

Pōrangahau Stopbanks Design Report

✦ Prepared for

Hawke's Bay Regional Council

✦ November 2025



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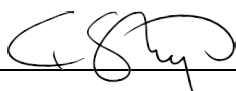
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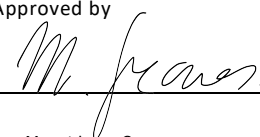
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Limitations:

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Executive Summary

Pattle Delamore Partners Limited (PDP) was engaged by Hawke's Bay Regional Council (HBRC) to develop the detailed design of the Pōrangahau stopbanks, Central Hawke's Bay, following the modelling and optioneering work completed by PDP that assessed the effects of Cyclone Gabrielle in February 2023.

The preferred option identified was to implement an earth embankment/floodwall (referred to collectively as stopbank) to provide flood protection and resilience for the Pōrangahau township. This report provides a summary of the detailed design process for implementing the preferred option.

The new stopbank along Pōrangahau River will be constructed to provide protection against a 1-in-100-year Annual Recurrence Interval (ARI) event with a 500 mm freeboard which allows for 400 mm freeboard above the climate change impact of RCP8.5, projected to 2040.

For the new stopbanks, a combination of a homogeneous earth embankment and floodwall is proposed.

The earth embankment stopbank is characterised by the following design parameters:

- ✧ Design specifications: typical height of 4 m.
- ✧ Batter slopes:
 - River side slope of 2.5H:1V (horizontal).
 - Land side slope of 2H:1V (horizontal).
- ✧ Crest width: typical width of 3.5 m.

The floodwall is proposed to be a sheet piled wall.

Consequential flooding impacts of the proposed works has been assessed, noting that the proposed stopbank design effectively mitigates flood risks for the Pōrangahau township. The modelling results indicate that the proposed works will lead to a moderate reduction in flood extent and significant reduction in the number of buildings subject to inundation.

An Ecological Impact Assessment was completed for the project site. The overall ecological values of terrestrial and wetland habitats were assessed as **very low to moderate** in the context of the project site. The overall ecological value of the aquatic habitat was assessed as **moderate** in the context of the wider environment due to the site's connection to the Pōrangahau Estuary and being a migratory pathway and habitat for several native fish.

Mitigation measures to offset ecological effects of the project were identified (e.g., management of risks to bats and birds). If these are implemented, the residual level of effect on terrestrial vegetation and habitats has been assessed as **very high to net gain**. The current works propose the removal of some potential bat roost trees. If these trees are being utilised by bats and are removed the loss of habitat cannot be mitigated or offset. However, if bats are not using the potential roosting trees this would drop to **moderate to net gain**. Similarly, if recommended mitigation measures are implemented (e.g., robust Erosion and Sediment Control Plan, native planting), the residual level of effect of the project on the aquatic environment has been assessed as **low** with the potential of **net gains** regarding restoring the riparian zone.

Note that the construction areas (borrow areas and stockpile locations) are yet to be finalised. Investigations have been undertaken to confirm the suitability of the borrow material for stopbank construction. The material currently does not meet the HBRC guidelines therefore requires HBRC to review the testing results and confirm acceptance of the use of this material.

Geotechnical, stability and settlement analyses of the proposed stopbank has been completed to confirm the detailed design.

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Appendix A: Pōrangahau Stopbank Upgrade Design Drawings

1.0 Introduction

Pattle Delamore Partners Limited (PDP) was engaged by Hawke's Bay Regional Council (HBRC) to develop the detailed design of the Pōrangahau stopbanks, Central Hawke's Bay, following the modelling and optioneering work completed by PDP that assessed the effects of Cyclone Gabrielle in February 2023.

The preferred option identified was to implement an earth embankment/floodwall (referred to collectively as stopbank) to provide flood protection and resilience for the Pōrangahau township. The proposed alignment of the stopbank adjacent to the town on the northern bank of the Pōrangahau River includes an interconnected floodwall and earth embankment construction.

This report provides a summary of the design process and should be read in conjunction with the detailed reports listed in the Document Register (refer to Section 12.0).

2.0 Site Location

Pōrangahau is a small settlement located on the southeastern coast of Hawke's Bay. It sits on the northern banks of the Pōrangahau River, known as Taurekaitai to local iwi, 4.5 km inland from the Pacific Ocean. Access to the town from the south is via Pōrangahau Road which becomes Abercromby Street, on the bridge over the Pōrangahau River (referred to as the Abercromby Street Bridge). Access from the north is from Old Hill Road, and from the east, Beach Road.

The location of the Pōrangahau River and township within the area of the proposed works is shown in Figure 1.

3.0 Existing Environment

3.1 Porongahau River

The Pōrangahau River is a sixth order river, with a catchment size of 687 km². Its headwaters lie to the southwest of Hawke's Bay's coastal hill country and flows 35 km before meeting the Pacific Ocean near the township. It is home to Hawke's Bay's largest estuary, the Pōrangahau Estuary. Formed behind a 14 km low sandy longshore, the 750-ha estuary is one of the least modified on the east coast of Aotearoa and classified as an outstanding fishery.

3.2 Sites of Significance

A sizeable portion of the town and surrounding land is Māori-owned. Rongomaraeroa Marae lies approximately 100 m south of the river on Pah Road while Kaiwhitikitiki Urupā on Pōrangahau Road lies 140 m west of the river. The region is home to the longest place name in the world - Taumatawhakatangihangakoauauotamateaturipukakapikimaungahoronukupokai-whenuakitanatahu.

3.3 Existing Infrastructure

The utilities for the township are reticulated with potable water supplied from the east of the township, from the Pōrangahau and Te Paerahi Water Treatment Plant (WTP), located at 425A Beach Road. The reticulated wastewater network conveys wastewater from the township to the Pōrangahau Wastewater Treatment Plant (WWTP) (oxidation pond), located at the end of Jones Street to the north of the Pōrangahau River. Stormwater overflow is discharged to the Pōrangahau River.

Other key community facilities include the Keppel (Boyd) cemetery at 31 Keppel Street, north of the Pōrangahau River. Pōrangahau School is also located north of the river at 56 Keppel Street.

The designed stopbank extents and the key facilities discussed above are shown in Figure 1.

The key existing infrastructure in the vicinity of the proposed stopbanks is presented in Figure 2.

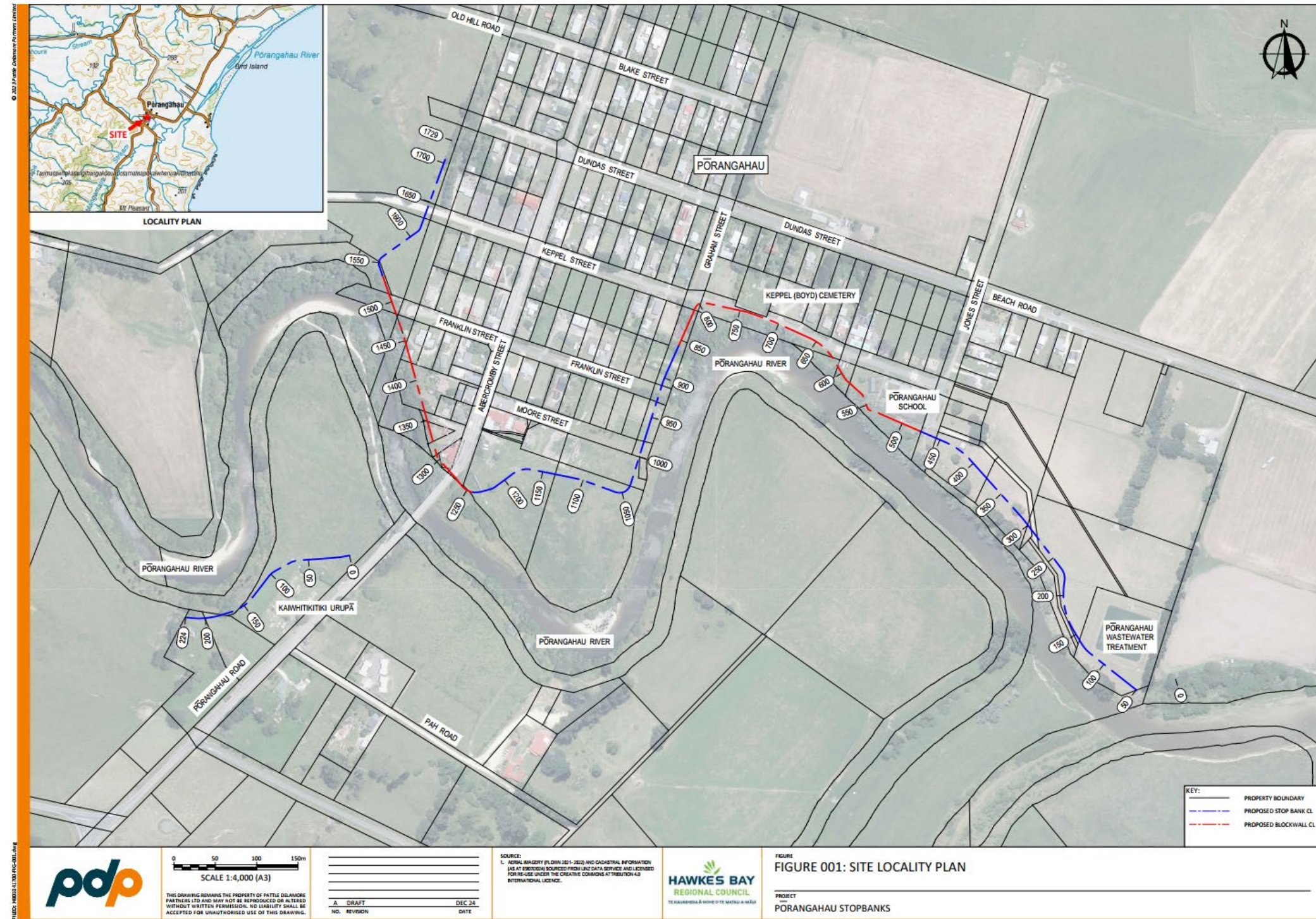


Figure 1: Site locality plan with key facilities identified.

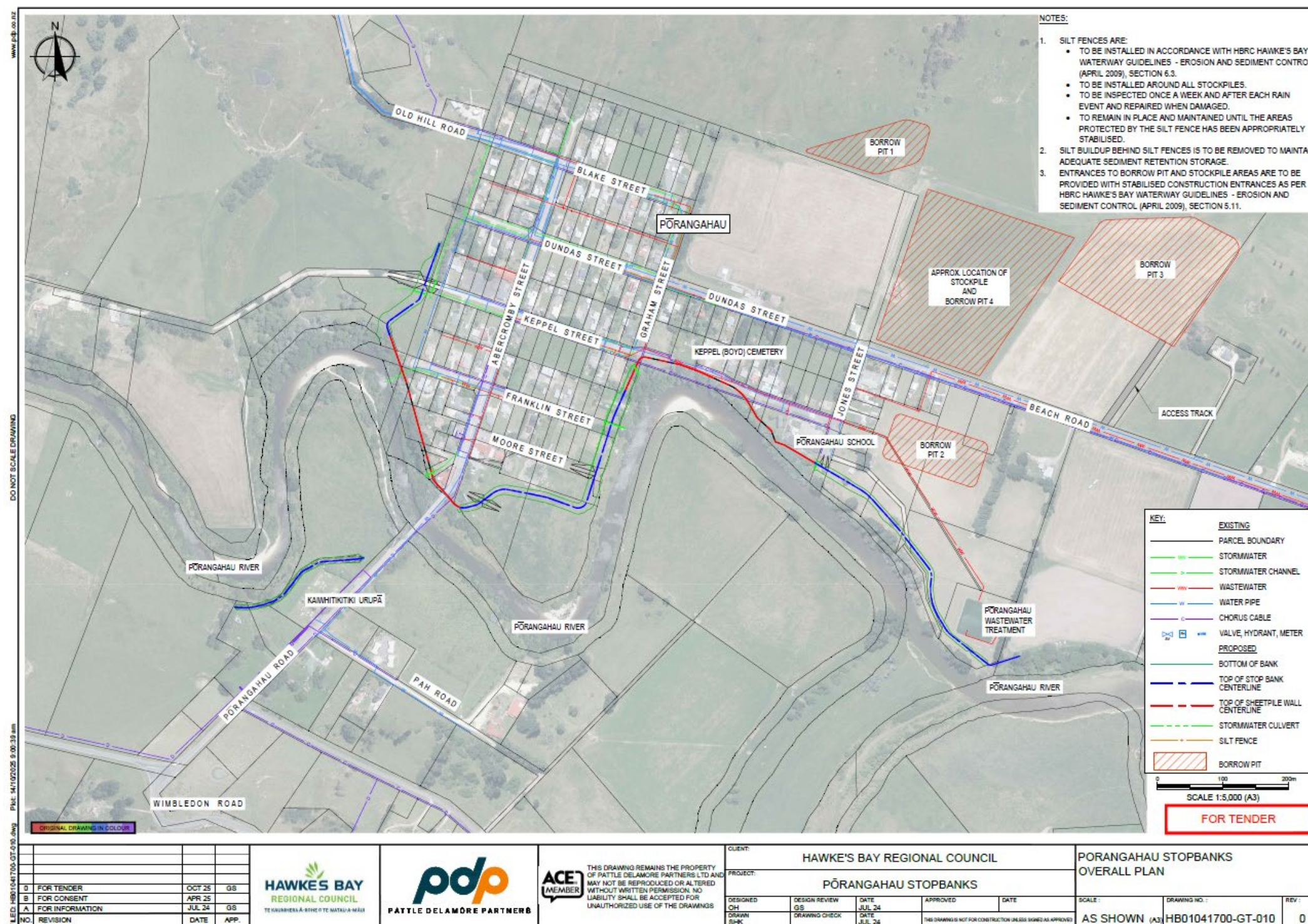


Figure 2: Key infrastructure in Pōrangahau near the proposed stopbanks.

3.4 Land Use and Development

The lower Pōrangahau catchment area is surrounded by dry moderate hill country and flat land. The catchment land use is dominated by extensive sheep and beef farming with some forestry, deer farming, cropping and contains a single vineyard. The catchment has a small collection of residential housing. The Pōrangahau area also has a rich associated history of Māori settlement.¹

4.0 Background

4.1 Aerial Imagery

A desktop review of available historical aerial photographs, sourced from Retrolens and more recent satellite imagery from 2004 to 2023 were sourced from Google Earth Pro to gain insight into the history of the site.

Detailed observations and photographs are provided in 'HB01041700L001 - Preliminary Site Investigation for Pōrangahau Stopbank' (PDPa, 2025) and 'HB01041700R004 – Geotechnical Assessment Report for the Proposed Pōrangahau Stopbanks and Southern Buildings, Central Hawke's Bay' (PDPe, 2025), and the key relevant observations and photographs are summarised in 'HB01041700R005 – Pōrangahau Stopbanks Preliminary Design Report ' (PDPf, 2025).

4.2 History of Flooding and Drainage Scheme

4.2.1 Flood History and Previous Modelling

Records of flooding the Hawke's Bay region date back almost 130 years. Details of some significant events and previous modelling relevant to the Pōrangahau settlement are provided below.

1. Flood Events and Recorded Flood Levels:

- ∴ The town of Pōrangahau has been subject to multiple significant flood events, notably in February 2004 and again in 2023.
- ∴ In 2004, flooding of the Pōrangahau town occurred following intense rainstorms in the catchment. Floodwaters in the Pōrangahau River peaked at approximately 10 m above normal levels at Wallingsford, approximately 28 km upstream of the Pōrangahau township. Water was observed in large portions of the town, including residential areas and the cemetery, causing extensive damage. Farmland surrounding the town was also affected by overland flow and erosion.

¹ Hawke's Bay State of the Environment 2018 – 2021. Section 20 - Pōrangahau and Southern Coast catchment

- ✧ Flooding in 2023 resulted in similar inundation patterns, reinforcing concerns regarding the town's vulnerability to extreme events.

2. Interim and Historic Flood Hazard Mapping:

- ✧ The 2021 Interim Flood Hazard Mapping for Central Hawke's Bay noted the absence of a comprehensive hydraulic flood model. Instead, hazard zones were estimated using buffer zones and preliminary assessments.
- ✧ The 2007 Pōrangahau River Flood Hazard Area map provided a draft delineation of the 100-year flood extent but lacked supporting documentation for validation.
- ✧ The 2023 flood level advice for the Pōrangahau Police Station indicated a peak flood level of 10.6 m (NZVD2016) at this location based on photographic evidence and LiDAR elevation data, although there is uncertainty regarding exact flood level. This level was higher than the 10.2 m level previously estimated in a 2006 study, suggesting potential underestimation in earlier models.

4.2.2 Drainage Scheme

The Pōrangahau scheme is managed as part of wider group as Small Schemes in Southern Grouping. The Flood Control Scheme was established in the later 1950s to alleviate the effects of flooding and bank erosion and to reduce the frequency and duration of closure to the main Waipukurau road. The Schemes includes 90km of waterways consisting of the Pōrangahau river and some of its tributaries in an area about 45km south of Waipukurau in Coastal Central Hawkes Bay. The Pōrangahau River has a catchment of 81,000-ha (810km²) that drains medium to steep hill country in the southern area of the Hawkes Bay Region. Detailed descriptions and figures are shown in 'HB01041700R005 – Pōrangahau Stopbanks Preliminary Design Report' (PDPf, 2025).

It is important to note that the Level of Service (LoS) can change after every flood due to changes in the river's morphology. New survey data is used to update the flood model to determine the effect of silt build-up on the river berm on flood protection standards.

5.0 Proposed Flood Protection Works

5.1 Level of Service and Proposed Works

Currently, no flood defence measures exist to protect the settlement along the Pōrangahau River. Following the severe effects of ETC-Gabrielle, HBRC is undertaking a series of infrastructure repair and upgrade projects to restore flood resilience in alignment with the Hawke's Bay Recovery Plan.

Proposed Level of Service: The new stopbank along Pōrangahau River will be constructed to provide protection against a 1% Annual Exceedance Probability (AEP) or a 1-in-100-year Annual Recurrence Interval (ARI) event with a 500 mm freeboard which allows for 400 mm freeboard above the climate change impact of RCP8.5, projected to 2040.

This project and design solutions include constructing stopbanks and raising some properties to ensure they can eventually move to Category 1.

The Severe Weather Emergency Recovery (Hawke's Bay Flood Protection Works) Order 2024 is an Order in Council (OiC) requested by the Hawke's Bay Regional Recovery Agency that came into effect on 7 June 2024. The delineated area for Pōrangahau to which the OiC applies is presented in Figure 3.



Figure 3: Proposed stopbanks relative to the Oic area for Pōrangahau.

The flood protection works proposed for the Pōrangahau River to improve flood management are detailed in Section 5.2 below.

5.2 Scope of Pōrangahau Stopbank Works

The scope of the proposed upgrades to achieve the proposed level of service are detailed below:

- ✧ As discussed in Section 5.1., it is proposed to construct a stopbank that will protect the settlement of Pōrangahau, meeting a design standard of a future state 1% AEP level plus 500 mm freeboard.
- ✧ The proposed stopbank is located along the northern bank of the Pōrangahau River, adjacent to the town for approximately 1,700m.
- ✧ The proposed stopbank will be constructed in sections comprising earth embankments and floodwalls.
- ✧ The preliminary and detailed design for the proposed stopbank upgrade has been undertaken by PDP.
- ✧ The stopbank upgrades are proposed as shown in Table 1.

Table 1: Proposed Pōrangahau stopbank upgrade sections.				
Section	Chainage (m)	Stopbank Type	Stopbank Height ¹ (Design Level)	Description
1	0-480	Earth embankment	1.03 – 2.33 m (8.9-9.6 m RL)	From the south of the Pōrangahau WWTP, along the northern bank of the river and transition to a floodwall near Pōrangahau School. Currently existing farmland and utilised by local farmers and residents for grazing.
2	480-850	Sheet pile wall	0.7– 2.2 m (9.61-9.97 m RL)	Continues along the northern bank of the Pōrangahau River. The main land use in this section is for a school, residential buildings and a municipal road reserve.
3	850-1240	Earth embankment	1.19 – 4.1 m (9.98-10.76 m RL)	Follows the southward curve of the Pōrangahau River, over the elevated depositional plain towards the Abercromby Street Bridge. Mixed land use of residential, commercial and farmland/grazing.
4	1240-1530	Sheet pile wall	1.1 – 2.2 m (10.82 m RL, 11.63 m RL)	Follows the northern Pōrangahau Riverbank in a north-north westerly direction. The main land use is residential.
5	1530-1700	Earth embankment	0.92 – 4.09 m (11.63 m RL)	This section continues past Franklin Street where it curves into a more northerly direction back towards the western end of Keppel Street. The main land use is farmland/grazing.
6	0-224	Earth embankment	0.0 – 1.8 m (11.83 m RL)	Separate stopbank proposed to protect the Kaitiwhitikitiki Urupā.
Notes: 1. Height range in metres above/below existing ground level for each section.				

Table 2. Derived crest elevations.						
Level	SB A	FW 1	SB B	FW 2	SB C	Urupā Bund
1 % AEP Peak Flood Level (m RL)	11.11	11.07	10.03	9.45	9.02	
Maximum Nominal Crest Elevation (including 500 mm freeboard) (m RL)	11.67	11.63	10.54	9.97	9.58	11.97 ^[1]
1 % AEP RCP4.5 to 2044 Peak Flood Level (m RL)	11.30	11.26	10.15	9.58	9.15	
Notes: 1. The urupā bund has been modelled without freeboard, as its primary purpose is to reduce flow velocities through the urupā, rather than reduce flood depths.						

5.3 Stopbank Cross-Drainage

To facilitate cross-drainage to the Pōrangahau River through the proposed stopbanks, several stormwater culverts are required.

The Central Hawke's Bay District Council (CHBDC) appointed Stantec Limited to review and assess the required upgrading of the stormwater infrastructure of Pōrangahau to provide the necessary outlets through the proposed stopbank. The sizing of the culverts has been determined and provided to PDP as part of this work.

6.0 Flood Modelling

6.1 Modelling Overview

PDP developed a hydraulic model of the Pōrangahau River using the TUFLOW software for the primary purpose of:

- ✧ Determining the design crest elevations of the proposed stopbanks located along the Pōrangahau River based on a 1% AEP future climate scenario (RCP8.5 to the year 2040) and,
- ✧ Assessing the impact of the proposed mitigation structures on flood levels, flood extents, flow velocities, and flood hazard classifications.

The hydraulic model development and crest derivation process, including the model's construction and validation, is detailed in '*HB0104700R002 Rev2 - Pōrangahau River: Design Model Build Report*' (PDPb, 2025) and '*HB01041700M002 Freeboard Assessment for Pōrangahau Flood Protection Works*' (PDPi, 2025); a summary of this report is provided below.

The model extent, LiDAR, and the location of boundary conditions are outlined in Figure 4.

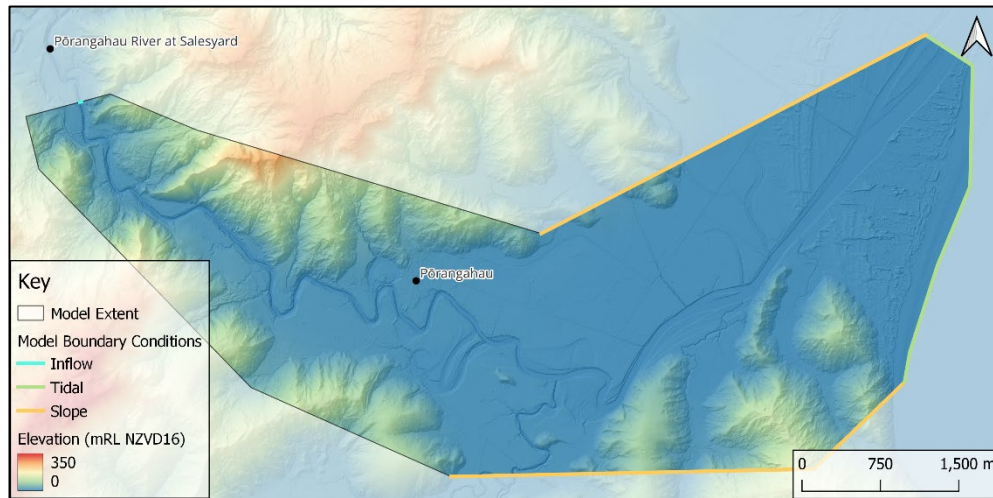


Figure 4: Model extent and terrain elevations derived from LiDAR.

6.2 Model Calibration

There were several factors which complicated the calibration of the Pōrangahau River model:

- ✧ **Flow:** The peak flow and hydrograph of the Cyclone Gabrielle event is unknown and only a peak flow estimate has been provided².
- ✧ **Geomorphometry:** The pre- and post-Gabrielle LiDAR surfaces show evidence of sediment deposition throughout the Pōrangahau River floodplain, particularly around the river's lower reaches. The exact form of the terrain surface at the peak of the flood event is unknown.
- ✧ **Abercromby Street Bridge:** Due to the large debris load, the Abercromby Street Bridge may have been partially blocked which could influence hydraulics and flood levels. Furthermore, supplied design drawings lacked sufficient detail to determine bridge pier blockage proportions and associated energy loss coefficients.
- ✧ **Influence of Mangamaire Stream:** Flow estimates of this downstream tributary and its potential backwater effects during Cyclone Gabrielle are unknown.
- ✧ **Surface Roughness:** The exact distribution of surface roughness across the floodplain is unknown.

In lieu of robust calibration data, the model was validated to recorded flood levels and extents from the February 2023 Cyclone Gabrielle flood event.

² National Institute of Water and Atmospheric Research. (2024). *Extreme value analysis of Cyclone Gabrielle flood flows in Hawke's Bay*. Prepared for Hawke's Bay Regional Council.

6.3 Elevation data

The upstream model extent begins approximately 600 m downstream of the recorder site, Pōrangahau River at Salesyard, and terminates at the coast (refer to Figure 4).

Topographic LiDAR datasets captured between September 2023 and April 2024 (LINZ, 2024) were used as the base ground elevation of the model. A 0.5 m resolution LiDAR dataset received from WSP in May 2024 was overlaid on the 2023-2024 LiDAR (preferred due to its higher resolution).

6.4 Model Inputs

The key model input parameters are summarised as follows:

- ∴ The **maximum resolution of the model** was determined by testing the cell size convergence as per TUFLOW recommendations. A 10 m model resolution with a 5 m sub-grid across key features was adopted for the study.
- ∴ Roughness represents the friction losses incurred by the water body as it traverses topography. The **model roughness** was determined by utilising multiple sources to define land cover, e.g., LINZ road parcels and building footprints, and aerial imagery. Manning's roughness value 'n' associated with each land cover was adopted for the model and tested for sensitivity.
- ∴ **Boundary conditions** define how water enters and exits the model. Three boundary conditions were required for this model:
 - Upstream boundary condition: flow vs time, applied at the Pōrangahau River approximately 3.5 km west of the township, based on NIWA peak flow estimates from Cyclone Gabrielle (1,590 m³/s) and 1% AEP design flows (1,663 m³/s). Peak flows were derived by NIWA from a generalised extreme value (GEV) distribution post-Cyclone Gabrielle. PDP conducted an independent hydrological assessment (prior to the NIWA study) which estimated the 1% AEP peak flow in the Pōrangahau River as 1,601 m³/s, approximately 4% lower than the NIWA estimate. Following a conservative approach, the NIWA estimate was adopted for the basis of design.
 - Downstream boundary condition: head vs time, applied at the eastern model extent using a sinusoidal tide curve representing spring tides with a 1.46 m sea level rise allowance (to 2130, SSP 8.5 + VLM).
 - Normal flow boundary condition: applied along the southern and northern boundaries downstream of the township, set to the average land slope to ensure model stability and remove overland flow.

- ✧ The model has one **structure**; the Abercromby Street Bridge, incorporated into the model based on survey data and design drawings.

Note that several simulations were necessary to encapsulate uncertainty in the model inputs associated with the Cyclone Gabrielle event.

6.5 Summary of Model Validation Results

The model validation results showed that:

- ✧ The addition of Mangamaire Stream tributary flows had a negligible influence on water levels in Pōrangahau township.
- ✧ Modelled water levels are sensitive to surface and energy losses from the bridge piers.
- ✧ The highest agreement with Cyclone Gabrielle recorded flood levels and extents was achieved when factoring in a 20% increase in surface roughness, the application of a 0.06 form loss coefficient for the bridge piers, and a 3% bridge pier blockage fraction.

The effects of the construction of the flood protections works have been summarised in the consequential flood assessment report Ref HB01041700R0006 (PDPb, 2025)

7.0 Investigations

7.1 Overview of Investigations

The following sections provide a comprehensive summary of the investigations conducted by PDP as part of the design of the proposed stopbank works at Pōrangahau. The primary objective of the proposed stopbank is to construct flood protection for the Pōrangahau settlement and ensure future infrastructure resilience.

Note that the hydraulic modelling undertaken to inform the design is discussed in Section 6.0 of this report.

It is highlighted that some investigations were undertaken using earlier revisions of the stopbank design/alignment. Therefore, there are some conflicts in the attached supplementary reports and this design report. Where there are conflicts/discrepancies due to design changes, this has been highlighted where appropriate.

7.2 Geotechnical

The following sections summarise the geotechnical investigations undertaken by PDP, for the proposed Pōrangahau flood protection works. Detailed reporting of the investigations is presented in 'HB01041700R004' (PDP, 2025); however, a summary of the key findings is provided in the following sections.

Note that the geotechnical analysis was completed based on different extents for Sections 1 – 5 of the stopbank alignment than that stated in Table 1 of this design report. The effects of this discrepancy are addressed in relevant geotechnical analysis sections in Section 9.1 of this design report.

7.2.1 Investigation Works

Geotechnical investigations were undertaken for the proposed stopbank footprint, including a desktop review of existing information, site walkover, and invasive investigation work (cone penetration tests, hand augers and boreholes) in November 2024.

7.2.2 Geology and Geomorphology

7.2.2.1 Regional Geology

The geology of southern Hawke's Bay reflects a dynamic tectonic history involving marine deposition, uplift, and erosion. The Late Cretaceous Glenburn Formation, running west of Pōrangahau and east of the Omakere Fault, consists of well-bedded sandstone and mudstone with concretions, conglomerates, and fossils, deposited in outer shelf to upper bathyal settings. The Whangai Formation (Tinui Group), also west of Pōrangahau and extending south of the town, comprises siliceous mudstone with glauconitic sandstone and greensand. South of Pōrangahau, Early Miocene Greenhollows Formation and Coast Road Formation (Owhanga Group) consist of sandstone and mudstone, overlain by Holocene alluvial deposits (Lee and Begg, 2002). Neogene sediments dominate the hill country, featuring sandstone, limestone, and conglomerate, with mudstone areas prone to slope instability.

Topsoil is present across the site, less than 1 m thick and comprises dark brown clayey silt/sand with or without gravel.

The sediments were grouped into a clay-rich horizon overlying a silt-rich horizon with the following properties:

- ✧ Clay-Rich Sediments: The more cohesive clayey sediments have a firm to stiff consistency, and a moderate to high plasticity. These may or may not contain distinct lenses fine sand, gravel, and clayey silty sand of variable thicknesses within them.
- ✧ Silt-Rich Sediments: These underlay the clay-rich sediments at similar depths along the alignment. Lenses comprising more granular sediments also exist within this grouping layer, consisting of clayey silty gravel or sand, which were loose to medium dense.

Bedrock was not encountered during the investigations (CPTs or boreholes).

7.2.2.2 Geomorphology

The geomorphology of the Pōrangahau area and lower Hawke's Bay is dynamic, shaped by seismic events such as the 1931 Napier earthquake and subsequent coastal uplift. The Pōrangahau River, with a large but short catchment, traverses a floodplain where its main channel frequently shifts, as evidenced by oxbows like the one in the site's northwestern corner, and to the southeast of the town.

Severe flooding events have occurred, causing the river to breach its banks in January 1953, February 2004 and more recently, with Cyclone Gabrielle in 2023. Breaching of the banks caused inundation of the floodplain, affecting the Pōrangahau township.

Coastal geomorphology in the region is young and continuously evolving due to ongoing sedimentation and tectonic activity.

7.2.3 General Groundwater Conditions

A piezometer was installed in borehole BH02 for monitoring the groundwater level. There are currently no other known groundwater monitoring wells within the area (HBRC Environmental Monitoring Portal, accessed 11 December 2024).

It is anticipated that groundwater levels are affected by the baseflow of the Pōrangahau River and affected by tidal fluctuations due to the proximity to the Pacific Ocean.

Groundwater levels were measured during the site investigation. The mean groundwater level on site was measured at approximately 5 m bgl.

7.2.4 Ground Model

A ground model was developed based on site data obtained from cone penetration testing (CPT) and boreholes. The site data was used to model the stratigraphy and inferred geological boundaries. It is noted that the alluvial deposits are variable in thickness and extent, due to the river shifting alignment with time and flood events; therefore, stratigraphical relationships are complex and difficult to model. The investigated long sections and cross-sections for developing the ground model are presented in Figures 3 – 8 in 'HB010416700R004'.

Based on the above, laboratory test results, and engineering judgement, the physical material properties for the ground was derived; this is summarised in HB01041700R004 (PDPe, 2025)

7.3 Ecological Assessments

Ecological assessments were undertaken to support HBRC's flood protection works project along the Pōrangahau River.

An Ecological Impact Assessment was undertaken in accordance with the Environment Institute of Australia and New Zealand's (EIANZ's) *'Guidelines for undertaking Ecological Impact Assessment'* (Roper-Lindsay *et al.*, 2018). The findings of the investigations and the impact assessment are reported in *'HB01041700R003 – Pōrangahau Flood Mitigation Ecological Impact Assessment'* (PDPc, 2025).

7.4 Construction

The following sections summarise the investigations undertaken by PDP pertaining to proposed construction activities (notably, earthworks).

7.4.1 Excavation and Soil Disturbance

A Preliminary Site Investigation (PSI) was undertaken for the proposed stopbank works. Refer to *'HB01041700L001 Preliminary Site Investigation for Pōrangahau Stopbank'* (PDPa, 2025) for the detailed assessment; a summary of the key information and findings is presented below.

The objective of the investigation was to identify any potential HAIL³ activities/sources of contamination from past and/or present land use activities at the site and to assess the potential risk to human health from soil disturbance within the context of the NES-CS⁴ for the development of the proposed flood protection infrastructure.

Disturbing and removing the soil of 'a piece of land' is regulated under the NES-CS. A site is determined to be 'a piece of land' if an activity or industry described in the MfE's HAIL has occurred on it (refer to NES-CS Regulation 5(7)).

Under the NES-CS, if the site is determined as 'a piece of land', then soil disturbance is a permitted activity under NES-CS Regulation 8(3) provided that:

- ✧ Controls are put in place to minimise contact with soil during the disturbance,
- ✧ The soil be reinstated to an erosion-resistant state within one month of completion of works, and
- ✧ Offsite disposal of removed soil is at an authorised facility.

³ *'The Hazardous Activities and Industries Lit Guidance: Identifying HAIL Land'* (HAIL; Ministry for the Environment (MfE), 2023) is a compilation of activities/industries that are considered likely to cause land contamination resulting from hazardous substance use, storage or disposal.

⁴ *'Resource Management Act (National Environmental Standard for Assessing and Managing Contaminants in Soils to Protect Human Health) Regulations'* (New Zealand Government, 2011) (referred to as the NES-CS).

The PSI included a review of available site history information including historical aerial photographs, CHBDC and HBRC information (including the Selected Land Use Register, or SLUR and active resource consents), and a site walkover. It is noted that the proposed works cross many properties; for the assessment, these properties are assigned letters A-W as shown in Figure 5. Site information was retrieved for these properties from online sources. A site walkover was also conducted by a PDP professional from the 18th – 22nd of November 2024 during geotechnical investigations to provide additional information on these properties.

Similarly to the geotechnical and ecological reports, note that the stopbank sections shown in Figure 5 from the PSI are slightly different to the finalised design. However, this makes no material difference to the findings of the PSI.

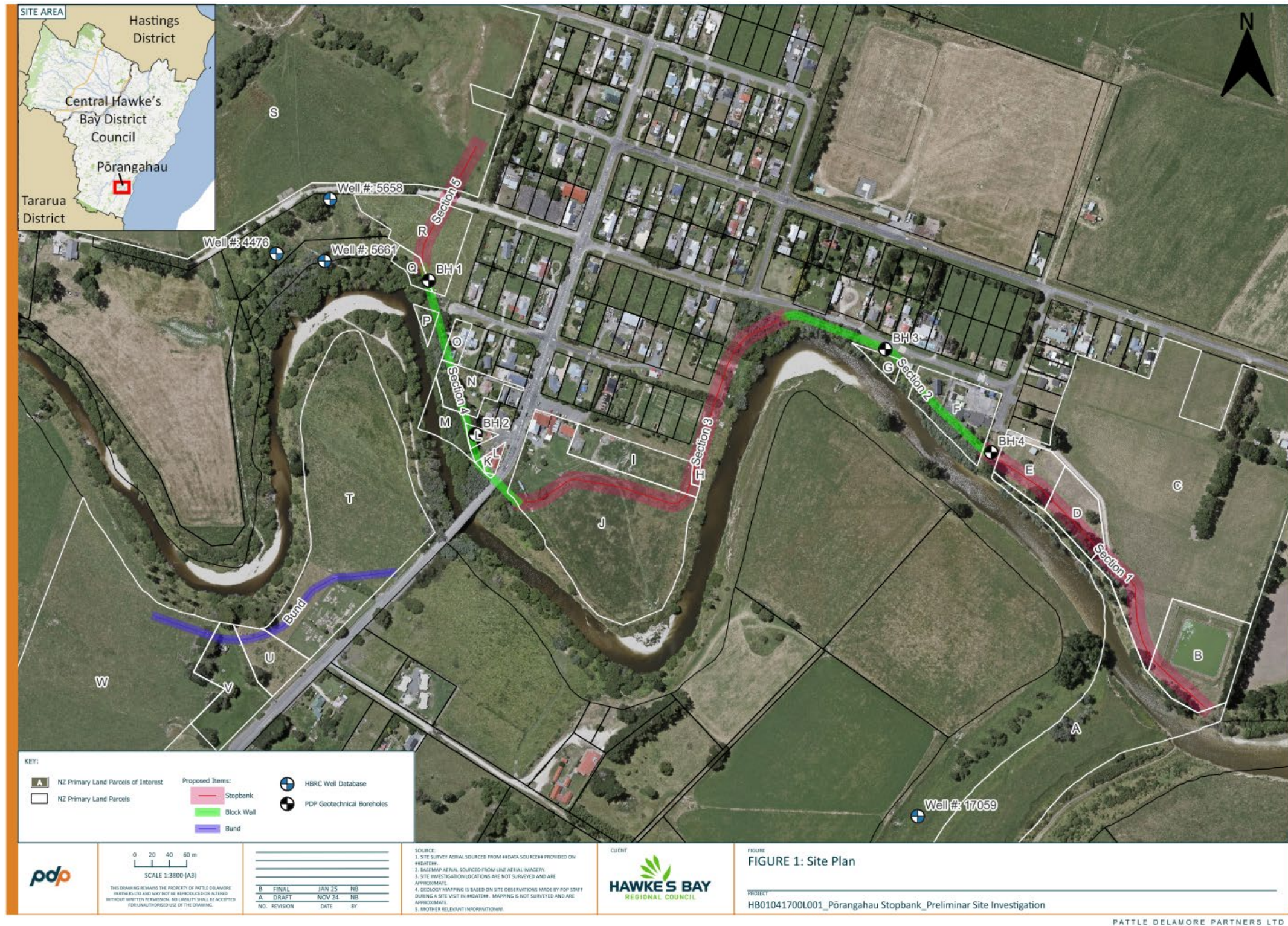


Figure 5: Properties investigated along the initial proposed stopbank alignments.

