3.02	1.85	1.70	1.67	1.65
OFFSET (-LHS/+RHS)	-15.27	-12.27	-2.50	0.00	10.42	12.42	13.19	16.19

CH 80



CONTROL EB03		5.24	8.80	8.80	1.66	0.32	1.68	
EXISTING SURFACE	5.81	5.24	3.12	2.71	1.66	1.66	1.68	1.71
OFFSET (-LHS/+RHS)	-16.17	-13.17	-2.50	0.00	10.72	12.72	13.61	16.61

CH 60

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

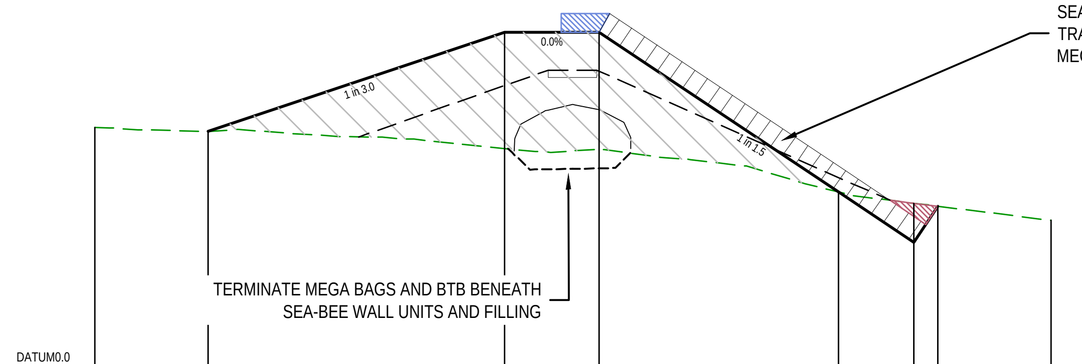
DRAWING TITLE
CONTROL EB03
SITE CROSS SECTIONS
SHEET 1

DRG NO.
P19012-AG-CV-09-01

REV.
A

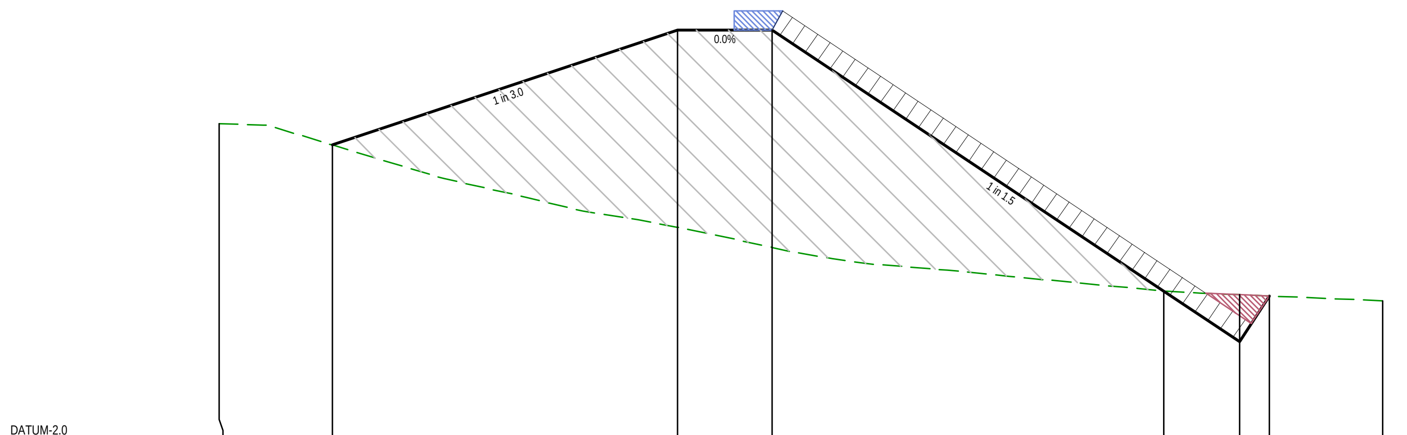
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- CONCRETE CROWN UNIT
- CONCRETE TOE BACKFILLING
- GENERAL (CORE) FILLING
- SEE BEE UNIT (HIGH CELLS NOT SHOWN)



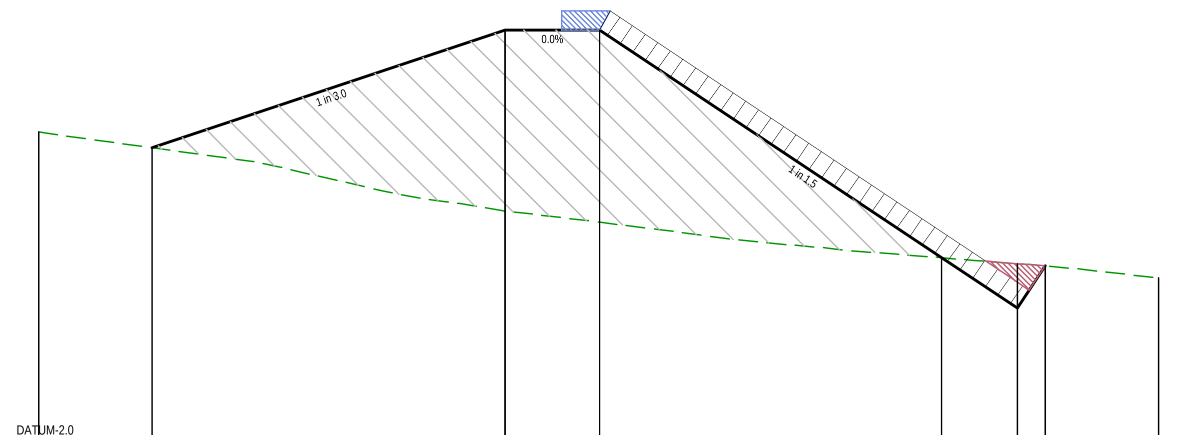
	6.18	8.80	8.80	4.58	3.25	4.20	
6.28	6.18	5.73	5.70	4.58	4.28	4.20	3.83
-13.35	-10.35	-2.50	0.00	6.33	8.33	8.96	11.96

CH 178



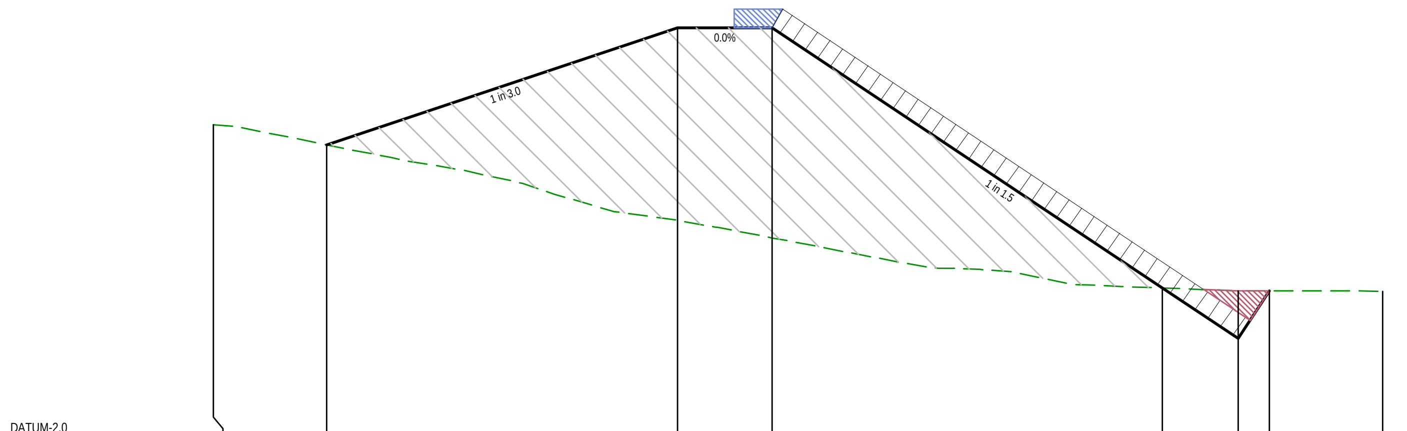
CONTROL EB03		5.76	8.80	8.80	1.89	0.56	1.76	
EXISTING SURFACE	6.33	5.76	3.57	3.05	1.89	1.79	1.76	1.63
OFFSET (-LHS/+RHS)	-14.63	-11.63	-2.50	0.00	10.36	12.36	13.16	16.16

