REPORT

Tonkin+Taylor

# Pakowhai Flood Protection Improvements

## Preliminary Design Report

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**Prepared by**
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# 1 Introduction

The Pakowhai area, approximately 6 km north of Hastings as shown in Figure 1.1, was flooded in cyclone Gabrielle in February 2023, due to upstream breaches of the Tūtaekurī River (at Moteo and Waiohiki) and the Ngaruroro River (at Omahu). There are existing low height and discontinuous stopbanks along the true left bank of the Tūtaekurī-Waimate (Tk-W) stream, which were constructed around the 1920s and 1930s. These existing stopbanks have since fallen into a state of disrepair.

Post-cyclone, Hawkes Bay Regional Council (HBRC) agreed to provide additional flood protection to the residential properties along Pakowhai Rd, known as the Category 2C area. These properties were generally defined as being those at elevations higher than 5.5 m RL. Those properties lying below about RL 5.5 m were categorised 3, meaning these areas were unsafe for continued use as residential land.

To provide flood protection system for Category 2C properties in the Pakowhai area, a new secondary stopbank is proposed along the left bank of the Tk-W stream. Effectively reinstating the former alignment and extending northwest to Waiohiki.

This preliminary design report summarises the design development methodology, the proposed levels of service, the operational design criteria considered, the design criteria and requirements adhered to. Preliminary design stage drawings are included in Appendix A, and the corresponding preliminary design stage schedule of quantities estimate is included in Appendix B.

The purpose of this report is to describe and document the preliminary design stage process. It may also be used to inform the resource consent application(s) under the Order in Council (OiC) temporary law change framework.

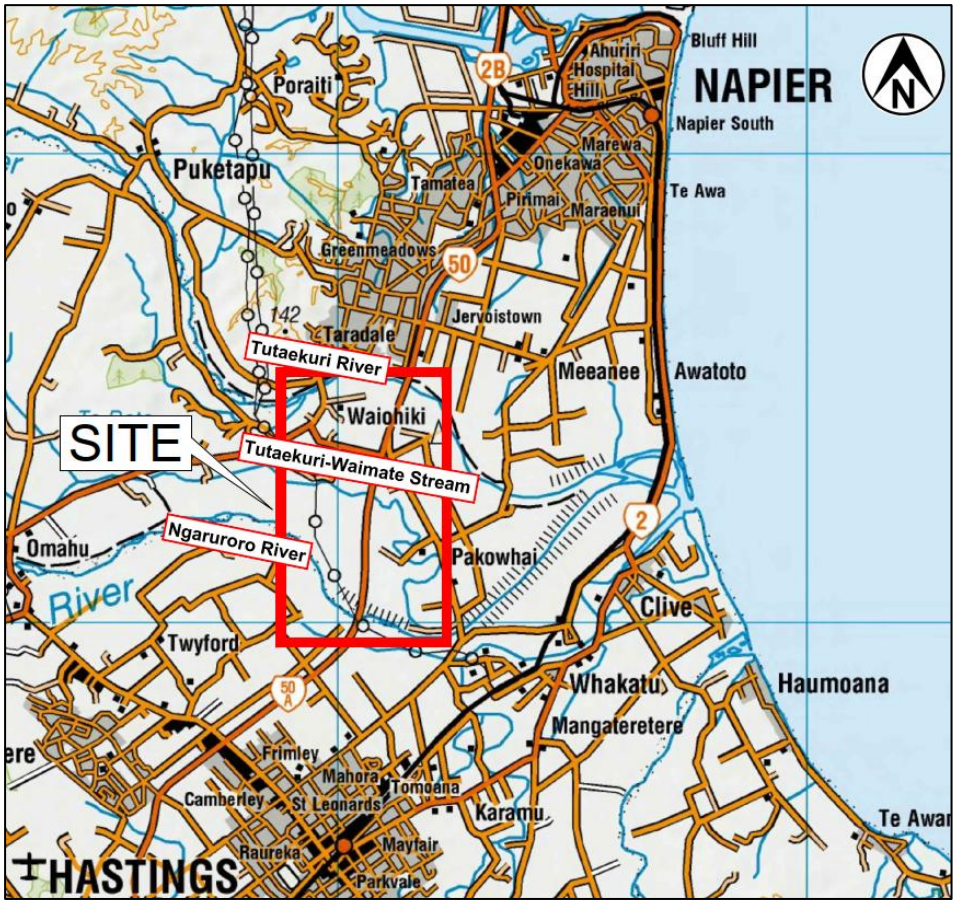



*Figure 1.1: Site location plan.*

# 2 Background

## 2.1 Scheme review

HBRC funding criteria is to provide protection to a 1 in 100-yr Average Recurrence Interval (ARI) Level of Service (LoS) with 500 mm freeboard. However, the Tk-W catchment is relatively small and the 1 in 100-yr ARI flood flows are generally held within the existing stream banks (as are the Tūtaekurī and Ngaruroro River channels held within their stopbanks).

Accordingly, HBRC requested a level of protection to an inflow level that is reasonably achievable to construct. A stopbank limit of 2-3 m high was accepted by HBRC as a practical limit due to local constraints/property constraints to provide an additional level of protection for inflows in a breach or overtopping scenario. Based on this, HBRC agreed to adopt a design inflow into the Pakowhai area of 200 $m^3/s$, which is significantly greater than a 1 in 100-yr ARI LoS local catchment flow (approximately 30 $m^3/s$). HBRC note that Pakowhai is vulnerable to a breach and/or an overtopping event on the upstream stopbanks, so a greater level of resilience is considered appropriate than just protection from the 30 $m^3/s$ local catchment flow.

T+T has developed and refined a Pakowhai area hydraulic model, including inflow boundary conditions at Waiohiki and Koropiko Road (SH50) near Fernhill, with a combined inflow of 200 $m^3/s$ as the basis of the design peak inflow. The flood model used to determine stopbank levels assumes the Waiohiki stopbank will overtop (i.e. The Tūtaekurī River flood level would need to exceed a 1 in 100-yr ARI event). The Koropiko Rd inflow location is generalised to assume flow could be incoming from the local catchment or overtopping/breach events at Moteo or Omahu. Some sensitivity testing to breach flow locations split has been carried out and is discussed in the August 2025 flood effects assessment[1].

We understand there is no scope to raise SH2 where it crosses the stopbank alignment as the levels tie into an existing bridge over the Tūtaekurī-Waimate Stream (deck level approx. 9 mRL).

The northern end of the stopbank alignment from SH2 to Links Rd, is proposed to avoid outflanking of flood flows from sheeting across orchard land near Franklin/Links Rd and entering Pakowhai from the SH2/Pakowhai Rd roundabout.

Based on the flood modelling, the adopted design levels were to tie in the upstream end of the stopbanks into existing high ground features (SH2 at 9 mRL, and 12 mRL at the upstream end near Links Rd). Following further refinement of the model, the downstream section was raised further (Hodgson Rd end to approx. 8.4 mRL) and a spillway with a crest at 7.5 mRL proposed at 1856 Pakowhai Rd.

The purpose of the spillway and the raising of the downstream end is to promote flows in an overdesign event to discharge into the Category 3 land, east of Pakowhai, rather than overtopping into Category 2 homes within the Hodgson Rd area of Pakowhai (as was observed in early model iterations).

Almost all the proposed alignment lies within private property and HBRC will need to acquire land and/or easements along the footprint to construct the stopbank. Several properties along the alignment have substantial orchard infrastructure or residential properties near the alignment. Accordingly, there are substantial constraints informing the current alignment and alternative construction arrangements such as localised retaining walls are proposed in these areas.

## 2.2 Project history

T+T was originally engaged by HBRC as part of the land categorisation response. This included hydraulic modelling, site visits, historical data reviews, and development of options for flood protection in impacted communities. Following this work, the concept design was refined, and key constraints were assessed in early 2025 to confirm the preferred corridor, including the following supporting work:

1 Concept design optioneering in collaboration with HBRC including flood model refinements as required to compare options.
2 Additional ecology work to review and refine the original concept assessment of effects.
3 Further investigation of areas where retaining and/ or flood walls may be required to inform feasibility.

Following the concept phase, the following works have been undertaken to inform the basis of the preliminary design:

1 Geotechnical investigations to inform ground conditions along the alignment (discussed in our ground investigations report)
2 Contaminated land investigations, to inform the nature and extent of potential contaminants associated with past site land use.
3 Ecological Opportunities and Constraints Assessment.

# 3 Site description

The proposed flood protection system is located along the true left of the Tūtaekurī- Waimate (Tk-W) stream and Waiohiki drain in Pakowhai, Hastings District, as shown in Figure 3.1. The alignment is approximately 8.5 km in length from Links Road to the Ngaruroro River stopbank. Approximately 5.5 km of inadequate stopbank is to be reestablished or replaced east of State Highway 2 (SH2), and approximately 3 km is to be created west of SH2 to Links Road.

The entire alignment lies in the centre of the Heretaunga Plains, which is generally flat, with a gradual decrease in existing ground level from approximately 10 to 6 mRL (NZVD16). The stopbank does tie into an existing terrace along Franklin Road, where it extends around various horticulture blocks. The Tk-W stream generally sits 2.5 m below the surrounding ground elevation with a base channel width of approximately 10 m.

The proposed stopbank corridor passes through various land parcels which are generally used for horticultural purposes, and the Hastings District Council (HDC) operative district plan zones the full site area as plains production.

The scope of the stopbank works varies along its entire alignment but generally consists of flood walls, retaining walls, flood control spillway, various road crossings, access ramps, stormwater drainage culverts & swales, watercourses work, as well as other general civil structures.