Based on the available information, the potential contamination sources from past or present land use activities may be restricted to the following:

- ✧ **HAIL – I** – *‘Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment’.*
- ✧ **HAIL – H** – *‘Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment’.*

The investigation of the site indicates that the land use in the area has remained relatively similar over the years except for increased residential housing and the construction of the Pōrangahau oxidation pond in the early 1990s.

Through the process of this review, potential HAIL activities have been identified at the site, as follows (refer to Figure 5 for property locations):

- ✧ HAIL reference I – for identified fill containing bricks in property E.
- ✧ HAIL reference I – associated with the deterioration of the car sheds in property F to G (Picton Street (a paper road)).
- ✧ HAIL reference H – associated with the movement of materials from HAIL sites by stormwater into Section 2 across Keppel Street.
- ✧ HAIL reference I – associated with the deterioration of buildings in properties L to N that may contain lead paint and asbestos.
- ✧ HAIL reference I – associated with the deterioration of a farm shed and associated farm equipment and vehicles in property U.

The above HAIL activities would need to be confirmed through a soil sampling investigation. In addition to the above identified HAIL activities, it is possible that the site soils contain other contaminants above local background concentrations, primarily because of the effects of Cyclone Gabrielle. Flooding and clean up from Cyclone Gabrielle may have moved much of the original topsoil that may have contained any asbestos and/or lead paint residues historically released from the buildings or heavy metals from stormwater discharges.

The primary persistent contaminants of concern associated with the identified HAIL activities over the site include (but not necessarily limited to) heavy metals and asbestos.

Based on the above, a potential risk to human health exists. If the proposed works are unable to meet the NES-CS permitted activity requirements for soil disturbances, a soil sampling investigation may be required. Regardless, a soil sampling investigation will be undertaken as part of the pre-construction works to characterise the soils to be excavated to inform the offsite disposal

requirements and health and safety management measures for site workers and future site occupiers.

7.4.2 Construction Material

Three potential borrow pits for construction have been identified and are currently being investigated (refer to Figure 2). The borrow pit size will be dictated by the availability of targeted material for construction of the stopbank. A material investigation is currently being undertaken of the potential borrow areas to confirm the suitability of the borrow pit material for the construction of the proposed stopbank and to check compliance with HBRC's (2021) material specification.

Any overburden from the borrow pit or unsuitable material from the stopbank excavation will be temporarily stockpiled in a laydown area.

A soil sampling investigation of the confirmed borrow area(s) has been undertaken and reported on in HB01041700R007 and subsequent Addendum (PDPd, 2025).

The proposed construction material does not meet the HBRC guidelines for stopbank material and requires HBRC to review the testing results and confirm acceptance of the use of this material. However, the testing indicates that although the material is classified as a clayey silt it does compact well at $\pm 2\%$ of the optimum moisture content (OMC) and is therefore could be considered for use for the construction of the stopbank.

The velocities modelled adjacent to the stopbank do not exceed 2 m/sec and based on CIRIA Report 116 (Hewlett, H.W.M, et al, 1987) a earth embankment with a good cover of plain grass will provide suitable protection against erosion in excess of 50 hours.

8.0 Design

8.1 Design Overview

The following sections provide a comprehensive summary of the design work undertaken by PDP to date. A full drawing set are provided in Appendix A of this report (Drawing GT-001 to GT-061).

8.2 Proposed Pōrangahau Stopbanks

8.2.1 Basis of Design

There are currently no flood defence measures to protect the Pōrangahau settlement during a significant flood event. It is intended to protect the settlement through the construction of a stopbank.

Kaiwhitikitiki Urupā is located off Pōrangahau Road, on the opposite side of the Pōrangahau River relative to the township. It is intended to protect the site by decreasing floodwater flow velocity over the graves and limit damage during a significant flood event.

The design of the proposed flood mitigation structures was informed by hydraulic modelling outputs as is detailed in PDP's 2025 model build report (PDPb, 2025).

The key design parameters and assumptions include the following:

- ✧ Design Event: The stopbanks and associated flood mitigation structures are designed to contain flows from the current state 1% AEP (100-year average recurrence interval) flood event.
- ✧ Freeboard: A freeboard of 500 mm was added to the peak flood level determined from the model for the 1% AEP event. This additional height provides a margin of safety to account for uncertainties in the modelling, potential debris loading, and predicted increases to peak flow magnitude due to climate change.
- ✧ Urupā Bund: The low bund adjacent to the urupā is intended to reduce flood velocities across the urupā site rather than flood depths. As such, freeboard was not added to its crest elevation.

Table 3 and Figure 6 outline the derived crest elevations for each proposed stopbank and floodwall segment.

Table 3. Derived crest elevations.						
Level	SB A	FW 1	SB B	FW 2	SB C	Urupā Bund
1 % AEP Peak Flood Level (m RL)	11.11	11.07	10.03	9.45	9.02	
Nominal Crest Elevation (m RL)	11.67	11.32 – 11.67	10.00 – 10.54	9.62 – 9.97	9.45 – 9.58	11.97 ^[1]
Minimum Freeboard (m)	0.55	0.56	0.51	0.52	0.54	
Notes: 1. The urupā bund has been modelled without freeboard, as its primary purpose is to reduce flow velocities through the urupā, rather than reduce flood depths.						

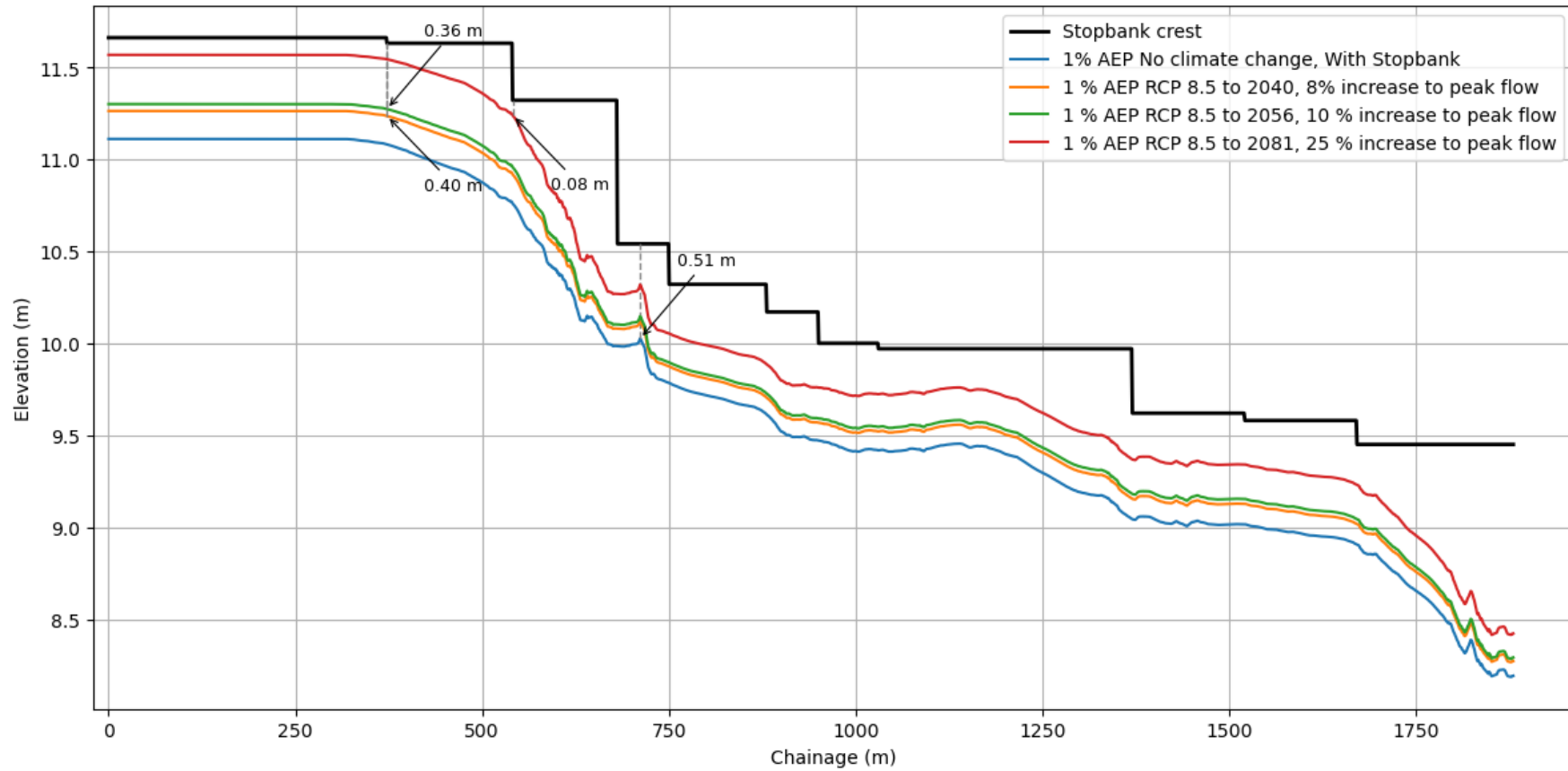


Figure 6. Comparison of modelled flood event peak water levels in relation to proposed stopbank crest height.

It is highlighted that the urupā bund is intended to reduce flood velocities across the urupā site such that damage to headstones is limited, rather than to mitigate flooding.

8.2.2 Value Engineering

To ensure that the detailed design delivers a solution that provides the acceptable level of protection at an affordable price and satisfies the HBRC requirement of 400 mm freeboard (which includes climate change), the following will be considered at the detailed design stage:

- ✧ Assessing the flood levels based on 1% AEP + 8% climate change event which is equivalent to RCP8.5 to 2040.

8.2.3 Detailed Design of the Pōrangahau Stopbanks

For the new stopbanks, a combination of a homogeneous earth embankment and floodwall is proposed.

The earth embankment stopbank is characterised by the following technical specifications and design parameters:

- ✧ Design specifications: typical height of between 2 to 4 m.
- ✧ Batter slopes:
 - River side slope of 2.5H:1V.
 - Land side slope of 2H:1V.
- ✧ Crest width: typical width of 3.5 m.

These dimensions will ensure stability and effectiveness in flood protection while adhering to common design practices for earth embankments; this design is illustrated in Drawing set in Appendix A for cross-sections along the earth embankment.

The floodwall is proposed to be a sheet piled wall. The 3 types of sheet pile wall and pipe culvert penetrations are illustrated in Figures 7 & 8.

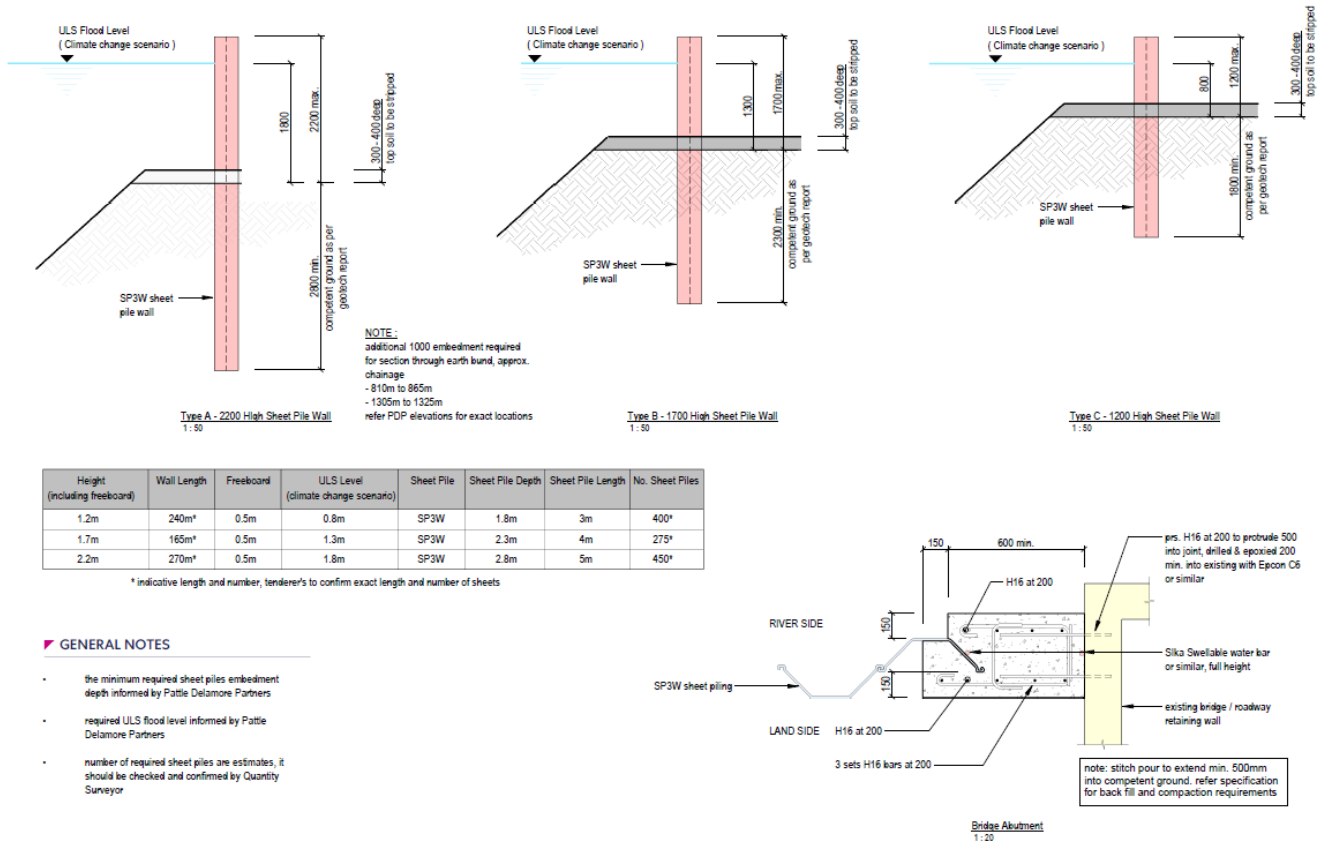


Figure 7: Sheet Piled Wall Types

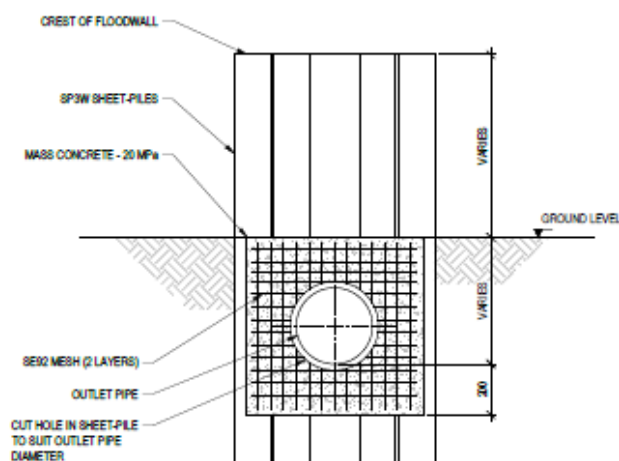
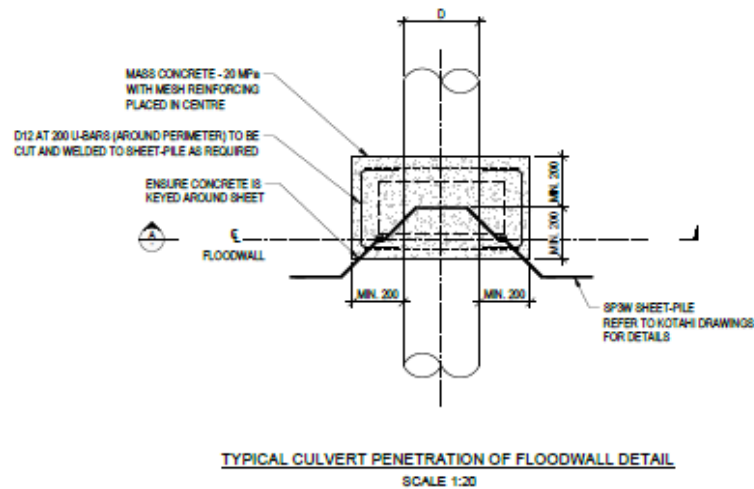


Figure 8: Sheet piled wall Penetrations.

8.2.4 Cross-drainage

The cross-drainage design and information provided by Stantec has been incorporated into the detailed design of the culverts penetrating the proposed stopbank. These cross drains are shown on drawings HB01041700-GT-20, 21, 50, 57 to 61.

Stormwater runoff draining towards the Pōrangahau River will be managed through tying into the existing swales currently directing stormwater to the Pōrangahau River and installing outlet culverts at these locations equipped with flap gates and the necessary erosion protection measures.

Where required, upgraded and new swales will have a maximum depth of 0.3 m and will be fully grassed via hydroseeding.

A new scruffy dome inlet and associated culvert will be installed at the eastern end of the Franklin Street paper road to ensure no ponding of stormwater will occur unless the river is in flood and the flap gate is closed.

9.0 Analysis

9.1 Geotechnical

As discussed in Section 7.2, PDP conducted a geotechnical investigation to support the design of flood protection measures for Pōrangahau following Cyclone Gabrielle.

The key geotechnical risks associated with the proposed stopbank were assessed and reported in 'HB01041700R004' (PDP, 2025). The key information from this report is summarised in Sections 9.1.1 - 9.1.6 below.

For the assessment, the stopbank chainages have been grouped into sections based on the stopbank type. As discussed in Section 7.2.1, the extent of the stopbank sections vary from the finalised stopbank sections shown in Table 1. The variation in the extents is provided in Table 4. This shows that only minor changes in the length of each section have occurred.

Table 4: Comparison of geotechnical assessment Pōrangahau stopbank sections and finalised design sections.

Section	Report	Chainage (m)	Stopbank Type
1	Finalised Design	0-475	Earth embankment
	Geotechnical Assessment	0-480	
2	Finalised Design	475-864	Floodwall
	Geotechnical Assessment	480-750	
3	Finalised Design	864-1244	Earth embankment
	Geotechnical Assessment	750-1220	
4	Finalised Design	1239-1537	Floodwall
	Geotechnical Assessment	1220-1500	
5	Finalised Design	1530-1700	Earth embankment
	Geotechnical Assessment	1500-1690	

9.1.1 Liquefaction Assessment

Liquefaction can cause a significant loss of stiffness and strength in the soil and large ground deformation can occur because of this (MBIE, 2021a). The effects of liquefaction can include subsidence of ground surface, reduced bearing capacity for foundations, sand boils and surface disruption. Where slopes or free edges such as a riverbank or drain are present, lateral spreading and flow failure can cause large horizontal displacements.

Liquefaction analysis was carried out for the proposed stopbanks based on Serviceability Limit State (SLS) and Ultimate Limit State (ULS) scenarios. The calculations assume a 50-year design life, noting that HBRC specified that the proposed Pōrangahau stopbanks are considered as Importance Level (IL) 2 structures.

Based on NZS 1170.0 (2002) and Module 1 of the earthquake geotechnical engineering practice manual (MBIE, 2021a), the following applies to Pōrangahau (Waipukurau)

- ✧ Importance Level 2, 50-year Design Life
 - SLS: 1/25 years (0.12g PGA; 6.4M)
 - ULS: 1/500 years (0.58g PGA; 71M)

An investigation into the surrounding fault lines suggests that ground rupture during an earthquake is unlikely.

Estimated liquefaction settlements can be summarised as follows:

- ✧ SLS Conditions: Less than 0 mm to 10 mm
- ✧ ULS Conditions: Less than 5 mm to 90 mm

The above is considered to be a conservative estimate based on Module 3 of the MBIE guidance. As the maximum vertical displacement under ULS conditions is 90 mm, this falls within the HBRC (2021) and BOPRC (2021) guideline requirements.

9.1.2 Lateral Spread

Lateral spreading was also assessed using GeoLogismiki software CLiq, based on the proposed alignment and edge. Typical cross-section profiles were created from survey data along the alignment. A groundwater level of 5 m bgl was assumed for the analyses, to approximate baseflow in the Pōrangahau River.

Cross-sections along the entire alignment were considered and CH880 (i.e., 1V: 3.34H) was selected for analyses as a worst-case scenario, under ULS conditions. This scenario considers a maximum height of 7 m along 12 m of the Pōrangahau Riverbank.

Modelling lateral spread under ULS conditions yielded a resultant movement of 400 mm. This is attributed to the proposed alignment's proximity to the edge of the existing riverbank. Proximity to the riverbank is an important consideration and due care must be taken in the design of the stopbank, as it will need to be near the edge due to the site spatial constraints, and lateral displacement could potentially occur during a ULS-scale seismic event.

The results were considered in terms of HBRC (2021) guidelines, which state:

"The acceptability criteria will need to be considered on a case-by-case basis, but in general, any ULS vertical settlement greater than 200 mm and/or any lateral spread of more than 500 mm would be considered damage" in respect of stopbanks. If this level of displacement is determined by analysis, then further analysis of the SLS event will be required to determine the potential displacement in a relatively minor event. Any "damage" in an SLS event will be unacceptable and mitigation will be required".

The SLS conditions were modelled, with a resultant lateral displacement of 6 mm. This falls within the guideline value.

9.1.3 Settlement

The foundation pressures based on the detailed design known. The settlement has been assessed and the maximum settlements for the highest portions of the earth embankment stopbank (ch 850-ch 1150) are expected to range between 31 to 38 mm overall with the static settlement ranging between 26 – 30 mm.

This is within the tolerance levels for earthworks construction.

9.1.4 Ground Bearing Capacity

Stopbank Footprint (Sections 1 – 5)

The ground bearing capacity of the underlying soil of the stopbank was assessed based on CPT data, with each of the stopbank sections (1 – 5) assessed individually. Refer to Table 4 for details on the assessed stopbank sections for the geotechnical analysis.

According to HBRC (2021), the following Factors of Safety (FoS) to determining sufficient available bearing capacity for a new stopbank under different scenarios are:

- ✧ Normal Conditions – 2.0
- ✧ Saturated Foundation – 1.8
- ✧ Saturated Embankment and unsaturated foundation – 1.5

The following applies under normal conditions:

- ✧ Section 1: Minimum GUBC of 230 kPa

- ✧ Section 2: Minimum GUBC of 200 kPa
- ✧ Section 3: Minimum GUBC of 200 kPa
- ✧ Section 4: Minimum GUBC of 190 kPa
- ✧ Section 5: Minimum GUBC of 210 kPa

The minor changes to the stopbank alignments made since the geotechnical investigation do not change the findings as the investigation found that the subsoil profile was relatively consistent along the sections; therefore, it can be inferred that the findings would apply to the realigned portions. Given that the maximum bearing loading of the compacted earth stopbank is between 60 – 65 kPa the required FoS are achieved.

Southern Buildings

GUBC for the buildings south of the Pōrangahau River (including the marae) was also conservatively estimated as 200 kPa. The in-situ material becomes softer with depth so the upper 1.5 m will need to be engineered should the GUBC be exceeded.

9.1.5 Slope Stability

A slope stability assessment was completed as part of the detailed design for the stopbank and following the completion of the construction material investigation. The assessment is detailed in HB01041700R009 (PDPj, 2025) with the critical sections analysed at chainages 190, 440, 900 and 1630.

The scenarios assessed included:

- ✧ Land side slope failure (static)
- ✧ River side slope failure (static)
- ✧ River side slope failure due to rapid drawdown
- ✧ Landside side ground heave due to excessive groundwater pressure
- ✧ Foundation failure due to liquefaction
- ✧ Embankment failure due to seismic loads

The results of the assessment are given in Table 6 below. The only issue is the local stability of the river embankment at ch 900 under flooding conditions which was assessed with a Factor of Safety (FoS) of 0.9 indicating possible failure. The failure plane is akin to a local slough of the river embankment that could occur as the flood recedes. The planting of further vegetation in this area would provide additional resistance to this local sloughing.

For all the other sections analysed the stopbank and river embankments have FoS in excess of the acceptable levels.

Table 6: Slope Stability Analyses Result Summary

Scenario		Chainage (m)									
		CH190			CH440		CH900			CH1630	
		River-side	Land-side	Embankment	River-side	Land-side	River-side	Land-side	Embankment	River-side	Land-side
Base Conditions		3.1	4.0	1.9	3.4	6.9	2.7	2.3	2.4	2.5	2.6
Normal Conditions (Transient)	T0	3.1	-	1.9 (2.6) ¹	3.4	-	2.7	-	2.4	2.5	-
	T1	3.1	-	1.9	3.4	-	2.7	-	7.7	2.5	-
	T2	3.1	-	2.7	4.0	-	3.9	-	7.2	3.5	-
	T3	3.1	-	2.3	4.2	-	4.4	-	6.5	3.9	-
	T4	4.0	-	2.2	4.6	-	4.6	-	4.7	3.8	-
	T5	4.6	-	2.1	4.6	-	4.6	-	4.3	3.4	-
	T6	3.9	-	2.0	4.0	-	4.2	-	3.7	2.7	-
	T7	3.1	-	2.0	3.4	-	2.9	-	2.6	2.1	-
	T8	3.1	-	2.0	2.9	-	2.1	-	1.7	1.8	-
	T9	3.1	-	1.8	2.7	-	1.8	-	0.9	1.8	-
	T10	3.1	-	1.7	2.7	-	1.8	-	0.9	1.8	-
SLS Normal Conditions		2.3	2.7	1.4	2.3	3.7	2.0	1.8	1.8	1.9	2.0
ULS Normal Conditions		1.1	1.1	0.6	1.0	1.3	0.9	0.9	0.8	0.9	1.0

Notes:

1. FoS values in brackets represent the FoS of a deeper failure surface.
Non-bracketed FoS values is the global minimum FoS of the analysed scenario.
2. Transient groundwater conditions were not considered or analysed for landside sections.

9.1.6 Summary

The stopbank does not comply with HBRC's acceptable FoS of 1.2 under ULS conditions. It is unlikely that this will be achievable without extensive and very costly engineering. As agreed with HBRC, this non-compliance is accepted, and a "repair-when-damaged" approach will be followed.

The existing river embankments at CH190 m and CH900 m were stable under static and SLS seismic conditions, with the lowest calculated FoS of 1.4. While CH900 m model results indicated that the embankment is not stable under rapid drawdown conditions (with a calculated FoS of 0.9), the CH190 m embankment is still stable under rapid drawdown conditions with an acceptable FoS of 1.7 – 1.8. Under ULS seismic conditions, however, both embankments do not comply with the HBRC's acceptable FoS of 1.2.

Seismic liquefaction analyses showed acceptable vertical settlements, and lateral spreading of 400 mm under ULS conditions was within the acceptable criteria threshold as defined by HBRC (2021).

9.2 Flooding Effects

9.2.1 Summary of Design Modelling Results

The design model assessed the effectiveness of the proposed stopbanks in providing flood protection up to future state 1% AEP event, and showed that:

- ✧ The proposed stopbank design effectively mitigates flood risks for the Pōrangahau township.
- ✧ A sensitivity analysis on bridge blockage was undertaken and highlights the potential impact of debris blockage on upstream flood levels.
- ✧ A design freeboard of 500 mm provides a margin for uncertainties in model input parameters, hydrological estimates, climate change impacts, and bridge blockage scenarios.

The assessment of flooding effects from the proposed upgrade was separately investigated and is discussed in the following sections.

9.2.2 Scope of Flooding Effects Assessment

Consequential flooding impacts from the proposed stopbanks have been assessed and reported in '*HB01041700R006 – Assessment of Effects on Flooding for Proposed Pōrangahau Stopbanks*' (PDPg, 2025). A summary of the key findings is presented below.

To assess the flood-related impacts of the proposed mitigation works, the hydraulic model was simulated for both pre-development (baseline) and post-

development (mitigation) scenarios. The results were compared to evaluate changes in flood extent, water levels, flow velocities, and hazard changes.

The outcomes of this comparison are illustrated through mapping outputs in the following appendices in 'HB01041700R006' (PDP, 2025):

- ✧ Appendix A – Flood Depth Maps
- ✧ Appendix B – Flood Hazard Maps
- ✧ Appendix C – Flood Velocity Maps

Flood hazard has been assessed following the methodology outlined in *Australian Rainfall and Runoff 2019*⁵, and illustrated in Figure 9.

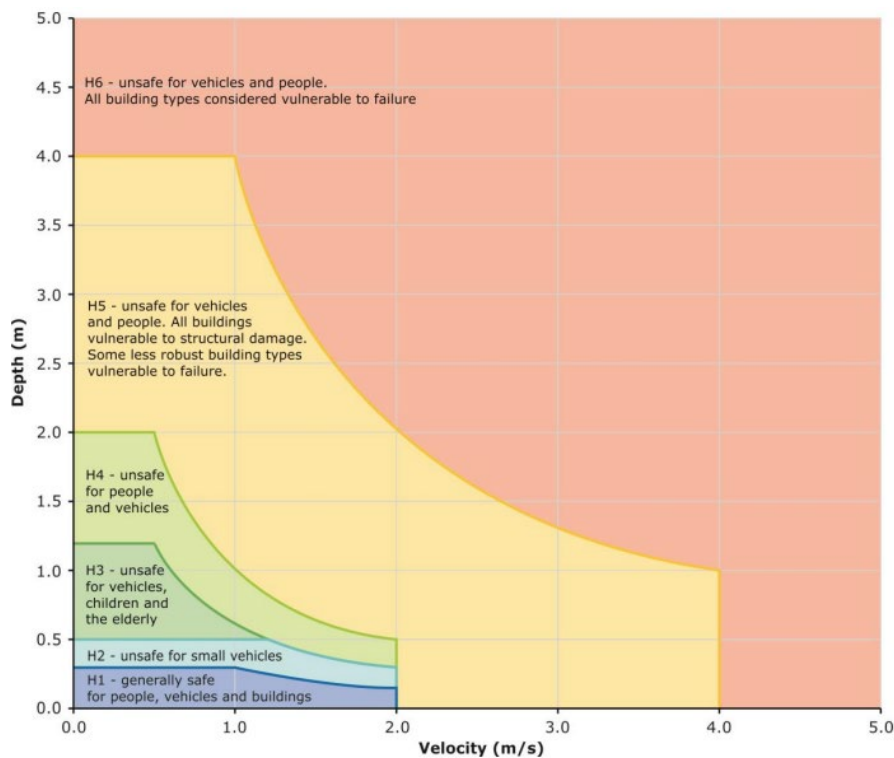


Figure 9: Flood hazard curves.

9.2.3 Changes in Flood Level and Extents

The modelling results indicate that the proposed works will lead to a moderate reduction in flood extent and significant reduction in the number of buildings subject to inundation. These are summarised in Table 5. It is noted that the assessment of the flood depths do not consider any existing freeboard of the

⁵ ARR. (2019). *Australian Rainfall & Runoff: A Guide to Flood Estimation*. Australian Rainfall & Runoff.

buildings, nor do they distinguish between dwellings and outbuildings (e.g., garages or sheds).

Table 5: Summary of inundation area and affected buildings.				
Event AEP	Area of Flooding (ha)		No. of Buildings in Flooded Area	
	Before proposed works (pre)	After proposed works (post)	Before proposed works (pre)	After proposed works (post)
1 % (100-yr ARI) + 25 % CC ⁴	1077.3	1051.1 (↓ 2%)	273	140 (↓ 49%)
Notes: 1. All flooded depths > 0 mm are reported. 2. Buildings and appurtenant structures have not been distinguished (i.e., dwelling vs. garage). 3. Building footprints have been identified using LINZ layer NZ building outlines; ID101290. 4. Climate change is represented by a 25% increase in peak flow rate.				

Key observations include:

- ✧ The most significant reduction in flood extent is observed within the Pōrangahau township, which is the primary area protected by the proposed stopbanks.
- ✧ Small increases in flood extent are observed in outlying rural areas, particularly on the southern side of the river, however, no additional buildings were predicted to experience flooding that previously did not.
- ✧ The greatest localised increase in flood level is approximately 200 mm, observed on what is assumed to be a farm shed at 109 Keppel Street, upstream of Stopbank A (SB_A, 'HB01041700R006' Figure 1).
- ✧ A total of 25 buildings are predicted to experience a flood level increase greater than 50 mm, primarily located on low-lying farmland south of the river, with two exceptions on Keppel Street (both at 109 Keppel Street).
- ✧ The marae and kaumātua flats are predicted to experience flood level increases up to 150 mm. In contrast, flood levels at the urupā are predicted to decrease by up to 500 mm as a result of the bund.
- ✧ It is noted that the assessment of flood levels on building footprints does not take into account any design freeboard of the structures.

9.2.4 Changes in Flood Hazard

Flood hazard categories were compared between the two modelled scenarios. Changes are summarised in terms of both land area (Table 6) and affected building footprints (Table 7).

The results indicate that while there are some small increases in land area classified as high hazard (H5–H6), the overall number of buildings affected by high hazard zones decreases. Importantly, no additional buildings are reclassified into H6 as a result of the proposed works.

Table 6: Flood risk areas before and after proposed works (based on ARR 2019 H1-H6 hazard rating).

Event AEP	Total area of flood risk per hazard category before proposed work (ha)					
	H1	H2	H3	H4	H5	H6
1 % (100YR ARI) + 25% CC	86.4	73.5	246.2	288.0	217.6	210.0
Event AEP	Total area of flood risk per hazard category after proposed work (ha)					
	H1	H2	H3	H4	H5	H6
1 % (100YR ARI) + 25% CC	87.4 (↑ 1 %)	66.9 (↓ 9 %)	236.1 (↓ 3 %)	267.6 (↓ 7 %)	222.0 (↑ 2 %)	213.9 (↑ 2 %)
Notes: 1. River corridors are included in the assessed area and will likely appear in the H6 category in both before and after proposed work scenarios.						

Table 7: Number of buildings within flood risk areas before and after proposed works (based on ARR 2019 H1-H6 hazard rating).

Event AEP	Total Number of Buildings within Hazard Classification					
	H1	H2	H3	H4	H5	H6
1 % (100YR ARI) + 25% CC	41	24	131	82	8	0
Event AEP	Total Number of Buildings within Hazard Classification					
	H1	H2	H3	H4	H5	H6
1 % (100YR ARI) + 25% CC	29 (↓ 29 %)	10 (↓ 58 %)	35 (↓ 73 %)	69 (↓ 16 %)	7 (↓ 13 %)	0
Notes: 1. Buildings and appurtenant structures have not been distinguished (i.e., dwelling vs. garage) 2. Building footprints have been identified using LINZ layer NZ building outlines; ID101290.						

9.2.5 Impacts on Culturally Sensitive Sites

Marae

As outlined in Section 9.2.3, the establishment of the stopbanks and floodwalls are predicted to increase flood levels on the marae building footprints by up to 150 mm, however, the marae remains classified as hazard class H4 under both the pre- and post-development scenarios. Post-mitigation peak flood levels for each of the marae building footprints is provided in Figure 10.

Remedial options include either the construction of a small earth bund or a floodwall. This will be confirmed as part of the detailed design.



Figure 10: Peak flood levels (post-mitigation scenario) on marae building footprints.

Kaumātua Flats

The flood hazard classification for the kaumātua flats' building footprints is predicted to remain unchanged for all but one building. The easternmost flat is downgraded from H4 to H3, reflecting a slight improvement in flood effects due to reduced flow velocities across the site. However, flood levels are predicted to increase at the following flats:

- ✧ Easternmost flat: +70 mm
- ✧ Northeastern flat: +150 mm
- ✧ Southeastern flat: +130 mm

Urupā

The proposed bund to the northwest of the urupā is predicted to significantly reduce flow velocities across the site, from baseline levels of 1.0 – 1.5 m/s to less than 0.5 m/s. This results in a downgrading of the flood hazard classification from H5 to H3. Visual confirmation of these changes is provided in 'HB01041700R006' Figures C1 and C2.

It is highlighted that the urupā bund must be well protected against erosion to ensure its integrity during flood events.

9.3 Ecological Effects

As part of the proposed stopbank and associated works, an ecological investigation and assessment of potential ecological impacts of the design was undertaken. For the full assessment, refer to 'HB01041700R003 – Pōrangahau Flood Mitigation Ecological Impact Assessment' (PDPC, 2025). The key impacts of the project on ecological habitats and communities is summarised below.

Note that at the time of the ecological investigation the final construction design and methodology had yet to be completed. The ecological impacts of the flood management design has been assessed based on the December 2024 stopbank alignment and borrow areas and stockpile location. It is reiterated that the minor changes to the alignment since 2024 will not make a material difference to the ecological impacts assessed. The terrestrial ecological values in relation to the proposed borrow areas has been reconsidered, and the Ecological Impact Assessment updated accordingly (Rev5).

Site Ecological Context and Ecological Values

The project area, primarily used for pastoral farming, poses ecological risks such as habitat degradation and increased sedimentation. The river and estuary supports native fish, migratory birds, and threatened species like Caspian terns and royal spoonbills.

Terrestrial surveys identified diverse vegetation types, including invasive species requiring removal. Potential bat roosts were found in several locations across the site, suggesting that the area could be used by native bats. The minor change to the stopbank alignment was to move away from some of these potential bat roosts near the existing Wastewater Pond.

Whilst there is no evidence that lizards are present within the area, there is suitable habitat suggesting a moderate risk to lizards from the proposed works.

Freshwater assessments were undertaken along the Pōrangahau River including a rapid habitat assessment and water quality assessment. eDNA samples were not taken during fieldwork as recent data was available through the Wilderlab's NZ

database for the Pōrangahau River near the site. This information was used to assess the ecological values and baseline condition of the Pōrangahau River.

The riparian margin along the Pōrangahau River was assessed as having marginal to suboptimal habitat quality. The area is dominated by exotic grass and willow species contributing to its poor quality. Erosion was observed at several locations along the riverbank and the presence of fine sediments instream limited the availability of macroinvertebrate habitats suitable for EPT⁶ taxa. The river is tidal at the site therefore it is unlikely that EPT taxa are typically present.