CH 120



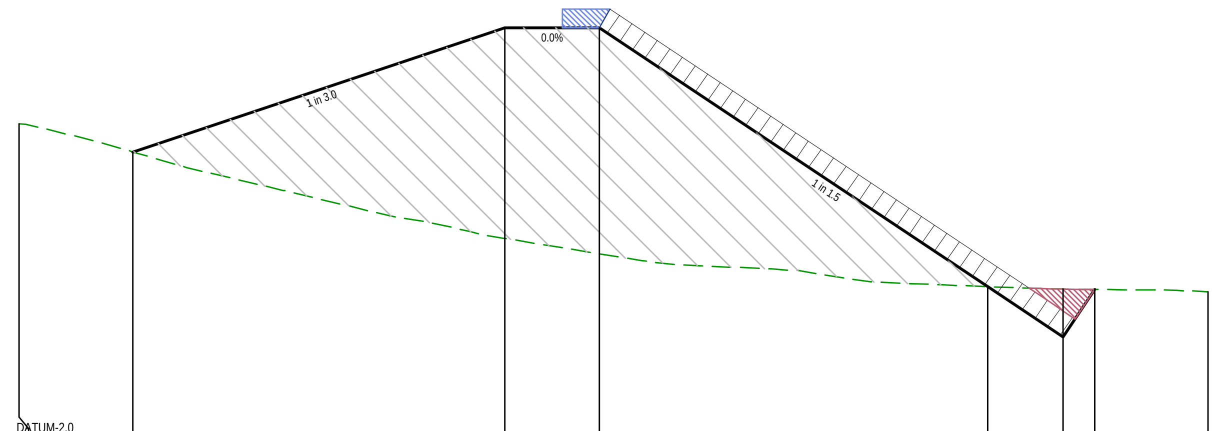
	5.69	8.80	8.80	2.77	1.44	2.56	
6.10	5.69	4.01	3.71	2.77	2.62	2.56	2.24
-14.84	-11.84	-2.50	0.00	9.04	11.04	11.78	14.78

CH 160



CONTROL EB03		5.71	8.80	8.80	1.92	0.58	1.84	
EXISTING SURFACE	6.24	5.71	3.71	3.24	1.92	1.84	1.84	1.83
OFFSET (-LHS/+RHS)	-14.78	-11.78	-2.50	0.00	10.33	12.33	13.16	16.16

CH 100



	5.52	8.80	8.80	1.95	0.62	1.88	
6.26	5.52	3.23	2.82	1.95	1.89	1.88	1.81
-15.35	-12.35	-2.50	0.00	10.27	12.27	13.10	16.10

CH 140

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
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GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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QLD, 4220. Australia
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www.bluecoastconsulting.com.au

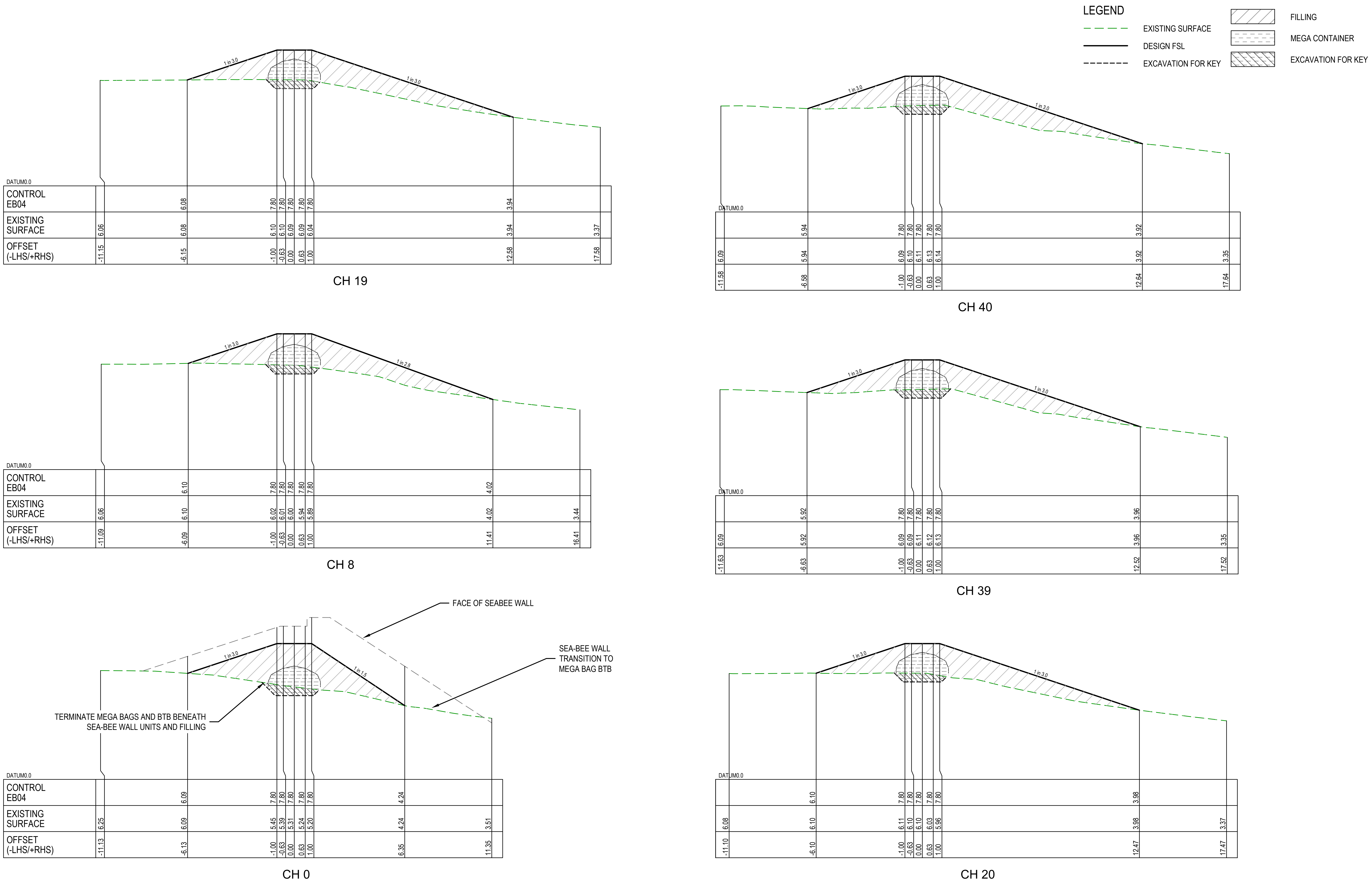
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
CONTROL EB03 SITE CROSS SECTIONS SHEET 3

DRG NO.
P19012-AG-CV-09-02

REV.
A



REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

SCALE 1:100 AT ORIGINAL SIZE (0 1 2 3 4 5m)

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
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GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