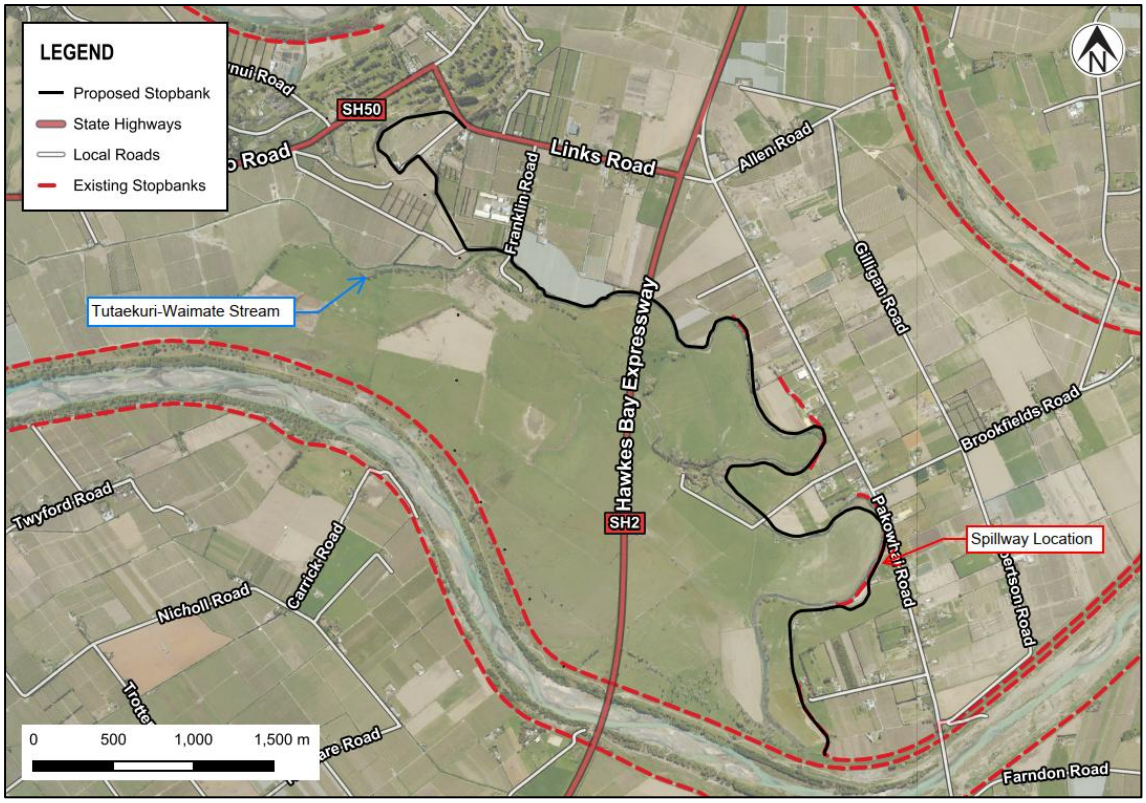



*Figure 3.1: Proposed stopbank alignment and flood control spillway location.*

## 3.1 Staging

As shown in Figure 3.1, the proposed site extents are spread over a large area, and the scope of work has high variability along the alignment. As such, a staged delivery approach has been preliminarily proposed, and agreed with HBRC, to split the project into two sections: northern stopbank (west of SH2), and the southern stopbank (east of SH2).

Each of the sections are expected to be delivered in portions as summarised in Figure 3.2, for the northern section, and Figure 3.3 for the southern section respectively. The timing of construction for each portion, is to be confirmed at the detailed design stage.

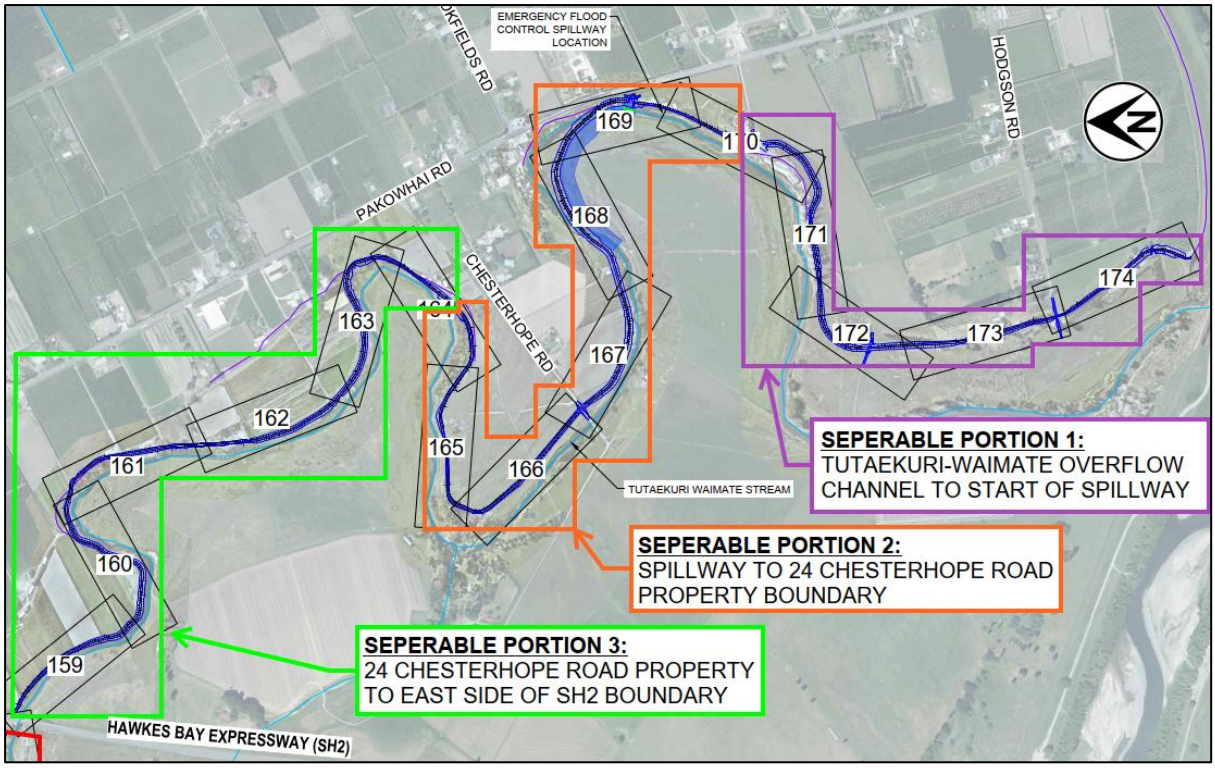



*Figure 3.2: Separable portion areas stopbank work areas on the eastern side of SH2.*

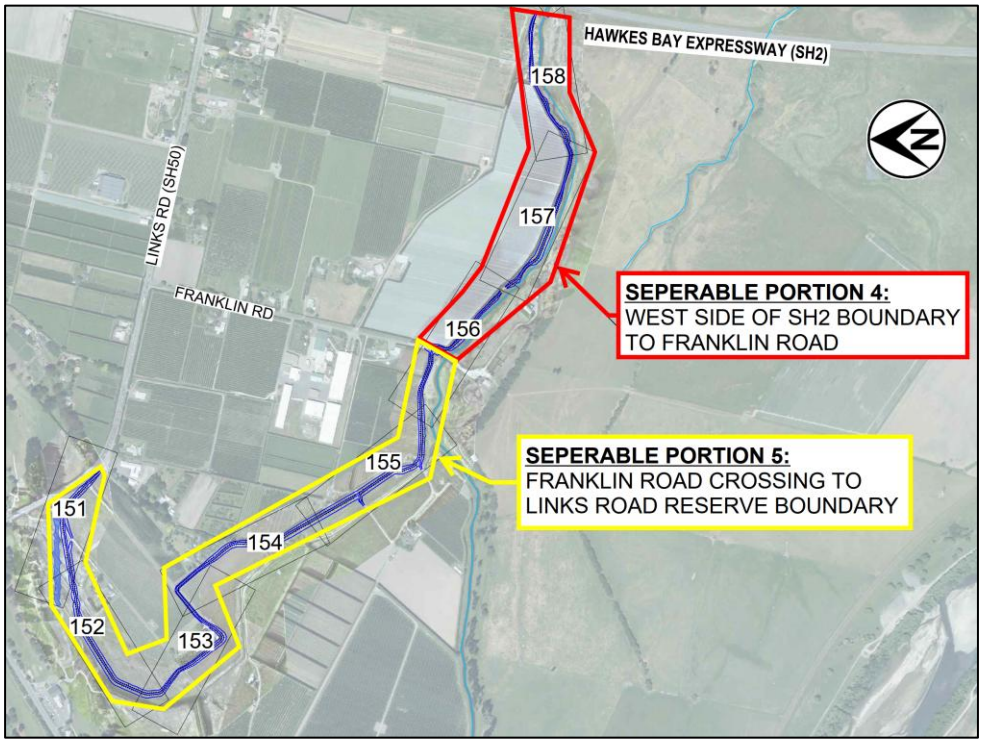



*Figure 3.3: Separable portion areas stopbank work areas on the western side of SH2.*

# 4 Design requirements

This section provides an overview of the design requirements adopted and adhered to in the development of the preliminary design scope of works for the project.

## 4.1 Flood protection level of service

As instructed by HBRC, the stopbank and spillway crest levels have been designed on the basis of a chosen peak flow rate and spillway discharge, rather than a specific hydrological return period event. HBRC have indicated that the proposed stopbank is to be designed to manage approximately 200 $m^3/s$ flow with a freeboard of 500 mm and allowance for some overtopping of the proposed spillway. Refer to Section 2.1 for further background information.

A flow of 200 $m^3/s$ may represent several potential hydrological events, including:

- A localised flood event within the Tūtaekurī-Waimate Stream catchment in excess of a 100-year event.
- Stopbank overtopping from a flood event within the Ngaruroro and/or Tūtaekurī River, e.g. overtopping corresponding to a return period between 100 and 500 years.
- Non-overtopping stopbank breach (e.g. piping failure) from a flood event within the Ngaruroro or Tūtaekurī Rivers, corresponding to a return period of less than 100 years.
- A combination of the above.

It is important to note that the above scenarios (including in combination) may also result in flow more than 200 $m^3/s$. Refer to the T+T August 2025 flood effects assessment report[1] for more details.

## 4.2 Borrow material sourcing

The current proposed borrow sites for the Pakowhai stopbanks involves the true left and right berms of the Ngaruroro River, located immediately south of the Pakowhai alignment. At the time of writing, we understand HBRC are assessing this material for suitability at the southern extent of the alignment. If suitable, extraction works will be undertaken in accordance with HBRC's global gravel extraction consent. Additionally, there are two nearby quarries that have been assessed as alternative and/ or supplementary borrow sources if required. For further information on the borrow material requirements, and geotechnical analyses, refer to the Geotechnical Assessment report[1].