Native fish are found in the river close to the site, indicating that the area provides habitats for these species as well as being a migratory pathway. The site has the potential to provide inānga spawning habitat along the banks and in adjacent wetlands. Kakahi freshwater mussels were identified at the site and are an important taonga species.

The overall ecological value of the terrestrial and wetland habitats were assessed as **very low** to **moderate** in the context of the project site.

The overall ecological value of the aquatic habitat was assessed as **moderate** in the context of the wider environment due to the site's connection to the Pōrangahau Estuary and being a migratory pathway and habitat for several native fish.

Ecological Effects

A detailed summary of the level of effects and mitigations for each potential activity associated with the works (e.g., stockpiling, noise and vibration, vegetation clearance, etc) is provided in Table 11 of 'HB01041700R003'. A high-level summary of the potential impacts of the proposal on ecological environments, the recommended mitigations and residual effects are presented in Table 8 below.

⁶ Sensitive freshwater *Ephemeroptera*, *Plecoptera*, and *Trichoptera* (EPT) taxa

Table 8: Potential impacts of the proposal on ecological environments and recommended mitigations.

Assessment	Ecological Value	Unmitigated Level of Effects	Recommended Mitigations	Residual Effects
Terrestrial Environment	Negligible to High	Very Low to Very High	✧ The planting of indigenous species following the completion of the works to mitigate the effects of vegetation clearance, particularly the loss of wetland vegetation. ✧ Management of in-situ substrates and earthworks equipment to minimise the risk of spreading pest plants offsite or to new locations on site. ✧ Management of risk to indigenous birds by nest inspection of and trees scheduled to be removed prior to felling. ✧ Management of risk to indigenous reptiles by a staged vegetation removal. ✧ Management of risk to indigenous bats by roost inspections of any trees scheduled to be removed with bat roost features prior to felling. ✧ Construction should occur outside the bird nesting season, with a 20 m boundary established around active nests until chicks have fledged. For lizards, staged vegetation clearance and eco-piles will create offsite habitats, minimising noise and habitat disruption.	Very high to Net Gain ²
Aquatic Environment	Moderate	Moderate to High	✧ The planting of indigenous species following the completion of the works to mitigate the effects of vegetation clearance causing loss of shade and bank stability, particularly the loss of wetland vegetation. ✧ A robust Erosion and Sediment Control Plan (ESCP) will be implemented under an Environmental Management Plan (EMP) developed for the works. Routine inspection and maintenance for onsite sediment controls will be outlined in the ESCP, and as such, we consider that the effects will be managed as effectively as possible. ✧ Management of in-situ substrates and earthworks equipment to minimise the risk of spreading pest plants offsite or to new locations on site. ✧ Timing construction to avoid peak migration and spawning of indigenous fish.	Low to Net Gain ³

Notes:

1. Detailed assessment of all proposed activities, magnitude of effects and mitigations in HB01041700R003 Table 11.
2. The current works propose the removal of some **potential** bat roost trees. If these trees are being utilised by bats and are removed, the loss of habitat cannot be mitigated/offset. However, if bats are not using the potential roosting trees, the level of residual effects would drop to '**moderate to net gain**'.
3. Potential of net gains regarding restoring the riparian zone of the river.

10.0 Construction

10.1 Methodology

As discussed in Section 8.2.3, the proposed stopbank design involves the construction of earth embankments of engineered fill and floodwalls comprising of Sheet piled walls.

The alignment and footprint of the proposed stopbank is shown in Figure 11.

The contract could be split into two separable portions comprising:

- ✧ The construction of the floodwall; and
- ✧ The construction of the earth embankment.

10.1.1 Construction of the Earth Embankment

The earth embankments will be constructed of engineered fill taken from the investigated borrow pit and compacted to the design specifications (to be determined following the completion of the borrow pit investigation and detailed design).

Based on the geotechnical investigations, it is recommended that all topsoil be removed (stockpiled for later use) from the entirety of the proposed stopbank footprint. The stopbank must be founded on in-situ soils underlying the topsoil. The footprint should be compacted in-situ using a vibratory roller or sheepsfoot compactor. The new stopbank can then be constructed in accordance with the engineering design and specifications.

10.1.2 Construction of the Floodwall

The construction of the sheet piled walls will involve driving sheet piles into the alluvial soils along the alignment.

The upper 200 - 300 mm of vegetation-rich soils beneath the floodwall foundation should be stripped and stockpiling it for later use (i.e., re-vegetation) before excavating for the foundation. The floodwall will be constructed in accordance with the engineering detailed design and specifications.

10.2 Erosion and Sediment Control

The extent of the proposed earthworks will be limited to the proposed stopbank footprint, the finalised borrow area(s) following the material investigations, and temporary stockpiling area(s). The proposed stopbank footprint and the indicative borrow areas and stockpile location at the time of writing is shown in Figure 11.

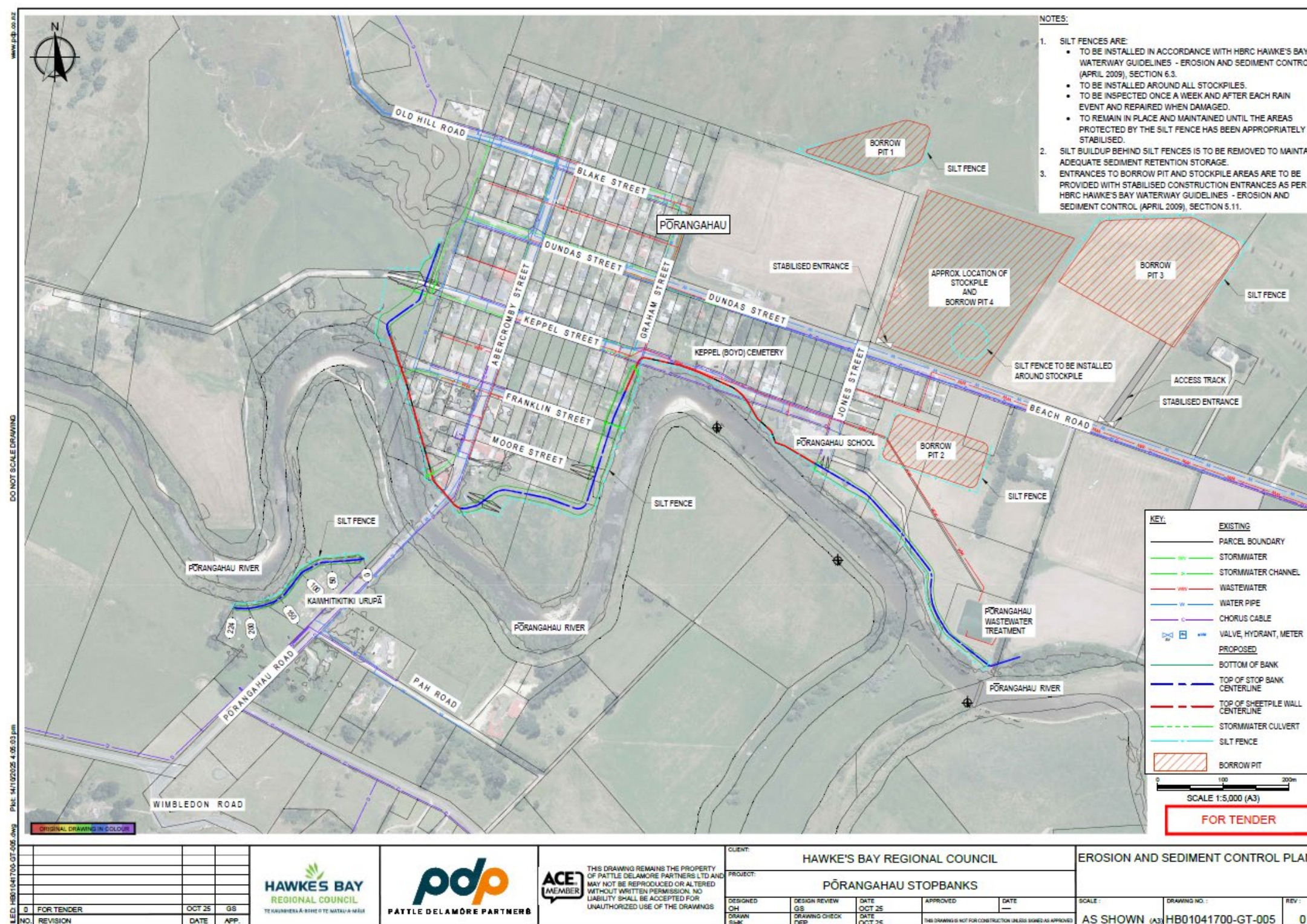


Figure 11: Erosion & Sediment Control Plan.

An Environmental Management Plan (EMP) will be prepared for the works with a detailed Erosion and Sediment Control Plan (ESCP). This will include a detailed plan showing potential locations and specifications for controls to mitigate erosion risk and uncontrolled sediment discharges. A summary of the key risks and potential controls that may be utilised are provided below.

Potential erosion and sediment control measures to be utilised for the project may include, but not be limited to, the following:

- ✧ **Silt fencing** will be the main method of sediment control for the project and will be placed as a boundary control, in exposed areas that cannot be drained due to site constraints.
- ✧ **Stabilised entranceways** to the work site will be installed prior to earthworks commencing on site. These will be at any location where traffic enters or leaves the site.
- ✧ **Wheel washes** will also be located at the entrance to borrow area(s). These will drain to through geofabric/silt fence to a channel or sump on-site.
- ✧ **Stabilised roads** with compacted hardfill will be provided for haulage roads, where required.
- ✧ **Dirty water diversion channels** as required will be constructed at downslope earthworks boundaries, near haulage roads, around stockpiles and other catchment boundaries, where there is sufficient space to construct the channel/bunding. **Drop-out pits** may be used at the end of dirty water diversion channels located in steep areas. Similarly, on sloping land, **contour drains** may be constructed to drain water to dirty water diversion channels.
- ✧ **Clean water diversion channels** (if required) may be used to divert clean water away from work areas, as required, where sufficient space is available.
- ✧ **Surface stabilisation** and **surface roughening** will be used wherever practicable. Stabilisation will be required for any cleared or unvegetated areas and may include mulching, geotextiles, temporary seeding or hydroseeding, or erosion control matting. Overburden stockpiles not used for the duration of the project will be stabilised by permanent seeding. The stopbank will be progressively stabilised during construction.
- ✧ **Compaction of stockpiles** using vehicle tracking to keep loose material from being mobilised by runoff.

The Contractor will be responsible for the design and construction/installation of all erosion and sediment controls in accordance with HBRC's *'Erosion and Sediment Control Guidelines'* (2009).

10.3 Contaminated Soil Management

Based on a review of the available site history information, and due to the presence of likely HAIL activities at the site, a potential risk exists to human health. If the proposed stopbank works are unable to meet the NES-CS permitted activity requirements for soil disturbance, then soil sampling maybe required.

A Contaminated Site Management Plan (CSMP) will be prepared for the proposed works. The CSMP shall be in place for the duration of the works and shall be treated as a 'live' document.

The following general site management principles will apply to all works conducted at the site:

- ✧ Appropriate disposal of soils dependent on the contaminant concentrations found to be present (if re-use is not appropriate);
- ✧ The use of certified cleanfill or soil meeting background criteria, should imported soil be required;
- ✧ The requirement for record keeping;
- ✧ The implementation of controls to prevent discharges of sediment and dust, and the generation of vapour/odour during development works (refer to Section 10.2 of this report);
- ✧ Appropriate dewatering practices (if required) in accordance with consent(s)/permit(s) and regional rules;
- ✧ Appropriate contingency measures to be enacted should unexpected visual or olfactory evidence of contamination be observed during site works; and
- ✧ Implementation of relevant health and safety work practices and policies.

In the case of any waste soil or material being disposed offsite, soil sampling will be undertaken to characterise the excavated to inform offsite disposal requirements and health and safety management measures for site contractors and future site occupiers.

10.4 Access and Parking

Access for construction of the stopbank will be via existing roads and along the alignment. Access across private land will be agreed with landowners by the HBRC Community Liaison team where necessary. Land acquisition is being carried out by HBRC.

Based on the agreements with landowners and the land being acquired an area for site facilities will be identified.

10.5 Noise and Vibration

Noise generated during construction shall be measured, assessed and managed in accordance with New Zealand Standards 6803:1999 *Acoustics – Construction Noise* (NZS 6803:1999).

The Contractor shall be responsible for all monitoring of and compliance with relevant noise and vibration limits during works.

10.6 Decommissioning

The Contractor shall be responsible for decommissioning of erosion and sediment control measures once construction of the development has ceased and the site is stabilised.

Potential borrow pit(s) have been identified for sourcing construction material; the suitability and volumes required is currently under investigation. The material investigation reporting will include appropriate procedures for rehabilitating selected borrow area(s). Rehabilitation of borrow area(s) will be in accordance with these procedures.

11.0 Operation and Maintenance

It is recommended that stopbank integrity surveys are periodically conducted on the proposed stopbank once it has been constructed.

Integrity checks should also be conducted following significant flooding events and any earthquake exceeding SLS conditions. Integrity surveys should include, as a minimum, a visual inspection of the entire stopbank to check for erosion, cracking, piping, leakage, or any lateral/vertical displacements.

A proposed checklist for integrity surveys will be compiled as part of the detailed design of the stopbank.

12.0 Document Register

A document register for the PDP deliverables for the proposed Pōrangahau stopbank and associated works is provided in Table 9.

Table 9: Document register for key PDP deliverables.

Document No.	Title	Author(s)	Date of Issue
HB01041700R001	Pōrangahau Flood Defence Options Assessment (Revision 2)	Izak Breytenbach / Stephanie Patchett / Julia Byrne	October 2024
HB01041700L001	Preliminary Site Investigation for Pōrangahau Stopbank	Nicole Bidart / Sally McKinnon	April 2025
HB01041700R002	Pōrangahau River: Design Model Build Report (Revision 2)	Steph Patchett	October 2025
HB01041700R003	Pōrangahau Flood Mitigation Ecological Impact Assessment	Chloe Waugh / Amber Simmonds / Cate Ryan / Nicki Papworth	October 2025
HB01041700R004	Geotechnical Assessment Report for the Proposed Pōrangahau Stopbanks and Southern Buildings, Central Hawke's Bay	Paul Lombard / Kyla Thorn	April 2025
HB01041700R006	Consequential Flood Assessment: Pōrangahau	Steph Patchett	October 2025

13.0 Limitations

The cross-drainage design has been completed by Stantec Limited and is not captured in this design report; however, this will be incorporated into the detailed design of the stopbank.

The geotechnical assessment has been completed based on a series of cone penetration tests, boreholes, and hand augers. The site conditions as described in the geotechnical report have been interpreted from, and are subject to, this information and its limitations; accordingly, PDP does not represent that its interpretation accurately represents the full site conditions. The geological and associated environmental conditions interpolated between the test positions are not guaranteed to be accurate.

Stability and settlement analyses of the proposed stopbank have yet to be completed. The findings of these assessments may require revision of the stopbank design.

14.0 References

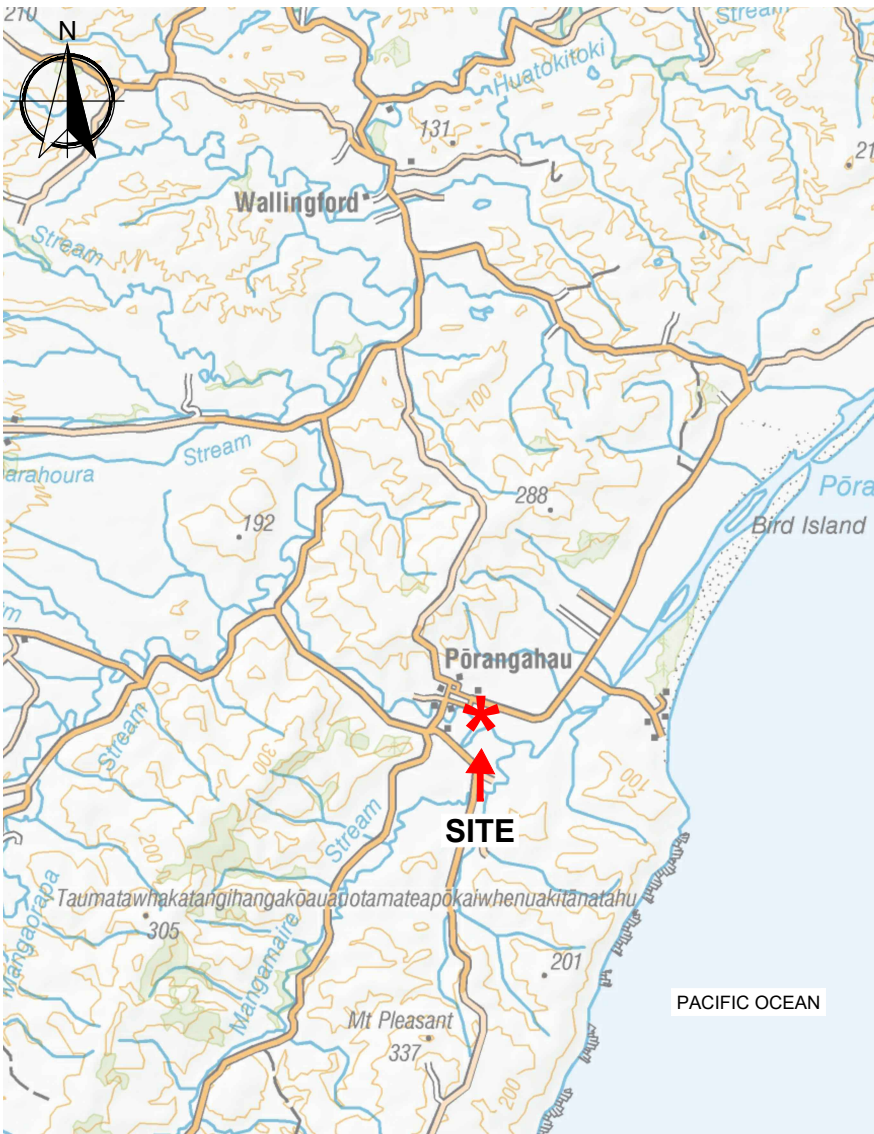
- Hewlett, H.W.M Boorman, L.A. and Bramley, M.E. (1987) Design of reinforced grass waterways, Construction Industry Research and Information Association (CIRIA) Report 116, 1987.
- Lee, Julie & Begg, John. (2002). Geology of the Wairarapa area. Institute of Geological and Nuclear Sciences, 1: 250 000 geological map8. ISBN 978-0-478-19822-5
- LINZ (2024) Hawke's Bay LiDAR 1m DEM (2023-2024). Retrieved from LINZ Data Service: <https://data.linz.govt.nz/layer/118755-hawkes-bay-lidar-1m-dem-2023-2024/>
- NZS 1170.0, (2002) Structural Design Actions – General Principles, New Zealand Standards.
- MBIE, (2021) - Module 1 of the earthquake geotechnical engineering practice manual, New Zealand Geotechnical Society (NZGS) and Ministry of Business Innovation & Employment (MBIE) Earthquake Geotechnical Engineering Practice in New Zealand.
- NZS 6803: (1999).New Zealand Standards 6803:1999 *Acoustics – Construction Noise*
- PDPa, (2025)- HB01041700L001 - Preliminary Site Investigation for Pōrangahau Stopbank.
- PDPb, (2025) - HB0104700R002 Rev2 - Pōrangahau River: Design Model Build Report.

- PDPc, (2025) HB01041700R003 – Pōrangahau Flood Mitigation Ecological Impact Assessment.
- PDPd, (2025) Pōrangahau Stopbank Borrow Area 3 Material Investigation Addendum to Pōrangahau Stopbank Borrow Area Material Investigation Ref HB01041700R007.
- PDPe, (2025) - HB01041700R004 – Geotechnical Assessment Report for the Proposed Pōrangahau Stopbanks and Southern Buildings, Central Hawke's Bay.
- PDPf, (2025) - HB01041700R005 – Pōrangahau Stopbanks Preliminary Design Report.
- PDPg, (2025) - HB01041700R006 – Assessment of Effects on Flooding for Proposed Pōrangahau Stopbanks
- PDPH, (2025) –HB01041700R007 Pōrangahau Stopbank Borrow Area Material and Bridge Debris Investigation
- PDPi, (2025) - HB01041700M002 Freeboard Assessment for Pōrangahau Flood Protection Works
- PDPj, (2025) - HB01041700R009 Pōrangahau Stopbank Slope Stability Analysis
- Roper-Lindsay, J., Fuller, S. A., Hoosan, S., Sanders, M. D., & Ussher, G. T. (2018). *Ecological Impact Assessment (EclA). EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems* (2nd ed.). EIANZ. <https://www.eianz.org/document/item/4447>

**Appendix A: Pōrangahau Stopbank
Upgrade Design Drawings**

HAWKE'S BAY REGIONAL COUNCIL

PŌRANGAHAU STOPBANKS



LOCALITY PLAN

DRAWING INDEX			
DRAWING No.	DRAWING TITLE	ISSUE DATE	REV
HB01041700-GT-001	COVER SHEET & DRAWING LIST	OCT 25	0
HB01041700-GT-002	GENERAL NOTES	OCT 25	0
HB01041700-GT-005	EROSION AND SEDIMENT CONTROL PLAN	OCT 25	0
HB01041700-GT-010	PORANGAHAU STOPBANKS OVERALL PLAN	OCT 25	0
HB01041700-GT-011	PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 1	OCT 25	0
HB01041700-GT-012	PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 2	OCT 25	0
HB01041700-GT-013	PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 3	OCT 25	0
HB01041700-GT-014	PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 4	OCT 25	0
HB01041700-GT-015	PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 5	OCT 25	0
HB01041700-GT-016	PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 6	OCT 25	0
HB01041700-GT-017	KAIWHITIKITIKI URUPA STOPBANK PLAN & LONGSECTION	OCT 25	0
HB01041700-GT-020	DETAILED PLAN VIEW OF KEPPEL STREET OUTLET	OCT 25	0
HB01041700-GT-021	DETAILED PLAN OF KEPPEL ROAD CULVERTS	OCT 25	0
HB01041700-GT-030	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 1	OCT 25	0
HB01041700-GT-031	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 2	OCT 25	0
HB01041700-GT-032	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 3	OCT 25	0
HB01041700-GT-033	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 4	OCT 25	0
HB01041700-GT-034	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 5	OCT 25	0
HB01041700-GT-035	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 6	OCT 25	0
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HB01041700-GT-046	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 17	OCT 25	0
HB01041700-GT-047	PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 18	OCT 25	0
HB01041700-GT-048	PORANGAHAU STOPBANKS RAMP LONG SECTIONS - SHEET 1	OCT 25	0
HB01041700-GT-049	PORANGAHAU STOPBANKS RAMP LONG SECTIONS - SHEET 2	OCT 25	0
HB01041700-GT-050	PORANGAHAU STOPBANKS STORMWATER OUTLET LONG SECTIONS	OCT 25	0
HB01041700-GT-051	KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 1	OCT 25	0
HB01041700-GT-052	KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 2	OCT 25	0
HB01041700-GT-053	KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 3	OCT 25	0
HB01041700-GT-055	EARTH FILL STOPBANK TYPICAL SECTION	OCT 25	0
HB01041700-GT-056	SHEET PILE STOPBANK TYPICAL SECTION	OCT 25	0
HB01041700-GT-057	TYPICAL DETAILS SHEET 1	OCT 25	0
HB01041700-GT-058	TYPICAL DETAILS SHEET 2	OCT 25	0
HB01041700-GT-059	TYPICAL DETAILS SHEET 3	OCT 25	0
HB01041700-GT-060	TYPICAL DETAILS SHEET 4	OCT 25	0
HB01041700-GT-061	TYPICAL DETAILS SHEET 5	OCT 25	0

DRAWING ISSUE :

FOR TENDER

DRAWING TITLE :

COVER SHEET & DRAWING LIST

DRAWING NO. : REV :

HB01041700-GT-001 0



NOTES

GENERAL NOTES

- 1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE TECHNICAL SPECIFICATIONS.
- 2. ALL WORKS ON CHBDC DISTRICT COUNCIL INFRASTRUCTURE TO COMPLY WITHE THE LATEST REVISION OF THE HASTINGS DISTRICT COUNCIL CODE OF ENGINEERING.
- 3. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS OTHERWISE STATED.
- 4. ALL RELATIVE GROUND LEVELS IN METERS (m RL) UNLESS OTHERWISE STATED.
- 5. THE CONTRACTOR IS TO BE RESPONSIBLE FOR PREPARATION AND IMPLEMENTATION OF A HEALTH AND SAFETY PLAN APPROVED BY THE ENGINEER AND PRINCIPAL PRIOR TO POSSESSION OF THE SITE.
- 6. ANY DISCREPANCIES, OMISSIONS OR ERRORS IN THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION PRIOR TO PROCEEDING WITH CONTRACT WORKS.
- 7. DRAWINGS TO BE PRINTED IN COLOUR FOR CLARITY.

SITE ACCESS

- 1. THE CONTRACTOR MUST ALLOW TO COORDINATE WITH HBRC (FOR ACCESS) PRIOR TO COMMENCEMENT OF WORK WITHIN AN AREA.
- 2. THE CONTRACTOR MUST PROVIDE TEMPORARY SITE ACCESS AND FENCE TO CORDON OFF WORK AREAS.

EXISTING SERVICES

- 1. THE LOCATION AND ALIGNMENT OF ALL EXISTING SERVICES SHOWN ON THE DRAWINGS ARE INDICATIVE ONLY. THE CONTRACTOR MUST HYDRO-EXCAVATE, POTHOLE AND/OR SLIT TRENCH TO CONFIRM THE LOCATION, LEVEL AND ALIGNMENT OF ALL EXISTING SERVICES PRIOR TO UNDERTAKING ANY EXCAVATION.
- 2. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION AND SUPPORT OF ALL EXISTING SERVICES THROUGHOUT CONTRACT WORKS.
- 3. IF SERVICES ARE FOUND TO BE IN CONFLICT WITH NEW STRUCTURES OR PIPES THE CONTRACTOR MUST NOTIFY THE ENGINEER FOR INSTRUCTION.
- 4. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL PROTECTED SURVEY MARKS.
- 5. THE CONTRACTOR MUST NOTIFY THE SERVICES PROVIDED PRIOR COMMENCEMENT OF WORK WITHIN A SERVICE CORRIDOR AND ARRANGE WITH THE RESPECTIVE SERVICES PROVIDED FOR RELOCATION.

EARTHWORKS

- 1. STRIPPED TOPSOIL IS TO BE STOCKPILED AND COVERED AT THE DESIGNATED STOCKPILE AREA FOR RE-USE.
- 2. STOCKPILED MATERIAL MUST BE LOCATED OUTSIDE THE ZONE OF INFLUENCE OF ANY EXCAVATIONS AND WATER SOURCE.
- 3. THE CONTRACTOR IS TO BE RESPONSIBLE FOR INSTALLATION, OPERATION AND MAINTENANCE OF AN EROSION AND SEDIMENT CONTROL PLAN APPROVED BY THE ENGINEER PRIOR TO POSSESSION OF THE SITE AND AS REQUIRED BY ANY RESOURCE CONSENT CONDITION.

AS-BUILT DRAWINGS

- 1. THE CONTRACTOR IS TO PREPARE AN AS-BUILT SET OF DRAWINGS AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO PRACTICAL COMPLETION.

TESTING AND COMMISSIONING

- 1. ALL QUALITY ASSURANCE TESTING AND COMMISSIONING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION.

DATA SOURCES

- 1. TOPOGRAPHICAL SURVEY AND UAV AERIAL IMAGERY BY WSP.
- 2. AERIAL IMAGERY (2021-2024) SOURCED FROM LINZ DATA SERVICE AND LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
- 3. CADASTRAL INFORMATION (UPDATED (05/07/2024) SOURCED FROM LINZ DATA SERVICE AND LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
- 4. COORDINATE SYSTEM: NZGD2000 (EPSG:2193)
- 5. LEVEL DATUM: NEW ZEALAND VERTICAL DATUM 2016
- 6. THE INDICATIVE LOCATION OF ALL EXISTING SERVICES SHOWN ON THE DRAWINGS HAVE BEEN PROVIDED AS FOLLOWS.

SERVICE	SERVICE PROVIDER	DATE RECEIVED/ DOWNLOADED
STORMWATER	CHBDC	15/01/2024
WASTEWATER	CHBDC	15/01/2024
WATER SUPPLY	CHBDC	15/01/2024
COMMUNICATION	CHORUS	13/03/2025

- 7. EXISTING SERVICES SHOWN ARE INDICATIVE ONLY, REFER TO ALL UTILITY SERVICE PROVIDERS PRIOR TO ANY WORKS.

STOPBANK

- 1. REFER TO THE TECHNICAL SPECIFICATION FOR THE STOPBANK MATERIAL.
- 2. ALL PROPOSED STOPBANK MATERIAL TO BE USED MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO USE.
- 3. PREPARATION
 - 3.1. STOPBANK BASE TO BE CLEARED OF ALL VEGETATION, INCLUDING TREES ROOTS AND ROOT BALLS, AND TOPSOIL REMOVED TO STOCKPILE.
 - 3.2. STOPBANK FOOTPRINT TO BE COMPACTED IN PREPARATION TOR EARTH FILL STOPBANK.
 - 3.3. CONTRACTOR TO TEST TO CONFIRM BEARING CAPACITY OF THE IN-SITU SOIL ALONG THE BASE OF THE STOPBANK.
 - 3.4. FOR IN-SITU SOIL < 100 kPa, CONTRACTOR TO NOTIFY THE ENGINEER. THE ENGINEER WILL PROVIDE A METHODOLOGY BASED ON LOCATION AND EXTENT.
- 4. CONSTRUCTION
 - 4.1. ALL FILL TO BE PLACED AT MAXIMUM 300mm LIFTS AND COMPACTED TO 95% MAXIMUM DRY DENSITY. NZ STD COMPACTION (HEAVY)
 - 4.2. ALL EARTHWORKS TO BE OVERFILLED, COMPACTED AND TRIMMED BACK TO DIMENSIONS AS PER THE DESIGN.
 - 4.3. COMPACTED SURFACES TO BE SCARIFIED AFTER APPROVAL OF THE TEST RESULTS AND PRIOR TO THE NEXT MATERIAL LAYER IS PLACED.
 - 4.4. TOPSOIL SHALL ONLY BE USED AS BACKFILL WITHIN 200mm OF THE FINAL SURFACE.
 - 4.5. ALLOW TO HYDROSEEDING OF TOPSOIL AND CONTRACTOR TO MAINTAIN FOR DURATION OF CONTRACT. REFER TO TECHNICAL SPECIFICATIONS FOR HYDROSEED.
- 5. SOFT SPOTS
 - 5.1. EXCAVATE SOIL TO WHERE BEARING CAPACITY IS > 100 kPa OR AS ADVISED BY THE ENGINEER,

FLOOD WALL:

- 1. FLOOD WALL TO BE DRIVEN SHEET PILES TO BE INSTALLED IN ACCORDANCE WITH TECHNICAL AND MANUFACTURERS SPECIFICATIONS.
- 2. SHEET PILES TO BE DRIVEN TO EMBEDMENT DEPTHS AS SHOWN ON THE DRAWINGS.
- 3. 5m WIDE STRIP ALONG FLOOD WALL ALIGNMENT TO BE CLEARED OF VEGETATION AND TOPSOIL STRIPPED.
- 4. TOPSOIL TO BE REPLACED FOLLOWING CONSTRUCTION OF FLOOD WALL AND THE AREA HYDROSEEDED.
- 5. ALL EARTHWORKS REQUIRED TO INSTALL THE SHEET PILES AND SHALL BE COMPACTED TO 95% MAX. DRY DENSITY N2 STD COMPACTION (HEAVY).

STORMWATER

- 1. ALL STORMWATER PIPES TO BE RCRRJ CLASS 4 UNLESS INDICATED OTHERWISE.
- 2. STORMWATER PIPES TO BE INSTALLED AS PER THE HASTING DISTRICT COUNCIL CODE OF ENGINEERING PRACTICE AND THE DETAILS SUPPLIED.
- 3. IF THE IN-SITU SOIL BEARING CAPACITY IS < 100 kPa, THE CONTRACTOR WILL NOTIFY THE ENGINEER PRIOR TO INSTALLATION.
- 4. RIPRAP
 - 4.1 ALL RIPRAP TO BE ANGULAR ROCK WITH A MIN. DENSITY OF 2,600 kg/m³. CONTRACTOR TO SUBMIT GRADING ANALYSES AND SOURCE TO THE ENGINEER FOR APPROVAL.
 - 4.2. RIPRAP TO BE D₅₀ 300mm UNLESS STATED OTHERWISE.
 - 4.3. ALL GEOTEXTILE TO BE CLASS D OR GREATER.
 - 4.4. ALL RIPRAP IS TO BE SETOUT AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
 - 4.5. RIPRAP TO BE PLACED AT MAX. 1V:1.5H SLOPE UNLESS OTHERWISE SPECIFIED.
 - 4.6. RIPRAP TO BE MIN. 2 x D₅₀ THICK.
- 5. HEADWALLS:
 - 5.1. TRAVERSABLE HEADWALLS TO BE INSTALLED WITHIN THE ROAD CORRIDORS. ALL OTHER HEADWALLS WILL BE STANDARD HEADWALLS AS PER THE HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE.
 - 5.2. ALL HEADWALLS TO HAVE A MIN. 200mm THICK AP65 BASE COMPACTED TO 95% DRY DENSITY.
- 6. ALL STORMWATER PIPES TO BE FITTED WITH FLAPGATES (WAGATE OR SIMILAR APPROVED).
- 7. SWALES
 - 7.1. MAXIMUM SWALE SIDE SLOPES TO BE 1V:4H.
- 8. LOCALISED SHAPING TO BE MAX. 1V:3H SLOPE AND ALLOW FOR REINSTATEMENT WITH TOPSOIL AND HYDRO SEEDING.
- 9. SCRUFFY DOMES TO BE HINGED AND LOCKABLE.
- 10. ALL MANHOLES TO BE HEAVY DUTY.

POTABLE WATER (WHERE REQUIRED):

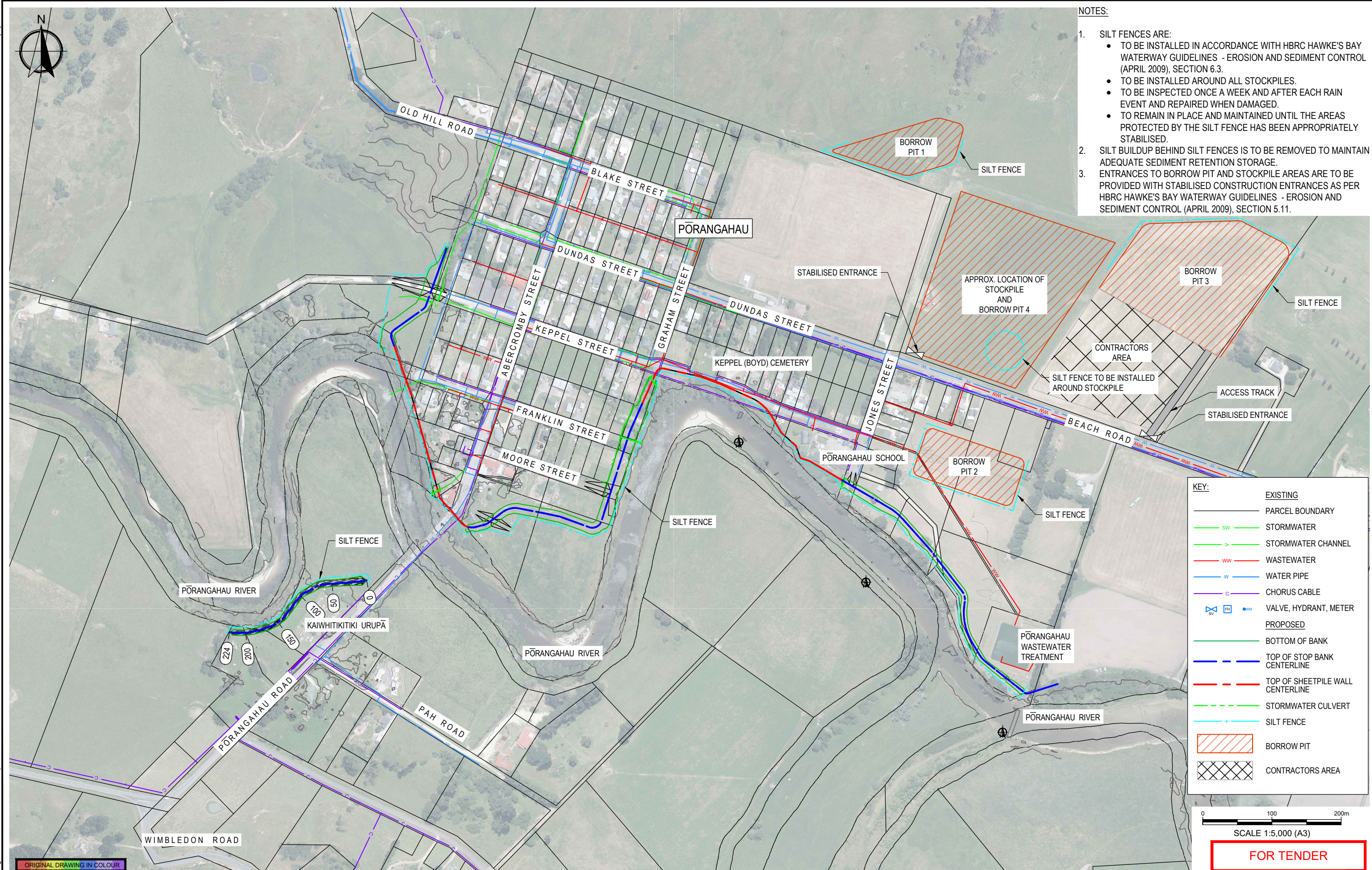
- 1. ALL POTABLE WATER TO BE INSTALLED AS PER THE HASTING DISTRICT COUNCIL CODE OF ENGINEERING PRACTICE DETAILS.
- 2. POTABLE WATER INFRASTRUCTURE TO BE COMMISSIONED AS PER HASTING DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE.
- 3. ALL VALVE COVERS TO BE TRAFFICABLE AND HEAVY DUTY.