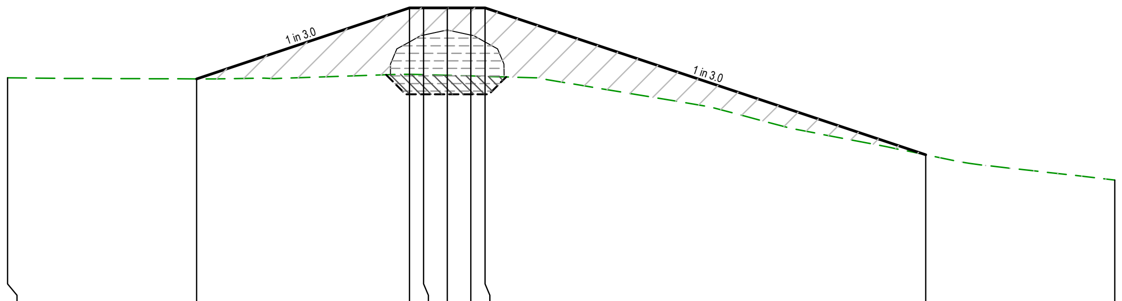
DRAWING TITLE
CONTROL EB04
SITE CROSS SECTIONS
SHEET 1

DRG NO.
P19012-AG-CV-10-01

REV.
A

LEGEND

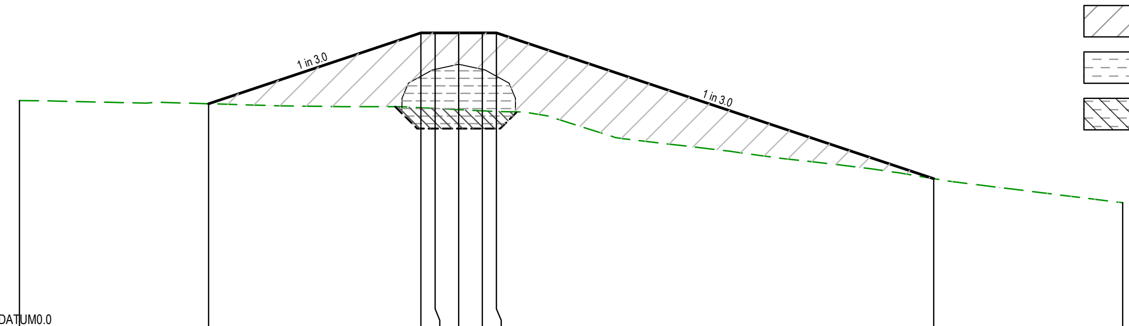
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM0.0

CONTROL EB04		5.92	7.80	7.80	7.80	7.80	7.80	3.92	
EXISTING SURFACE	5.95	5.92	6.04	6.03	6.02	6.00	5.99	3.92	3.25
OFFSET (-LHS/+RHS)	-11.63	-6.63	-1.00	-0.62	0.00	0.62	1.00	12.65	17.65

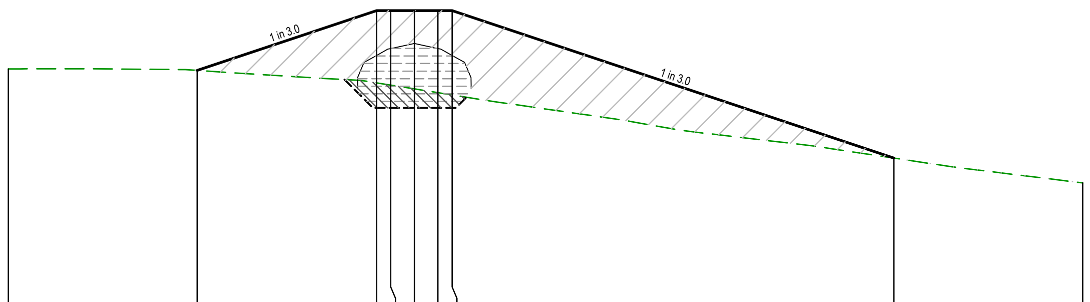
CH 80



DATUM0.0

		5.93	7.80	7.80	7.80	7.80	7.80	3.94	
	6.01	5.93	5.82	5.80	5.77	5.74	5.72	3.94	3.31
	-11.62	-6.62	-1.00	-0.62	0.00	0.62	1.00	12.57	17.57

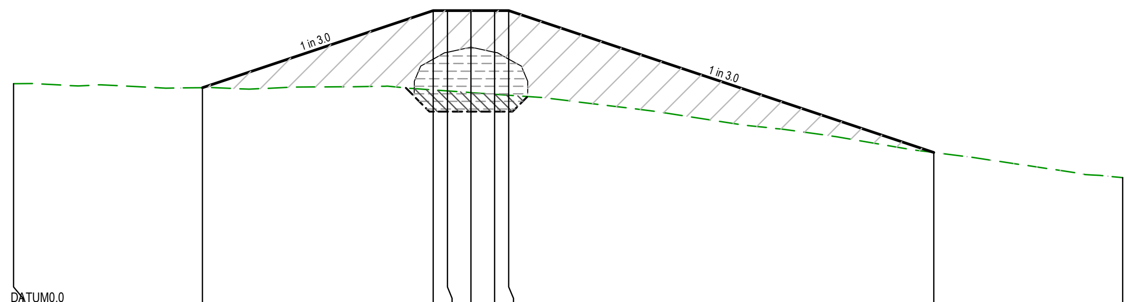
CH 120



DATUM0.0

CONTROL EB04		6.22	7.80	7.80	7.80	7.80	7.80	3.90	
EXISTING SURFACE	6.26	6.22	5.89	5.83	5.73	5.63	5.57	3.90	3.25
OFFSET (-LHS/+RHS)	-10.75	-5.75	-1.00	-0.62	0.00	0.62	1.00	12.69	17.69

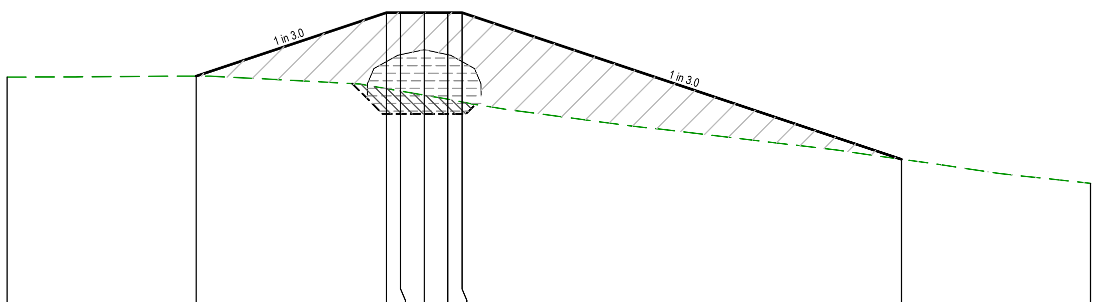
CH 64



DATUM0.0

		5.76	7.80	7.80	7.80	7.80	7.80	4.05	
	5.87	5.76	5.70	5.68	5.63	5.59	5.56	4.05	3.39
	-12.11	-7.11	-1.00	-0.62	0.00	0.62	1.00	12.25	17.25

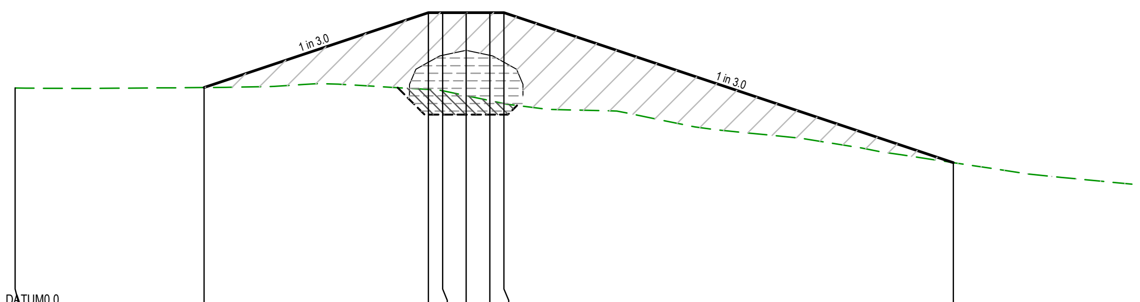
CH 111



DATUM0.0

CONTROL EB04		6.12	7.80	7.80	7.80	7.80	7.80	3.93	
EXISTING SURFACE	6.10	6.12	5.79	5.73	5.62	5.51	5.44	3.93	3.29
OFFSET (-LHS/+RHS)	-11.03	-6.03	-1.00	-0.62	0.00	0.62	1.00	12.62	17.62