## 4.3 Stream works

Stream works were only specified where either there was an opportunity for ecological improvement of the environs, and/ or the construction risks of building a stopbank or retaining wall in the area were deemed unacceptable to HBRC.

Where new lengths of stream are longer than the old length of flow path, the new stream section matched the existing stream section at the downstream end (at a minimum) to reduce impact on hydraulic conveyance capacity.

Where new lengths of stream are lesser length than the old length of flow path, the new stream section matched the existing stream section at the downstream end (at a minimum) as well as matching the bank-to-bank volume storage of the old stream length.

[1] Pakowhai Stopbank Geotechnical Assessment Report, Tonkin & Taylor Ltd, September 2025.

Stream works were specified in general accordance with HBRC – Environmental Code of Practice for River Control and Waterway Works (February 2017), to ensure the flood protection works follow the environmental standards for river control and drainage works.

## 4.4 Spillway level of service

The spillway component was included to control stopbank overflow in flood events equal to and greater than the stopbank flood protection LoS. The spillway is expected to operate during the adopted 200 $m^3/s$ inflow design event at a peak flow of approximately 40 $m^3/s$, this is required to manage flood levels on the stream side of the proposed stopbank.

The overdesign event for spillway operation adopted a 300 $m^3/s$ inflow rate, which is expected to cause the spillway to operate at a rate of 120 $m^3/s$. This event was used to design the spillway geometrics and erosion protection systems for safe spillway operation in extreme events.

The spillway location was chosen as to control flood flow in overdesign events to discharge into the Category 3 land, east of Pakowhai, rather than overtopping into Category 2 homes within the Hodgson Rd area of Pakowhai (as was observed in early flood model iterations). The overflow follows an existing overflow route from the Tk-W stream which largely limits adverse impacts on Category 2C properties in extreme events.

## 4.5 Stormwater drainage infrastructure

Existing overland flow paths intercepted by the new stopbanks are to be conveyed along the toe of the proposed stopbank to designated culvert crossing points. This stormwater drainage infrastructure was designed using a general approach outlined in HBRC's waterway guidelines for stormwater management (May 2009).

Specific design parameters were adopted from Hastings District Councils (HDC) engineering code of practice, published in March 2022. HBRC's waterway guidelines took precedence wherever there was a contradiction between the two guidelines.

## 4.6 Vehicle crossings and access

Vehicle crossings are defined as cases where there is a ramp proposed on each side of the stopbank in a smooth motion, whereas vehicle access ramps are defined as a singular ramp on either the stream or the landward side of the stopbank.

Vehicle crossings, unless noted otherwise, adopted Auckland Transports' High Productivity Motor Vehicle (HPMV) 22 m long truck and trailer as the design vehicle for tracking and vertical clearance checks. The proposed crossing surfacing matches the existing road surfacing unless otherwise agreed with HBRC and/ or HDC on a case-by-case basis. No specific pavement design has been undertaken at this stage.

Vehicle access ramps which are private accesses for HBRC and/ or landowners only, adopted a standard ute as the design vehicle for tracking and vertical clearance checks. Gravel surfacing is proposed for the ramps. No specific pavement design has been undertaken at this stage.

## 4.7 Existing infrastructure

Existing infrastructure was avoided in the selection of the new stopbank alignment wherever possible. Where encountering of existing infrastructure was unavoidable, the existing infrastructure is proposed to be relocated outside of the operational and maintenance zones of the new flood protection system infrastructure, and in accordance with the asset owners' guidelines where

possible. All affected asset owners were contacted regarding their infrastructure, and correspondence is attached in Appendix C.

## 4.8 Design life

The design life adopted for the various system components of the flood protection system, assuming routine inspections and regular maintenance works are undertaken, are as follows:

- Earth stopbanks - 50 years+
- Stormwater drainage infrastructure - 50 years+
- Erosion protection systems - 50 years+
- Surfacing of vehicle crossings and ramps – 25 years+
- Flood walls – 50 years+
- Retaining walls – 50 years+
- Existing infrastructure relocations – refer to respective asset owners' requirements

## 4.9 Maintenance and operability

The HBRC engineering team have agreed to 3.5 m wide crest, and 1V:2.5H side slopes, as the standard stopbank section design (wherever feasible) to enable safe vehicular access along the crest, and safe mowing of the side slopes. Any areas with a lesser crest width, or steeper side slopes, required dispensation approval from the engineering team on a case-by-case basis. Similarly, ramp locations and various other access points were determined in collaboration with HBRC engineering.

## 4.10 Health and safety

Health and safety not only of the operators but also of the private landowners and public accessing the stopbanks is considered the top priority to Mana Whenua and HBRC. The ministry of Business, Innovation & Employment (MBIE) building code clause F4 – safety from falling of the building code was followed to assess and treat design related safety risks in the first instance. Additionally, a risk register (in Appendix D) and a safety in design register (in Appendix E) have been developed throughout the preliminary design stage, in conjunction with Mana Whenua and HBRC, to identify & treat health and safety risks. It is intended for these registers to be reviewed and revised in subsequent design stages with contractor input.

## 4.11 Environmental

### 4.11.1 Erosion and sediment control

The erosion and sediment control plan for the project is to be confirmed by the contractor prior to construction.

### 4.11.2 Planting and ecology

Planting and ecology has been considered in the Ecological Opportunities and Constraints Assessment and will be further directed by conditions of consent and considered in the Ecology Management Plan.

# 5 Design methodology

This section provides an overview of the methodology undertaken to develop the preliminary design scope of works for the project.

## 5.1 Earthworks

### 5.1.1 Stopbank geometrics

The stopbank geometrical design was developed within Civil 3D design software. During the concept design phase, the HBRC engineering team agreed on the minimum requirements for the stopbank geometrics which was adopted where feasible:

- A slope angle of 1V:2.5H (previously 1V:3H in the concept design)
- A minimum crest width of 3.5 metres (previously 4 m in the concept design)

Where either of these geometrical criteria could not be reasonably achieved, the variance was discussed and with HBRC engineering team and also highlighted on the drawings.

DroneIT survey information, obtained between May-October 2024, was be utilised as the existing ground surface wherever possible. Where else, the latest publicly available LiDAR was used.

### 5.1.2 Stopbank types

Three different typical stopbank sections were adopted to suit the varying existing site layout and conditions over the length of the alignment, which are summarised as follows:

- Typical stopbank refurbishment section:
  Adopted where an existing poor condition stopbank is present and is to be refurbished. These areas generally require topsoil removal, key undercut along the new stream side toe, benching into the existing stopbank, cut to waste of existing stopbank material (to be spread in with topsoil outside of the stopbank footprint area), and fill & compaction of suitable imported borrow material.
- Typical new stopbank section – Type A:
  Adopted where the creation of a new stopbank is required over ground that is currently being utilised for a different land-use. Type A is specified where ground foundation soil conditions are suitable for typical earthworks-only stopbank construction. These areas generally require the same process as for typical stopbank refurbishment type albeit typically with less cut to waste material required, and more suitable imported borrow material required.
- Typical new stopbank section – Type B:
  Adopted where the creation of a new stopbank is required over ground that is currently being utilised for a different land-use. Type B is specified where ground foundation soil conditions are not suitable for typical earthworks-only stopbank construction, and a collector drain is required on the landward side toe to alleviate pore water pressure seeping from the stream side under the stopbank in a flood event. These areas generally require the same process as for typical stopbank new stopbank section type A except with the addition of the landward side toe drain.

For further details on the stopbank types and the supporting geotechnical analyses refer to the Geotechnical assessment report[2].

### 5.1.3 Preliminary design stage quantity estimates

Earthworks quantities were estimated from the 3D model within Civil 3D design software. This method of quantities estimation is industry standard for earthworks projects. The model relies on drone surveyed existing ground surface levels where possible, and publicly available 1 m grid LiDAR existing ground surface levels where else (refer to the drawings in Appendix A for sources). Due to

[2] Pakowhai Stopbank Geotechnical assessment report, Tonkin & Taylor Ltd, September 2025.

the wide-spread vegetation coverage across the site, levels may vary compared to reality. Additionally, the site area is large and varied so minor earthworks quantities errors may compound to create a significant difference.

To counteract this as best as practicable at this stage, conservative assumptions were used for all cut earthworks (refer to Section 5.1.4), and a conservative bulking factor of 15 % was applied to all imported fill volumes calculated in the schedule of quantities in Appendix B.

A basic overview of the key total earthworks quantities, which are representative of how the land form is proposed to change, is summarised in Table 5.1.

**Table 5.1: Summary of total earthworks quantities across the stopbank alignment**

| Earthworks Items | Quantity Estimate | Units |
|---|---|---|
| Total area of vegetation clearance[1] required | 165,000 | $m^2$ |
| Total bulk earthworks volumes[1] (- :cut, + :fill, b :balance) | - 55,000, +292,900, b: +237,900 | $m^3$ |

*Notes:*

1. *Total area of vegetation clearance is approximately equivalent to the disturbed area required to construct the entirety of the flood protection system (not including any enabling works). Therefore, a proportion of this area is not expected to specifically require clearance of vegetation.*
2. *Bulk earthworks volumes are finished design surface minus existing ground surface. These volumes do not account for undercuts required, compaction factors, or re-use of suitable site won material. The volumes are only representative of how the landform is changing and should not be relied upon for estimating or quantity surveying purposes.*

Cut earthworks are generally required to form the key for the stopbank, remove unsuitable foundation soils, as well as various stream, drain, and swale works. Whereas fill earthworks are generally required to place imported suitable fill material from off-site, mixed with an assumed proportion of site-won material (where suitable). The balance earthworks figure in Table 5.1 is representative only of how the landform is proposed to change. For further details on the earthworks quantities, and quantities for all aspects of work required, refer to the schedule of quantities supplied in Appendix B.

### 5.1.4 General assumptions

The general assumptions adopted for the earthworks design development at this stage are as follows:

- Due to the large site area, topsoil depth is expected to vary considerably from area to area. As such, topsoil stripping and replacing has been assesses as area estimates at this stage. Depths will be provided at detailed design, when the site is staged into smaller sections.
- A key cut and benching depth of 500 mm over the entire footprint area, for all stopbank profile types, has been assumed for the schedule of quantities. In reality, the key depth is 500 mm minimum and the bench depth varies but is expected to be approximately 300 mm on average, so 500 mm depth assumption across the area is considered a conservative average.
- Cut to waste material from key and benching is assumed to be mixed in with stripped topsoil and re-spread over disturbed areas outside of the stopbank footprint only. Topsoil respread on the stopbank side slopes is assumed to use stripped topsoil only.
- Earthworks resulting in the development of temporary arrangements have not been accounted for in the earthworks design for the purposes of this reporting. Enabling works

required such as temporary haul roads, stockpiles, and borrow site works, are summarised in Section 6.