EXISTING OR PROPOSED SERVICES THROUGH STOPBANK:

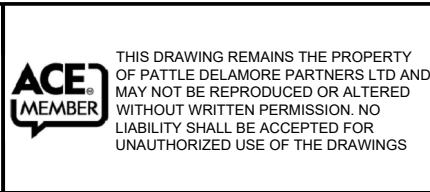
- 1. ALLOW A DRAINAGE COLLAR TO BE INSTALLED ON ALL SERVICES CROSSING UNDERNEATH THE PROPOSED STOPBANKS.
- 2. ALLOW FOR FILTER MEDIA TO BE NZTA F2 OR SIMILAR APPROVED.
- 3. FILTER COLLAR TO TERMINATE AT POINT 2/3RD OF STOPBANK HEIGHT AT CROSSING. EXTENT TO BE SET-OUT BY CONTRACTOR AND APPROVED BY ENGINEER.
- 4. FILTER COLLAR END TO BE 2 x DIA OF PIPE OTHERWISE MIN. 1m DEPTH AND WIDTH.
- 5. TRENCH BACKFILL ON LAND SIDE OF FILTER COLLAR TO INCLUDE FILTER DRAIN.
- 6. WRAP FILTER COLLAR IN GEOTEXTILE (BIDIM CLASS C)
- 7. REFER TO BOPRC STOPBANK DESIGN & CONSTRUCTION GUIDELINES 2021.

FOR TENDER

						 THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THE DRAWINGS	CLIENT: HAWKE'S BAY REGIONAL COUNCIL PROJECT: PŌRANGAHAU STOPBANKS <table><tr><td>DESIGNED OH</td><td>DESIGN REVIEW GS</td><td>DATE SEP 25</td><td>APPROVED</td><td>DATE</td></tr><tr><td>DRAWN SHK</td><td>DRAWING CHECK</td><td>DATE SEP 25</td><td colspan="2">THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED</td></tr></table>	DESIGNED OH	DESIGN REVIEW GS	DATE SEP 25	APPROVED	DATE	DRAWN SHK	DRAWING CHECK	DATE SEP 25	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		GENERAL NOTES		
DESIGNED OH	DESIGN REVIEW GS	DATE SEP 25	APPROVED	DATE																
DRAWN SHK	DRAWING CHECK	DATE SEP 25	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED																	
0	FOR TENDER	OCT 25	GS	SCALE :	DRAWING NO. :	REV :														
NO.	REVISION	DATE	APP.	AS SHOWN (A3)	HB01041700-GT-002	0														

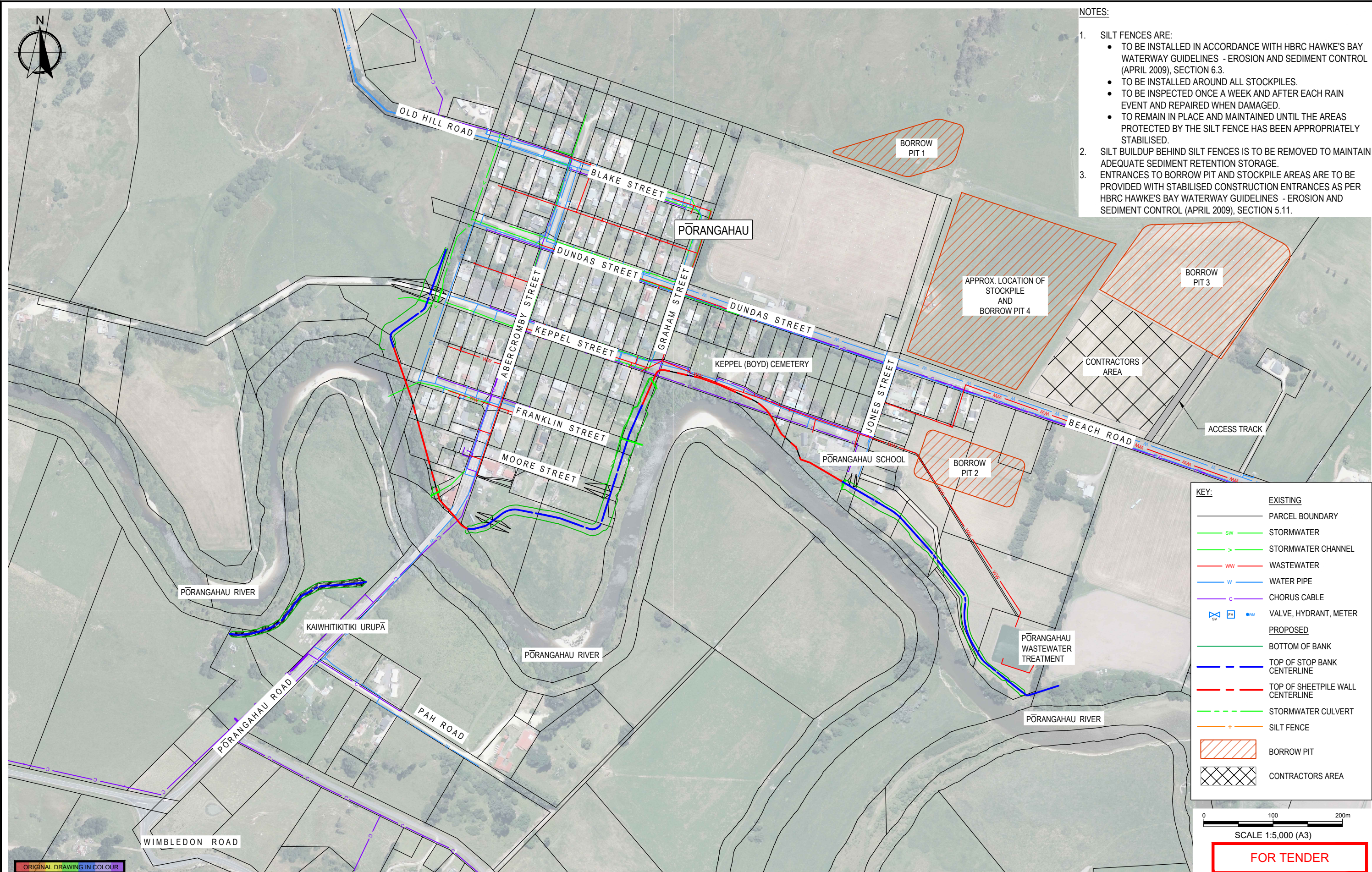


0	FOR TENDER	OCT 25	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL			
PROJECT: PŌRANGAHAU STOPBANKS			
DESIGNED OH	DESIGN REVIEW GS	DATE OCT 25	APPROVED
DRAWN SHK	DRAWING CHECK DFP	DATE OCT 25	DATE
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			

EROSION AND SEDIMENT CONTROL PLAN			
SCALE: AS SHOWN (A3)	DRAWING NO.: HB01041700-GT-005	REV: 0	



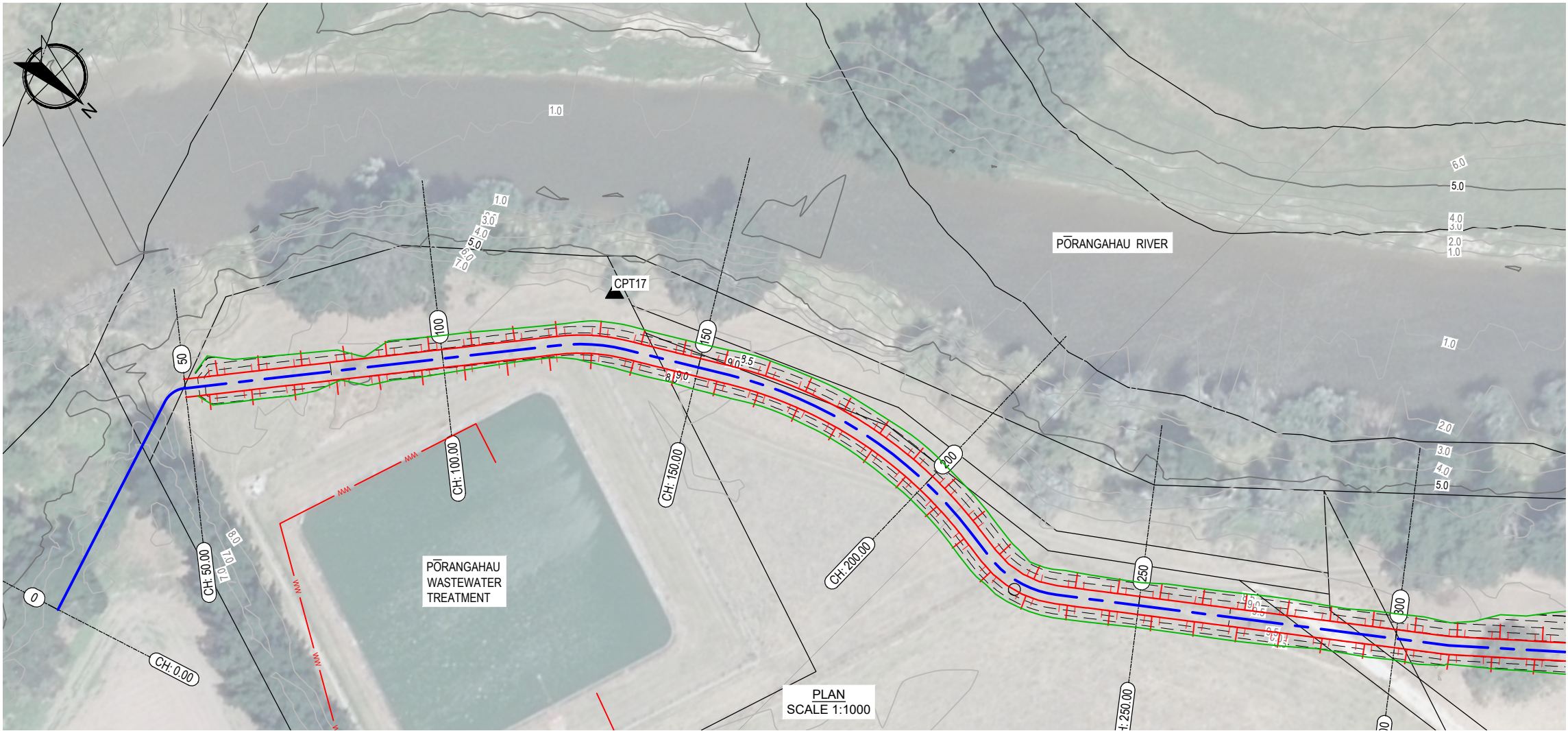
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



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CLIENT: HAWKE'S BAY REGIONAL COUNCIL					
PROJECT: PŌRANGAHAU STOPBANKS					
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	
DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		

PORANGAHAU STOPBANKS OVERALL PLAN		
SCALE: AS SHOWN (A3)	DRAWING NO.: HB01041700-GT-010	REV: 0



KEY:

EXISTING

PARCEL BOUNDARY

SW

STORMWATER

STORMWATER CHANNEL

WW

WASTEWATER

W

WATER PIPE

C

CHORUS CABLE

SV

FH

WM

VALVE, HYDRANT, METER

PROPOSED

TOP OF BANK

STORMWATER DRAIN

BOTTOM OF BANK

TOP OF STOP BANK CENTERLINE

TOP OF SHEETPILE WALL CENTERLINE

STORMWATER CULVERT

- NOTES
1.

REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2.

DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3.

COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4.

LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5.

GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6.

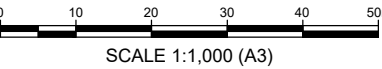
ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7.

LONGSECTION VERTICAL SCALE IS EXAGGERATED.

H.A DATUM 3.0m RL VERT EXAG 1:5		EXISTING STORMWATER CHANNEL		PŌRANGAHAU WASTEWATER TREATMENT		100 YRS FLOOD LEVEL	
PROPOSED DESIGN LEVELS (m RL)							
EXISTING GROUND LEVEL (m RL)	7.52	7.85	7.94	7.29	5.43	7.60	8.92
LEVEL DIFFERENCE (m)							8.94
CHAINAGE (m)	0.00	10.00	20.00	30.00	40.00	50.00	60.00
							1.03
							0.99
							0.12
							0.85
							0.80
							0.64
							0.41
							1.09
							8.08
							8.10
							8.06
							1.16
							8.22
							8.09
							1.30
							1.29
							8.08
							1.38
							8.13
							8.09
							1.33
							1.11
							8.47
							8.29
							1.26
							8.32
							1.21

STOPBANK SECTIONS A LONG SECTION CH0 TO CH300

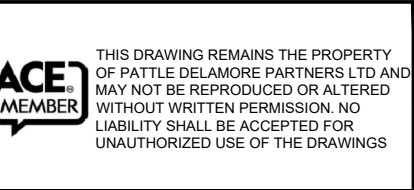
HORIZONTAL SCALE 1: 1000
VERTICAL SCALE 1: 200



SCALE 1:1,000 (A3)

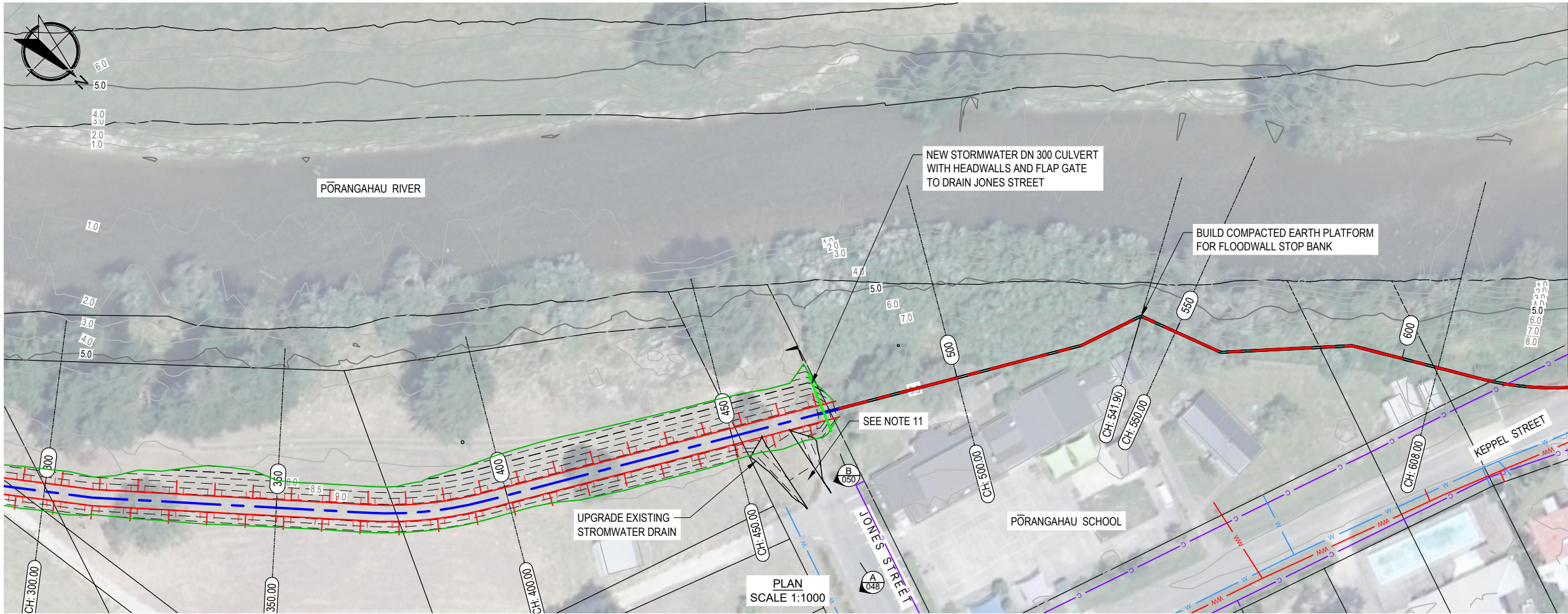
FOR TENDER

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



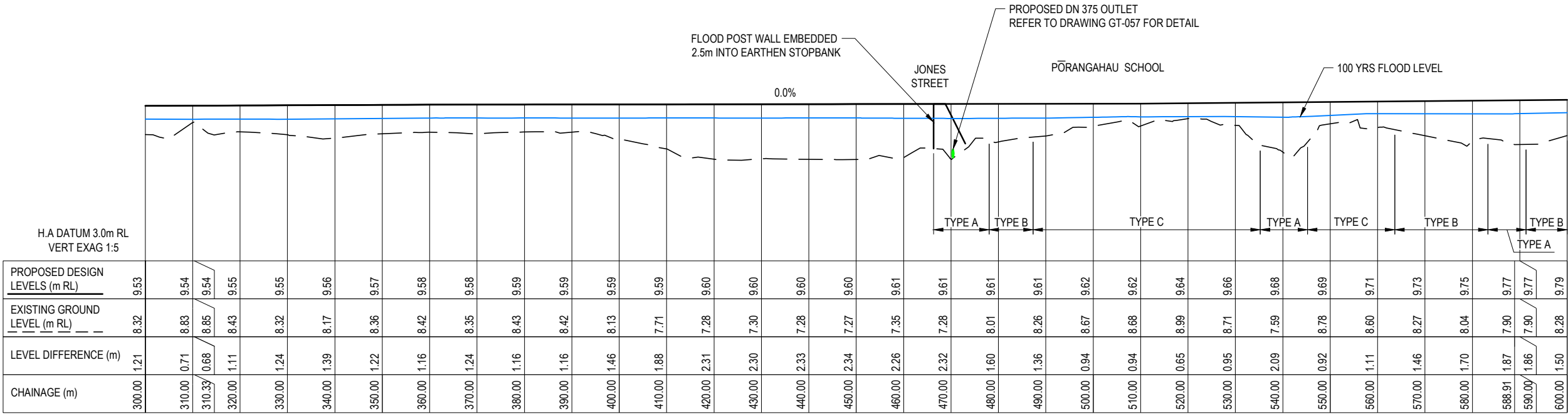
CLIENT: HAWKE'S BAY REGIONAL COUNCIL			
PROJECT: PŌRANGAHAU STOPBANKS			
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED
DRAWN SHK	DRAWING CHECK	DATE JUL 24	DATE
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			

PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 1		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-011	REV : 0



KEY:	
	EXISTING
	PARCEL BOUNDARY
	STORMWATER
	STORMWATER CHANNEL
	WASTEWATER
	WATER PIPE
	CHORUS CABLE
	VALVE, HYDRANT, METER
PROPOSED	
	TOP OF BANK
	STORMWATER DRAIN
	BOTTOM OF BANK
	TOP OF STOP BANK CENTERLINE
	TOP OF SHEETPILE WALL CENTERLINE
	STORMWATER CULVERT

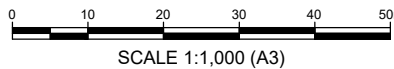
- NOTES**
- REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
 - DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
 - COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
 - LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
 - GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
 - ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
 - LONGSECTION VERTICAL SCALE IS EXAGGERATED.
 - FLOOD WALL TO BE SHEET PILLED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
 - LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
 - FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-061.
 - ALL ACCESS RAMPS ARE TO BE SURFACED WITH MIN. 200mm OF COMPACTED ROAD BASECOURSE.



H.A DATUM 3.0m RL VERT EXAG 1:5	
PROPOSED DESIGN LEVELS (m RL)	9.53
EXISTING GROUND LEVEL (m RL)	8.32
LEVEL DIFFERENCE (m)	1.21
CHAINAGE (m)	300.00
310.00	0.71
310.33	0.68
320.00	1.11
330.00	1.24
340.00	1.39
350.00	1.22
360.00	1.16
370.00	1.24
380.00	1.16
390.00	1.16
400.00	1.46
410.00	1.88
420.00	2.31
430.00	2.30
440.00	2.33
450.00	2.34
460.00	2.26
470.00	2.32
480.00	1.60
490.00	1.36
500.00	0.94
510.00	0.94
520.00	0.65
530.00	0.95
540.00	2.09
550.00	0.92
560.00	1.11
570.00	1.46
580.00	1.70
588.91	1.87
590.00	1.86
600.00	1.50

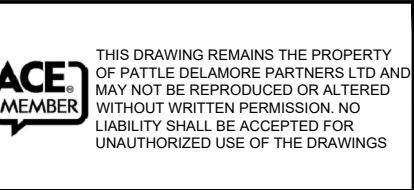
STOPBANK SECTIONS A LONG SECTION CH300 TO CH600

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



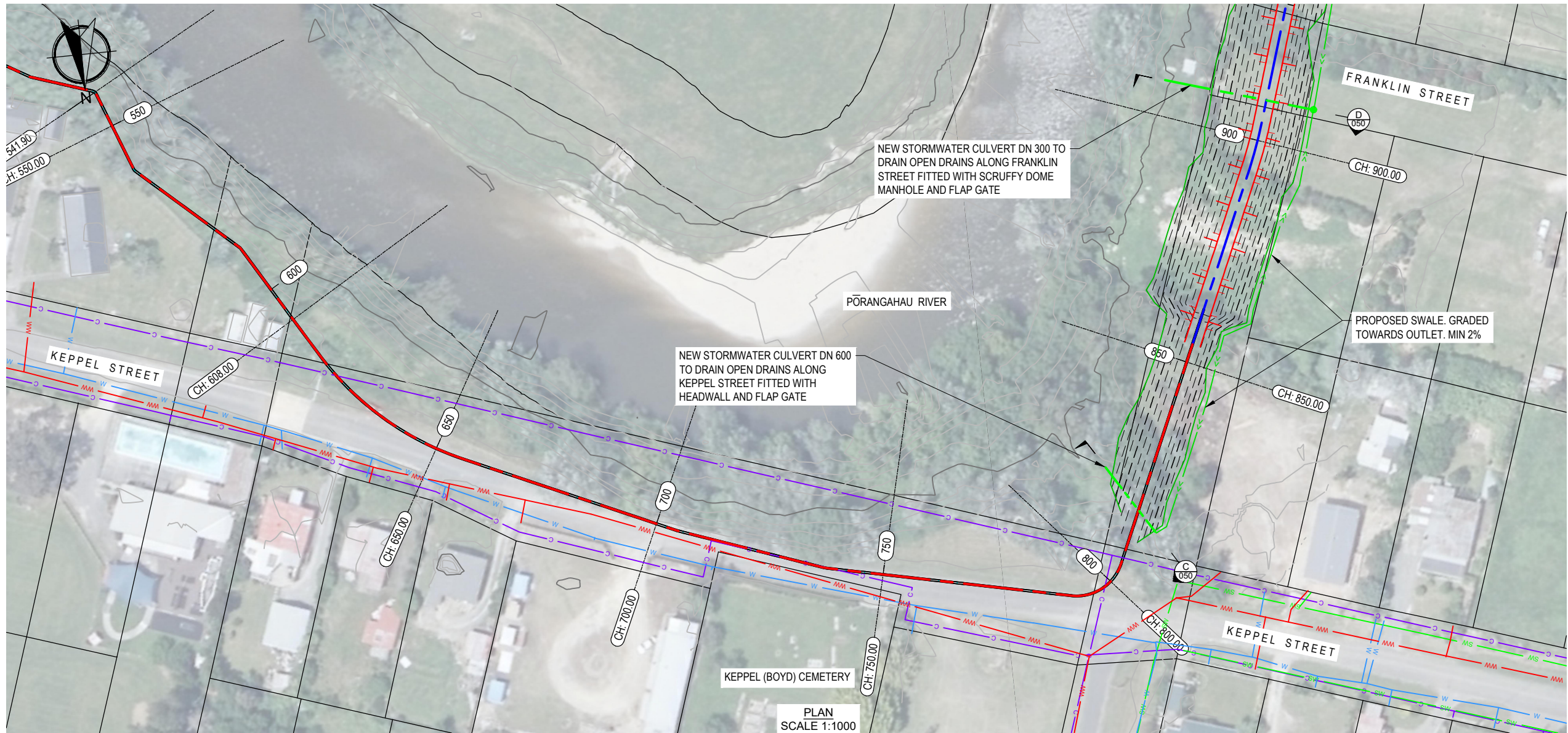
FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS



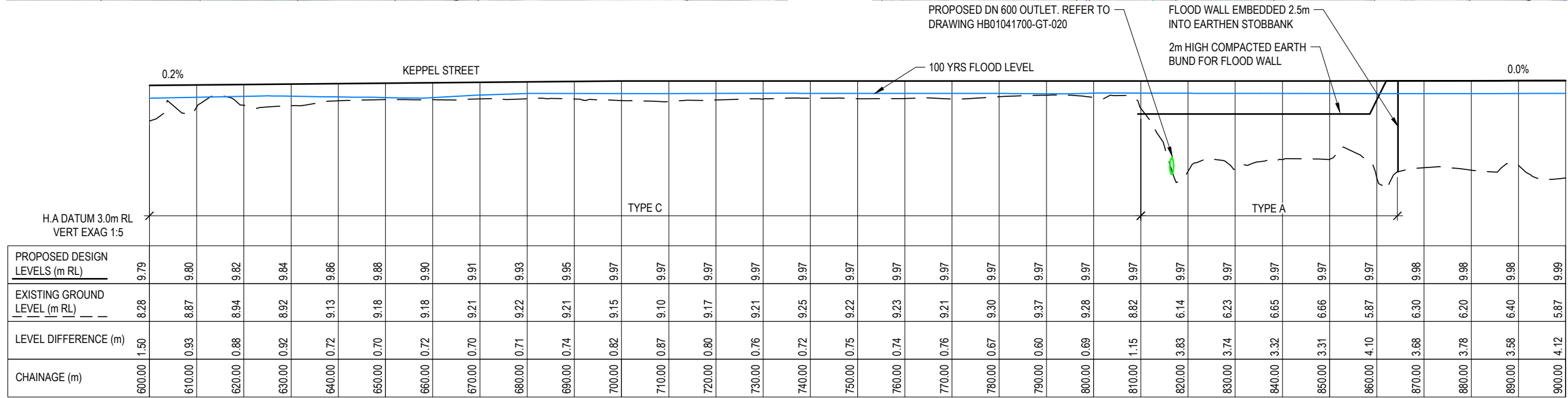
CLIENT:	
HAWKE'S BAY REGIONAL COUNCIL	
PROJECT:	
Pōrangahau Stopbanks	
DESIGNED	DESIGN REVIEW
OH	GS
DRAWN	DRAWING CHECK
SHK	
DATE	DATE
JUL 24	JUL 24
APPROVED	DATE
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 2		
SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-012	0



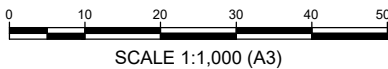
KEY:	
	EXISTING
	PARCEL BOUNDARY
	STORMWATER
	STORMWATER CHANNEL
	WASTEWATER
	WATER PIPE
	CHORUS CABLE
	VALVE, HYDRANT, METER
PROPOSED	
	TOP OF BANK
	STORMWATER DRAIN
	BOTTOM OF BANK
	TOP OF STOP BANK CENTERLINE
	TOP OF SHEETPILE WALL CENTERLINE
	STORMWATER CULVERT

- NOTES**
- REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
 - DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
 - COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193) LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
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 - ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
 - LONGSECTION VERTICAL SCALE IS EXAGGERATED.
 - FLOOD WALL TO BE SHEET PILED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
 - LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
 - FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-061.



STOPBANK SECTIONS C & D LONG SECTION CH0 TO CH300

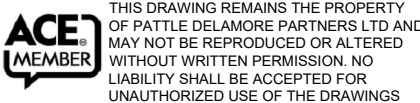
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



SCALE 1:1,000 (A3)

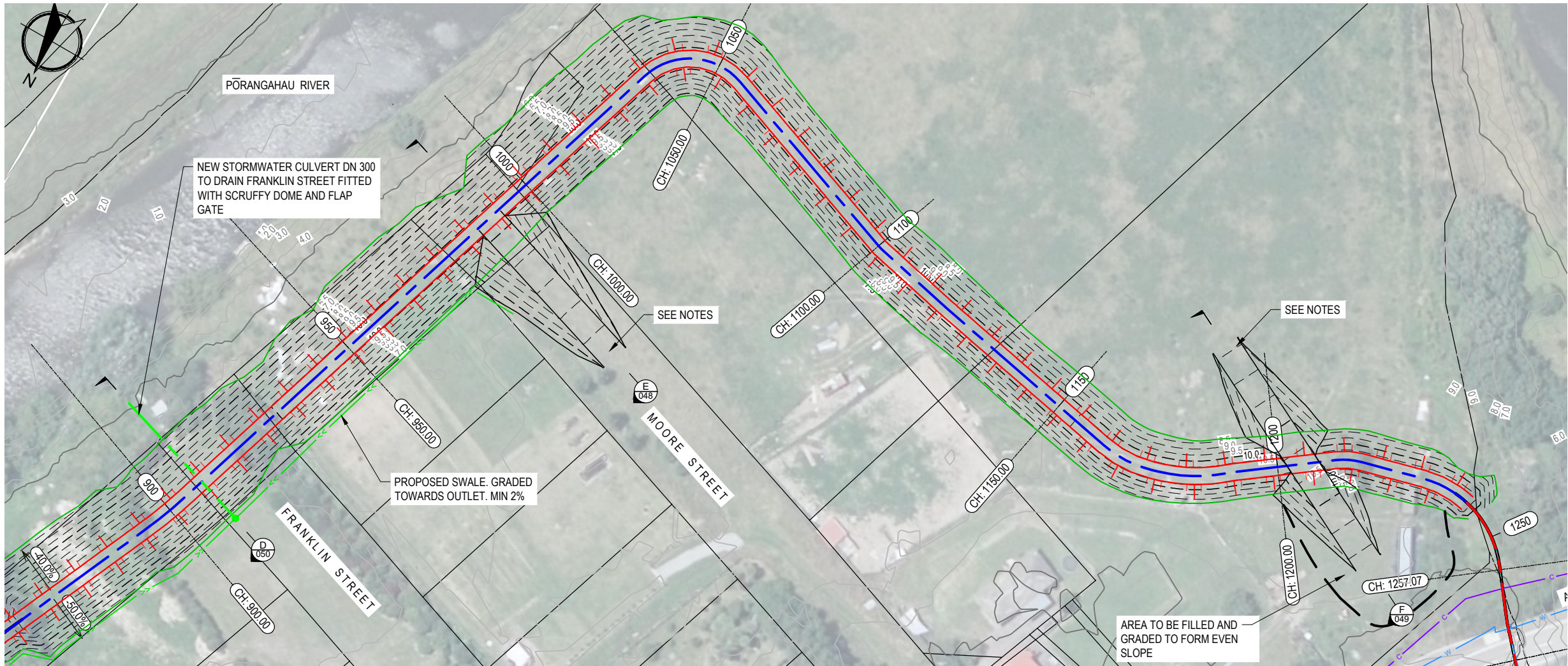
ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
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A	FOR INFORMATION	JUL 24	GS



CLIENT: HAWKE'S BAY REGIONAL COUNCIL			
PROJECT: PŌRANGAHAU STOPBANKS			
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED
DRAWN SHK	DRAWING CHECK	DATE JUL 24	DATE
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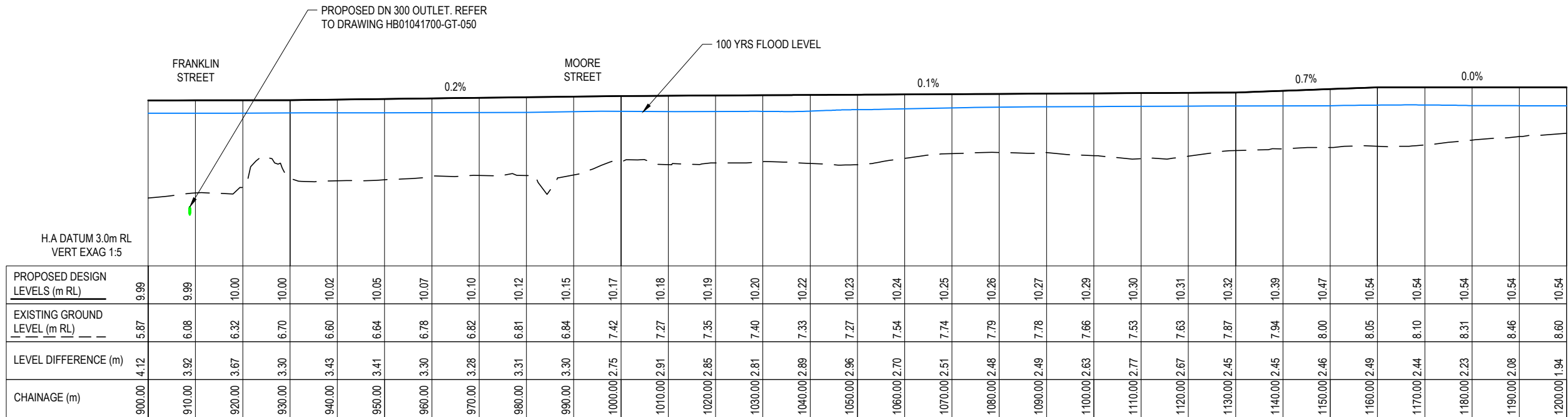
PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 3		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-013	REV : 0



KEY:	
EXISTING	
PARCEL BOUNDARY	
STORMWATER	SW
STORMWATER CHANNEL	
WASTEWATER	WW
WATER PIPE	W
CHORUS CABLE	C
VALVE, HYDRANT, METER	SV, PH, MH
PROPOSED	
TOP OF BANK	
STORMWATER DRAIN	>>
BOTTOM OF BANK	
TOP OF STOP BANK CENTERLINE	
TOP OF SHEETPILE WALL CENTERLINE	
STORMWATER CULVERT	

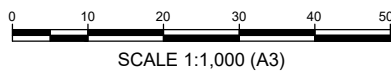
NOTES

- REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
- DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
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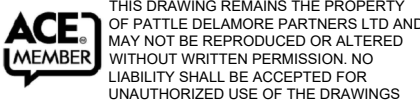
STOPBANK SECTION C LONG SECTION

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



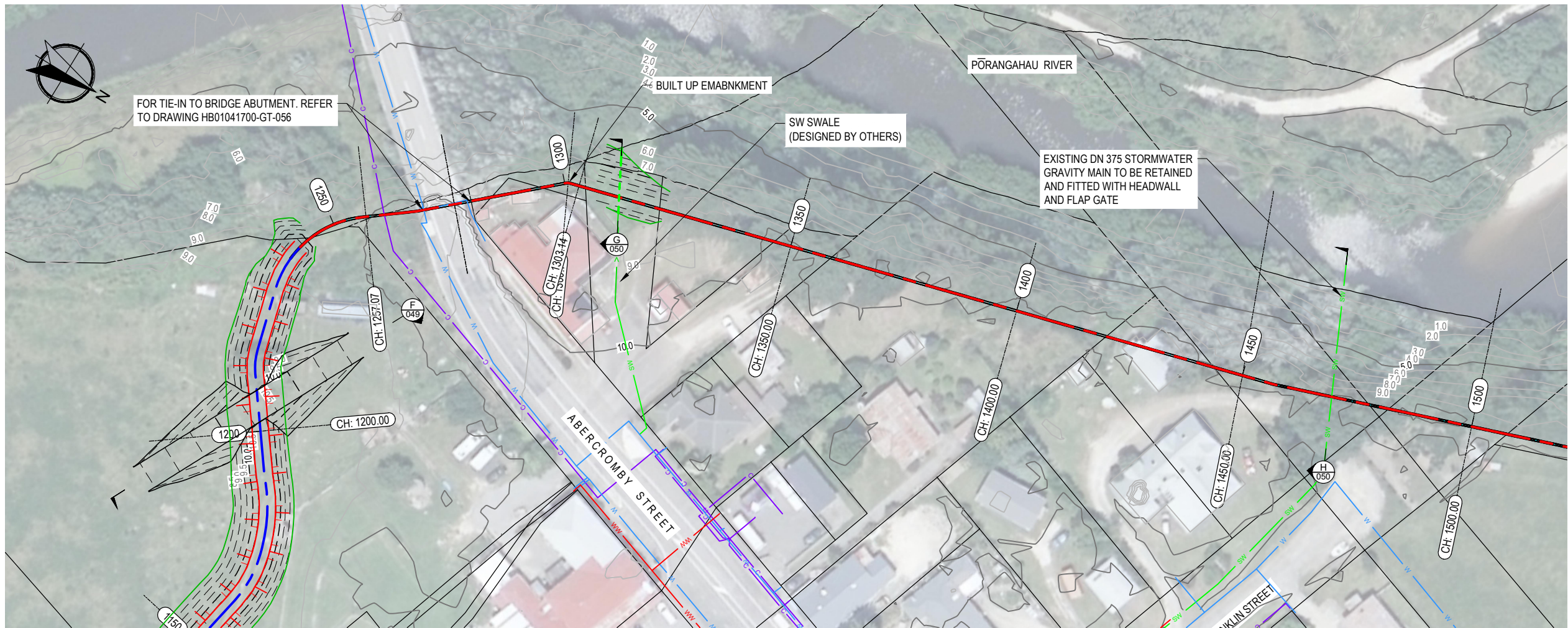
FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS



CLIENT: HAWKE'S BAY REGIONAL COUNCIL			
PROJECT: Pōrangahau Stopbanks			
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED
DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	DATE
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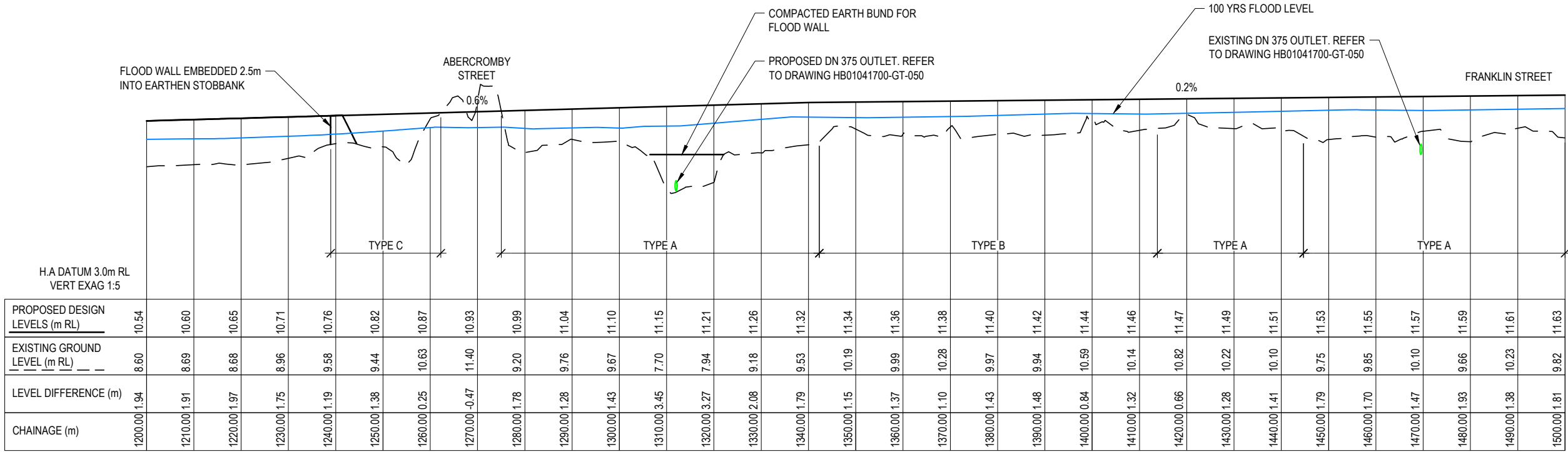
PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 4		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-014	REV : 0



KEY:	
	EXISTING
	PARCEL BOUNDARY
	STORMWATER
	STORMWATER CHANNEL
	WASTEWATER
	WATER PIPE
	CHORUS CABLE
	VALVE, HYDRANT, METER
PROPOSED	
	TOP OF BANK
	STORMWATER DRAIN
	BOTTOM OF BANK
	TOP OF STOP BANK CENTERLINE
	TOP OF SHEETPILE WALL CENTERLINE
	STORMWATER CULVERT

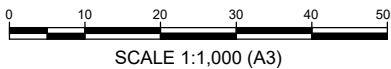
NOTES

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- LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
- FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-061.