CH 60



DATUM0.0

		5.82	7.80	7.80	7.80	7.80	7.80	3.84	
	5.81	5.82	5.77	5.74	5.61	5.48	5.40	3.84	3.24
	-11.94	-6.94	-1.00	-0.62	0.00	0.62	1.00	12.89	17.89

CH 100

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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Burleigh Heads
QLD, 4220, Australia
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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

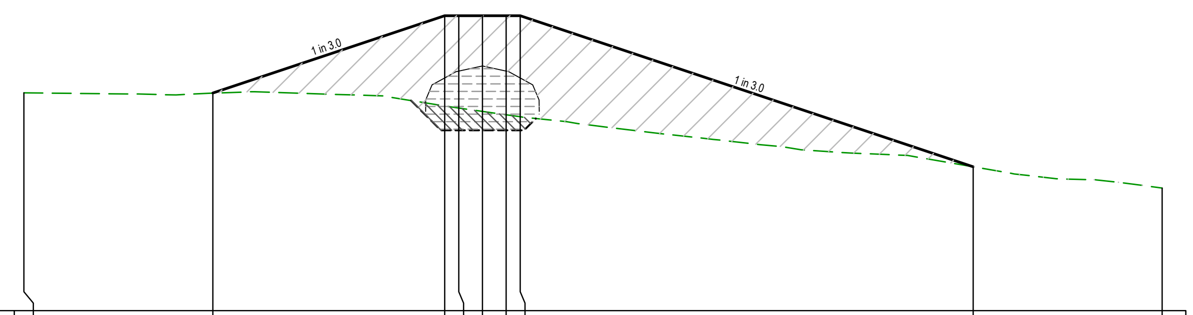
DRAWING TITLE
CONTROL EB04
SITE CROSS SECTIONS
SHEET 2

DRG NO
P19012-AG-CV-10-02

REV
A

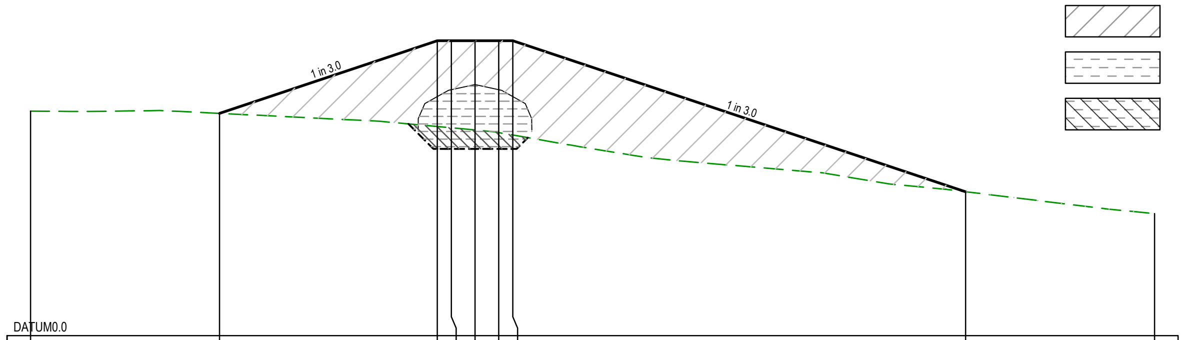
LEGEND

- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



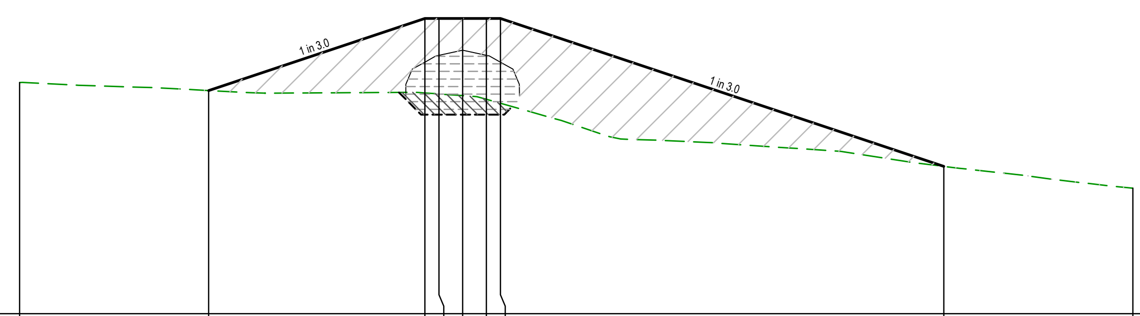
CONTROL EB04		5.76	7.80	7.80	7.80	7.80	7.80	3.81	
EXISTING SURFACE	5.76	5.76	5.41	5.36	5.27	5.18	5.13	3.81	3.24
OFFSET (-LHS/+RHS)	-12.13	-7.13	-1.00	-0.63	0.00	0.63	1.00	12.98	17.98

CH 155



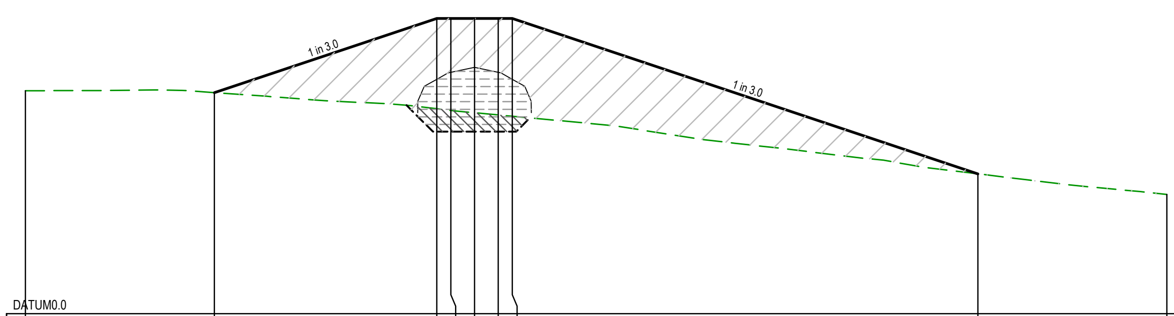
CONTROL EB04		5.88	7.80	7.80	7.80	7.80	7.80	3.81	
EXISTING SURFACE	5.94	5.88	5.53	5.50	5.44	5.37	5.31	3.81	3.23
OFFSET (-LHS/+RHS)	-11.76	-6.76	-1.00	-0.62	0.00	0.62	1.00	12.98	17.98

CH 180



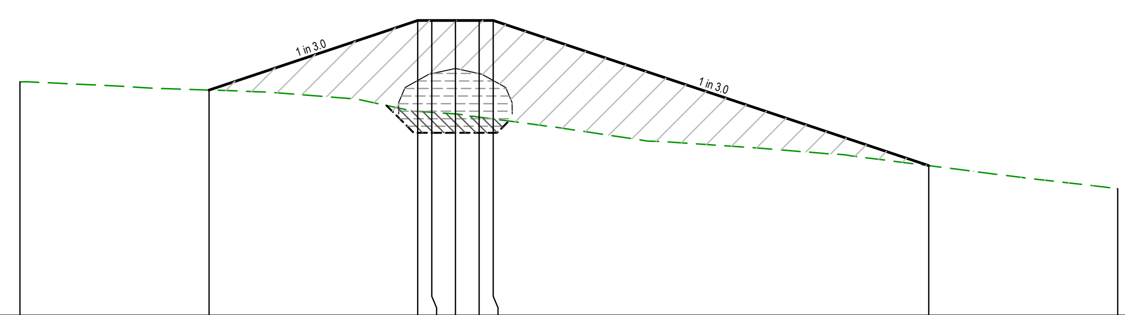
CONTROL EB04		5.89	7.80	7.80	7.80	7.80	7.80	3.89	
EXISTING SURFACE	6.11	5.89	5.83	5.80	5.76	5.66	5.56	3.89	3.32
OFFSET (-LHS/+RHS)	-11.72	-6.72	-1.00	-0.63	0.00	0.63	1.00	12.72	17.72