## 5.2 Spillway

### 5.2.1 Flood effects

With the creation of a new stopbank alignment, adverse flood effects on the stream side of the new alignment are expected and require management. The spillway was proposed to alleviate these potential adverse effects in flood events, as well as to provide a dedicated overflow point to further manage flooding on the landward side of the proposed stopbanks in extreme flood events. The flood control spillway was located where an existing stopbank overtopping location was known to be, and the resulting overland flow path on the landward side follows an existing route in extreme events over Pakowhai Road to the Ngaruroro River to the east.

For further information on the hydraulics and purpose of the spillway refer to the Flooding assessment of effects report.

### 5.2.2 Geometrics

The geometrical design of the spillway was developed within Civil 3D design software. The design intent of the spillway was for the geometrics at the crest to be long and with shallow overflow depth for the over design spillway event. The wide crest and flat channel slope have been provided to help control flow velocities thereby reducing erosion potential and hence reducing the cost of the erosion protection system required on the landward side batter slope.

The landward side batter slope was defined at a 1V:15 H gradient, again to control flow velocities over the spillway, and thereby reduce erosion potential at the toe of the spillway, hence reducing the cost of the erosion protection system required.

The crest along the length of the spillway was intended to be trafficable, in line with the design requirements for the rest of the stopbank alignment. However, vehicles other than ride-on mowers are not permitted on the turf reinforcement erosion protection systems at this stage.

Training bunds will be provided to ensure flows remain contained within the channel at the 1:15H gradient during design events.

### 5.2.3 Slope erosion protection

The flood model developed could reliably estimate depth over the spillway but not flow or velocity. The overtopping discharge was estimated using the Brater and King (1976) formula for a broad crested weir using a low weir coefficient of 1.5 and high weir coefficient of 1.8 (in accordance with the HEC-RAS technical reference manual). The overtopping flowrate was translated to velocity down the spillway slope using Mannings formula for open channels rearranged to calculate for velocity. The depth over the spillway, flow range, and velocity range, for the flood events assessed are summarised in Table 5.2. The spillway design calculations are provided in Appendix F.

**Table 5.2: Depth and flowrate over spillway, and peak velocities down spillway slope, in design and over-design flood events**

| Flood Event | Maximum Overtopping Depth (m) | Overtopping Flow Range, min – max ($m^3/s$) | Spillway Slope Velocity Range, min – max (m/s) | Assumed Peak Duration (hours) |
|---|---|---|---|---|
| Design 200 $m^3/s$ | 0.23 | 38 – 46 | 1.2 – 1.4 | 10 |
| Overdesign 300 $m^3/s$ | 0.50 | 119 - 143 | 2.1 – 2.2 | 10 |

As shown in Table 5.2, the maximum flow velocity down the spillway slope for the overdesign case is expected to be approximately 2.2 m/s. On this basis, a turf reinforcement mat was considered the most appropriate erosion protection for the spillway slope, due to the aesthetic benefits, low operating and maintenance costs, and relatively low construction cost. Refer to Appendix C for key correspondence with erosion protection suppliers which informed this choice.

In both the design and overdesign event, the spillway is expected to be able to operate without damage. For events above the overdesign event, some repairable damage is possible although the integrity of the stopbank/ spillway structure is expected to remain operational. Noting, if the duration of overtopping is larger than outlined in Table 5.2, then the potential for scour damage is expected to increase, and repairable damage could occur in events lesser than the overdesign event.

When the spillway is due to operate, it is possible that flood debris may accumulate at the crest of the spillway which could cause concentrated flow issues leading to erosion. A concrete sill was specified in place of the turf reinforcement along the crest of the spillway to protect against this erosion potential. The turf reinforcement may also be anchored to the concrete sill further strengthening the system against erosion.

A provisional single roll width of turf reinforcement along the stream side of the reinforced concrete sill has also been allowed for to provide stability for the crest of the embankment in the event of significant amounts of debris depositing along the crest; which may form shallow eddies with scour potential along the stream side of the crest.

The installation of the matting in accordance with the suppliers' specifications is essential to ensure the product meets the intended design requirements, and this is intended to be included in T+T specifications in detailed design.

### 5.2.4 Toe erosion protection

Flow is expected to travel over the spillway crest under subcritical conditions. Whereas flow over the spillway slope is expected to travel under supercritical conditions. At the toe of the spillway, the flow is expected to return to subcritical flow conditions which means a hydraulic jump will form. Hydraulic jumps have the potential to cause significant destruction and erosion depending on the type of the jump, and the type of erosion protection measures in place.

Hydraulic jump calculations were undertaken to determine the expected jump type, jump length, and energy release, in the minimum and maximum spillover flood events modelled for the spillway (refer to Table 5.2). In the concept design, the spillway was specified with a 1V:10H slope which resulted in high velocities and an oscillating jump at the toe of the spillway which is considered destructive. The spillway design calculations are provided in Appendix F.

In preliminary design, the spillway slope was revised to 1V:15H slope to reduce flow velocity and change the expected jump type at the toe from "oscillating" to "weak" which is considered adequate in spillway design. The maximum jump length was calculated to be 2 m under the over-design flow event scenario, and so the turf reinforcement was specified to extend 3 m beyond the toe of the

spillway slope to manage the erosion potential resulting from the hydraulic jump. Refer to Appendix C for key correspondence with erosion protection suppliers which informed this choice.

### 5.2.5 Maintenance and operability

The reinforced concrete spillway crest is expected to have a maintenance-free design life of 100 years assuming three activations maximum over this time. After each activation, clearance of any debris which has accumulated on the crest, as well as a general inspection of the structural integrity of the concrete condition is recommended and any maintenance work undertaken as soon as practical.

The turf reinforcement provided along the spillway slope (on the landward side), and along the stream side crest of the embankment, is expected to have a design life of 50 years with the following key maintenance and operability controls in place:

- Topsoil and seed the turf reinforcement areas as soon as possible.
- Ensure good, thick, grass coverage over the turf reinforcement areas at all times of year. The key degradation mechanism of the mating structure is due to UV exposure from the sun.
- Mower blades need to be positioned so they do not touch the matting or the anchor heads, particularly at the transition from the slope face to the crest.
- Disallow driving vehicles (other than ride-on mowers) over the turf reinforcement mating.
- Undertake condition spot checks of the reinforcement structural integrity, covering the whole mating area, over a frequency to be confirmed with the chosen manufacturer but is expected to be in the order of once every 5-10 years.
- Repairs to localised areas of poor condition mating, if required, may be undertaken in accordance with the manufacturer's recommendations.
- Following any spillway crest overtopping event, some repairs to the matting may be required even if all design assumptions are met. For example, the topsoil surface above the matting (approximately 50 mm) may need to be reinstated if scoured out.
- The spillway slope grass requires routine and regular maintenance. Bare patches of grass (e.g., the grass has not established and/or dries out over the summer), or debris caught on the crest, may cause localised areas of higher-than-expected velocities which could increase the risk of scour.

In summary, adverse performance will result if conditions arise beyond the design assumptions and/ or the matting and grass is not properly maintained (noting that damage may occur at flows less than design level event if it is not well maintained).

## 5.3 Structures

A retaining wall structure and a free-standing flood wall may be required at multiple locations along the stopbank alignment where space is significantly constrained between the Tk-W stream, and another area of significance to a private landowner i.e.- orchard netting, irrigation pump, or building etc. For each of the locations, preliminary assessment for a range of options have been undertaken to inform an option proceeded with. Specific methodology, and recommendations for each site area, are detailed in the geotechnical assessment report.

The two structures proposed in space constrained areas are described briefly below. Refer to the geotechnical assessment report for the detailed assumptions made in the development of the structures design. It is likely both structures proposed below will require building consent to carry out the works.

### 5.3.1 71 Franklin Road (FEL Kiwifruit Orchard Block)

The area between this property and the Tk-W stream is significantly space constrained over a length of approximately 800 m. A hybrid earth stopbank and flood wall system has been proposed to both provide sufficient flood protection, refurbish the existing bank stability, and minimise the length and height of wall required (where earthworks can be undertaken). Approximately 695 m of steel sheet pile wall is proposed up to varying retained water heights ranging from 0.5 to 3.0 m.

The extent and geometry of the wall is constrained by the existing FEL Block canopy tension poles (0.5 m setback from toe of embankment) and the active stream channel (1.0 m setback from toe of embankment). There is an existing pump station in place to take water from the Tk-W stream for irrigation purposes, which will require a penetration. We understand a step ladder/access will be required to service this pump shed intake. We understand the construction of the flood wall solution will start with limited earthworks (to construct a low height embankment) followed by driving of the sheet piles to the appropriate flood height/foundation level.

### 5.3.2 24 Chesterhope Road

The area between 24 Chesterhope Road and the Tk-W stream is space constrained due to existing infrastructure (sheds/groundwater bore). The area with the highest constraints (adjacent to sheds) follows a 40 m length with an additional 35 m of constraints due to hydrodynamics (e.g. to prevent undermining of a retaining solution over time).

A river-side kingpost-deadman anchor type retaining wall would result in a retaining wall with a maximum retained height of approximately 3.5 m. An alternative landward retaining wall with riverside ground improvement would result in a retaining wall of 1.5 m max height and a reduced 2 m crest level. Both options will be explored further at detailed design to confirm.

## 5.4 Roading

### 5.4.1 Vehicle crossings and ramps

The vehicle crossings and ramps were geometrically designed to different standards depending on their locality and intended use, as agreed with HBRC engineering team and Hastings District Council (HDC) roading team (within road reserves only). A summary of the trafficability requirements, which informed the geometrical design, is provided in Table 5.3. Specific pavement design and surfacing details are to be confirmed in detailed design, although general surfacing type is outline in Table 5.3.