STOPBANK SECTIONS A, B & C LONG SECTION CH1200 TO CH1500

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



SCALE 1:1,000 (A3)

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

TE KAUNIHERA A-ROHE O TE MATAU-A-MĀUI

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CLIENT: HAWKE'S BAY REGIONAL COUNCIL

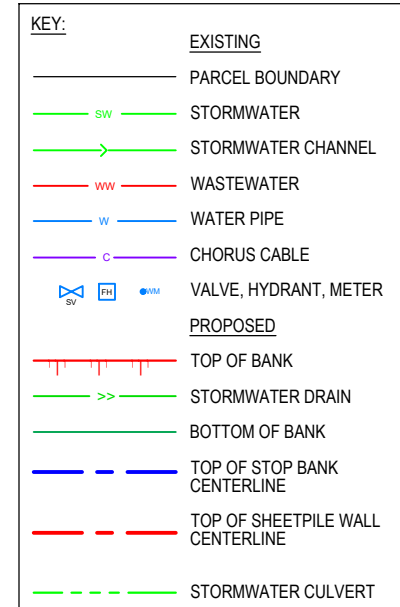
PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

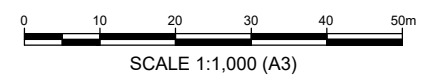
SCALE: AS SHOWN (A3)

DRAWING NO.: HB01041700-GT-015

REV: 0



1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.
8. FLOOD WALL TO BE SHEET PILLED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
9. LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
10. FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-061.
11. ALL ACCESS RAMPS ARE TO BE SURFACED WITH MIN. 200mm OF COMPACTED ROAD BASECOURSE.

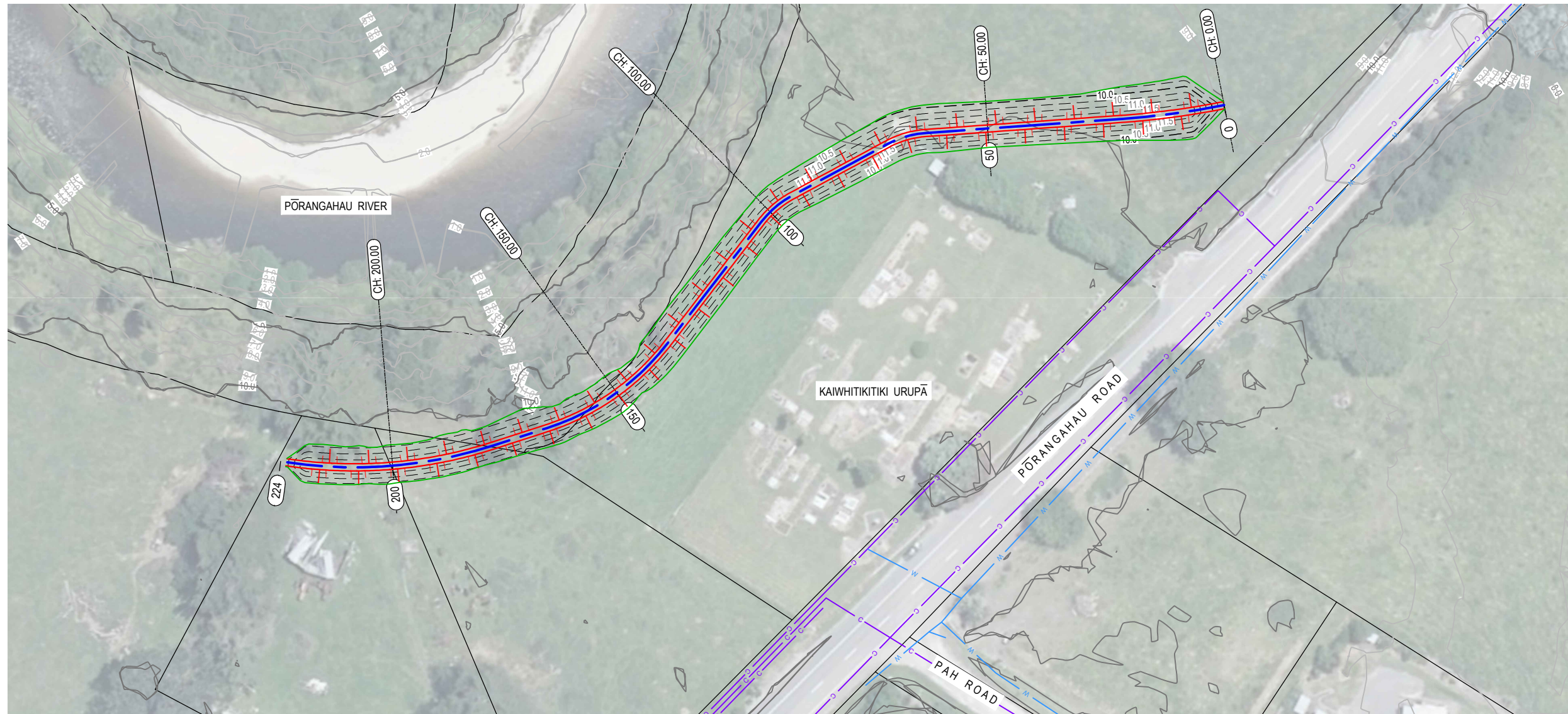


FOR TENDER

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

ORIGINAL DRAWING IN COLOUR

[illegible]

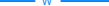


PLAN
SCALE 1:1000

CHAINAGE (m)	LEVEL DIFFERENCE (m)	EXISTING GROUND LEVEL (m RL)	PROPOSED DESIGN LEVELS (m RL)
0.00	0.00	8.96	8.96
10.00	2.58	9.24	11.83
20.00	2.16	9.86	11.83
30.00	1.86	9.96	11.83
40.00	1.81	10.02	11.83
50.00	1.81	10.02	11.83
60.00	1.86	9.97	11.83
70.00	1.85	9.98	11.83
80.00	1.74	10.08	11.83
90.00	1.61	10.21	11.83
100.00	1.45	10.38	11.83
110.00	1.54	10.28	11.83
120.00	1.70	10.12	11.83
130.00	1.63	10.19	11.83
140.00	1.58	10.25	11.83
150.00	1.61	10.21	11.83
160.00	1.39	10.44	11.83
170.00	1.44	10.39	11.83
180.00	1.26	10.57	11.83
190.00	1.51	10.32	11.83
200.00	1.41	10.42	11.83
210.00	1.48	10.34	11.83
220.00	0.96	10.30	11.27
229.66	10.34	10.34	10.34

KAIWHITIKITIKI URUPĀ STOPBANK LONG SECTION CH0 TO CH305

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

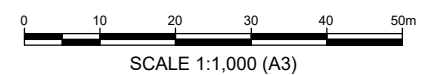
<u>KEY:</u>	<u>EXISTING</u>
	PARCEL BOUNDARY
	STORMWATER
	STORMWATER CHANNEL
	WASTEWATER
	WATER PIPE
	CHORUS CABLE
  	VALVE, HYDRANT, METER
<u>PROPOSED</u>	
	TOP OF BANK
	STORMWATER DRAIN
	BOTTOM OF BANK
	TOP OF STOP BANK CENTERLINE
	TOP OF SHEETPILE WALL CENTERLINE
	STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 5786886 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.

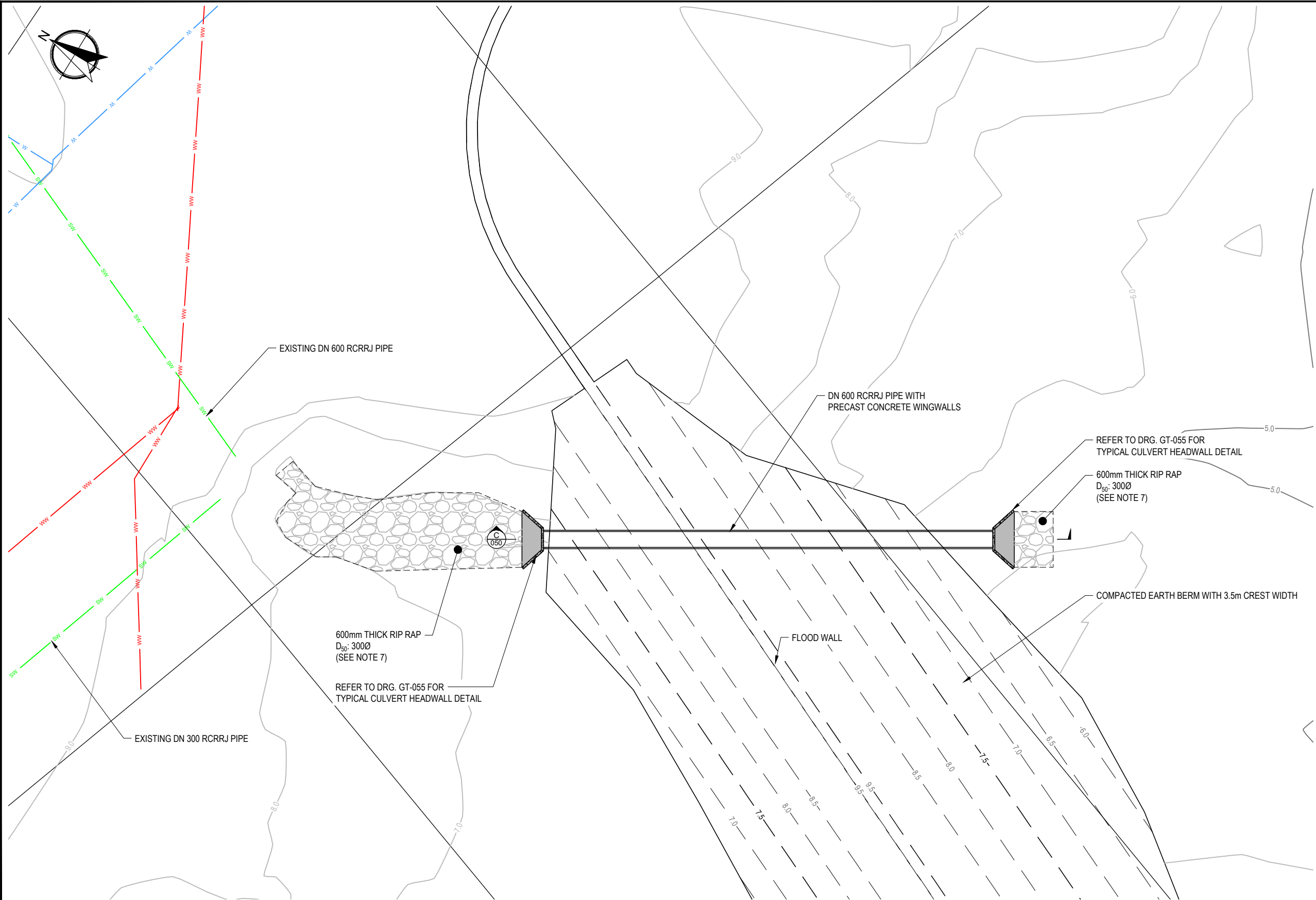
NOTES

1. REFER DRAWING HB01041700-GT-002



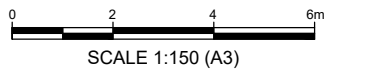
FOR TENDER

[illegible]



KEY:	
EXISTING	
	PARCEL BOUNDARY
	STORMWATER
	STORMWATER CHANNEL
	WASTEWATER
	WATER PIPE
	CHORUS CABLE
	VALVE, HYDRANT, METER
PROPOSED	
	TOP OF BANK
	STORMWATER DRAIN
	BOTTOM OF BANK
	TOP OF STOP BANK CENTERLINE
	TOP OF SHEETPILE WALL CENTERLINE
	STORMWATER CULVERT

- NOTES**
- REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
 - DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
 - COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
 - LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
 - GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
 - ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
 - EXTENT OF RIPRAP AT EXISTING OUTLETS TO SUIT ON-SITE CONDITIONS.



FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS



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CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE OCT 25	APPROVED	DATE
DRAWN SHK	DRAWING CHECK DFP	DATE OCT 25	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

DETAILED PLAN VIEW OF KEPPEL STREET OUTLET		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-020	REV : 0

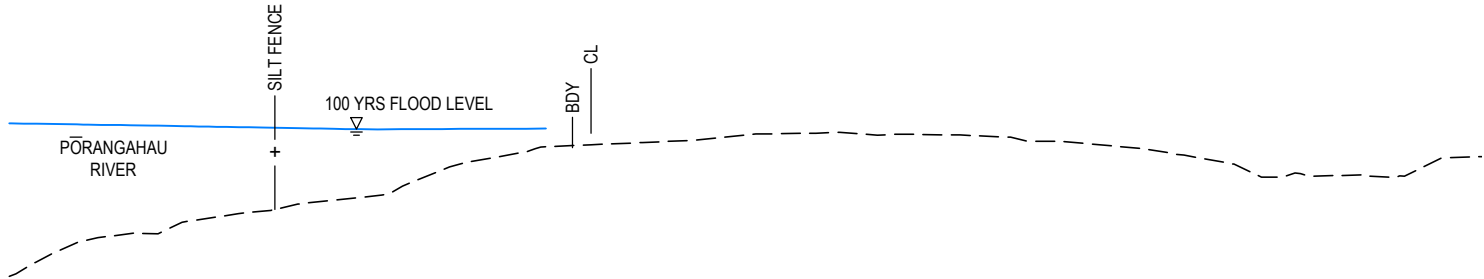
[illegible]



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	
EXISTING LEVELS (m RL)	
LEVEL DIFFERENCE (m)	
OFFSETS (m)	

XSEC CL-STOPBANK-COMBINED-SLG_61 (CH:00)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	
EXISTING LEVELS (m RL)	
LEVEL DIFFERENCE (m)	
OFFSETS (m)	

XSEC CL-STOPBANK-COMBINED-SLG_62 (CH:50)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.

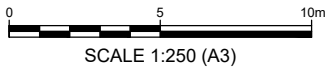
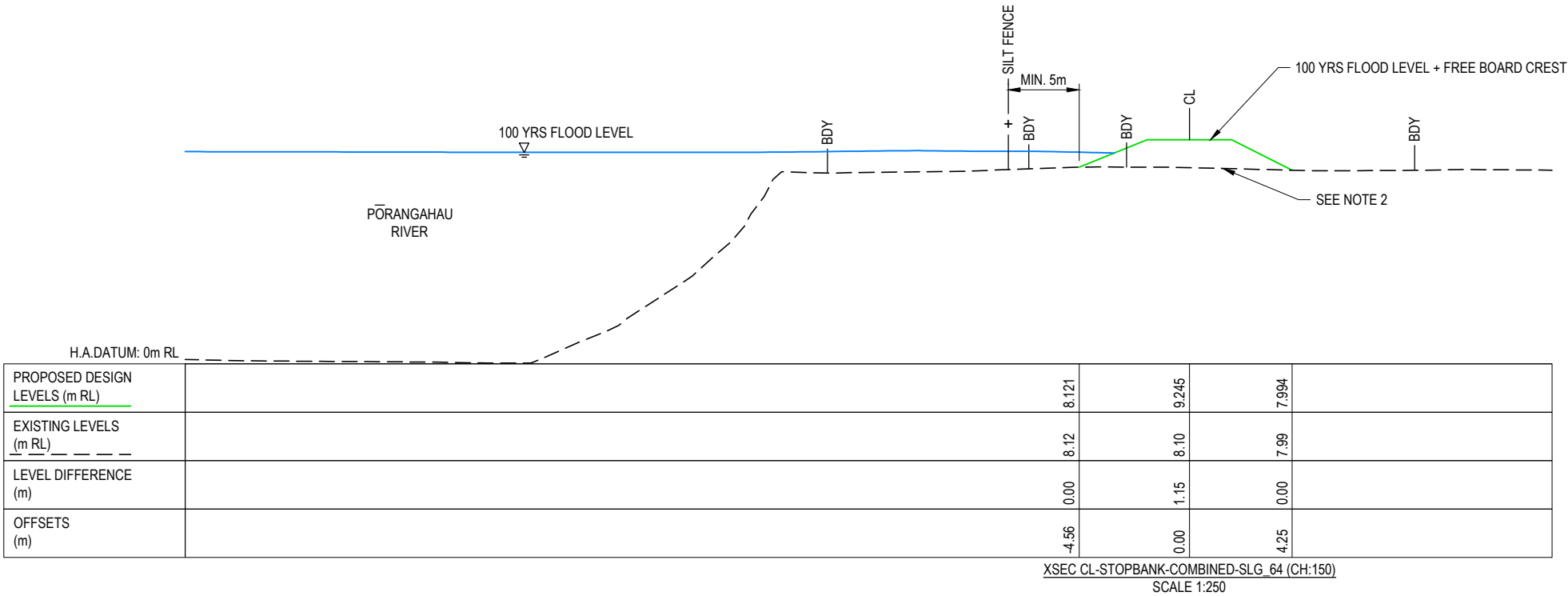
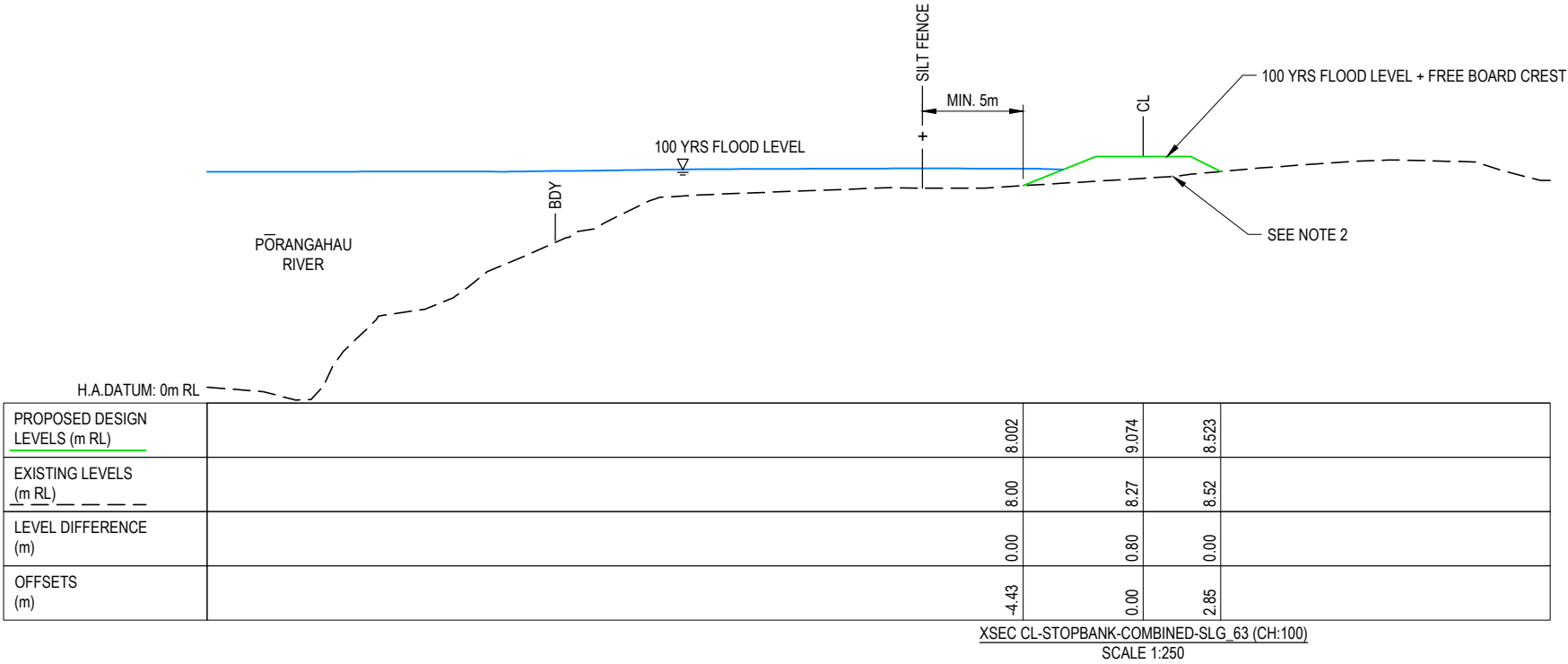


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CLIENT: HAWKE'S BAY REGIONAL COUNCIL					
PROJECT: PŌRANGAHAU STOPBANKS					
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 1					
SCALE :	DRAWING NO. :	REV :			
AS SHOWN (A3)	HB01041700-GT-030	0			

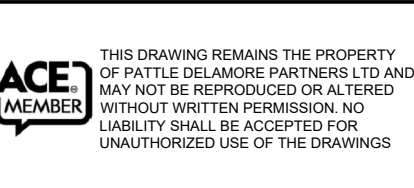
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 - 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 - 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 - 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



FOR TENDER

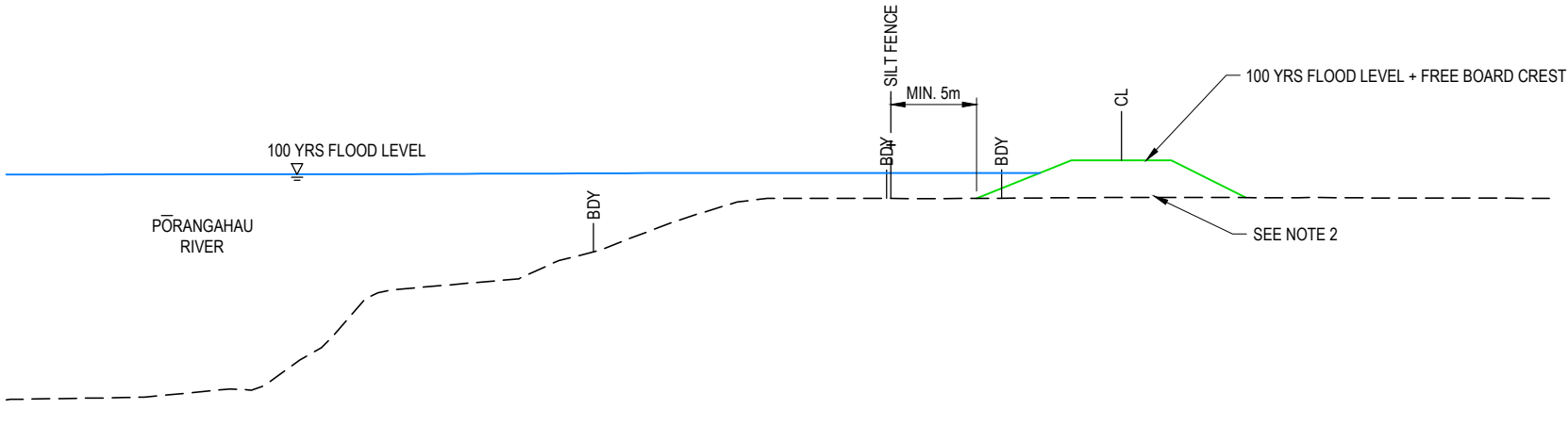
ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL					
PROJECT: PŌRANGAHAU STOPBANKS					
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 2		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-031	REV : 0

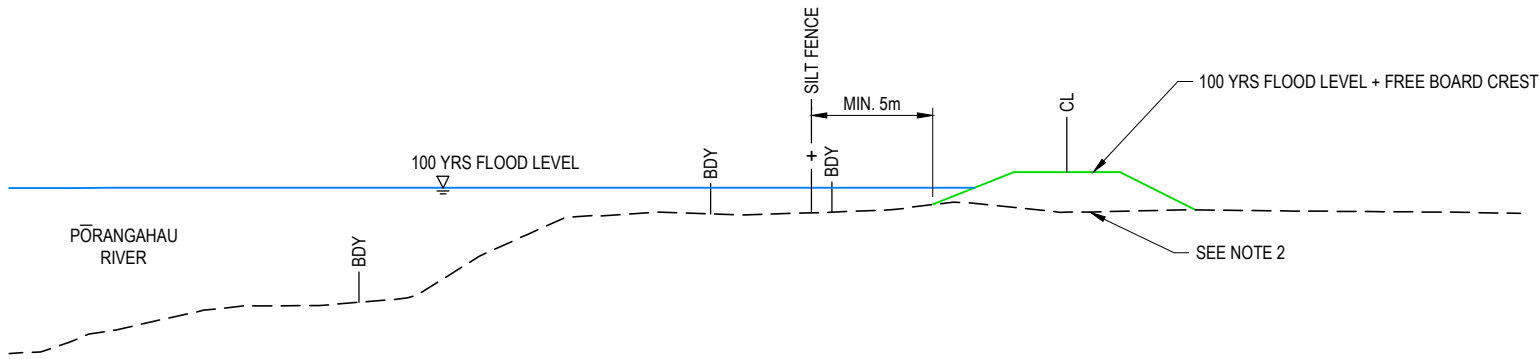


PROPOSED DESIGN LEVELS (m RL)			8.087		9.416		8.113	
EXISTING LEVELS (m RL)			8.09		8.12		8.11	
LEVEL DIFFERENCE (m)			0.00		1.30		0.00	
OFFSETS (m)			-5.07		0.00		4.36	

XSEC CL-STOPBANK-COMBINED-SLG_65 (CH:200)
SCALE 1:250

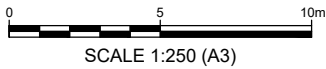
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



PROPOSED DESIGN LEVELS (m RL)			8.408		9.485		8.233	
EXISTING LEVELS (m RL)			8.41		8.16		8.23	
LEVEL DIFFERENCE (m)			0.00		1.33		0.00	
OFFSETS (m)			-4.44		0.00		4.25	

XSEC CL-STOPBANK-COMBINED-SLG_66 (CH:250)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



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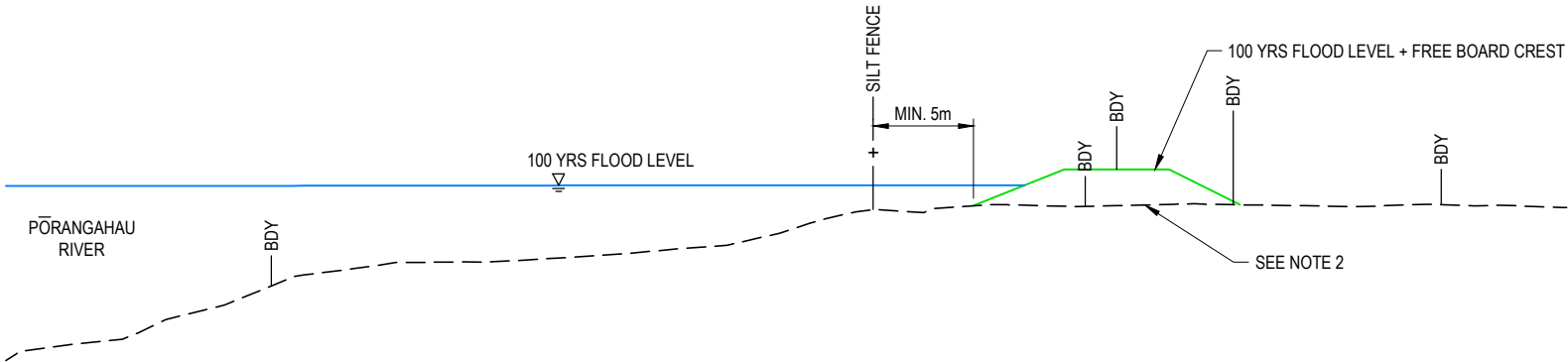
CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 3

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-032	0

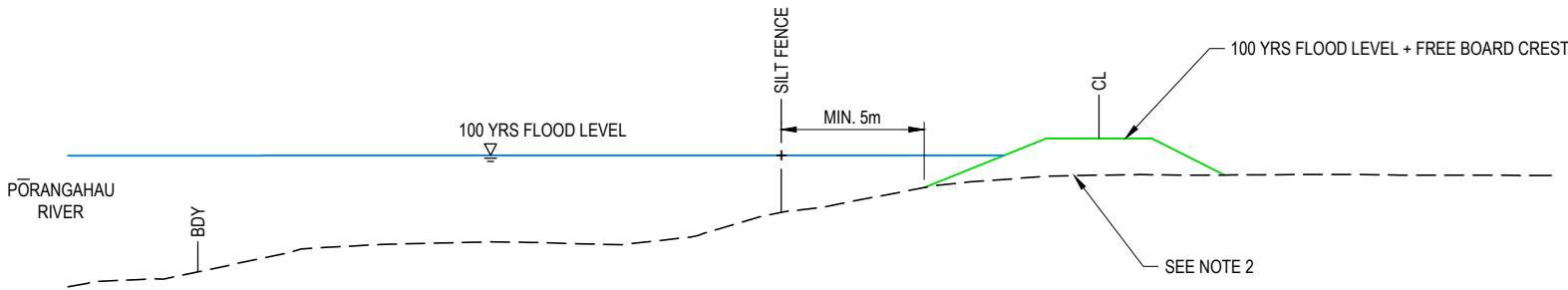
NOTES:

- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
- 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
- 3. FOOTPRINT TO BE COMPACTED IN-SITU.
- 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
- 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
- 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
- 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



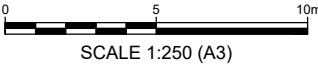
H.A.DATUM: 0m RL				
PROPOSED DESIGN LEVELS (m RL)			8.318	
EXISTING LEVELS (m RL)			8.32	
LEVEL DIFFERENCE (m)			0.00	
OFFSETS (m)			-4.77	

XSEC CL-STOPBANK-COMBINED-SLG_67 (CH:300)
SCALE 1:250



H.A.DATUM: 0m RL				
PROPOSED DESIGN LEVELS (m RL)			7.950	
EXISTING LEVELS (m RL)			7.95	
LEVEL DIFFERENCE (m)			0.00	
OFFSETS (m)			-5.80	

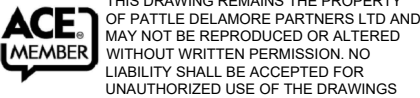
XSEC CL-STOPBANK-COMBINED-SLG_68 (CH:350)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



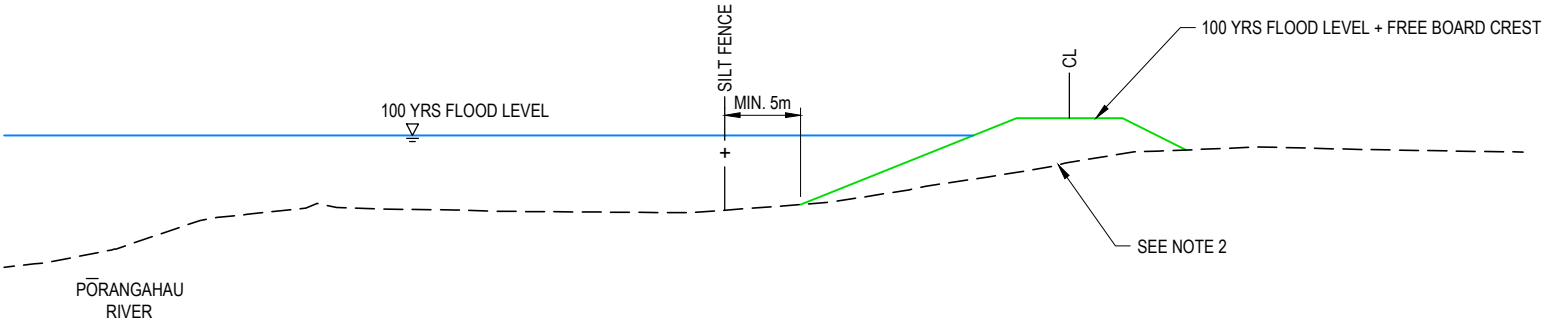
CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 4

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-033	0

NOTES:

- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
- 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
- 3. FOOTPRINT TO BE COMPACTED IN-SITU.
- 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
- 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
- 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
- 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.

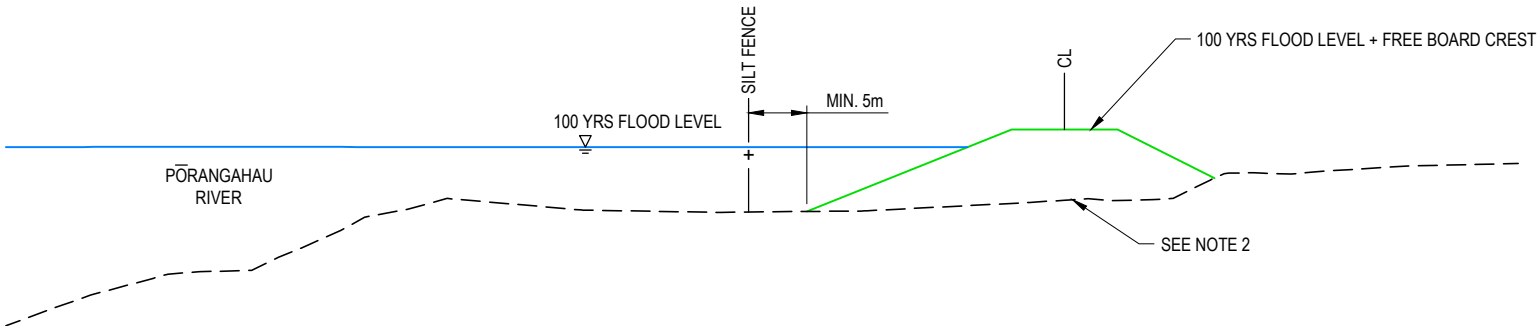


H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)		6.732	9.591	8.539	
EXISTING LEVELS (m RL)		6.73	8.13	8.54	
LEVEL DIFFERENCE (m)		0.00	1.46	0.00	
OFFSETS (m)		-8.90	0.00	3.85	

XSEC CL-STOPBANK-COMBINED-SLG_69 (CH:400)
SCALE 1:250

ILT FENCE



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)		6.895	9.604	7.998	
EXISTING LEVELS (m RL)		6.90	7.27	8.00	
LEVEL DIFFERENCE (m)		0.00	2.34	0.00	
OFFSETS (m)		-8.62	0.00	4.96	

XSEC CL-STOPBANK-COMBINED-SLG_610 (CH:450)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.

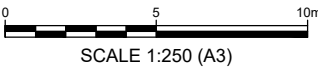
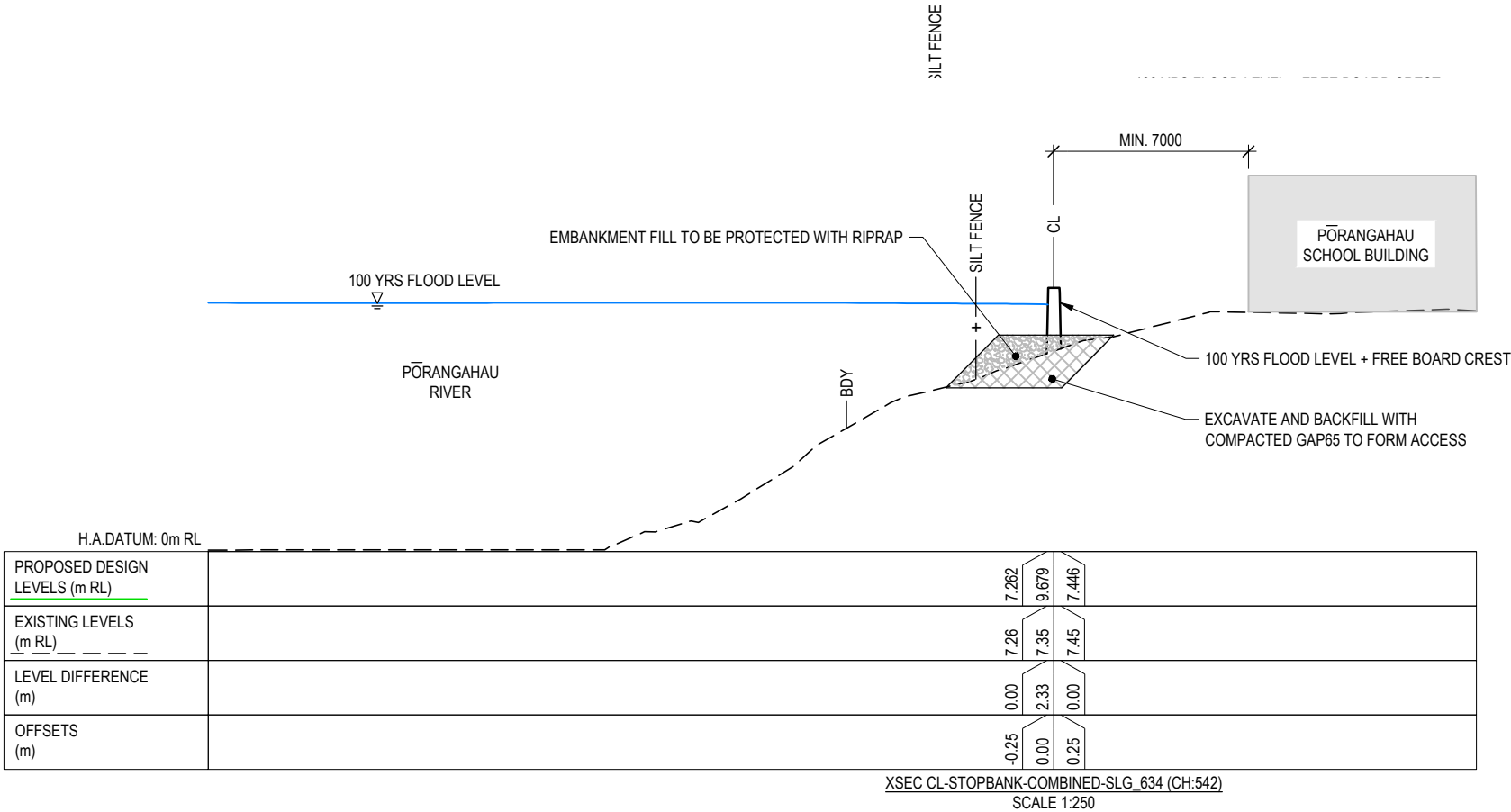
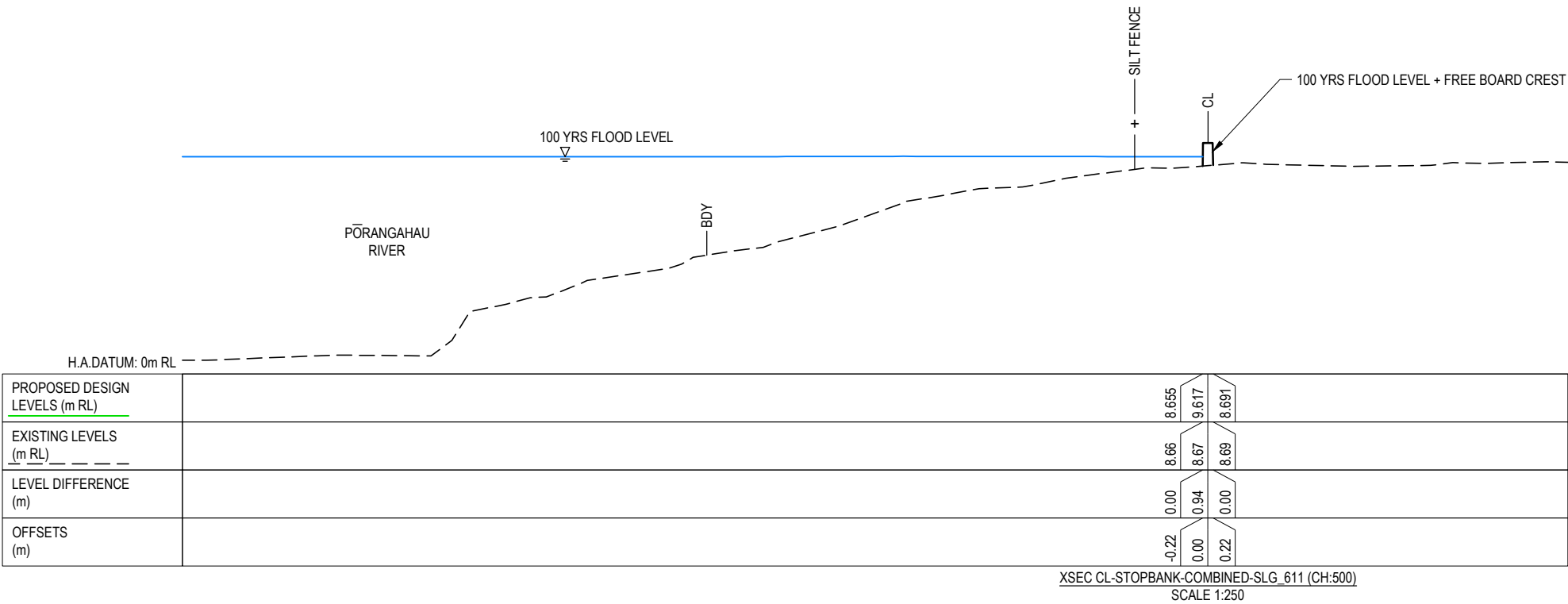


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CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 5		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-034	REV : 0

- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.