CH 140



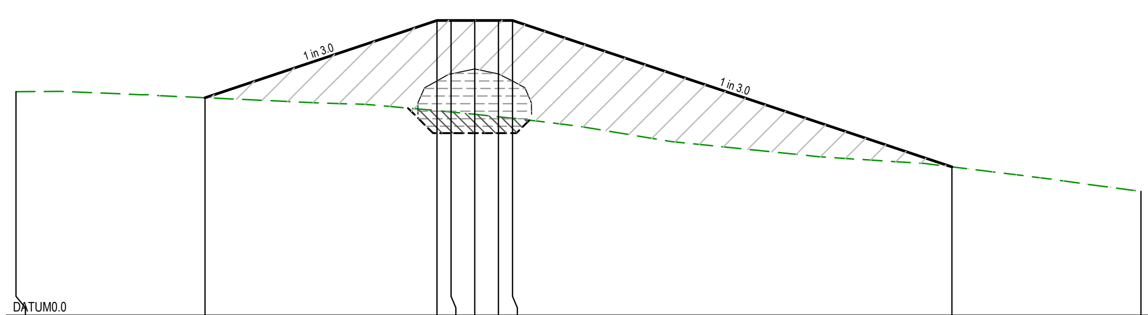
CONTROL EB04		5.84	7.80	7.80	7.80	7.80	7.80	3.69	
EXISTING SURFACE	5.89	5.84	5.41	5.37	5.31	5.25	5.21	3.69	3.15
OFFSET (-LHS/+RHS)	-11.88	-6.88	-1.00	-0.62	0.00	0.62	1.00	13.32	18.32

CH 173



CONTROL EB04		5.96	7.80	7.80	7.80	7.80	7.80	3.96	
EXISTING SURFACE	6.17	5.96	5.40	5.37	5.33	5.24	5.19	3.96	3.35
OFFSET (-LHS/+RHS)	-11.52	-6.52	-1.00	-0.63	0.00	0.63	1.00	12.52	17.52

CH 137



CONTROL EB04		5.76	7.80	7.80	7.80	7.80	7.80	3.93	
EXISTING SURFACE	5.91	5.76	5.41	5.38	5.32	5.25	5.21	3.93	3.28
OFFSET (-LHS/+RHS)	-12.13	-7.13	-1.00	-0.63	0.00	0.63	1.00	12.62	17.62

CH 160

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND

PLANS PREPARED BY:
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Burleigh Heads
QLD, 4220. Australia
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www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

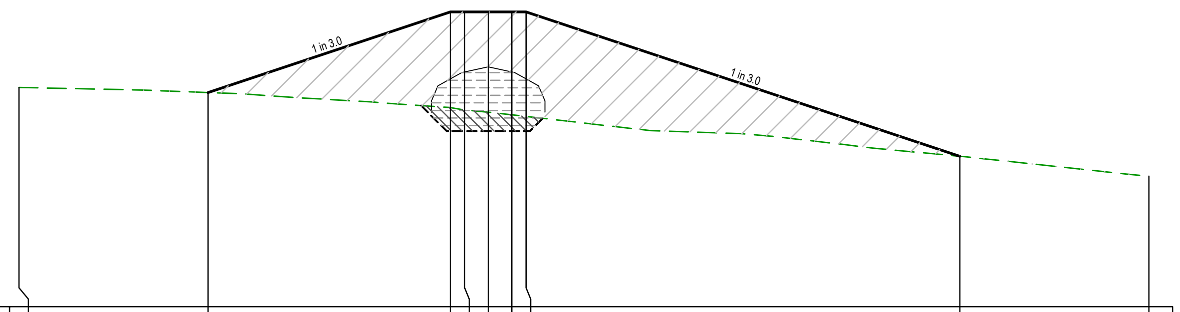
DRAWING TITLE
CONTROL EB04
SITE CROSS SECTIONS
SHEET 3

DRG NO
P19012-AG-CV-10-03

REV
A

LEGEND

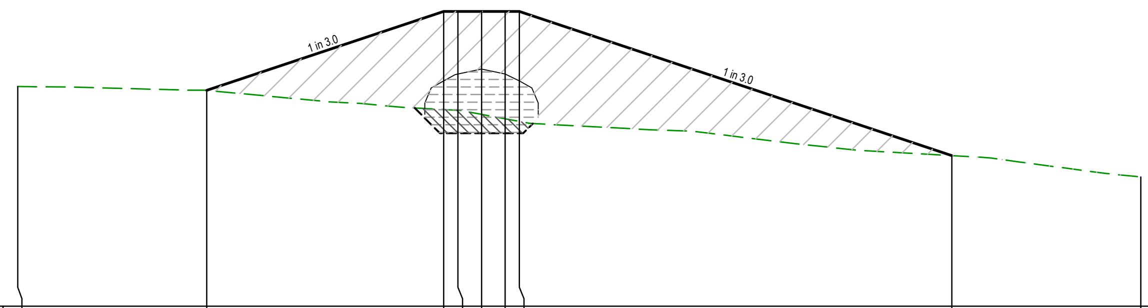
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM0.0

CONTROL EB04		5.67	7.81	7.81	7.81	7.81	7.81	3.99	
EXISTING SURFACE	5.81	5.67	5.27	5.21	5.15	5.08	5.04	3.99	3.46
OFFSET (-LHS/+RHS)	-12.41	-7.41	-1.00	-0.62	0.00	0.62	1.00	12.47	17.47

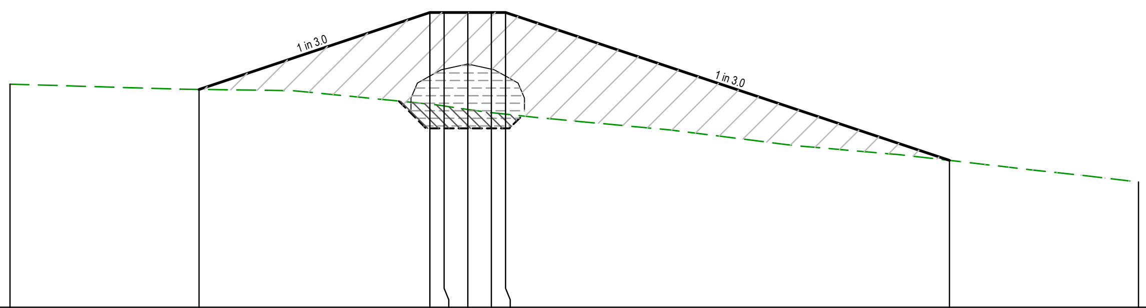
CH 220



DATUM0.0

CONTROL EB04		5.71	7.80	7.80	7.80	7.80	7.80	3.98	
EXISTING SURFACE	5.81	5.71	5.20	5.18	5.08	4.96	4.89	3.98	3.42
OFFSET (-LHS/+RHS)	-12.27	-7.27	-1.00	-0.62	0.00	0.62	1.00	12.45	17.45