**Table 5.3: Vehicle crossings and ramps trafficability and surfacing requirements**

| Crossing/Ramp ID | Trafficability Requirements | Surfacing Requirement |
|---|---|---|
| 1135 Links Road accessway | Private and/ or HBRC access only. One-way traffic. Large rigid truck design vehicle. | Sealed, to match existing |
| 1153 Links Road access ramps | Private and/ or HBRC access only. One-way traffic. Large rigid truck design vehicle. | Unsealed, to match existing |
| 70 Franklin Road access ramps | Private and/ or HBRC access only. One-way traffic. 22 m HPMV truck and trailer design vehicle. | Unsealed, to match existing |
| Franklin Road crossing | Public access. Two-way traffic. 22 m HPMV truck and trailer design vehicle. | Sealed, to match existing |
| Chesterhope Road crossing | Public access. Two-way traffic. 22 m HPMV truck and trailer design vehicle. | Sealed, to match existing |
| 1882 Pakowhai Road access ramps | HBRC access only. One-way traffic. Large rigid truck design vehicle. | Unsealed, to match existing |
| 1854 Pakowhai Road crossing 1 | Private and/ or HBRC access only. One-way traffic. 22 m HPMV truck and trailer design vehicle. | Unsealed, to match existing |
| 1854 Pakowhai Road crossing 2 | Private and/ or HBRC access only. One-way traffic. Stock & light duty vehicles only. | Unsealed, to match existing |
| 1854 Pakowhai Road crossing 3 | Private and/ or HBRC access only. One-way traffic. Stock & light duty vehicles only. | Unsealed, to match existing |
| Hodgson Road crossing | Private and/ or HBRC access only. One-way traffic. Stock & light duty vehicles only. | Unsealed, to match existing |

Vehicle crossings within road reserves are required at Franklin Road, Chesterhope Road, and Hodgson Road. The HDC minimum requirements in their Engineering Code of Practice (2020) define all the roads at the location of the vehicle crossings as rural “live & play” (residential & home occupation) accesses with the following requirements:

- Maximum vehicles per day (vpd) traffic volume of 100.
- Serving 1-10 public lots or 1-6 private lots.
- Target operating speed of 20 km/h
- Minimum road carriageway width of 6 m
- Maximum longitudinal grade of 20 %
- No line marking required for < 6 m wide carriageways, or centreline and edge line markings required for > 6 m wide carriageways

The maximum longitudinal grade of 20% was considered excessive in this case where the surrounding terrain is relatively flat and so a maximum grade of 15 % was adopted, with an ideal

maximum of 12.5 % worked to. The existing Hodgson Road carriageway is approx. 3 m wide, and is a dead-end road, with the proposed vehicle crossing only serving one private uninhabited lot currently. As a result, and as agreed with HDC, the Hodgson Road vehicle crossing adopted a 3 m wide road width, gravel surfacing rather than sealing, no line marking or signage, and no public access allowed (gated).

Stopbank crossings of Franklin Road and Chesterhope Road are 6 m wide sealed roads with 0.5 m gravel shoulders on either side of the road. The existing Franklin Road carriageway is approx. 6 m wide, whereas Chesterhope Road is approx. 3.5 m wide. For both roads, traffic on the true right bank side is proposed to have priority whereas traffic on the true left bank (stopbank side) is proposed to give way as per the signage shown in Figure 5.1. Additionally for Chesterhope Road, a give way sign and line marking is proposed to stop traffic coming over the crossing from the true right bank side in the case that an oncoming vehicle is travelling along Chesterhope Road to access the crossing, as shown in Figure 5.2.


*Figure 5.1: PW33 narrow bridge and RP52 single lane signage (left and centre), and RP2 give way sign (right).*

The other vehicle crossings and ramps not located within road reserves and servicing singular private properties and/ or HBRC maintenance & operations access, were developed based on discussions between HBRC and impacted parties (as applicable).

No specific pavement design has been undertaken or vehicle loading assessed. Additionally, surfacing has not been assessed, and regular routine maintenance is expected to be required particularly at turning points onto and off the stopbanks where damage is expected to be observed first.

The adopted pavement and surfacing for all ramps and crossings not within road reserves, but including Hodgson Road crossing, use a typical gravel pavement detail which is to be confirmed at detailed design. The adopted pavement design and surfacing for crossings within road reserves (excluding Hodgson Road) is as per the HDC standard drawing WS104 as shown in Figure 5.2, where pavement depths are to be confirmed in detailed design.

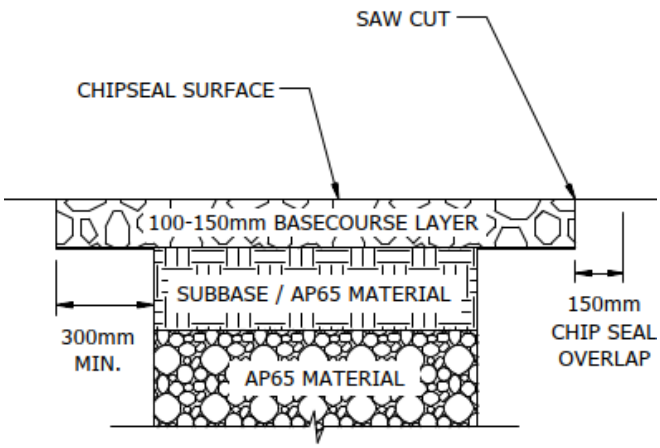



*Figure 5.2: Typical trench reinstatement and surfacing detail drawing WS104 (Hastings District Council, Engineering Code of Practice, 2020).*

## 5.5 Drainage

### 5.5.1 Existing stormwater management arrangement

The existing stormwater management arrangement across the site resembles a typical rural setting where stormwater is largely conveyed overland and via stormwater drainage channels with a piped network only consisting of culvert crossings under roads or driveway accesses.

The proposed stopbank alignment was generally chosen to follow localised crests in the landform where possible. However, where the proposed stopbank isn't located along the localised crest, the existing overland flow paths would be impeded by the stopbank. In large rainfall events, significant ponding and flooding could occur on the landward side of the proposed stopbank without any intervention.

### 5.5.2 Proposed stormwater management arrangement

To prevent ponding on the landward side, stormwater management systems are proposed to convey stormwater runoff through the stopbank to the nearest drain/stream/river. An overland flow path assessment was undertaken to assess the stormwater drainage infrastructure required as supplied in Appendix F.

To understand the catchment size required which could result in significant ponding/ flooding, without flood modelling information available, the rational method was re-arranged to calculate for catchment area using multiple conservative assumptions as follows:

- Time of concentration of 10 minutes in selecting rainfall intensity from HIRDS data.
- Average land cover in the area consists of medium soakage pasture/ grass cover (RC = 0.3) and residential area <36 % (RC=0.45) so an average RC of 0.4 is assumed.
- Typical flow capacity of a DN300 pipe laid at approximately 1 % grade of a standard-length amounts to approximately 100 L/s. This flow rate was considered the point at which an overland flow path would require a secondary stormwater system to control the flow.

The resulting catchment area amounted to 6520 $m^2$ which was then used for the watershed analysis (or overland flow path assessment) in Global Mapper using a 2023 existing ground LIDAR surface with a grid size of 1 m. This watershed analysis uncovered all the overland flow paths which would be intercepted by the proposed stopbank.

The culverts and swales were generally designed in accordance with HBRC's Stormwater Management guidelines[3]. Culverts were specified as sparingly as possible to reduce cost, reduce carbon emissions, and reduce the risk of piping failure in the stopbank (floodwaters running along pipeline causing erosion and stopbank failure over time). Where multiple overland flow paths intercept the stopbank at reasonably close distances, or where ground levels are accommodating, swales were proposed to adjoin multiple catchment areas toward one culvert crossing.

All culverts were designed in accordance with the following process and key assumptions:

- Rational method was used to inform overland flow rates at stopbank penetrations.
- Runoff coefficients were sourced from HBRC Stormwater Management Guidelines, Table 6-1a.
- Time of Concentration was calculated using the Ramser-Kirpich method, as recommended in Section 6.1.4.1 of the HBRC Stormwater Management Guidelines.
- Rainfall intensity was derived from HIRDS data for the 2081–2100 period under RCP 6.0, using a 100-year Average Recurrence Interval (ARI).
- Culvert diameters were calculated by comparing the orifice capacity equation (inlet-controlled culvert) and Manning's equation (outlet-controlled culvert). The more conservative diameter was chosen.
- Culverts were selected from a suppliers' Reinforced Concrete Rubber Ring Jointed (RCRRJ) pipe catalogue.

All swales were designed in accordance with the following process and key assumptions:

- Swales located directly alongside the landward side toe of the stopbank where possible.
- Swale side slopes were set to 3H:1V to taper off the stopbank side slopes.
- A Manning's roughness coefficient of 0.03 was selected in accordance with Table 7-1 of the HBRC Stormwater Management Guidelines.
- A uniform swale base width of 500 mm was adopted for consistent construction.

Swales on the landward side of the stopbank were designed to comply with a minimum hydraulic residence time (HRT) of 9 minutes, where practical, in accordance with HBRC Stormwater Management Guidelines. Swales on the stream side of the stopbank were not designed to comply with these residence times as they are short in length, and purely for conveyance rather than the collection of overland flows.

Approximately half of the landward side swales do not comply with the minimum HRT requirements, as shown in Appendix F. The non-complying swales are considered sufficient in this case, as all the overland flows collected run over rural grassed paddock land which contribute to the removal of pollutants. Therefore, the contaminant load at the collection point into the swales is expected to be very low when compared against urban catchment areas, and so residence time is not crucial for adequate treatment in this case.

[3] Hawke's Bay Waterway Guidelines – Stormwater Management, Hawke's Bay Regional Council, May 2009.

### 5.5.3 Culvert design

Two different types of inlet arrangements were developed and adopted based on the following requirements:

- Scruffy dome manhole – adopted for situations where incoming swale depth(s) are shallow and the culvert inlet is relatively deep.
- Wingwall – adopted for situations where incoming swale depth(s) are comparable to the culvert inlet depth.

The only outlet arrangement specified for all culverts includes a reinforced concrete wingwall, a rock rip rap erosion protection apron, and a polyethylene flap gate to prevent flood water ingress into the culvert barrel.

For both inlet and outlet wingwall arrangements, where there is a fall from height risk greater than 1 m from the top of the headwall to the finished channel base, a 1.1 m high safety barrier fence was specified in accordance with NZBC F4.