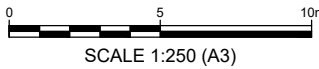
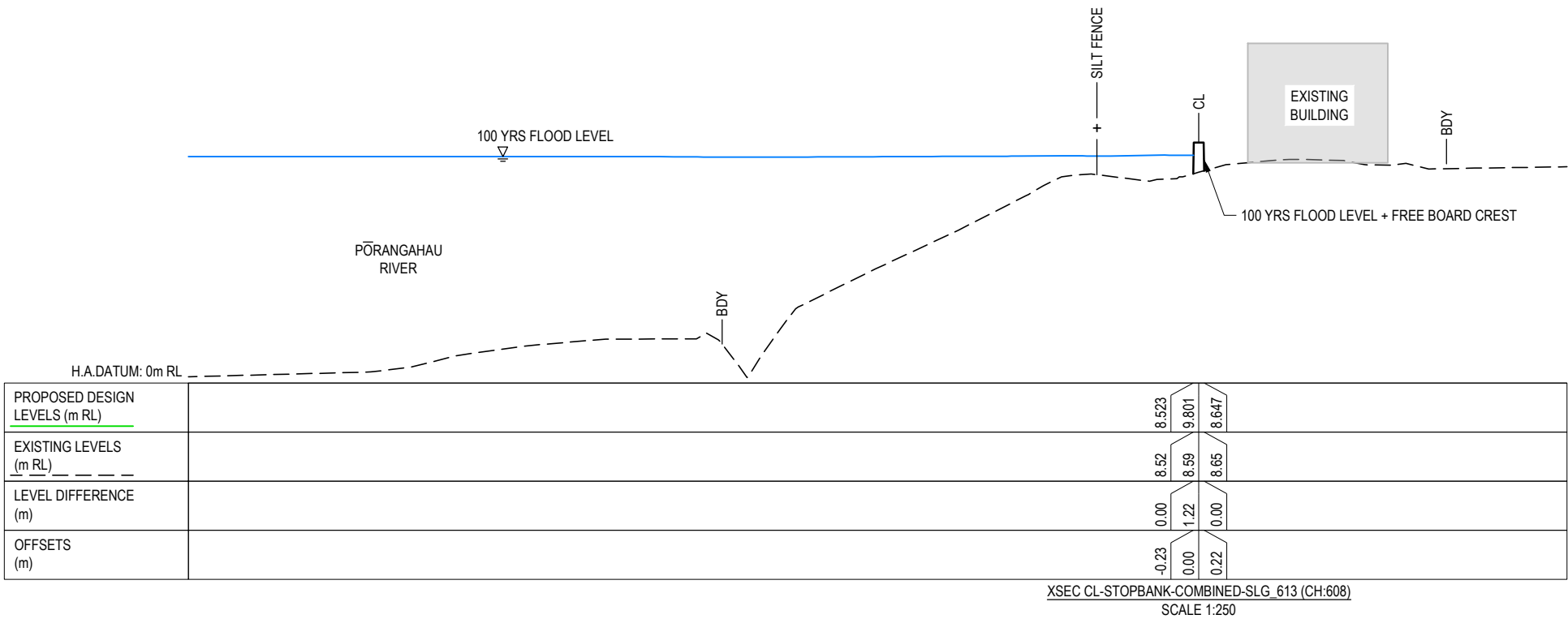
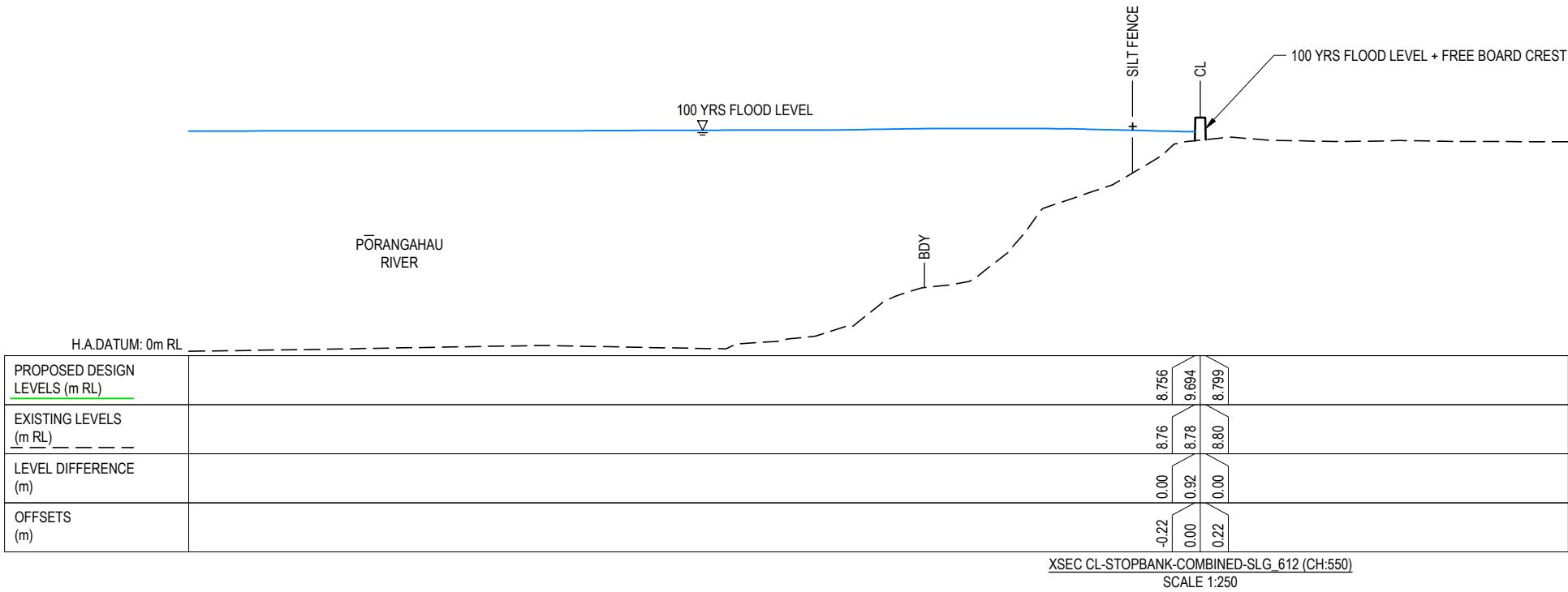


THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THE DRAWINGS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL					
PROJECT: PŌRANGAHAU STOPBANKS					
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 6		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-035	REV : 0

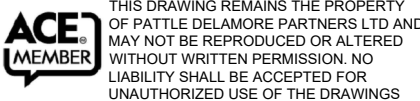
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.

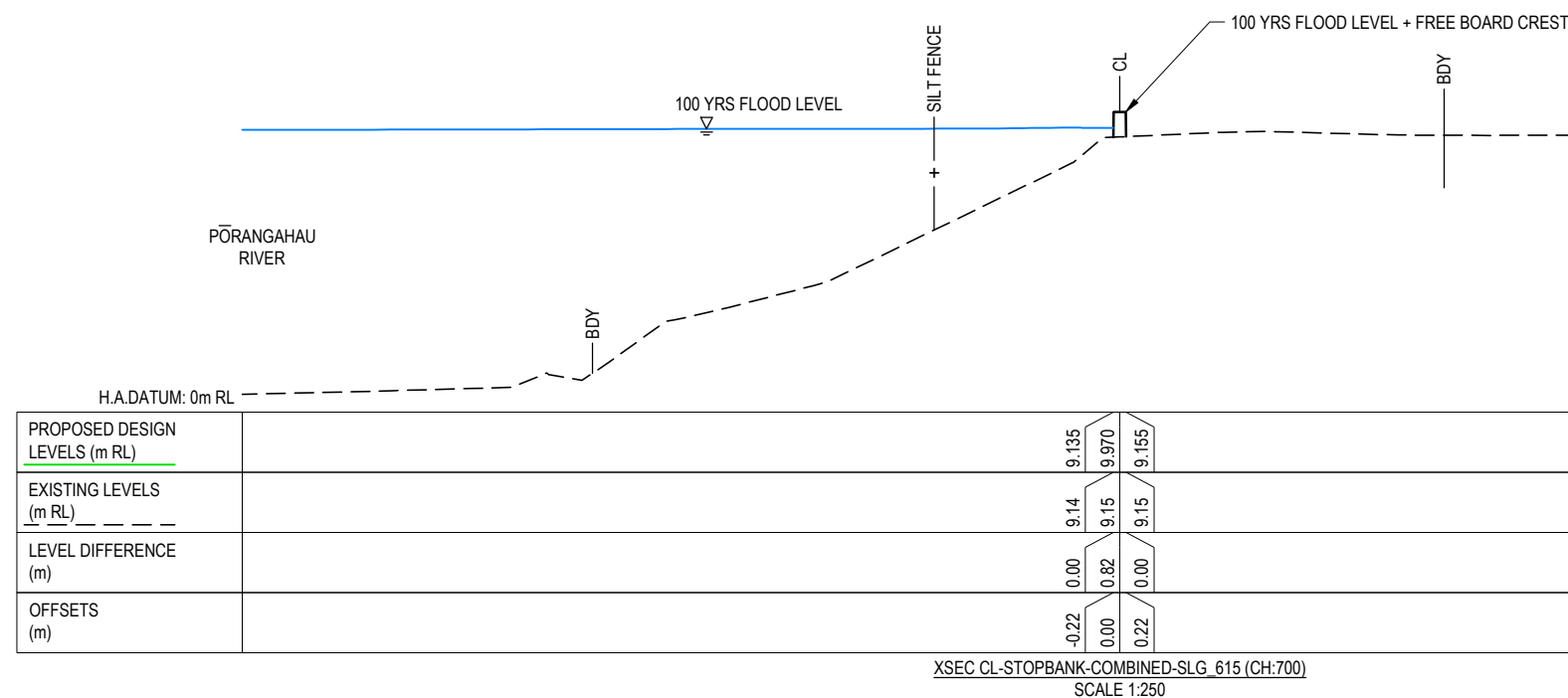


CLIENT: HAWKE'S BAY REGIONAL COUNCIL					
PROJECT: PŌRANGAHAU STOPBANKS					
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 7

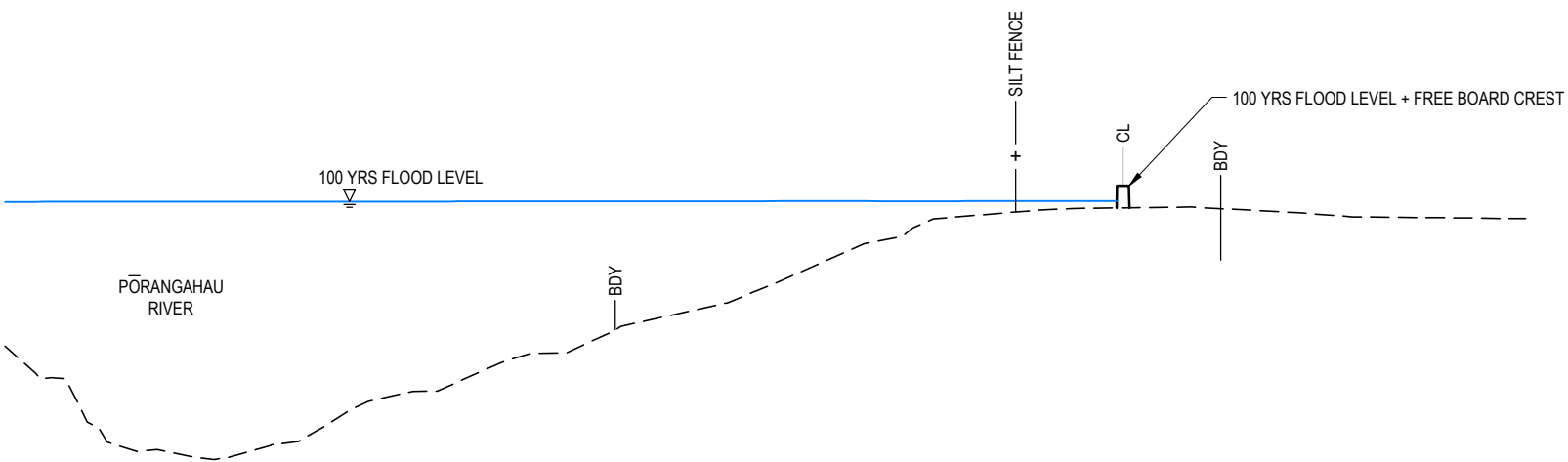
SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-036	0

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



FOR TENDER

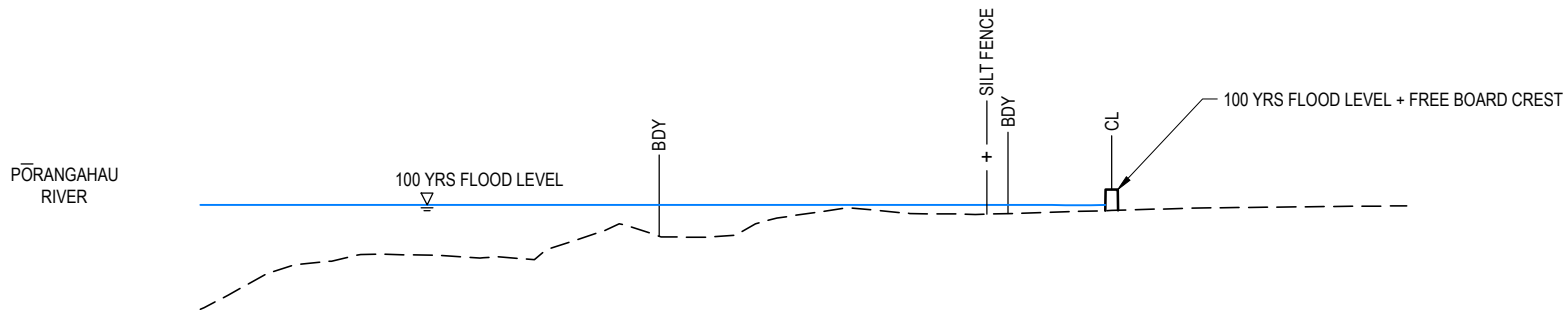
[illegible]



H.A.DATUM: 0m RL	
PROPOSED DESIGN LEVELS (m RL)	9.219 9.219 9.224
EXISTING LEVELS (m RL)	9.22 9.22 9.22
LEVEL DIFFERENCE (m)	0.00 0.75 0.00
OFFSETS (m)	-0.22 0.00 0.21

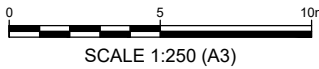
XSEC CL-STOPBANK-COMBINED-SLG_616 (CH:750)
SCALE 1:250

- NOTES:
- FOR GENERAL NOTES REFER HB01041700-GT-002.
 - REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 5m RL	
PROPOSED DESIGN LEVELS (m RL)	9.270 9.270 9.282
EXISTING LEVELS (m RL)	9.27 9.28 9.28
LEVEL DIFFERENCE (m)	0.00 0.69 0.00
OFFSETS (m)	-0.21 0.00 0.21

XSEC CL-STOPBANK-COMBINED-SLG_617 (CH:800)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



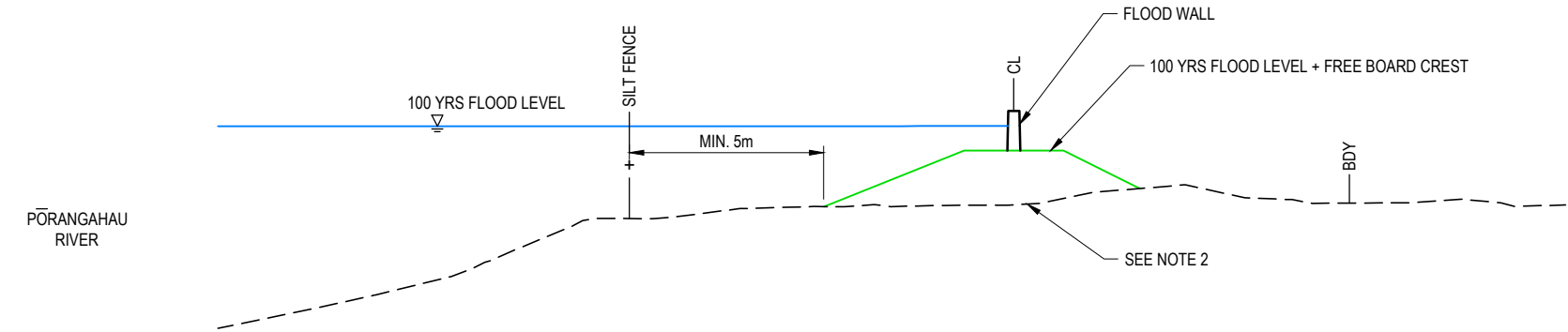
THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THE DRAWINGS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 9

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-038	0

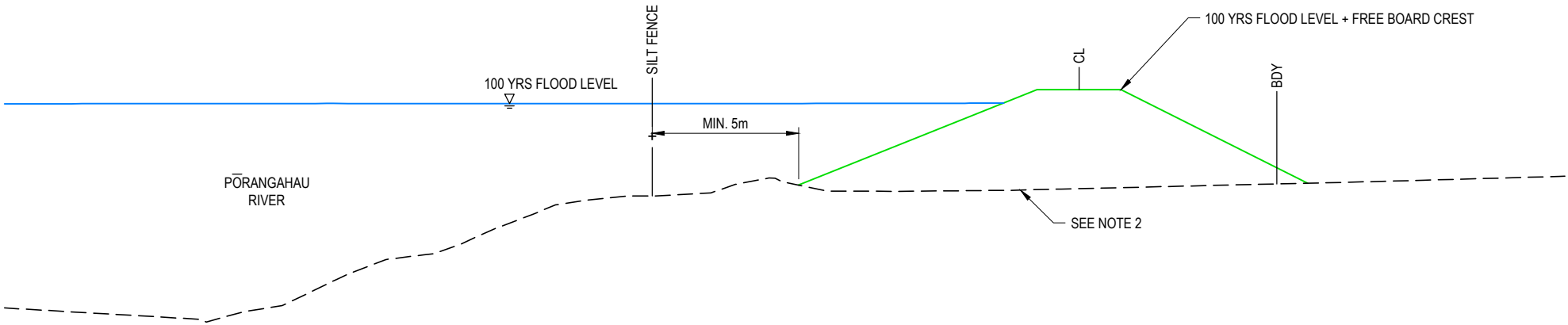
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 - 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 - 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 - 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.
 - 7. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)		6.599	9.970	7.238	
EXISTING LEVELS (m RL)		6.60	6.66	7.24	
LEVEL DIFFERENCE (m)		0.00	3.31	0.00	
OFFSETS (m)		-6.70	0.00	4.43	

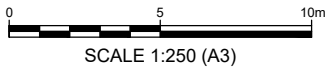
XSEC CL-STOPBANK-COMBINED-SLG_618 (CH:850)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)		6.010	9.989	6.093	
EXISTING LEVELS (m RL)		6.01	5.87	6.09	
LEVEL DIFFERENCE (m)		0.00	4.12	0.00	
OFFSETS (m)		-11.70	0.00	9.54	

XSEC CL-STOPBANK-COMBINED-SLG_619 (CH:900)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



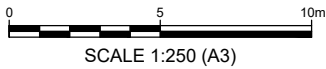
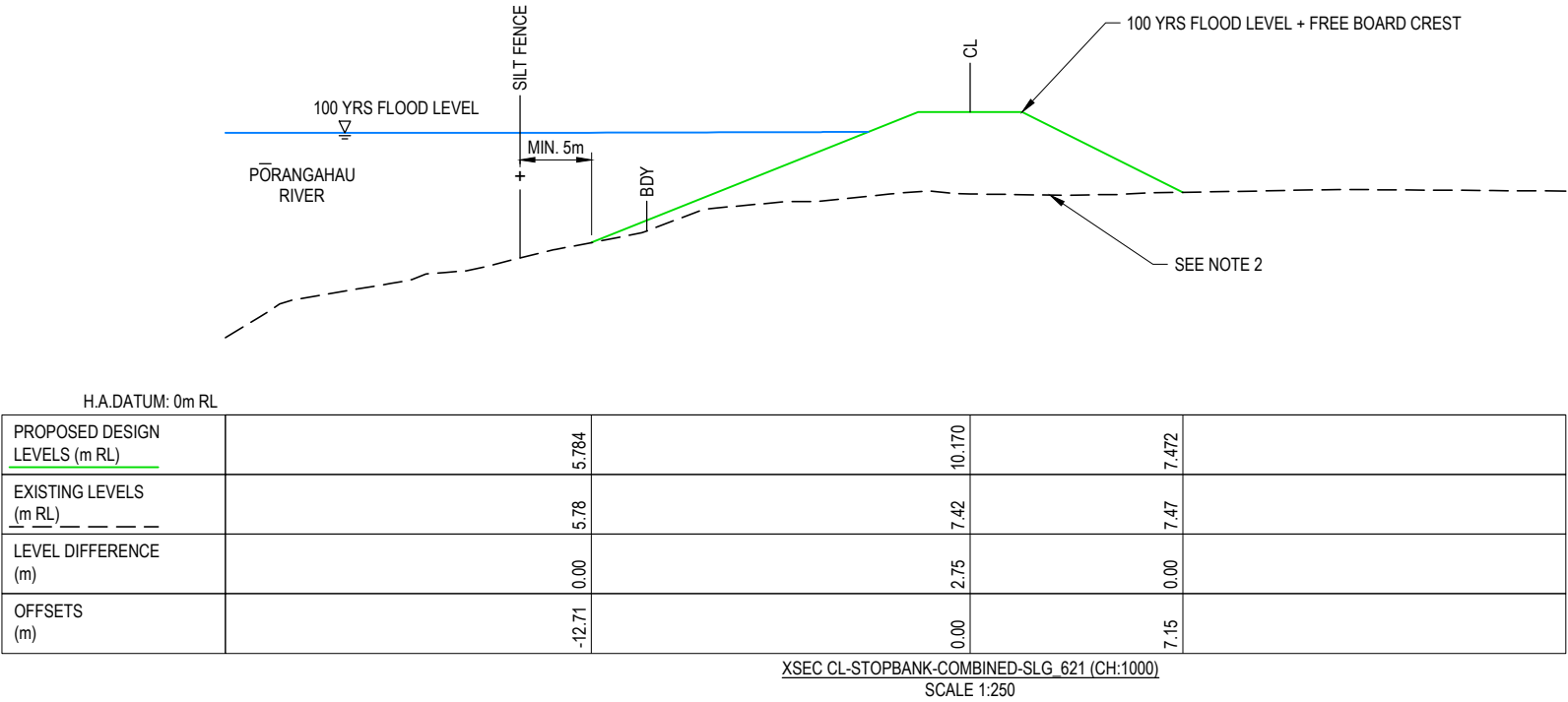
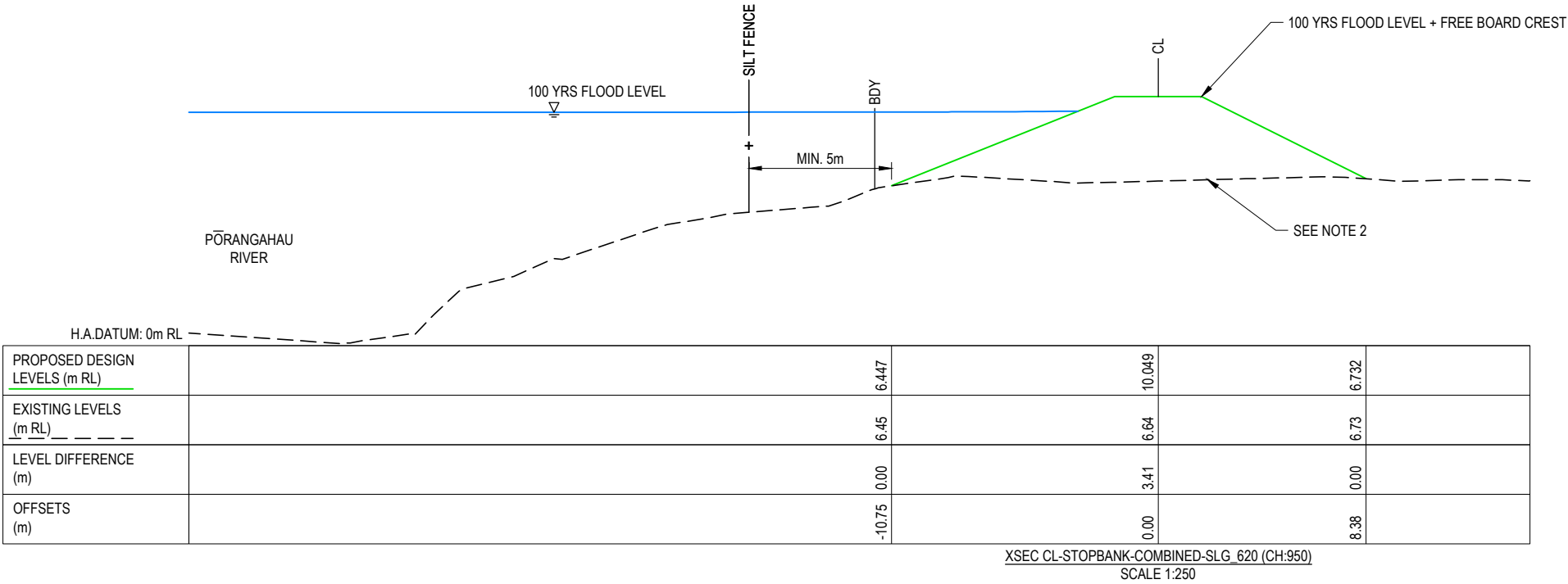
THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THE DRAWINGS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 10

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-039	0

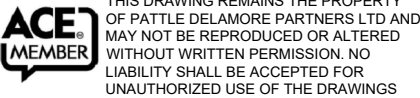
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 - 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 - 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 - 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.

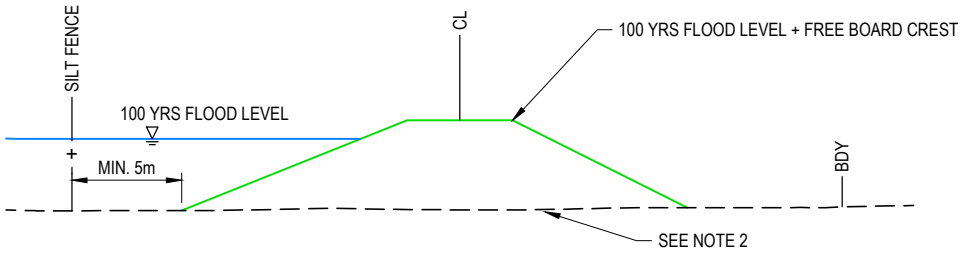


CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 11

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-040	0

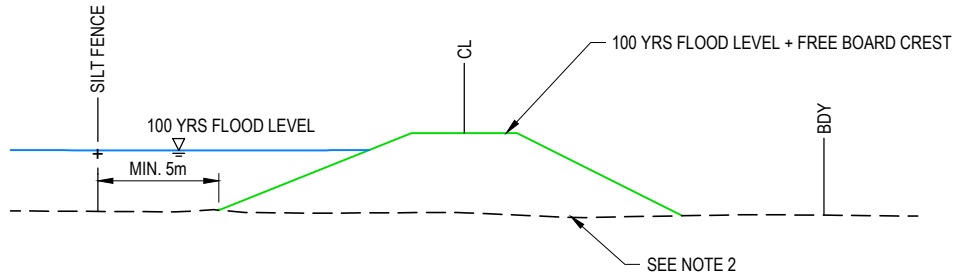
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 - 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 - 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 - 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	7.247	10.228	7.341
EXISTING LEVELS (m RL)	7.25	7.27	7.34
LEVEL DIFFERENCE (m)	0.00	2.96	0.00
OFFSETS (m)	-9.20	0.00	7.52

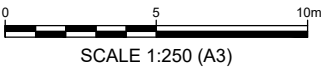
XSEC CL-STOPBANK-COMBINED-SLG_622 (CH:1050)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	7.741	7.746	10.285	7.556
EXISTING LEVELS (m RL)	7.74	7.74	7.66	7.56
LEVEL DIFFERENCE (m)	0.00	0.01	2.63	0.00
OFFSETS (m)	-8.11	-8.10	0.00	7.21

XSEC CL-STOPBANK-COMBINED-SLG_623 (CH:1100)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



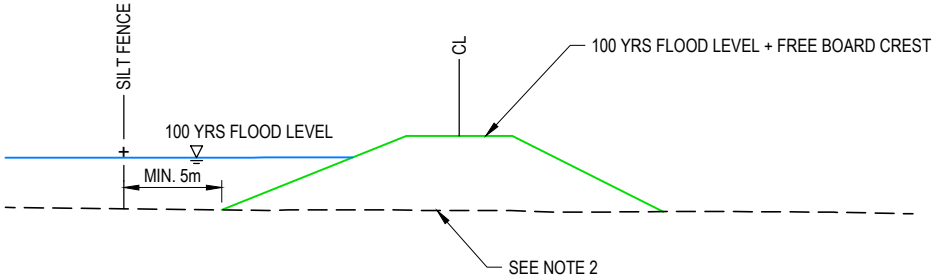
THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THE DRAWINGS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 12

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-041	0

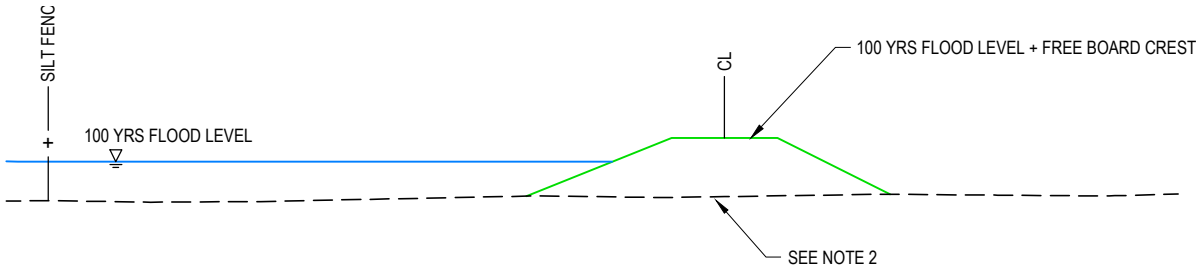
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 - 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 - 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 - 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	8.025	10.467	7.967
EXISTING LEVELS (m RL)	8.02	8.00	7.97
LEVEL DIFFERENCE (m)	0.00	2.46	0.00
OFFSETS (m)	-7.85	0.00	6.75

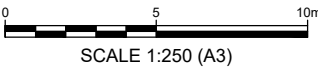
XSEC CL-STOPBANK-COMBINED-SLG_624 (CH:1150)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	8.617	10.540	8.677
EXISTING LEVELS (m RL)	8.62	8.60	8.68
LEVEL DIFFERENCE (m)	0.00	1.94	0.00
OFFSETS (m)	-6.56	0.00	5.48

XSEC CL-STOPBANK-COMBINED-SLG_625 (CH:1200)
SCALE 1:250

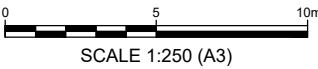
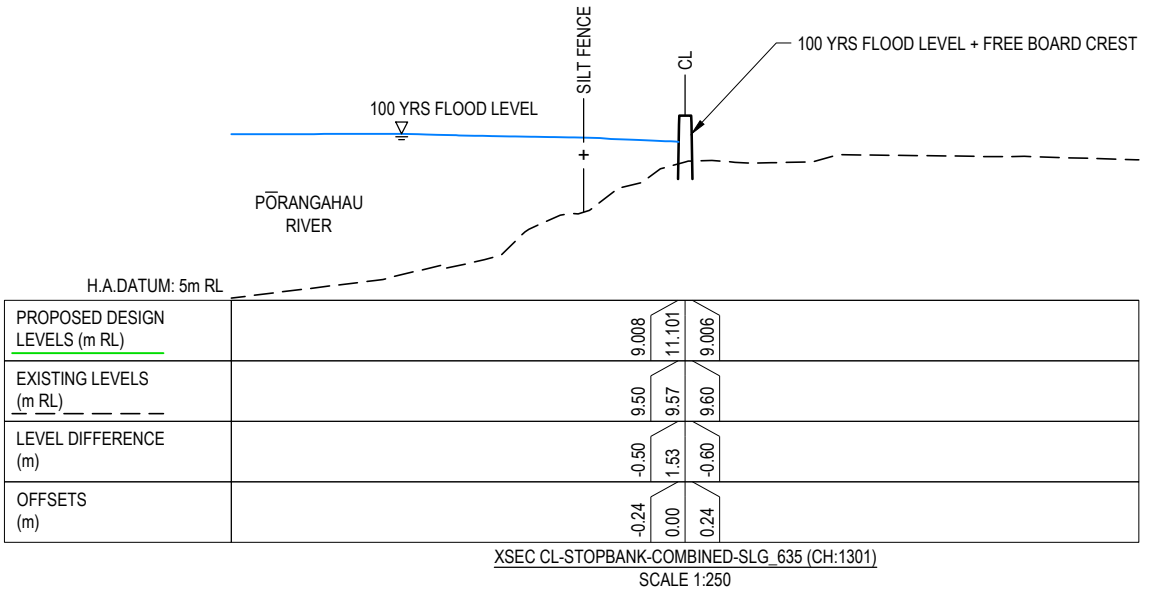
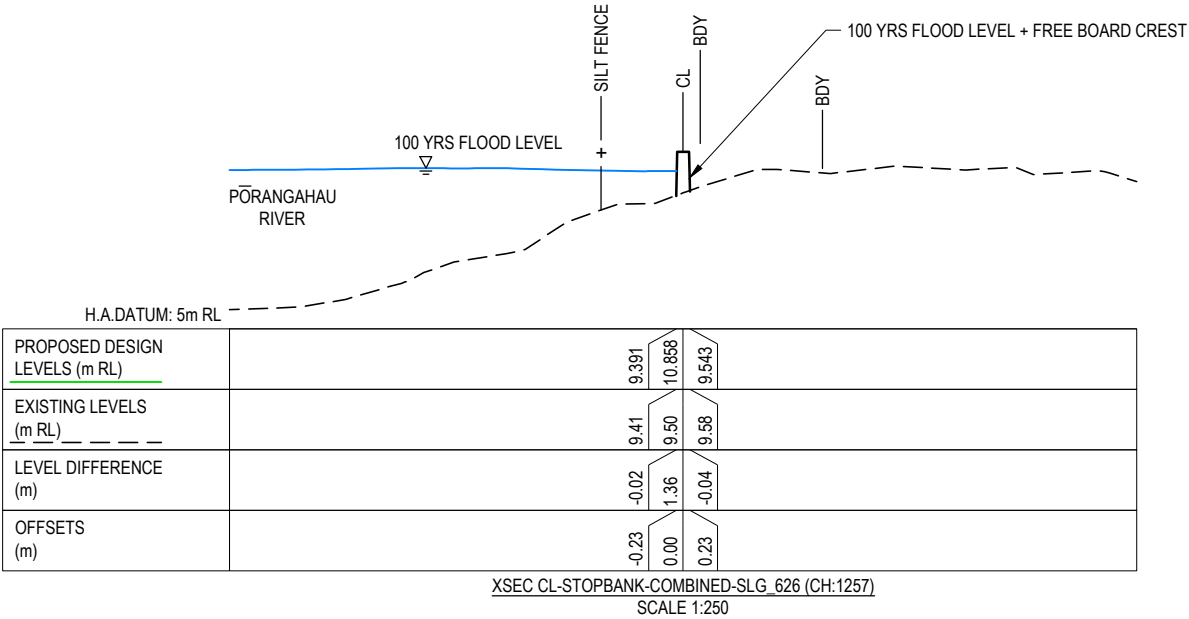


FOR TENDER

ORIGINAL DRAWING IN COLOUR

				 TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI	 PATTLE DELAMORE PARTNERS	 THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THE DRAWINGS	CLIENT: HAWKE'S BAY REGIONAL COUNCIL					PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 13			
							PROJECT: PŌRANGAHAU STOPBANKS								
0	FOR TENDER	OCT 25	GS				DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	SCALE :	DRAWING NO. :	REV :	
B	FOR CONSENT	APR 25					DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			AS SHOWN (A3)	HB01041700-GT-042	0
A	FOR INFORMATION	JUL 24	GS												
NO.	REVISION	DATE	APP.												