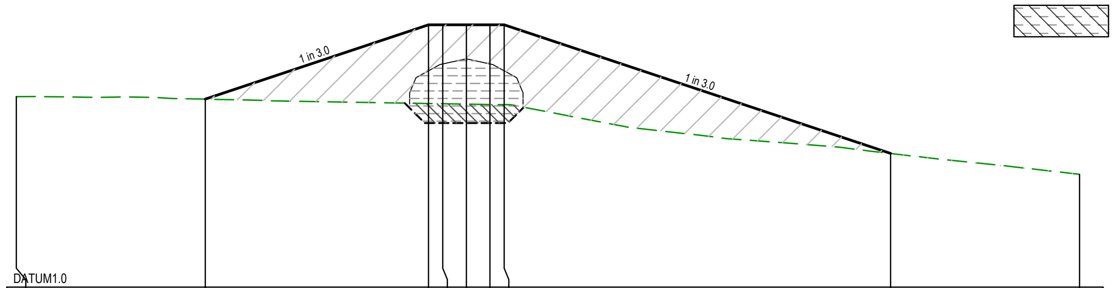
CH 213



DATUM0.0

CONTROL EB04		5.76	7.80	7.80	7.80	7.80	7.80	3.89	
EXISTING SURFACE	5.90	5.76	5.37	5.33	5.23	5.15	5.11	3.89	3.32
OFFSET (-LHS/+RHS)	-12.11	-7.11	-1.00	-0.62	0.00	0.62	1.00	12.74	17.74

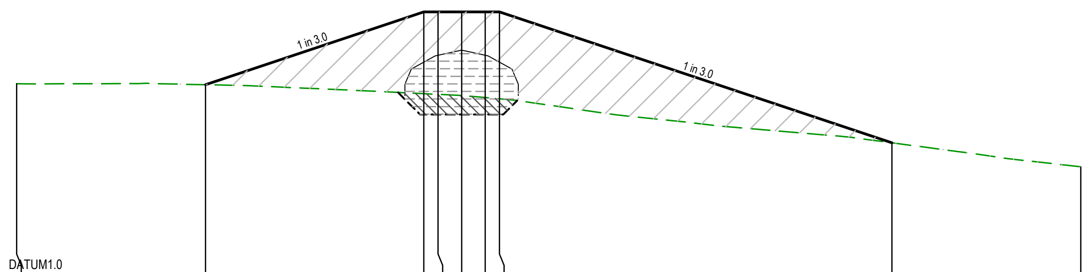
CH 200



DATUM1.0

	5.98	7.95	7.95	7.95	7.95	7.95	4.54	
6.05	5.98	5.87	5.86	5.85	5.84	5.83	4.54	3.99
-11.91	-6.91	-1.00	-0.62	0.00	0.62	1.00	11.23	16.23

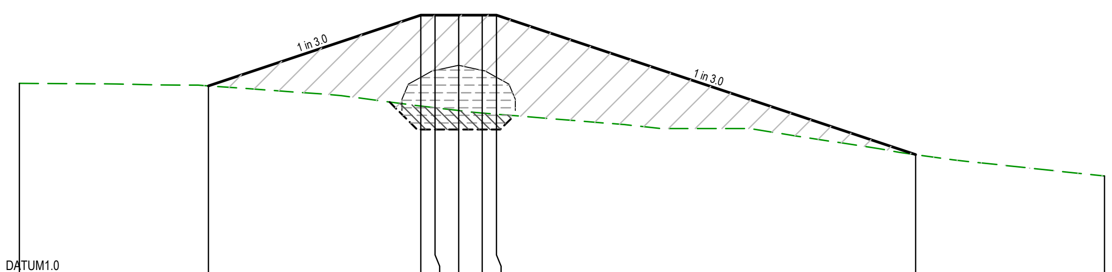
CH 280



DATUM1.0

	5.98	7.90	7.90	7.90	7.90	7.90	4.44	
6.00	5.98	5.74	5.72	5.69	5.64	5.60	4.44	3.81
-11.78	-6.78	-1.00	-0.62	0.00	0.62	1.00	11.39	16.39

CH 260



DATUM1.0

	5.98	7.86	7.86	7.86	7.86	7.86	4.16	
6.05	5.98	5.45	5.40	5.33	5.26	5.23	4.16	3.59
-11.63	-6.63	-1.00	-0.62	0.00	0.62	1.00	12.10	17.10

CH 240

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

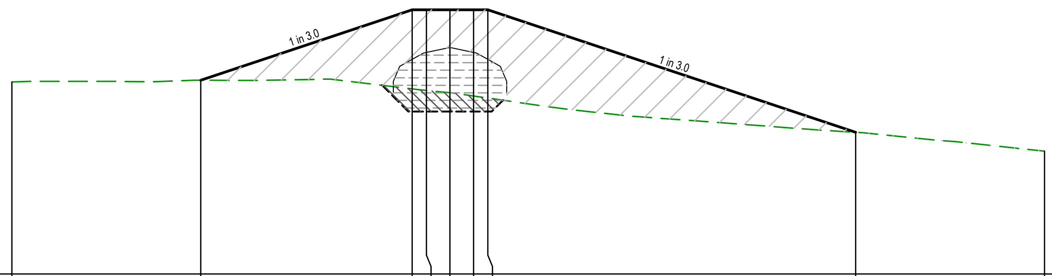
DRAWING TITLE
CONTROL EB04
SITE CROSS SECTIONS
SHEET 4

DRG NO
P19012-AG-CV-10-04

REV
A

LEGEND

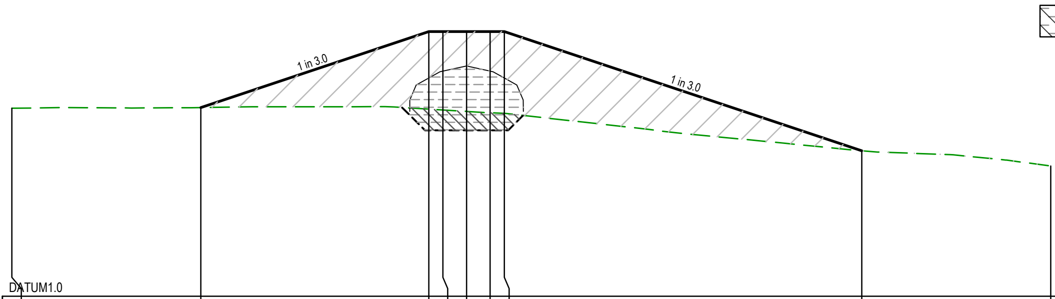
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM1.0

CONTROL EB04		6.13	8.00	8.00	8.00	8.00	8.00	4.75	
EXISTING SURFACE	6.09	6.13	5.90	5.87	5.80	5.72	5.66	4.75	4.26
OFFSET (-LHS/+RHS)	-11.60	-6.60	-1.00	-0.62	0.00	0.62	1.00	10.74	15.74

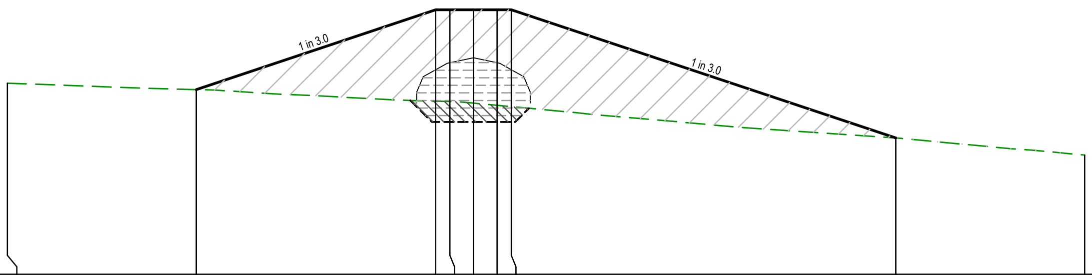
CH 340



DATUM1.0

CONTROL EB04		5.99	8.00	8.00	8.00	8.00	8.00	4.85	
EXISTING SURFACE	5.97	5.99	5.95	5.93	5.89	5.85	5.84	4.85	4.44
OFFSET (-LHS/+RHS)	-12.03	-7.03	-1.00	-0.63	0.00	0.63	1.00	10.46	15.46