The culvert trench detail for stopbank penetrations was designed to mitigate pore water pressure build-up should flood water seep into the trench backfill material. The culvert trench mechanism was generally adopted as follows:

- A typical culvert trench detail for type HS2 support (as per standard Hastings District Council drawing WS201) is used for underneath the water side of the embankment
- A filter collar is located on the landward side of the stopbank centreline, under the crest, to stop and direct water into
- The filter drain trench detail, which transfers water under the landward side slope which ultimately directs water back into the swale at the landward side toe

The filter collar backfill material is to be confirmed at detailed design and may vary from culvert to culvert. Geotextile fabric is proposed around the filter collar and trench to minimise silt migration into the trench. Culverts that are not transferring water from the landward side to the water side of the embankment (culverts that are situated on the landward side of the core stop bank structure), adopted the typical trench detail for the full length.

### 5.5.4 Erosion protection

The peak flow velocities in the swales and culverts were calculated to select the appropriate material which is resistant to the erosion potential of the stormwater it is conveying. The peak flows within the swales and culverts were assessed at the 1 % AEP RCP6.0 for the period 2081–2100 rainfall scenario as per the conveyance capacity design.

Grassed swales were the design preference, and they can typically handle up to 1.5 m/s instantaneous peak flows without erosion protection. The peak flow velocities within the swales on the landward side range from 0.31 to 0.91 m/s so no additional erosion protection is required. The peak flow velocities on the stream side channels range from 0.9 to 1.92 m/s. Channels on the stream side are expected to be in flood from the stream in a 1 % AEP event, and so the peak velocity calculated is not expected to be realised so no additional erosion protection is required.

The culverts concentrate the flow from the swales and so the culvert outlets typically experience high erosion potential. The outlet erosion protection adopted a rock rip rap solution in accordance with Section 4 of the Auckland Council Hydraulic Energy Management guidelines. This method found that all culverts required outlet rock rip rap aprons to protect against channel erosion which was then designed also in accordance with Section 4 of the Auckland Council Hydraulic Energy Management guidelines.

## 5.6 Watercourses

### 5.6.1 Stream diversion

The Tūtaekurī-Waimate Stream currently aligns closely to Pakowhai Road near the Pakowhai memorial hall and the town centre area, as shown in Figure 5.3. This area is highly constrained against the construction of a new stopbank, and in the concept optioneering phase of the project multiple options were considered including flood walls, relocating all affected buildings, and various stream infill options. The option chosen was to construct a stream diversion so that the works could largely be done offline to the existing stream thereby limiting environmental impacts on the existing stream ecosystem.

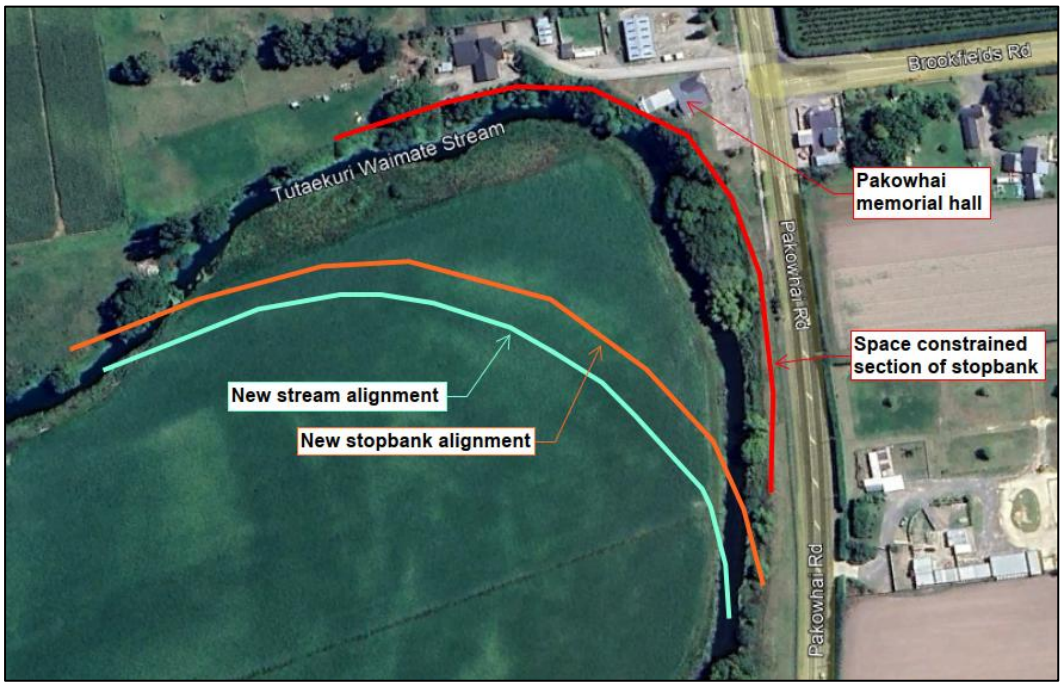



*Figure 5.3: Stream diversion plan (aerial image 20/2/2025, image source: 2025 Airbus, Google Earth).*

#### 5.6.1.1 Hydraulic analysis

The geometrics of the stream diversion were dictated by matching the downstream stream cross-section along the full length, and no dedicated hydraulic analysis was undertaken. However, the stream diversion was modelled in 3D in Civil 3D design software and added to the design surface which was used for flood modelling. The flood model results showed a similar hydraulic performance of the stream to the pre versus post development scenario.

The new diversion is proposed to match the existing stream section which involves a deep wide main channel for low and high flows, and an upper bank for flood flows. This design facilitates habitat by offering diverse aquatic environments: the main flow channel supports existing species, while the upper bank provides refuge for smaller organisms and promotes biodiversity.

The indicative proposed section and planting plan for the channel is shown in Figure 5.4, which has been prepared with input from T+T ecologists. At detailed design we suggest that the roughness of the proposed planting zones is checked against the hydraulic model, as such the dimensions of the channel or the planting scheme may need to be amended to achieve the desired diversion performance requirements.

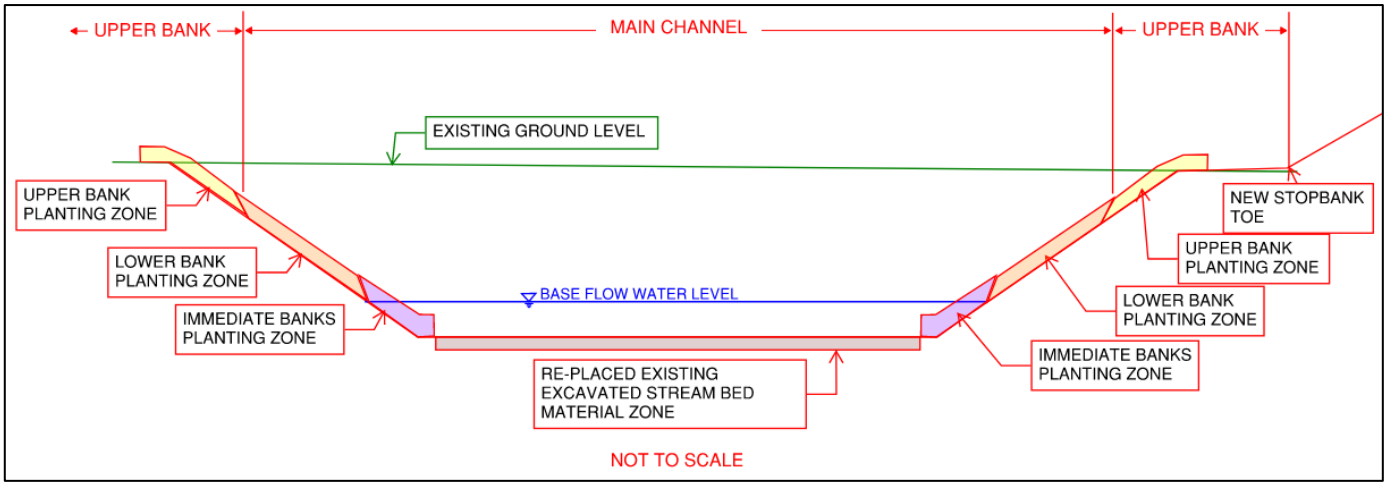



Figure 5.4: Proposed typical stream diversion channel and planting plan.

The diversion is expected to maintain flood capacity while the reduced stream length is expected to increase water velocity locally within the area of the new stream diversion, however the erosion potential increase is marginal and is to be managed with targeted planting.

The hydrogeological analysis and assessment of the stream are to be covered within a separate interpretive design report at or prior to the detailed design stage.

#### 5.6.1.2 Construction considerations

A construction methodology is to be developed as part of detailed design, informed by the Project Ecologist. Consideration will be given to constructing the new stream channel in a dry environment, fish relocation as required, and connection of the new alignment to the existing stream environment at either end including riparian planting.

Additionally, seasonal groundwater levels are not well known at this stage and dewatering may be required. However, this is expected to be kept to a minimum as the new stream base is at/ near the existing stream base level. A provisional plan for dewatering is to be incorporated in the contractors' construction method statements, as well as the erosion and sediment control plan.

## 5.7 Existing infrastructure

There is existing infrastructure present within the stopbank alignment corridor at various locations along the alignment which require consideration as follows:

- HBRC stormwater drainage infrastructure – culverts require replacement, and drains require connection or replacement.
- Private infrastructure/ features – shelter belts, trees, feature walls, orchard infrastructure, irrigation pump systems, and sheds. Private fencing was not considered, as new fencing along the landward side of the stopbank is proposed along its full length.
- Unison power supply infrastructure – high voltage overhead power, low voltage overhead power, low voltage property connections, and buried cables. Transpower infrastructure is nearby but was not found within the construction corridor.
- Chorus communications infrastructure – buried property connection fibre, ADSL, VDSL, and telephone cabling.

All affected asset owners were contacted, and key correspondence is included in Appendix C as well as proposed mitigation plans where possible. Relocation and/ or protection plans for the affected

existing infrastructure is to be developed in collaboration with the affected asset owner at the detailed design stage.