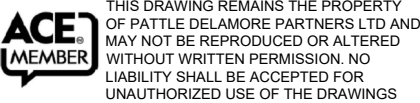
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

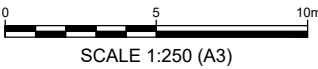
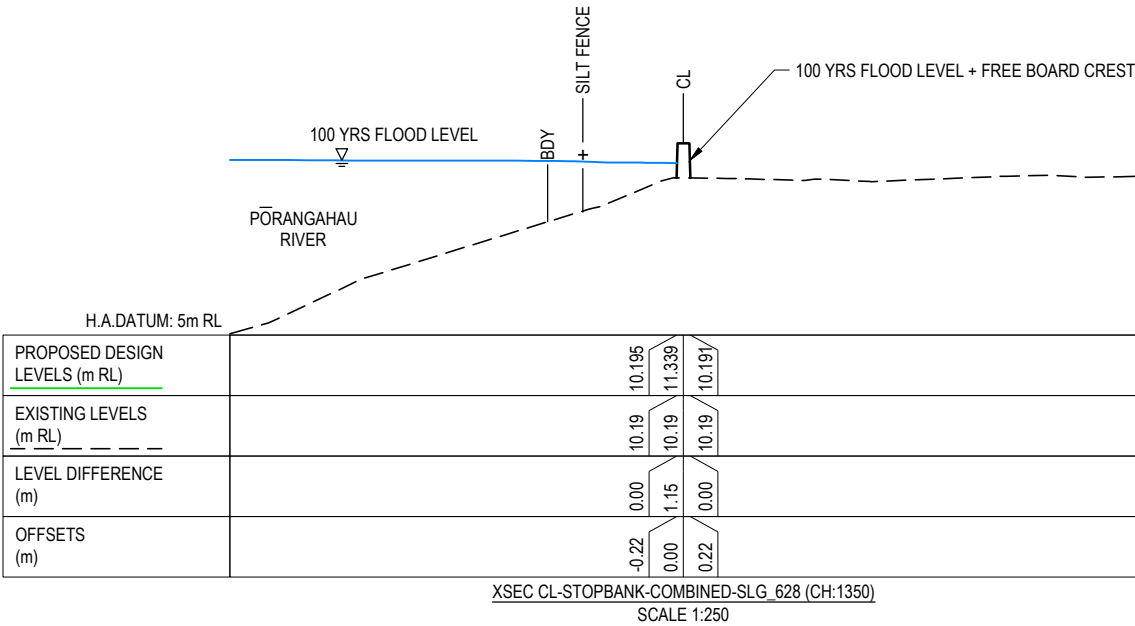
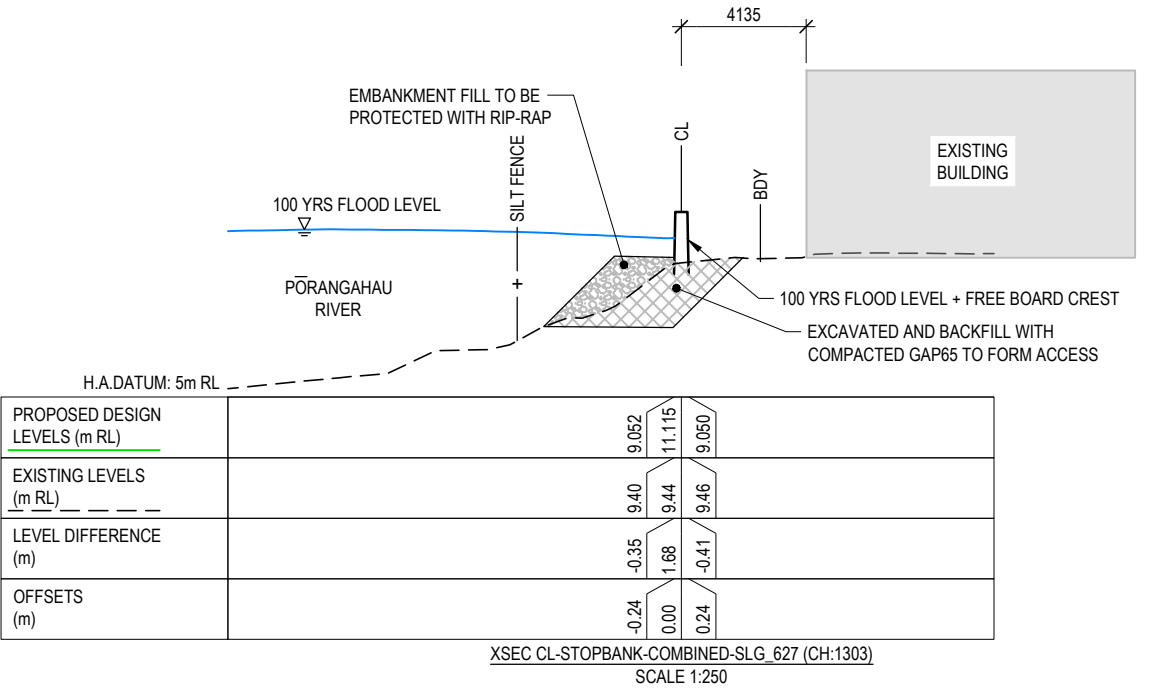
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 14		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-043	REV : 0

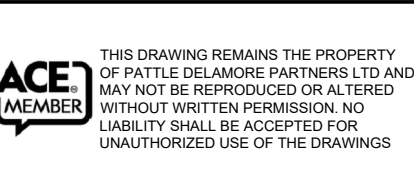
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

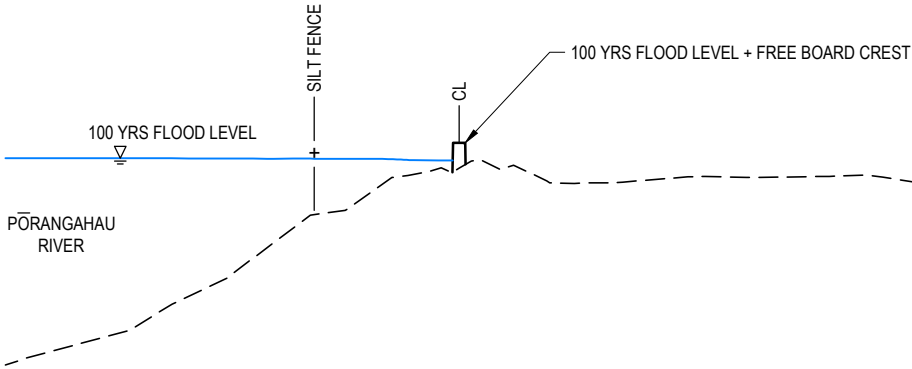
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 15				
SCALE :	DRAWING NO. :	REV :		
AS SHOWN (A3)	HB01041700-GT-044	0		

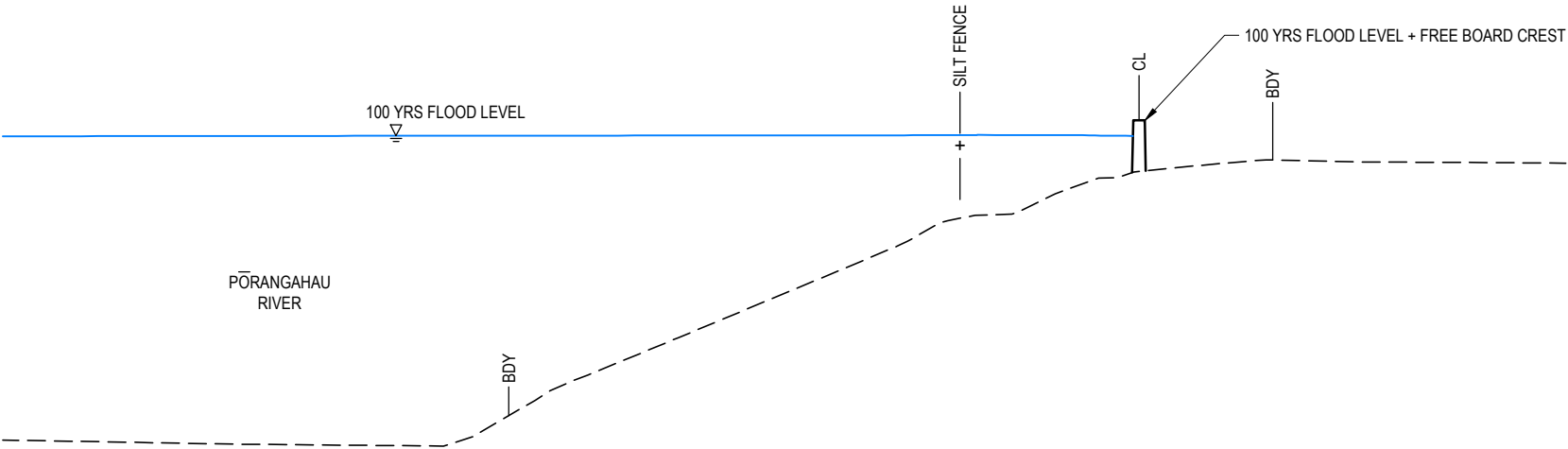
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)			10.460	11.436	10.720
EXISTING LEVELS (m RL)			10.46	10.59	10.72
LEVEL DIFFERENCE (m)			0.00	0.84	0.00
OFFSETS (m)			-0.22	0.00	0.21

XSEC CL-STOPBANK-COMBINED-SLG_629 (CH:1400)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)				9.712	11.533	9.772
EXISTING LEVELS (m RL)				9.71	9.75	9.77
LEVEL DIFFERENCE (m)				0.00	1.79	0.00
OFFSETS (m)				-0.24	0.00	0.24

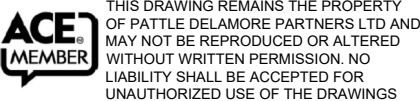
XSEC CL-STOPBANK-COMBINED-SLG_630 (CH:1450)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

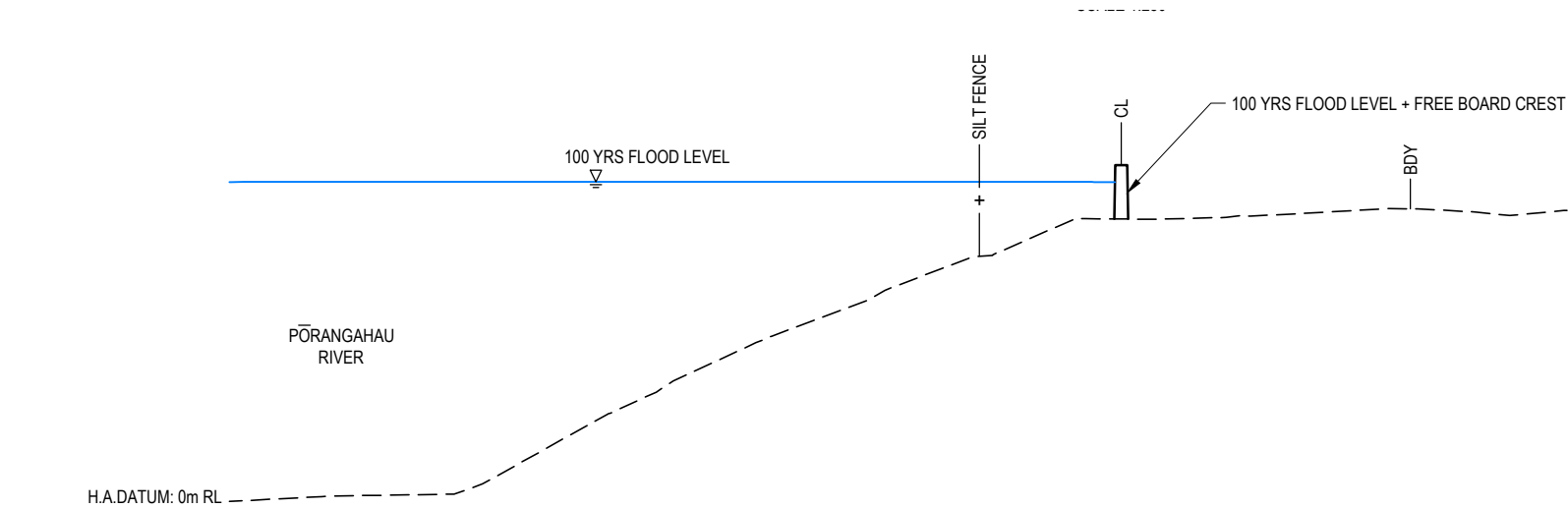
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL					
PROJECT: PŌRANGAHAU STOPBANKS					
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE	
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		

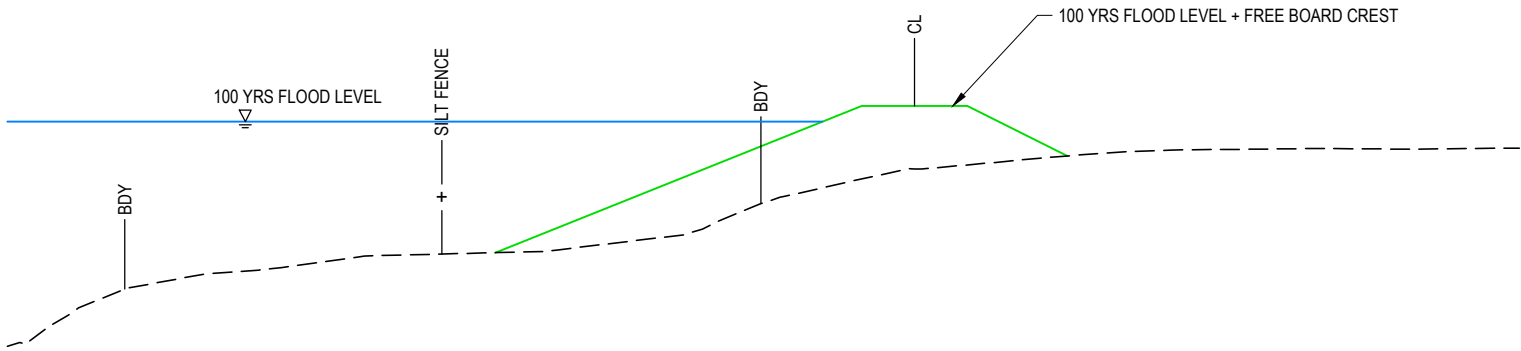
PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 16		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-045	REV : 0

- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



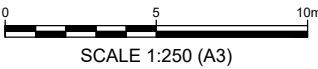
PROPOSED DESIGN LEVELS (m RL)		9.823	11.630	9.819
EXISTING LEVELS (m RL)		9.82	9.82	9.82
LEVEL DIFFERENCE (m)		0.00	1.81	0.00
OFFSETS (m)		-0.24	0.00	0.24

XSEC CL-STOPBANK-COMBINED-SLG_631 (CH:1500)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)		6.782	11.630	9.981
EXISTING LEVELS (m RL)		6.78	9.55	9.98
LEVEL DIFFERENCE (m)		0.00	2.08	0.00
OFFSETS (m)		-13.87	0.00	5.05

XSEC CL-STOPBANK-COMBINED-SLG_632 (CH:1550)
SCALE 1:250

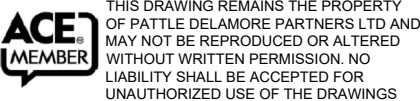


SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.

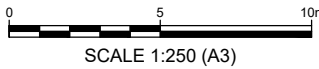
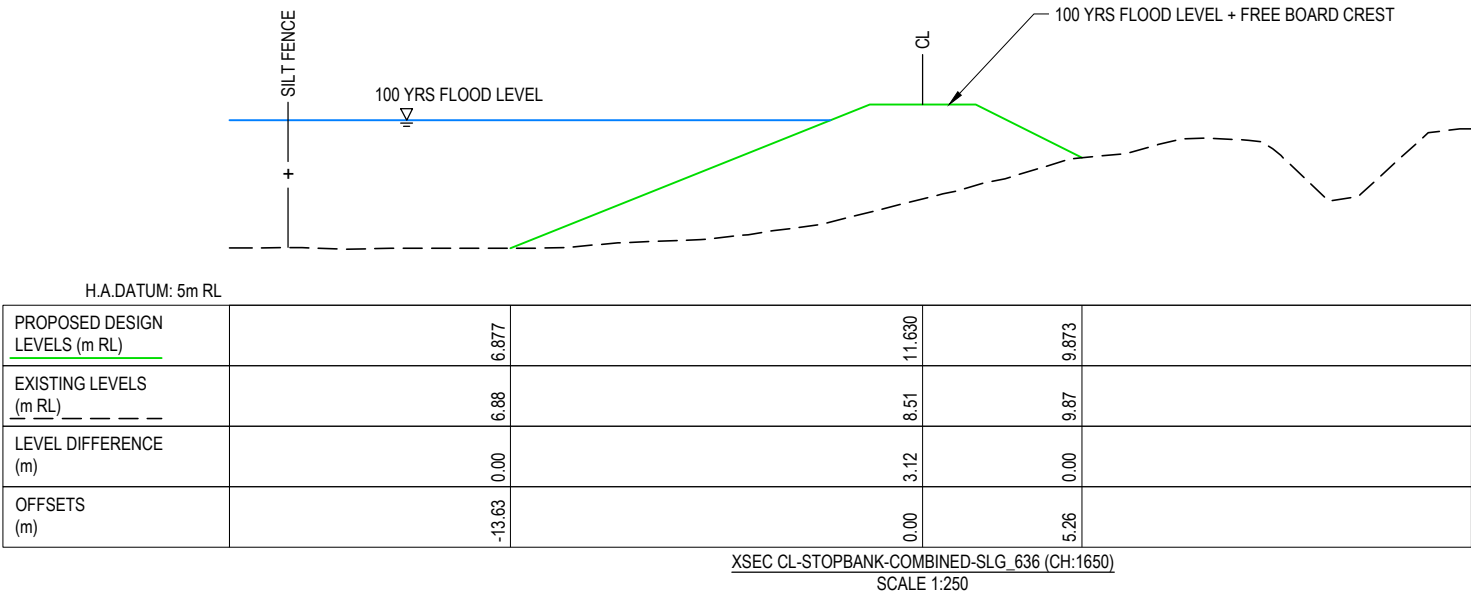
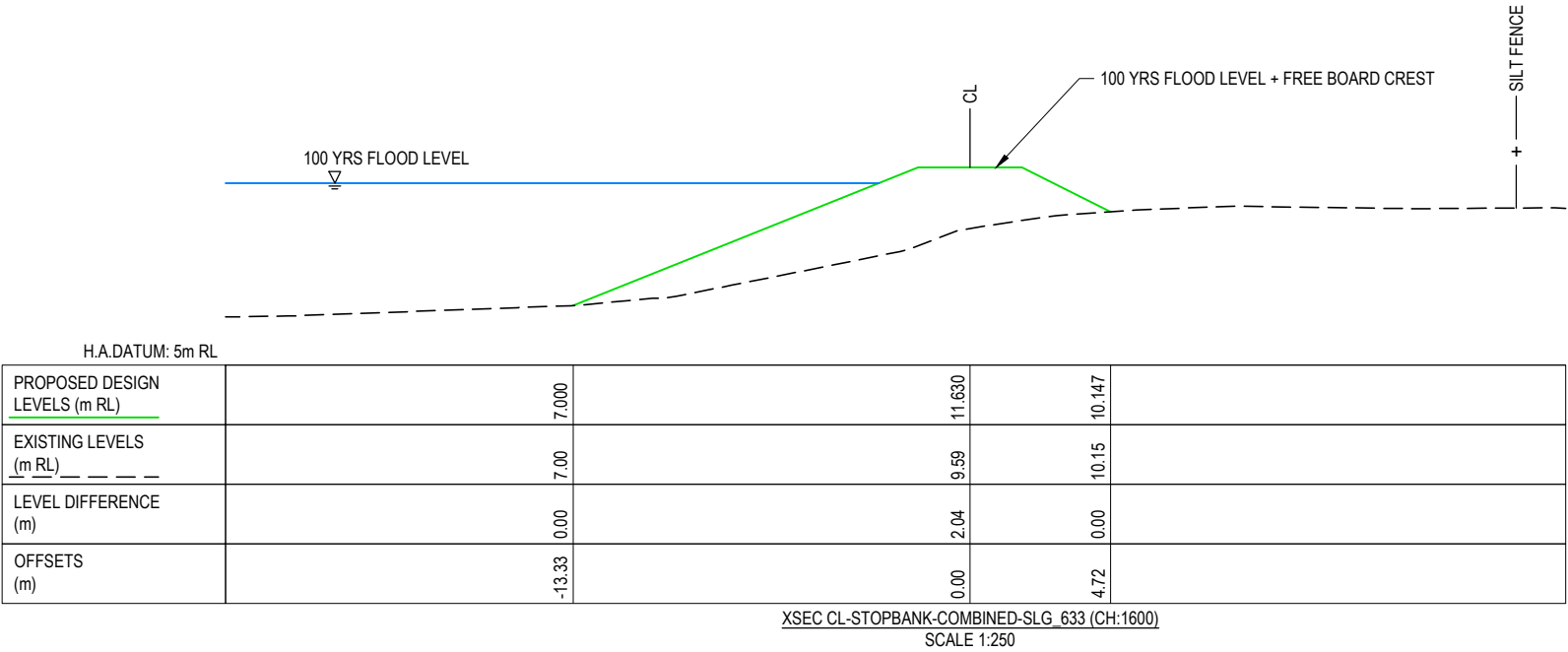


CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 17

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-046	0

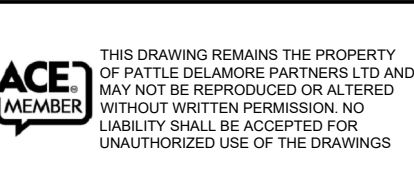
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

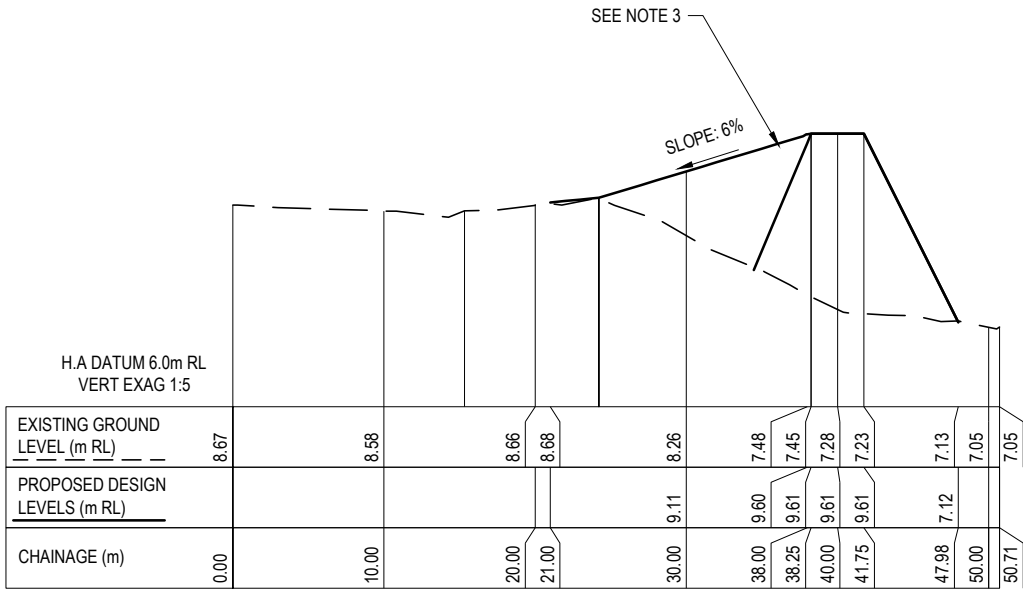
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



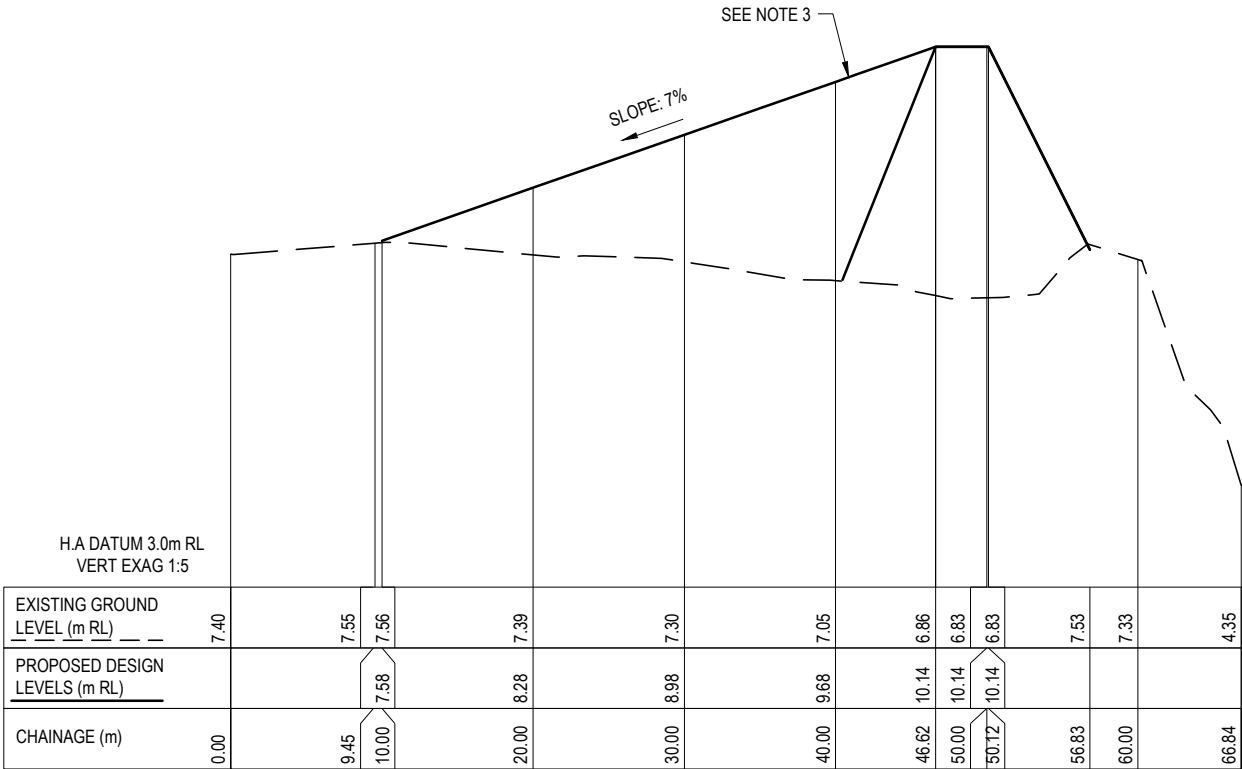
CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK DFP	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 18		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-047	REV : 0

- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.
 - 3. ALL ACCESS RAMPS ARE TO BE SURFACED WITH MIN. 200mm OF COMPACTED ROAD BASECOURSE.



JONES STREET ON-RAMP LONG SECTION A
012
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



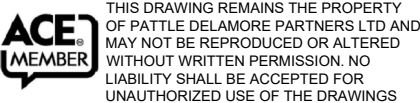
MOORE STREET ON-RAMP LONG SECTION E
014
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

0 10 20m
SCALE 1:500 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
NO.	REVISION	DATE	APP.



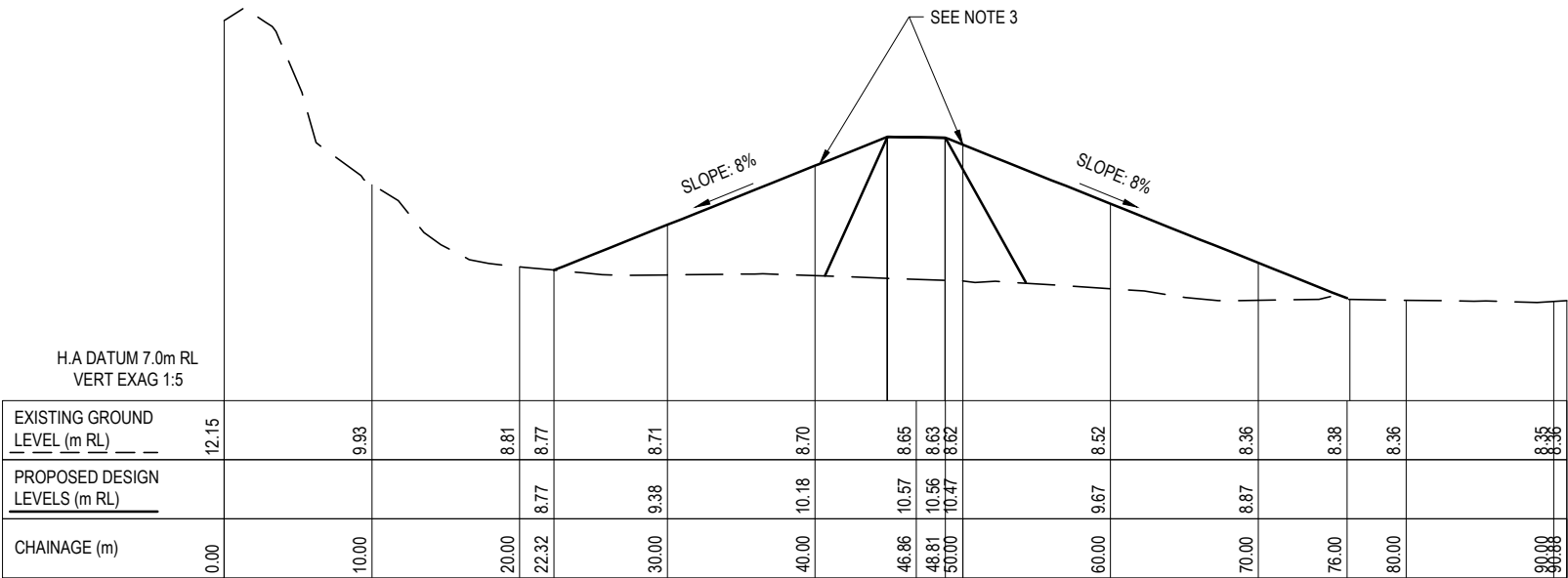
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CLIENT: HAWKE'S BAY REGIONAL COUNCIL			
PROJECT: PŌRANGAHAU STOPBANKS			
DESIGNED OH	DESIGN REVIEW GS	DATE SEP 25	APPROVED
DRAWN SHK	DRAWING CHECK DFP	DATE SEP 25	DATE
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			

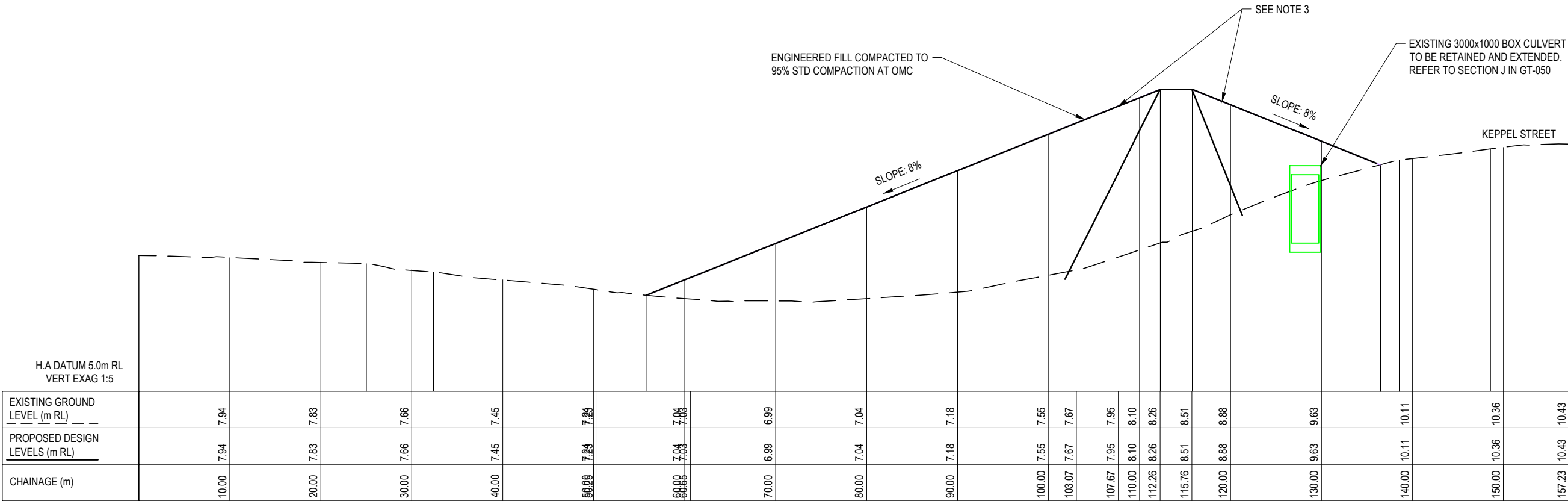
PORANGAHAU STOPBANKS RAMP LONG SECTIONS - SHEET 1

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-048	0

- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.
 - 3. ALL ACCESS RAMPS ARE TO BE SURFACED WITH MIN. 200mm OF COMPACTED ROAD BASECOURSE.



ABERCROMBY STREET ON-RAMP LONG SECTION (F 014)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



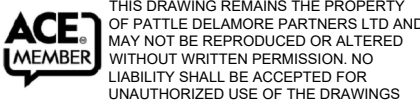
KEPPEL STREET ON-RAMP LONG SECTION (J 016)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

0 10 20m
SCALE 1:500 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL			
PROJECT: PŌRANGAHAU STOPBANKS			
DESIGNED OH	DESIGN REVIEW GS	DATE SEP 25	APPROVED
DRAWN SHK	DRAWING CHECK DFP	DATE SEP 25	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

PORANGAHAU STOPBANKS RAMP LONG SECTIONS - SHEET 2

SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-049	REV : 0
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REFER TO DRAWING GT-055 FOR
TYPICAL HEADWALL DETAIL

HA.DATUM 4m RL					
CHAINAGE (m)	0.00	10.00	10.66	20.00	24.74
EXISTING GROUND LEVEL (m RL)	8.68	7.46	7.42	7.08	6.07
PIPE INVERT LEVEL (m RL)			7.55		7.00
DEPTH TO INVERT (m)			-0.11		-0.42
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 300 13.2m		
GRADE (%)			4.21%		

OUTLET 1 - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250B
012REFER TO DRAWING GT-055 FOR
TYPICAL HEADWALL DETAIL

HA.DATUM 4m RL					
CHAINAGE (m)	0.00	10.00	11.05	20.00	25.98
EXISTING GROUND LEVEL (m RL)	7.53	6.01	6.15	6.67	5.60
PIPE INVERT LEVEL (m RL)			6.13		5.94
DEPTH TO INVERT (m)			-0.06		-0.15
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 600 17.5m		
GRADE (%)			1.09%		

OUTLET 2 - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250C
013SCRUFFY DOME INLET
REFER TO DRAWING
HB01041700-GT-060

HA.DATUM 3m RL					
CHAINAGE (m)	0.00	10.00	10.88	20.00	30.00
EXISTING GROUND LEVEL (m RL)	6.45	6.26	6.24	6.06	5.83
PIPE INVERT LEVEL (m RL)			5.36		5.90
DEPTH TO INVERT (m)			0.90		5.22
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 300 RCRRJ CLASS 2 32.0m		4.23
GRADE (%)			1.83%		

OUTLET 3 - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250D
014REFER TO DRAWING GT-055 FOR
TYPICAL HEADWALL DETAIL

HA.DATUM 4m RL					
CHAINAGE (m)	0.00	2.82	10.00	16.01	19.67
EXISTING GROUND LEVEL (m RL)	8.81	8.02	6.91	5.96	5.54
PIPE INVERT LEVEL (m RL)			8.12		5.97
DEPTH TO INVERT (m)			-0.09		-0.15
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 375 14.0m		
GRADE (%)			15.44%		

OUTLET 4 - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250G
015EXISTING GRAVITY MAIN TO BE
RETAINED. REFER TO DRAWING
GT-055 FOR TYPICAL HEADWALL
DETAIL

HA.DATUM 1m RL					
CHAINAGE (m)	0.00	10.00	10.58	11.04	20.00
EXISTING GROUND LEVEL (m RL)	10.11	10.21	10.14	10.02	6.07
PIPE INVERT LEVEL (m RL)			10.13		7.54
DEPTH TO INVERT (m)			-0.01		-0.14
PIPE TYPE, DIA (mm) & LENGTH (m)			EXISTING DN 375 9.2m		
GRADE (%)			28.18%		

OUTLET 5 - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250H
015REFER TO DRAWING GT-055 FOR
TYPICAL HEADWALL DETAILEXISTING BOX CULVERT TO BE
EXTENDED.
REFER SECTION J

HA.DATUM 5m RL					
CHAINAGE (m)	0.00	9.31	10.00	20.00	29.49
EXISTING GROUND LEVEL (m RL)	9.60	8.85	8.73	7.52	7.23
PIPE INVERT LEVEL (m RL)			8.50		7.41
DEPTH TO INVERT (m)			0.27		-0.16
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 1050 19.2m		
GRADE (%)			-5.68%		

OUTLET 6 - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250I
016KEPPEL STREET ACCESS
RAMP. SEE NOTE 4COMPACTED EARTHEN STOPBANK -
COMPACTED TO 95% STD COMPACTION AT OMCFORM SWALE TO MATCH
EXISTING SWALENEW BARGE BOARDS 700mm HIGH POLES
WITH 2No. 200mm RAILS - PAINTED WHITE
TIE INTO EXISTING FENCESEXISTING 3000x1000 BOX CULVERT
TO BE EXTENDED

HA.DATUM 6m RL					
CHAINAGE (m)	0.00	10.00	20.00		27.68
EXISTING GROUND LEVEL (m RL)	8.49	9.63	7.59		9.63
PIPE INVERT LEVEL (m RL)		8.36		8.13	
PIPE TYPE, DIA (mm) & LENGTH (m)		EX BOX CULVERT (3000X1000) 20.5m			
GRADE (%)		-1.11%			

EXISTING BOX CULVERT - LONG SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250K
0160 10 20m
SCALE 1:500 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

CLIENT:

HAWKE'S BAY REGIONAL COUNCIL

PROJECT:

PŌRANGAHAU STOPBANKS

DESIGNED
OH
DRAWN
SHKDESIGN REVIEW
GS
DRAWING CHECK
DFPDATE
SEP 25
DATE
SEP 25APPROVED
DATE

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PORANGAHAU STOPBANKS STORMWATER
OUTLET LONG SECTIONS

SCALE :

AS SHOWN (A3)

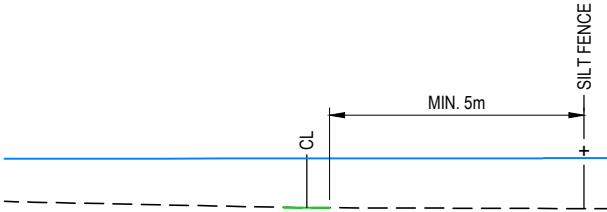
DRAWING NO. :