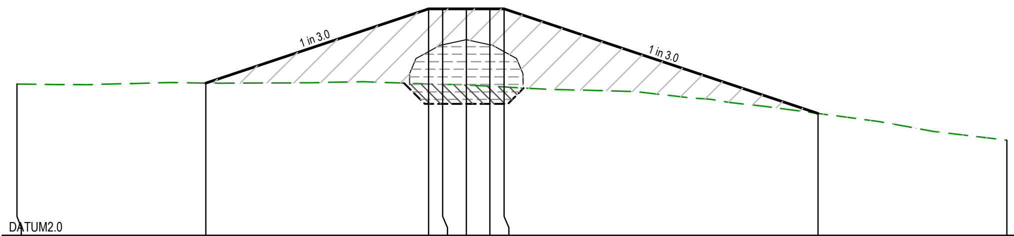
CH 400



DATUM1.0

CONTROL EB04		5.89	8.00	8.00	8.00	8.00	8.00	4.61	
EXISTING SURFACE	6.06	5.89	5.58	5.57	5.53	5.47	5.44	4.61	4.15
OFFSET (-LHS/+RHS)	-12.34	-7.34	-1.00	-0.62	0.00	0.62	1.00	11.18	16.18

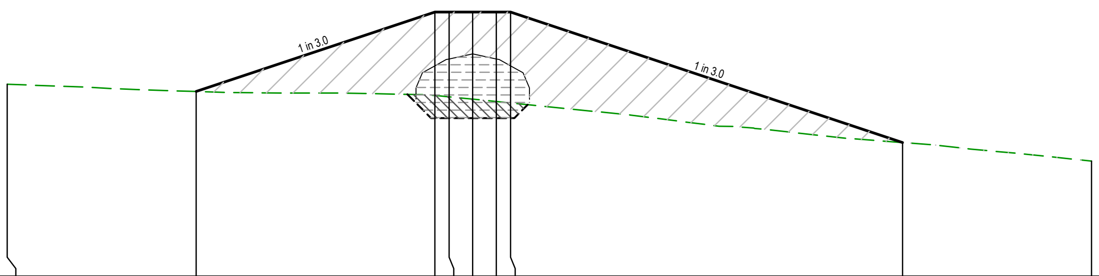
CH 320



DATUM2.0

CONTROL EB04		6.03	8.00	8.00	8.00	8.00	8.00	5.23	
EXISTING SURFACE	6.01	6.03	6.01	6.00	5.98	5.95	5.93	5.23	4.52
OFFSET (-LHS/+RHS)	-11.90	-6.90	-1.00	-0.63	0.00	0.63	1.00	9.31	14.31

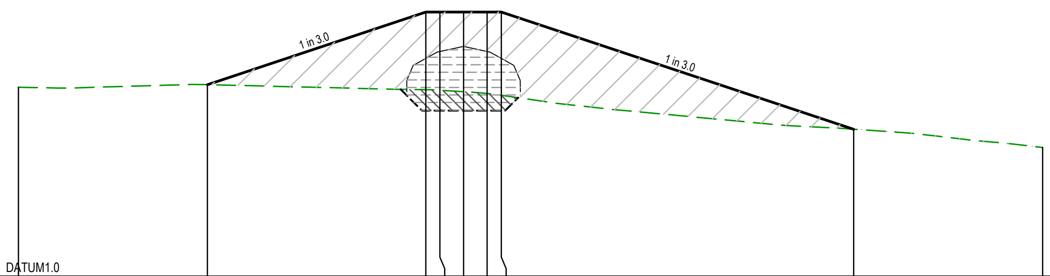
CH 380



DATUM1.0

CONTROL EB04		5.89	8.00	8.00	8.00	8.00	8.00	4.54	
EXISTING SURFACE	6.08	5.89	5.79	5.75	5.69	5.63	5.59	4.54	4.05
OFFSET (-LHS/+RHS)	-12.32	-7.32	-1.00	-0.62	0.00	0.62	1.00	11.37	16.37

CH 300



DATUM1.0

CONTROL EB04		6.07	8.00	8.00	8.00	8.00	8.00	4.89	
EXISTING SURFACE	6.00	6.07	5.94	5.93	5.89	5.84	5.79	4.89	4.41
OFFSET (-LHS/+RHS)	-11.78	-6.78	-1.00	-0.62	0.00	0.62	1.00	10.32	15.32

CH 360

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
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GREEN CLIMATE FUND

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Burleigh Heads
QLD, 4220, Australia
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www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

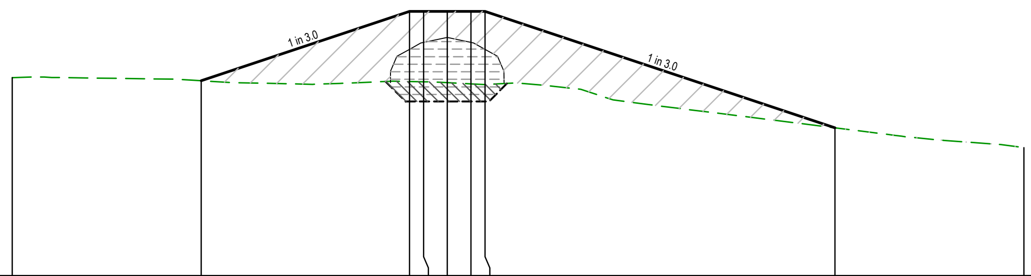
DRAWING TITLE
CONTROL EB04
SITE CROSS SECTIONS
SHEET 5

DRG NO
P19012-AG-CV-10-05

REV
A

LEGEND

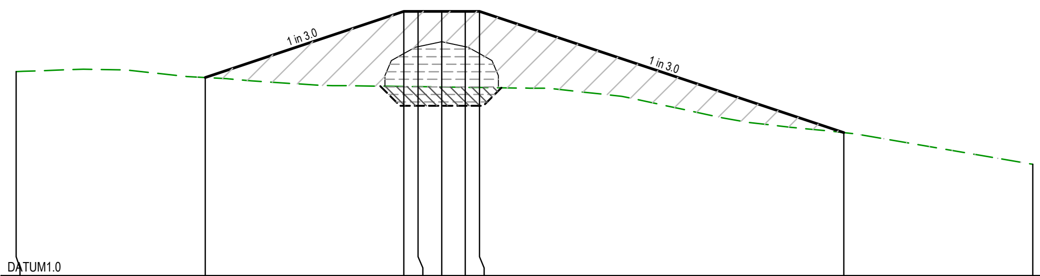
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM1.0

CONTROL EB04		6.16	8.00	8.00	8.00	8.00	8.00	4.91	
EXISTING SURFACE	6.25	6.16	6.14	6.14	6.11	6.08	6.06	4.91	4.39
OFFSET (-LHS/+RHS)	-11.51	-6.51	-1.00	-0.62	0.00	0.62	1.00	10.26	15.26

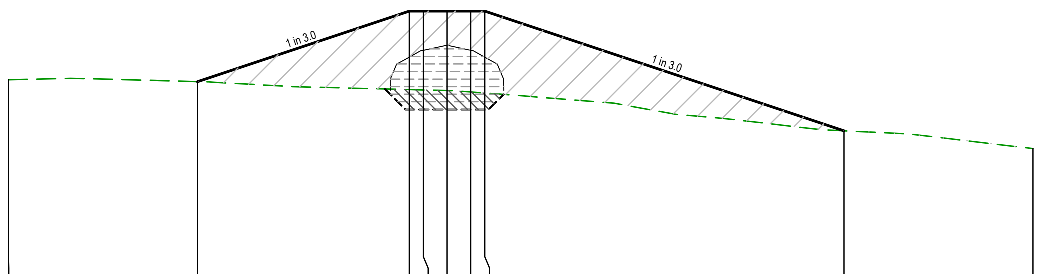
CH 460



DATUM1.0

		6.25	8.00	8.00	8.00	8.00	8.00	4.79	
	6.40	6.25	6.01	6.01	6.00	5.99	5.98	4.79	3.95
	-11.26	-6.26	-1.00	-0.63	0.00	0.63	1.00	10.64	15.64

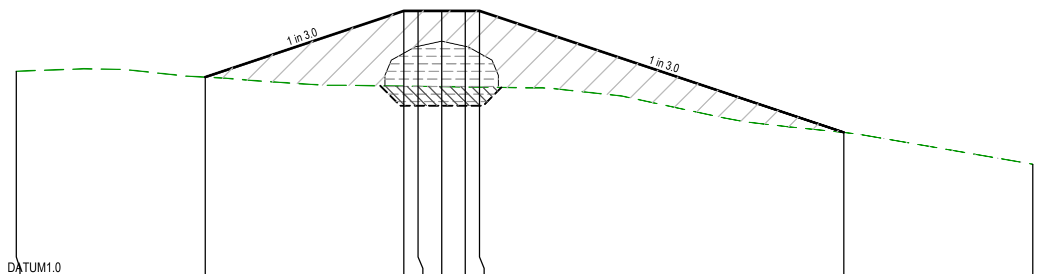
CH 500



DATUM1.0

CONTROL EB04		6.13	8.00	8.00	8.00	8.00	8.00	4.83	
EXISTING SURFACE	6.18	6.13	5.92	5.91	5.90	5.86	5.83	4.83	4.36
OFFSET (-LHS/+RHS)	-11.60	-6.60	-1.00	-0.63	0.00	0.63	1.00	10.50	15.50

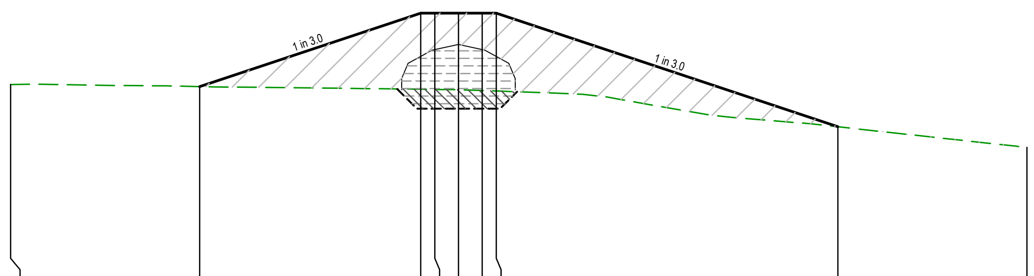
CH 440



DATUM1.0

		6.25	8.00	8.00	8.00	8.00	8.00	4.79	
	6.40	6.25	6.01	6.01	6.00	5.99	5.98	4.79	3.95
	-11.26	-6.26	-1.00	-0.63	0.00	0.63	1.00	10.64	15.64

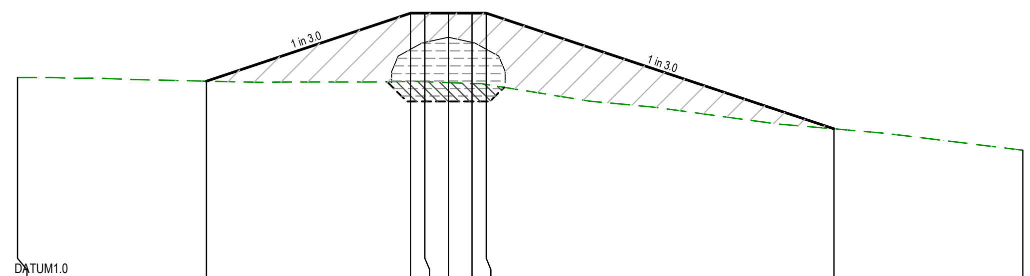
CH 500



DATUM1.0

CONTROL EB04		6.05	8.00	8.00	8.00	8.00	8.00	4.99	
EXISTING SURFACE	6.11	6.05	5.98	5.98	5.97	5.95	5.94	4.99	4.44
OFFSET (-LHS/+RHS)	-11.84	-6.84	-1.00	-0.63	0.00	0.63	1.00	10.03	15.03

CH 420



DATUM1.0

		6.20	8.00	8.00	8.00	8.00	8.00	4.93	
	6.29	6.20	6.19	6.18	6.16	6.13	6.11	4.93	4.36
	-11.41	-6.41	-1.00	-0.63	0.00	0.63	1.00	10.20	15.20

CH 480

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m

SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES

SURVEY PROVIDED BY

HORIZONTAL DATUM

UTM-WGS84 / UTSM60S EPSG32760

VERTICAL DATUM

CHART DATUM (CD) TGZ

PLANS PREPARED FOR:

Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:

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Burleigh Heads
QLD, 4220, Australia
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www.bluecoastconsulting.com.au

PROJECT

TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER

P19012

DRAWING TITLE

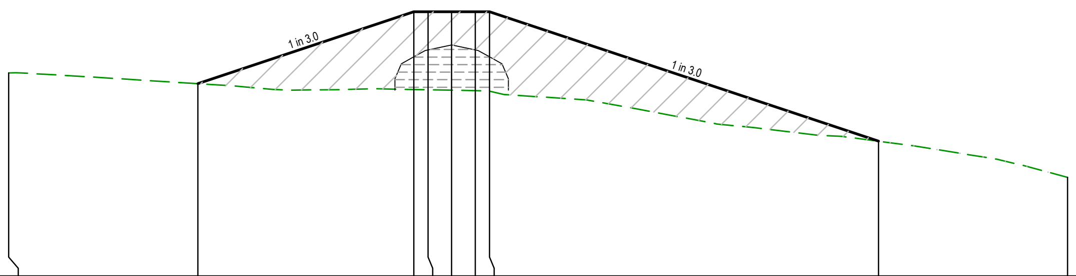
CONTROL EB04
SITE CROSS SECTIONS
SHEET 6

DRG NO. P19012-AG-CV-10-06

REV A

LEGEND

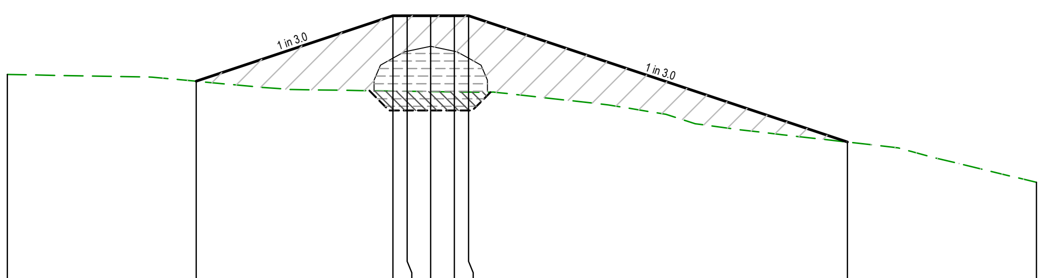
- EXISTING SURFACE
- DESIGN FSL
- EXCAVATION FOR KEY
- FILLING
- MEGA CONTAINER
- EXCAVATION FOR KEY



DATUM1.0

CONTROL EB04		6.10	8.00	8.00	8.00	8.00	8.00	4.57	
EXISTING SURFACE	6.38	6.10	5.94	5.93	5.92	5.91	5.90	4.57	3.61
OFFSET (-LHS/+RHS)	-11.71	-6.71	-1.00	-0.63	0.00	0.63	1.00	11.29	16.29

CH 539



DATUM1.0

CONTROL EB04		6.26	8.00	8.00	8.00	8.00	8.00	4.66	
EXISTING SURFACE	6.44	6.26	6.01	6.00	5.99	5.98	5.98	4.66	3.59
OFFSET (-LHS/+RHS)	-11.21	-6.21	-1.00	-0.63	0.00	0.63	1.00	11.03	16.03

CH 520

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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GREEN CLIMATE FUND
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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), NANUMEA

PROJECT NUMBER
P19012

DRAWING TITLE
CONTROL EB04
SITE CROSS SECTIONS
SHEET 7

DRG NO
P19012-AG-CV-10-07

REV
A