HB01041700-GT-050

REV :

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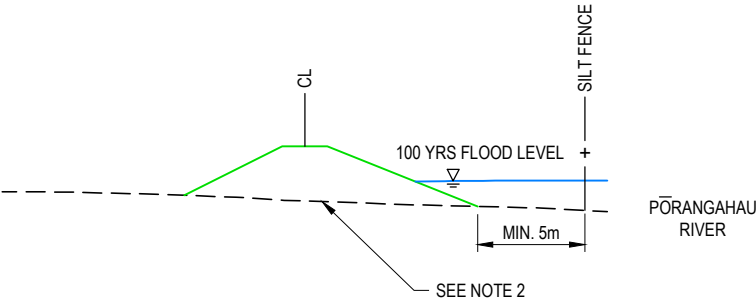
- NOTES:
- 1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 - 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 - 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 - 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 - 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)		8.973	8.963	8.959
EXISTING LEVELS (m RL)		8.97	8.96	8.96
LEVEL DIFFERENCE (m)		0.00	0.00	0.00
OFFSETS (m)		-0.77	0.00	0.76

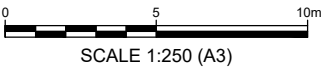
XSEC CL-STOPBANK-CEMETARY-SLG_51 (CH:00)
SCALE 1:250



H.A.DATUM: 5m RL

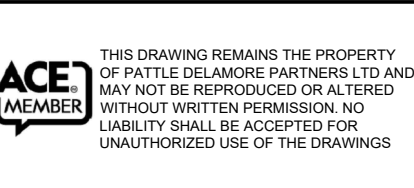
PROPOSED DESIGN LEVELS (m RL)		10.208	11.826	9.838
EXISTING LEVELS (m RL)		10.21	10.02	9.84
LEVEL DIFFERENCE (m)		0.00	1.81	0.00
OFFSETS (m)		-3.98	0.00	5.72

XSEC CL-STOPBANK-CEMETARY-SLG_52 (CH:50)
SCALE 1:250



FOR TENDER

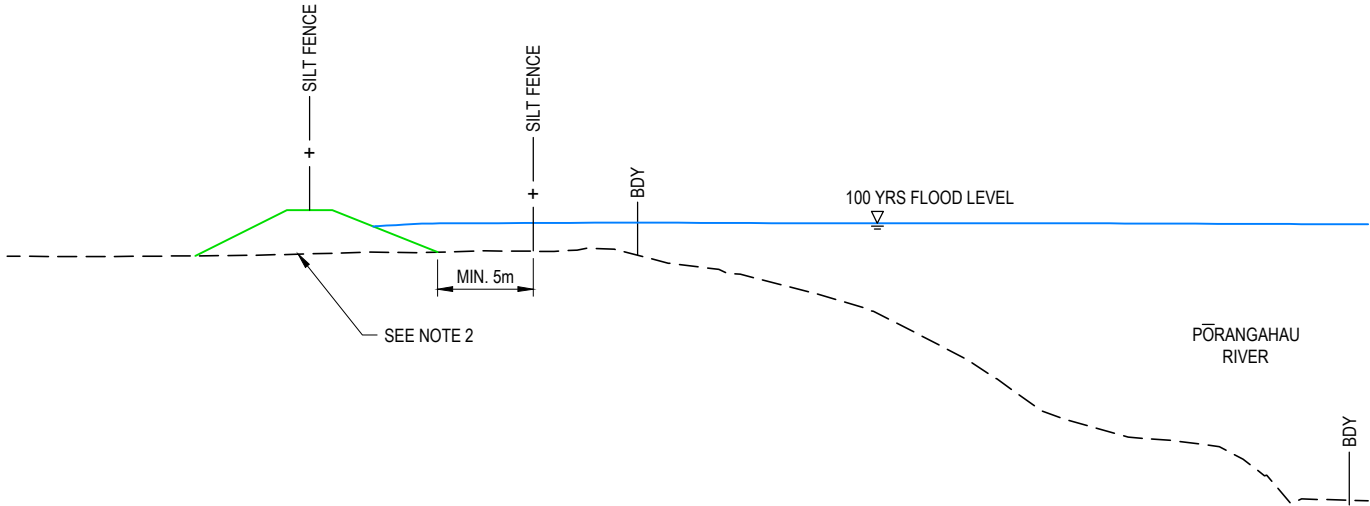
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 1				
SCALE :	DRAWING NO. :	REV :		
AS SHOWN (A3)	HB01041700-GT-051	0		

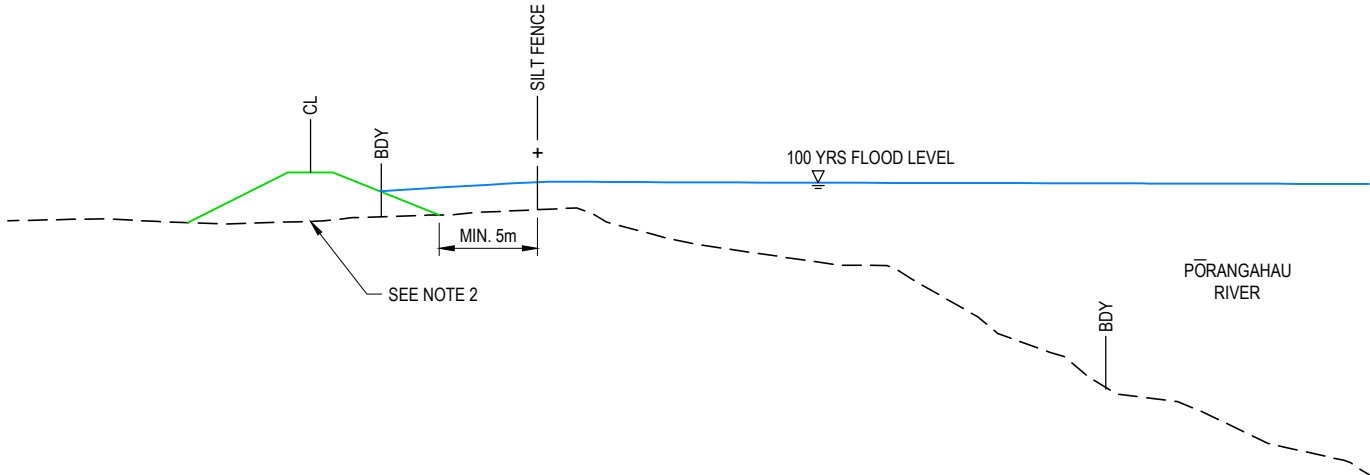
- NOTES:
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
 2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
 3. FOOTPRINT TO BE COMPACTED IN-SITU.
 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
 5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
 7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	10.312	11.825	10.432
EXISTING LEVELS (m RL)	10.31	10.38	10.43
LEVEL DIFFERENCE (m)	0.00	1.45	0.00
OFFSETS (m)	-3.78	0.00	4.23

XSEC CL-STOPBANK-CEMETARY-SLG_53 (CH:100)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	10.172	11.825	10.423
EXISTING LEVELS (m RL)	10.17	10.21	10.42
LEVEL DIFFERENCE (m)	0.00	1.61	0.00
OFFSETS (m)	-4.06	0.00	4.26

XSEC CL-STOPBANK-CEMETARY-SLG_54 (CH:150)
SCALE 1:250



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
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TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI



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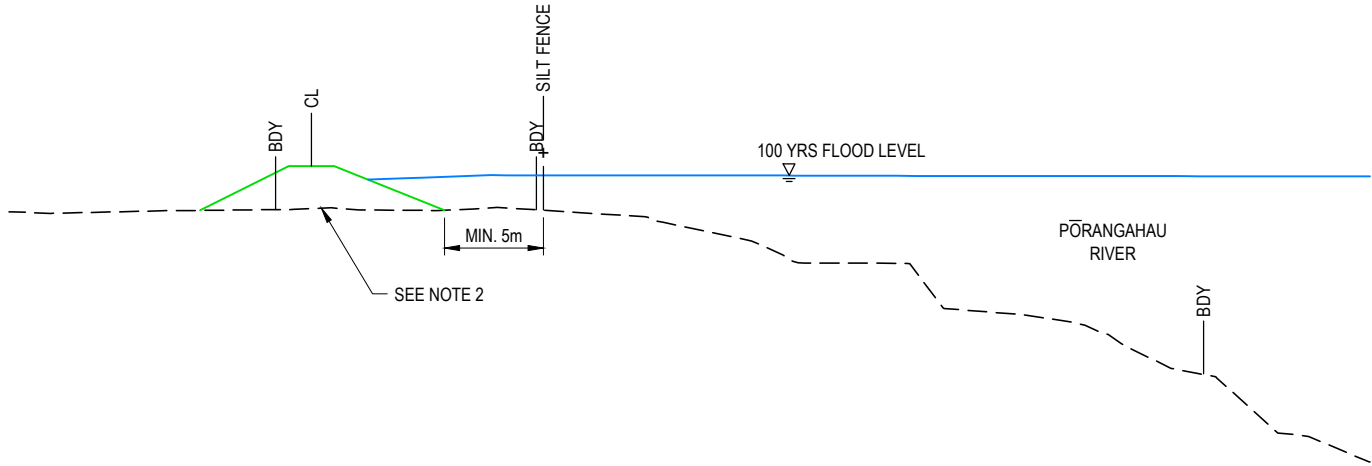
CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 2

SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-052	REV : 0
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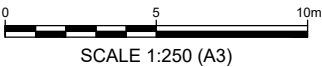


H.A.DATUM: 0m RL				
PROPOSED DESIGN LEVELS (m RL)		10.359	11.825	10.365
EXISTING LEVELS (m RL)		10.36	10.42	10.36
LEVEL DIFFERENCE (m)		0.00	1.41	0.00
OFFSETS (m)		-3.68	0.00	4.40

XSEC CL-STOPBANK-CEMETARY-SLG_55 (CH:200)
SCALE 1:250

NOTES:

- FOR GENERAL NOTES REFER HB01041700-GT-002.
- STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
- FOOTPRINT TO BE COMPACTED IN-SITU.
- ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
- ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
- ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
- REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS
NO.	REVISION	DATE	APP.



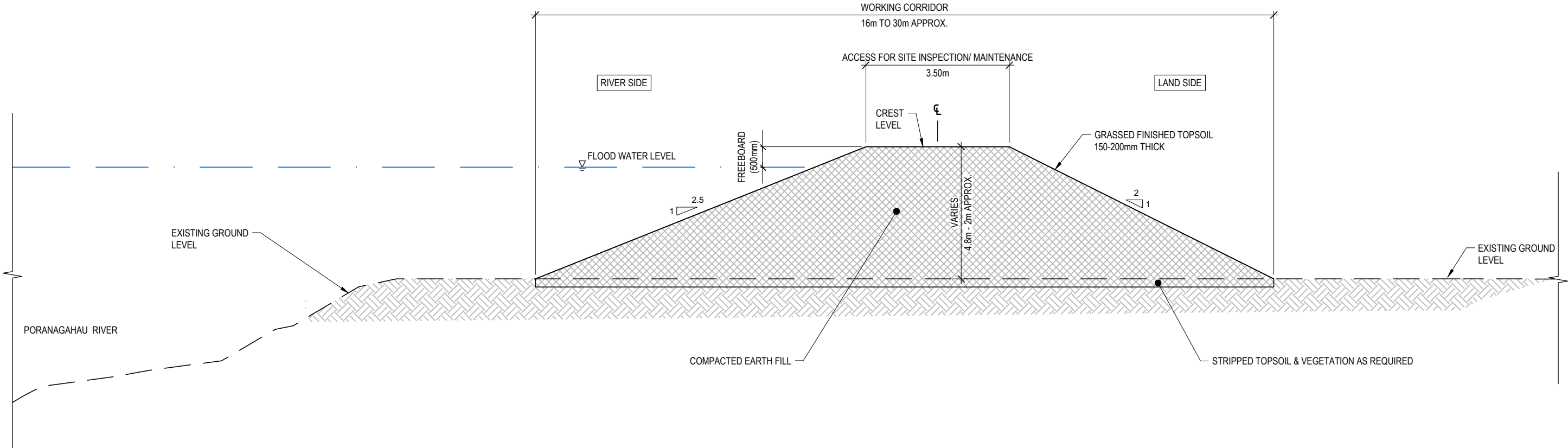
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CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE JUL 24	APPROVED	DATE
DRAWN SHK	DRAWING CHECK	DATE JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

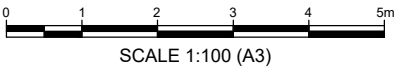
KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 3

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-053	0

- NOTES:
- 1. REFER TO DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
 - 2. DIMENSIONS IN METERS UNLESS OTHERWISE SHOWN.
 - 3. ALL CULVERT BEDDING MATERIAL TO BE IN ACCORDANCE WITH NZS 3725.
 - 4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO DIMENSION ON THE DRAWINGS.
 - 5. ALL FILL TO BE PLACED IN MAX. 300mm LIFTS TO AT LEAST 95% OF MAX DRY DENSITY (HEAVY).
 - 6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO DIMENSIONS ON THE DRAWINGS.
 - 7. COMPLICATED SURFACES TO BE SACRIFICED AFTER APPROVAL OF TEST RESULTS BEFORE APPLYING THE NEXT LAYER.
 - 8. REFER TO DRAWING HB01041700-GT-059 FOR TYPICAL STORMWATER OUTLET DETAIL.



EARTH FILL STOPBANK TYPICAL SECTION 1
SCALE 1:100



FOR TENDER

ORIGINAL DRAWING IN COLOUR

0	FOR TENDER	OCT 25	GS
NO.	REVISION	DATE	APP.



HAWKES BAY
REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI



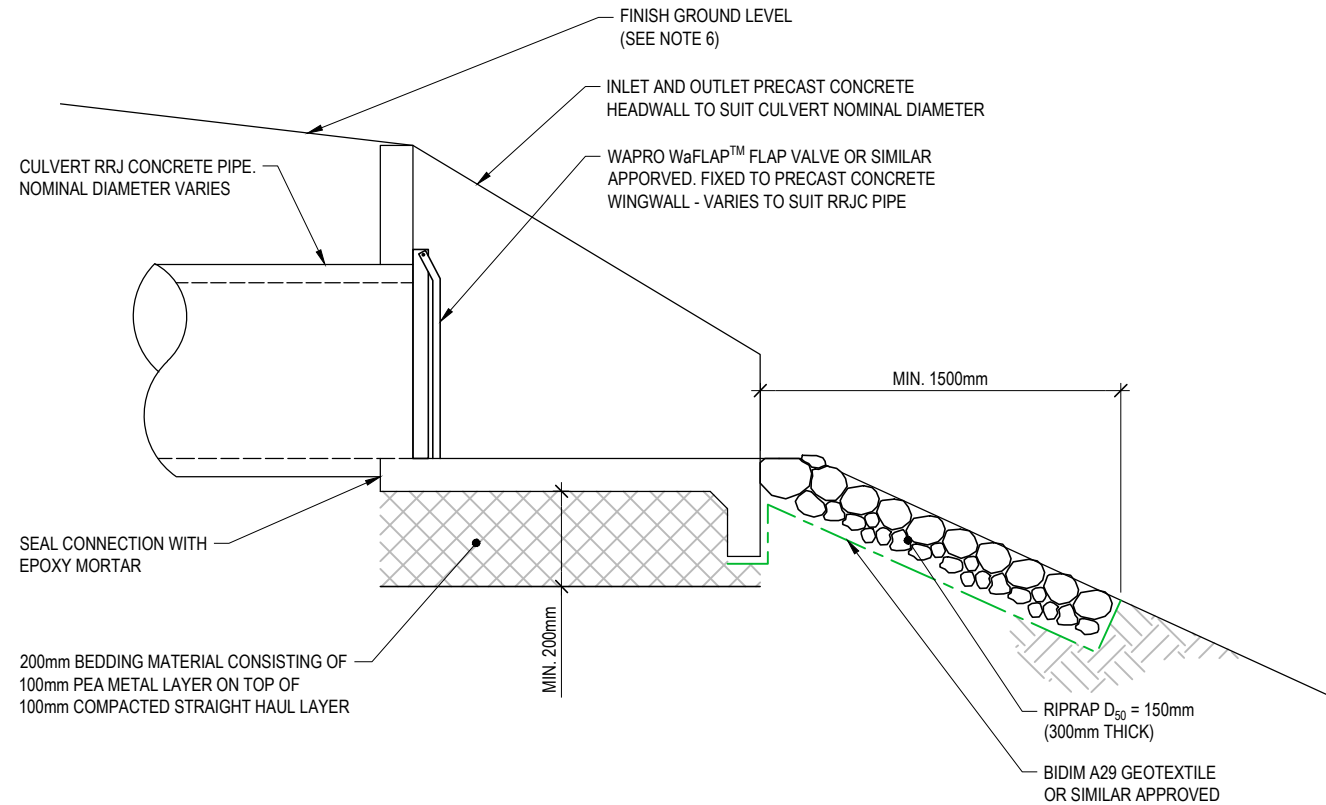
PDP
PATTLE DELAMORE PARTNERS



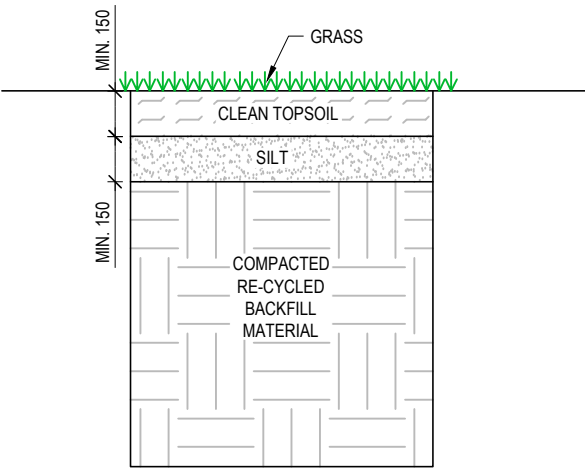
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CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE OCT 25	APPROVED	DATE ----
DRAWN SHK	DRAWING CHECK DFP	DATE OCT 25	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

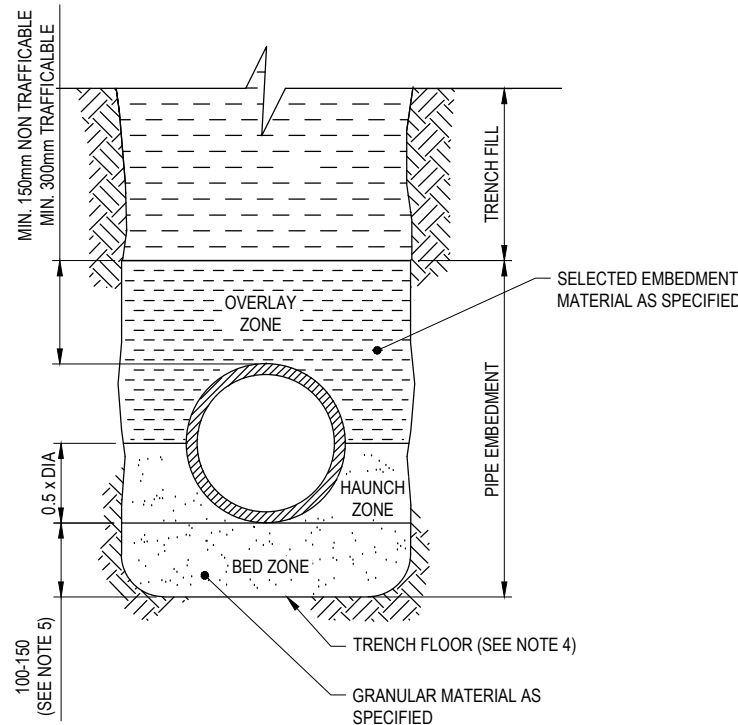
EARTH FILL STOPBANK TYPICAL SECTION		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-055	REV : 0



TYPICAL CULVERT HEADWALL DETAILS
NTS



TYPICAL URBAN BERM REINSTATEMENT DETAIL
NTS



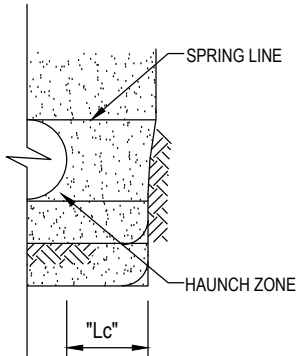
TYPICAL EMBEDMENT DETAIL - TYPE HS2 SUPPOT
NTS

TABLE OF PIPE CULVERTS		
DESCRIPTION	NOMINAL DIAMETER	PIPE MATERIAL
OUTLET 1	300mm	RRJ CONCRETE
OUTLET 2	600mm	RRJ CONCRETE
OUTLET 3	300mm	RRJ CONCRETE
OUTLET 4	375mm	RRJ CONCRETE
OUTLET 5	375mm	TO SUIT EXISTING SW PIPE
OUTLET 6	1050mm	RRJ CONCRETE

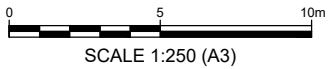
- NOTES:
- ALL DIMENSION ARE IN MILLIMETRES UNLESS SPECIFIED.
 - PIPE TRENCH DETAIL:
 - RIGID PIPES: REINFORCE CONCRETE
 - PLACEMENT OF EMBEDMENT, TRENCHFILL AND COMPACTION TO MEET THE REQUIRMENTS OF THE CONTRACT SPECIFICATIONS.
 - EXCAVATE OR COMPACT TRENCH FLOOR TO PROVIDE A FIRM BASE (MIN. 50KPa) TO SUPPORT BEDDING MATERIAL AND MINIMISE PIPELINE SETTLEMENT.
 - ENSURE BEDDING IS DEEP ENOUGH THAT PIPE JOINT PROJECTIONS (SOCKETS, FLANGES) DO NOT TOUCH THE TRENCH FLOOR.
 - PRECAST HEADWALLS ARE NOT TO SIT PROUD AGAINST SURROUNDING SURFACE.

SPRING LINE TRENCH CLEARANCE	
NOMINAL DIAMETER DN	MINIMUM CLEARANCE "Lc"
<150	100
>150-<300	150
>300-<450	200
>450-<900	300
>900-<1500	350

TRENCH WIDTH TO BE SUFFICIENT TO SAFELY LAY PIPE AND COMPACT THE SIDE SUPPORT ZONE.



MINIMUM TRENCH WIDTH
NTS



FOR TENDER

0	FOR TENDER	OCT 25	GS
A	FOR INFORMATION	APR 25	GS
NO.	REVISION	DATE	APP.

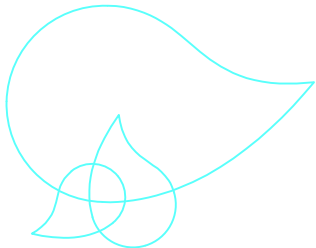


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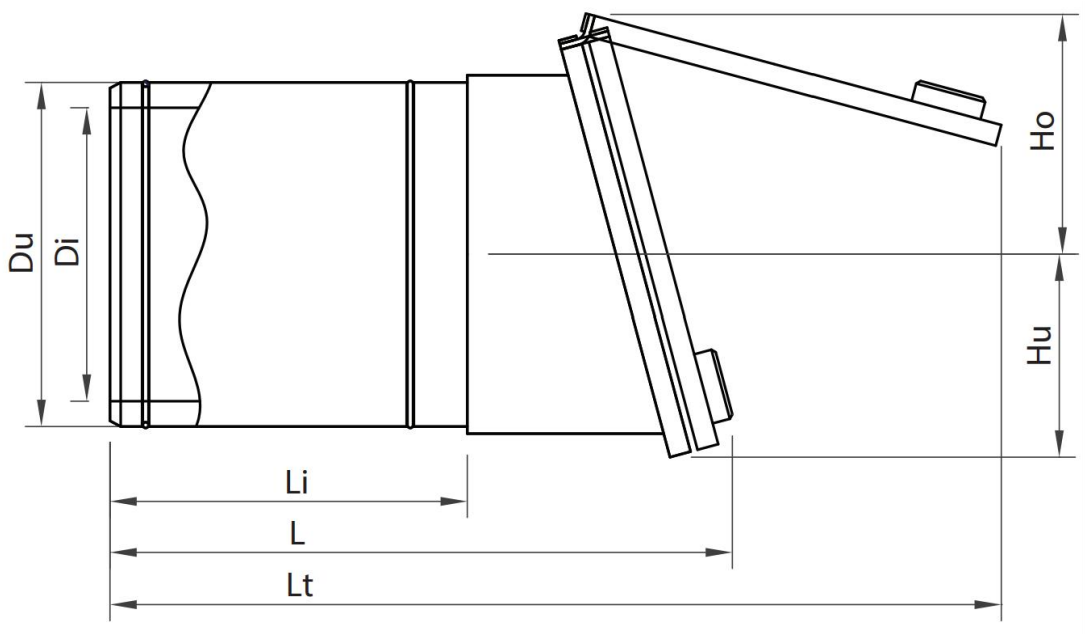
CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
PROJECT: PŌRANGAHAU STOPBANKS				
DESIGNED OH	DESIGN REVIEW GS	DATE SEP 25	APPROVED	DATE
DRAWN SHK	DRAWING CHECK DFP	DATE SEP 25	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

TYPICAL DETAILS SHEET 1				
SCALE :	DRAWING NO. :	REV :		
AS SHOWN (A3)	HB01041700-GT-057	0		

WAFLAPTTM



FLAP VALVE - KVI DN/OD 200-630



DIMENSIONS IN [MM]

DN/OD	Ø	Du	Di	B	Li	L	Lt	Ho	Hu	WEIGHT [KG]
200	200	181-200	164	225	200	395	530	166	107	4,1
225	225	205-225	184	275	200	400	560	181	121	4,8
250	250	230-250	205	275	250	470	650	197	132	6,1
280	280	250-280	230	305	250	495	670	214	147	7,5
300	315	280-315	258	345	300	500	735	239	165	10,9
350	355	320-355	291	405	300	630	775	245	203	15,2
400	400	359-400	327	450	400	730	940	274	226	18,6
450	450	405-450	368	510	450	800	1080	322	256	29
500	500	451-500	409	560	500	900	1175	338	281	42
550	550	500-560	458	610	560	980	1320	387	306	53,2
600	630	558-630	516	710	600	1040	1460	431	357	73,2

Other dimensions on request. Reserves the right to changes.

Contact: wapro.com +46 (0)454 185 10 sales@wapro.com
Contact GB and IE: wapro.com +44 114 308 0123 sales@wapro.com



FOR TENDER



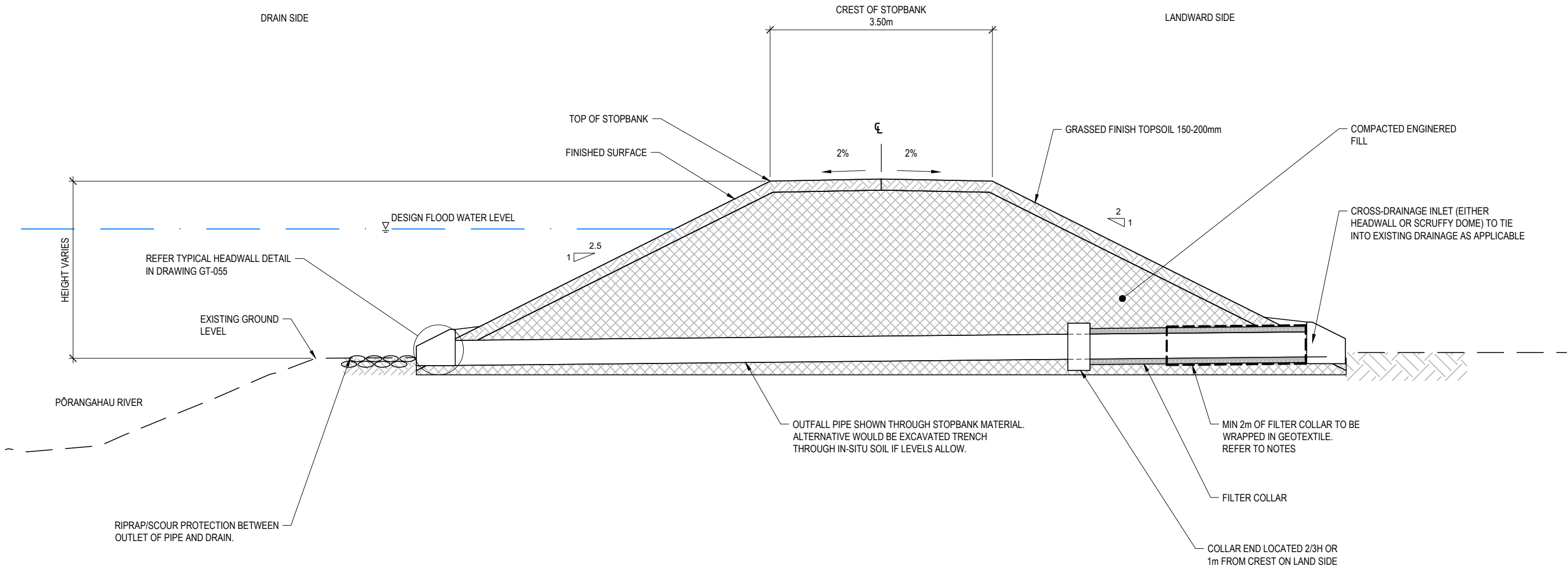
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TYPICAL DETAILS SHEET 2			
SCALE :	DRAWING NO. :	REV :	
AS SHOWN (A3)	HB01041700-GT-058	0	

NOTES

1. FILTER MEDIA TO BE NZTA F2 OR SIMILAR APPROVED.
2. ALLOW FOR MIN. FIRST 2 M ON LANDSIDE TO BE WRAPPED IN GEOTEXTILE (BIDIM).
3. TERMINATE FILTER COLLAR AT POINT ALONGTHE CROSS-DRAINAGE 2/3H (H IS HEIGHT OF EMBANKMENT) FROM LANDSIDE END.
4. FILTER COLLAR TO BE 2XDIA OF PIPE (MIN. 1M) DEPTH AND WIDTH.
5. FILTER MEDIA TO BE NZTA F2 OR SIMILAR APPROVED.
6. TRENCH BACKFILL DOWNSTREAM OF FILTER COLLAR TO INCLUDE FILTER DRAIN.
7. REFER TO BOPRC STOPBANK DESIGN & CONSTRUCTION GUIDELINES 2021.



TYPICAL OUTFALL DETAIL THROUGH STOPBANK
SCALE N.T.S.

FOR TENDER

0	FOR TENDER	OCT 25	GS
NO.	REVISION	DATE	APP.

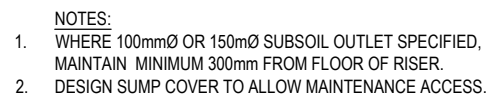


ACE MEMBER

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CLIENT: HAWKE'S BAY REGIONAL COUNCIL				
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TYPICAL DETAILS SHEET 3		
SCALE : AS SHOWN (A3)	DRAWING NO. : HB01041700-GT-059	REV : 0



Technical drawing of a pile cap cross-section. The drawing shows a rectangular pile cap with a central rectangular void. The overall width is labeled 'D'. The cap is supported by two SP3W sheet-piles, which are shown in cross-section at the bottom. The cap is made of mass concrete (20 MPa) with mesh reinforcing placed in the center. D12 U-bars are provided around the perimeter, to be cut and welded to the sheet-pile as required. The concrete is keyed around the sheet-pile. The drawing includes dimensions for the cap width (D), the void width (MIN. 200), and the cap height (MIN. 200). A section line 'A-A' is indicated on the left. A note refers to Kotahi drawings for details of the SP3W sheet-pile.

MASS CONCRETE - 20 MPa
WITH MESH REINFORCING
PLACED IN CENTRE

D12 AT 200 U-BARS (AROUND PERIMETER) TO BE
CUT AND WELDED TO SHEET-PILE AS REQUIRED

ENSURE CONCRETE IS
KEYED AROUND SHEET

A-A

FLOODWALL

D

MIN. 200

MIN. 200

MIN. 200

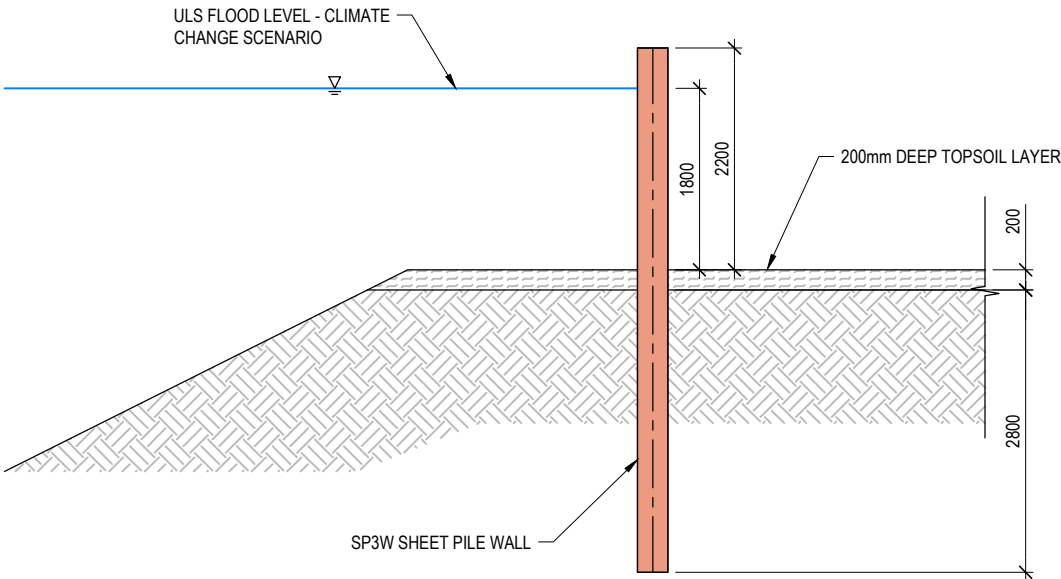
MIN. 200

SP3W SHEET-PILE
REFER TO KOTAHI DRAWINGS
FOR DETAILS

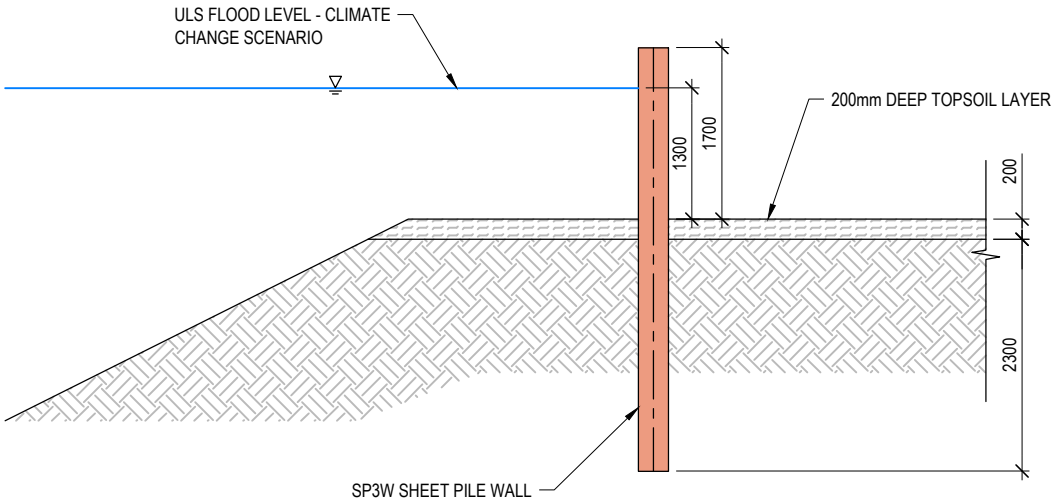
The diagram illustrates a cross-section of a floodwall. The structure is composed of several layers: a top layer of 'CREST OF FLOODWALL', followed by 'SP3W SHEET-PILES', and a thick base of 'MASS CONCRETE - 20 MPa'. The base is reinforced with 'SE92 MESH (2 LAYERS)'. A central 'OUTLET PIPE' is shown, with a 'CUT HOLE IN SHEET-PILE TO SUIT OUTLET PIPE DIAMETER' indicated. The ground level is marked on the right. Dimensions are indicated on the right side: 'VARIES' for the height above ground, 'VARIES' for the height below ground, and '200' for the thickness of the concrete base.

FOR TENDER

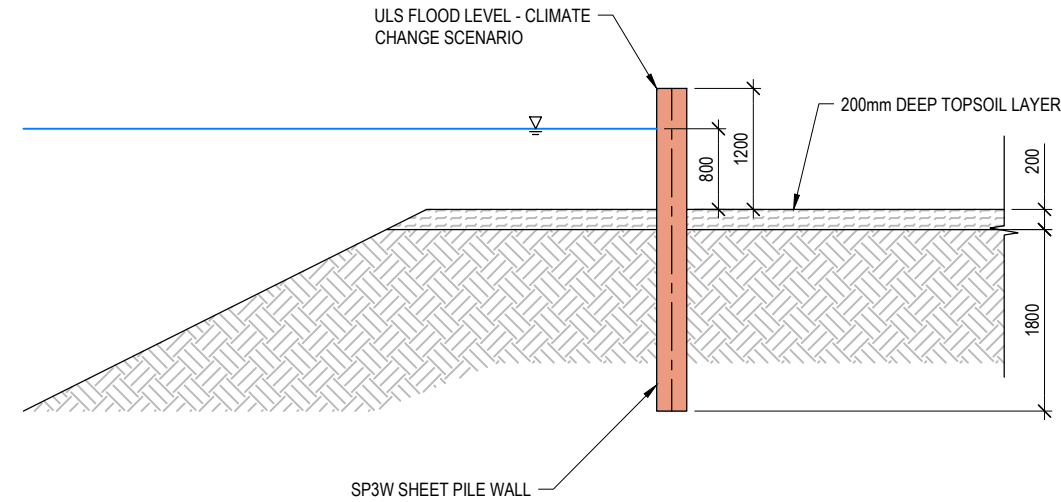
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TYPE A - 2.2m HIGH SHEET PILE WALL
SCALE 1:75



TYPE B - 1.7m HIGH SHEET PILE WALL
SCALE 1:75



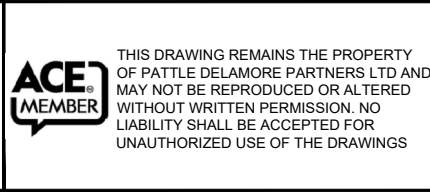
TYPE C - 1.2m HIGH SHEET PILE WALL
SCALE 1:75

NOTES

1. NUMBER OF REQUIRED SHEET-PILES ARE ESTIMATES, IT SHOULD BE CHECKED AND CONFIRMED BY QUANTITY SURVEYOR.
2. HIT AND MISS WELDING REQUIRED CLUTCHES.

FOR TENDER

0	FOR TENDER	OCT 25	GS
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TYPICAL DETAILS SHEET 5		
SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-061	0