## 5.8 Risk management

The project risk management approach utilised a collaborative approach between T+T and HBRC, where weekly design update meetings were undertaken throughout the development of the preliminary design to present risks and agree on any treatments required together. Other less notable risks, which are inherent in the works and require treatment, have been preliminarily addressed by T+T at this stage. The top four risks identified with the greatest residual risk post preliminary design, in no particular order, are as follows:

- Disseverance of widespread poor foundation soils for stopbank construction due to limited existing ground investigation information.
- Programme delays, and cost overruns, due to difficulties in coordination with landowners and other stakeholders.
- Procurement and supply of borrow material and other construction materials.
- Erosion, sediment, and dust, creation leading to environmental enforcement and/ or damage to nearby landowners' orchards/ crops.

These risks are expected to be investigated further in the detailed design stage, and post consenting, to treat the risks further thereby reducing the residual project risk prior to the construction stage. Refer to Appendix D for a summary of the project risk register, which is expected to be reviewed, revised, and updated at each stage of design and construction.

A safety in design (SiD) hazard register was developed by T+T throughout the preliminary design stage and is included in Appendix E. The aim of the SiD register is to capture all hazards which may impact on the constructor and/ or operator throughout the design life of the systems proposed. Due to the nature of this project, most of the hazards occur at the construction stage and register is expected to inform the contractor on safety hazards they may encounter pre-construction so they may further develop the mitigation methods. The top three SiD hazards identified with the greatest residual risk post preliminary design, in no particular order, are as follows:

- Working in close proximity to live watercourses, and flood prone areas, which may result in serious harm/ death if personnel and/ or equipment fall into Tk-W stream.
- Working in proximity to electrical cables, both high and low voltage. Power supply assets are to be relocated where situated within the corridor but boom strike (overhead strike) is still possible which may result in serious harm/ death of personnel due to electrocution.
- Traffic and road safety mainly related to trucks transporting borrow material to site and travelling back to the borrow site safely. The Pakowhai transport network area has numerous high-speed intersections with poor sight distances, and Pakowhai Road particularly also has high traffic volumes. Collisions with traffic are possible and may result in serious harm/ death to the public and/ or personnel.

These hazards are expected to be investigated further in the detailed design stage, and post consenting, to treat the hazards further prior to the construction stage.

# 6 Enabling works

The enabling works phase of the project is defined as the temporary works required to construct the permanent configuration. The enabling works phase of the project is understood to start in advance of the permanent works and generally consists of:

- Site clearance such as vegetation removal, fencing removal, infrastructure removal & relocations etc).
- Stockpile and/ or hardstand area(s) establishment.
- Haul roads establishment including any temporary drainage arrangements.

The management of the temporary arrangements throughout the duration of the permanent works, and the reestablishment to final form, may be the responsibility of the enabling works contractor or permanent works contractor, depending on HBRC's procurement arrangement, which is to be confirmed at the detailed design stage.

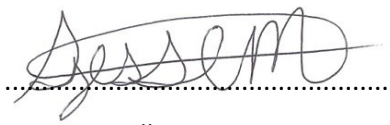
# 7 Applicability

This report has been prepared for the exclusive use of our client Hawke's Bay Regional Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Hawkes Bay Regional Council as the consenting authority will use this report for the purpose of assessing that application.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

Report prepared by:



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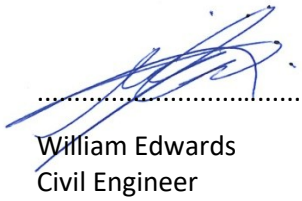
Jesse McCall
Civil Engineer

Report prepared by:



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William Edwards
Civil Engineer

Authorised for Tonkin & Taylor Ltd by:

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Report reviewed by:
Jamie Yule, Project Manager, Senior Engineering Geologist
Cam Drury, Project Planner, Principal planner (Stradegy)

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# Appendix A Preliminary design drawings

HAWKE'S BAY REGIONAL COUNCIL

# PĀKŌWHAI SECONDARY STOPBANK

## PRELIMINARY DESIGN

PROJECT NO : 1017353.2403

ISSUE DATE : 04/09/2025

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# DRAWING LIST

| | | DRAWING NUMBER | REV | TITLE |
|---|---|---|---|---|
| | | GENERAL | | |
| 1 | ✓ | 1017353.2403-001 | 3 | DRAWING LIST & LOCATION PLAN |
| 2 | ✓ | 1017353.2403-002 | 1 | NOTES AND LEGEND |
| | | GENERAL ARRANGEMENT PLAN | | |
| 3 | ✓ | 1017353.2403-050 | 4 | OVERALL PLAN |
| | | GENERAL ARRANGEMENT | | |
| 4 | ✓ | 1017353.2403-151 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 1 |
| 5 | ✓ | 1017353.2403-152 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 2 |
| 6 | ✓ | 1017353.2403-153 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 3 |
| 7 | ✓ | 1017353.2403-154 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 4 |
| 8 | ✓ | 1017353.2403-155 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 5 |
| 9 | ✓ | 1017353.2403-156 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 6 |
| 10 | ✓ | 1017353.2403-157 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 7 |
| 11 | ✓ | 1017353.2403-158 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 8 |
| 12 | ✓ | 1017353.2403-159 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 9 |
| 13 | ✓ | 1017353.2403-160 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 10 |
| 14 | ✓ | 1017353.2403-161 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 11 |
| 15 | ✓ | 1017353.2403-162 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 12 |
| 16 | ✓ | 1017353.2403-163 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 13 |
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| 18 | ✓ | 1017353.2403-165 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 15 |
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| 20 | ✓ | 1017353.2403-167 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 17 |
| 21 | ✓ | 1017353.2403-168 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 18 |
| 22 | ✓ | 1017353.2403-169 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 19 |
| 23 | ✓ | 1017353.2403-170 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 20 |
| 24 | ✓ | 1017353.2403-171 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 21 |
| 25 | ✓ | 1017353.2403-172 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 22 |
| 26 | ✓ | 1017353.2403-173 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 23 |
| 27 | ✓ | 1017353.2403-174 | 1 | STOPBANK PLAN AND LONG SECTION - SHEET 24 |
| 28 | ✓ | 1017353.2403-191 | 1 | STOPBANK RETAINING WALL PLAN 1 |
| 29 | ✓ | 1017353.2403-192 | 1 | STOPBANK RETAINING WALL PLAN 2 |
| 30 | ✓ | 1017353.2403-193 | 1 | SPILLWAY PLAN AND LONG SECTION |
| | | SECTIONS | | |
| 31 | ✓ | 1017353.2403-210 | 2 | TYPICAL STOPBANK (REFURBISHMENT) - TYPE A |
| 32 | ✓ | 1017353.2403-211 | 1 | TYPICAL NEW STOPBANK SECTION - TYPE A |
| 33 | ✓ | 1017353.2403-212 | 1 | TYPICAL NEW STOPBANK SECTION - TYPE B |
| 34 | ✓ | 1017353.2403-213 | 1 | FEL BLOCK HYBRID STOPBANK/FLOOD WALL SECTION |
| 35 | ✓ | 1017353.2403-214 | 1 | TYPICAL SECTION SPILLWAY DETAIL |
| | | DETAILS | | |
| 36 | ✓ | 1017353.2403-301 | 1 | TYPICAL VEHICLE ACCESS DETAILS |
| 37 | ✓ | 1017353.2403-302 | 1 | TYPICAL STREAM DIVERSION DETAILS |
| 38 | ✓ | 1017353.2403-311 | 1 | TYPICAL STORMWATER DRAINAGE DETAILS SHEET 1 |
| 39 | ✓ | 1017353.2403-312 | 1 | TYPICAL STORMWATER DRAINAGE DETAILS SHEET 2 |
| 40 | ✓ | 1017353.2403-313 | 1 | TYPICAL STORMWATER DRAINAGE DETAILS SHEET 3 |
| 41 | ✓ | 1017353.2403-314 | 1 | TYPICAL STORMWATER DRAINAGE DETAILS SHEET 4 |
| | ✓ | DENOTES DRAWINGS IN THIS ISSUE: 04/09/2025 | | |


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## LOCATION PLAN

NOT TO SCALE

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DRAFT | MLE | JWY | 10.12.2024 |
| 2 | CONCEPT DESIGN OPTIONS - FOR CLIENT REVIEW | KATU | JEMC | 30.05.2025 |
| 3 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT HAWKE'S BAY REGIONAL COUNCIL

PROJECT PĀKŌWHAI SECONDARY STOPBANK

TITLE GENERAL
DRAWING LIST & LOCATION PLAN

SCALE (A1) N.T.S. DWG No. 1017353.2403-001 REV 3

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-002.dwg 2025-Sep-04 1:18:29 pm Plotted By: KATU

## GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL COMPLY WITH THE PROJECT DRAWINGS AND SPECIFICATIONS AND CURRENT LOCAL AND HAWKE'S BAY REGIONAL COUNCIL (HBRC) GUIDELINES. ANY CONFLICT BETWEEN THE PROJECT DOCUMENTS AND HBRC STANDARDS SHALL BE RAISED WITH THE ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION.
2. ALL DIMENSIONS SHOWN ON THESE DRAWINGS ARE IN METRES UNLESS NOTED OTHERWISE.
3. AERIAL IMAGERY AND EXISTING PROPERTY BOUNDARIES SOURCED FROM LINZ DATA SERVICE, LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE, ACCESSED 02/09/2024.
4. SITE CONTOURS AND CROSS SECTION INFORMATION BASED ON A COMBINATION OF 2021 HAWKE'S BAY LIDAR (SOURCED FROM LINZ DATA SERVICE, LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE) AND EXISTING GROUND SURVEY DATA SUPPLIED BY THE SURVEYING COMPANY IN JULY 2024.
5. COORDINATE SYSTEM: NEW ZEALAND TRANSVERSE MERCATOR (NZTM2000).
6. LEVEL DATUM: NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
7. NO LIABILITY IS ACCEPTED FOR THE ACCURACY OR COMPLETENESS OF THE PLOTTED SERVICES. OTHER UNDERGROUND OR OVERHEAD SERVICES MAY EXIST THAT ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL SERVICES USING NETWORK UTILITY AUTHORITY DATA AND HAVE ALL SERVICES MARKED OUT ACCURATELY ON SITE USING UTILITY AUTHORITY ON SITE LOCATION SERVICES PRIOR TO COMMENCING ANY GROUND DISTURBANCE.
8. THE CONTRACTOR SHALL ENSURE AN EROSION AND SEDIMENT CONTROL PLAN (ESCP) IN ACCORDANCE WITH HBRC IS PROVIDED TO THE ENGINEER FOR REVIEW PRIOR TO COMMENCING WORK.
9. FLOOD PROTECTION DESIGN LEVEL SET TO 500mm FREEBOARD ABOVE A DESIGN INFLOW OF 200m³/s SIMULATING A FLOOD EVENT. THIS IS CLASSED AS BETWEEN A 1% AND 0.2% AEP FLOOD EVENT.
10. LOCATION AND EXTENTS OF EROSION PROTECTION REQUIRED AT VARIOUS LOCATIONS ALONG THE STREAM BANK, AND NEAR THE PROPOSED STOPBANK TOE, ARE TO BE CONFIRMED AT DETAILED DESIGN.
11. STOPBANK TYPE A CORRESPONDS TO A STANDARD STOPBANK UPGRADE, WHICH EITHER CONSISTS OF A FULL STOPBANK REPLACEMENT OR A CREST RAISE IMPROVEMENT WITH IMPORTED MATERIAL.
12. STOPBANK TYPE B IS A STOPBANK WHICH REQUIRES A RELIEF SAND DRAIN ON THE LANDWARD SIDE OF THE STOPBANK. WE NOTE THIS IS TYPICALLY CONSTRAINED TO AREAS ALONG THE NORTHERN EDGE OF THE ALIGNMENT.
13. STOPBANK - FEL BLOCK CONSISTS OF A STOPBANK-FLOOD WALL HYBRID AND IS CONSTRAINED TO THE PROPERTY AT 71 FRANKLIN ROAD.
14. PROPOSED STORMWATER INFRASTRUCTURE FOLLOWS A CONSISTENT NAMING CONVENTION ACROSS THE DRAWINGS. WHERE "DC-X" IS A DRAINAGE CHANNEL, "C-X" IS A CULVERT, AND THE "X" IS AN IDENTIFIABLE NUMBER GENERALLY IN ASCENDING ORDER ALONG THE STOPBANK ALIGNMENT CHAINAGE DIRECTION.

## SITE HAZARDS TABLE

| HAZARD ID | DESCRIPTION |
|---|---|
| 1 | WORKS UNDER OVERHEAD POWERLINES |
| 2 | WORKS IN CLOSE PROXIMITY TO OVERHEAD POWERLINES |
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |
| 4 | UNMAPPED UNDERGROUND UTILITIES EXPECTED WITHIN VICINITY |
| 5 | WORKS WITHIN STREAM REQUIRED |
| 6 | TRAFFICKING INTO AND OUT OF SITE AREAS (BLIND CORNERS, BUSY INTERSECTIONS) |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.

## LEGEND - PLANS

- PROPERTY BOUNDARIES
- 7.5 EXISTING MAJOR CONTOURS (2.5m INTERVAL)
- EXISTING MINOR CONTOURS (0.5m INTERVAL)
- 8.0 STOPBANK DESIGN CONTOURS (0.5m INTERVAL)
- EXISTING STOPBANK ALIGNMENT
- EXISTING RIVER/STREAM ALIGNMENT
- EXISTING ROAD (EDGE OF SEAL)
- EXISTING FENCE
- EXISTING BUILDINGS
- SW EXISTING STORMWATER PIPE
- SW EXISTING STORMWATER CULVERT
- W EXISTING WATER PIPE
- IRR EXISTING ABOVE GROUND IRRIGATION PIPE
- OH/LV EXISTING OVERHEAD LV POWER
- OH/HV EXISTING OVERHEAD HV POWER
- UG/HV EXISTING UNDERGROUND HV POWER
- EXISTING POWER POLE
- EXISTING POWER STRUCTURE
- FIBRE EXISTING FIBRE CABLE
- ORCHARD - EXISTING END POSTS
- ORCHARD - EXISTING BASE RAKER POSTS
- ORCHARD - EXISTING GROUND ANCHORS
- ORCHARD - EXISTING NET BASE
- PROPOSED RETAINING WALL EXTENT
- SW PROPOSED STORMWATER CULVERT
- PROPOSED DRAINAGE CHANNEL
- PROPOSED STREAM REALIGNMENT WORKS
- PROPOSED STOPBANK ALIGNMENT
- PROPOSED STOPBANK CREST
- PROPOSED STOPBANK EXTENT - TYPE A
- PROPOSED STOPBANK EXTENT - TYPE B
- PROPOSED STOPBANK/FLOOD WALL HYBRID EXTENT - FEL BLOCK
- PROPOSED STOPBANK EXTENT - SPILLWAY AREA
- PROPOSED TURF REINFORCEMENT

## LEGEND - LONG SECTIONS

- DESIGN FLOOD LEVEL (REFER TO NOTE 9)

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

NOT FOR CONSTRUCTION

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APPROVED DATE

CLIENT HAWKE'S BAY REGIONAL COUNCIL
PROJECT PĀKŌWHAI SECONDARY STOPBANK
TITLE GENERAL NOTES AND LEGEND
SCALE (A1) N.T.S. DWG No. 1017353.2403-002 REV 1

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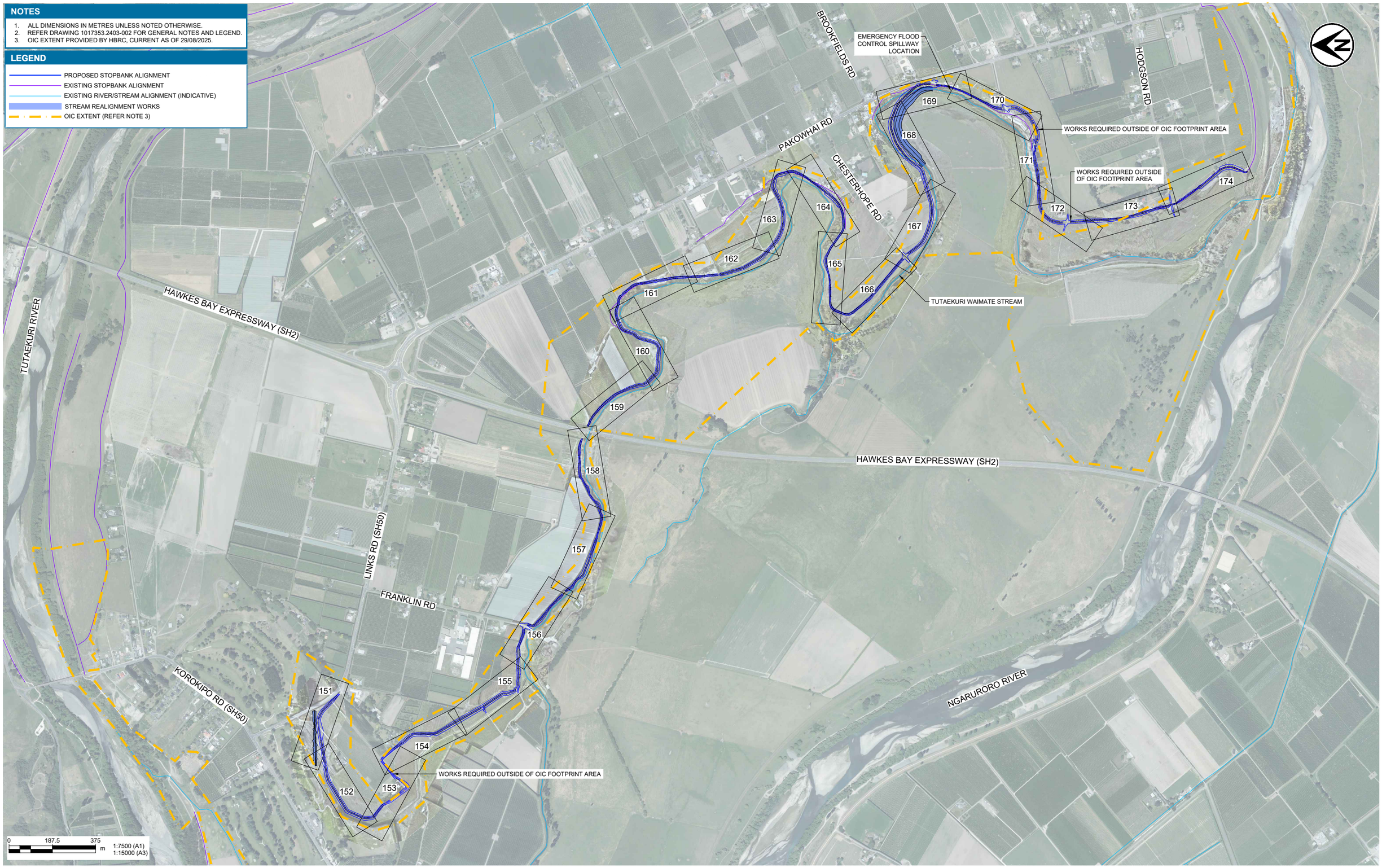
## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. OIC EXTENT PROVIDED BY HBRC, CURRENT AS OF 29/08/2025.

## LEGEND

- PROPOSED STOPBANK ALIGNMENT
- EXISTING STOPBANK ALIGNMENT
- EXISTING RIVER/STREAM ALIGNMENT (INDICATIVE)
- STREAM REALIGNMENT WORKS
- OIC EXTENT (REFER NOTE 3)




Tonkin+Taylor

www.tonkintaylor.co.nz

| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DRAFT | MLE | ANCA | 25.10.2024 |
| 2 | PRELIMINARY DRAFT - REVISED | MLE | JWY | 10.12.2024 |
| 3 | CONCEPT DESIGN OPTIONS - FOR CLIENT REVIEW | KATU | JEMC | 30.05.2025 |
| 4 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | |
|---|---|---|
| DESIGNED | JEMC | JUN.25 |
| DRAWN | KATU | JUN.25 |
| DESIGN CHECKED | JWY | SEP.25 |
| DRAWING CHECKED | HUGO | SEP.25 |

DRAWING STATUS: PRELIMINARY DRAFT

PROJECT PHASE: PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

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APPROVED DATE

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**

PROJECT **PĀKŌWHAI SECONDARY STOPBANK**

TITLE GENERAL ARRANGEMENT PLAN
OVERALL PLAN

SCALE (A1) 1:7500 DWG No. 1017353.2403-050 REV 4

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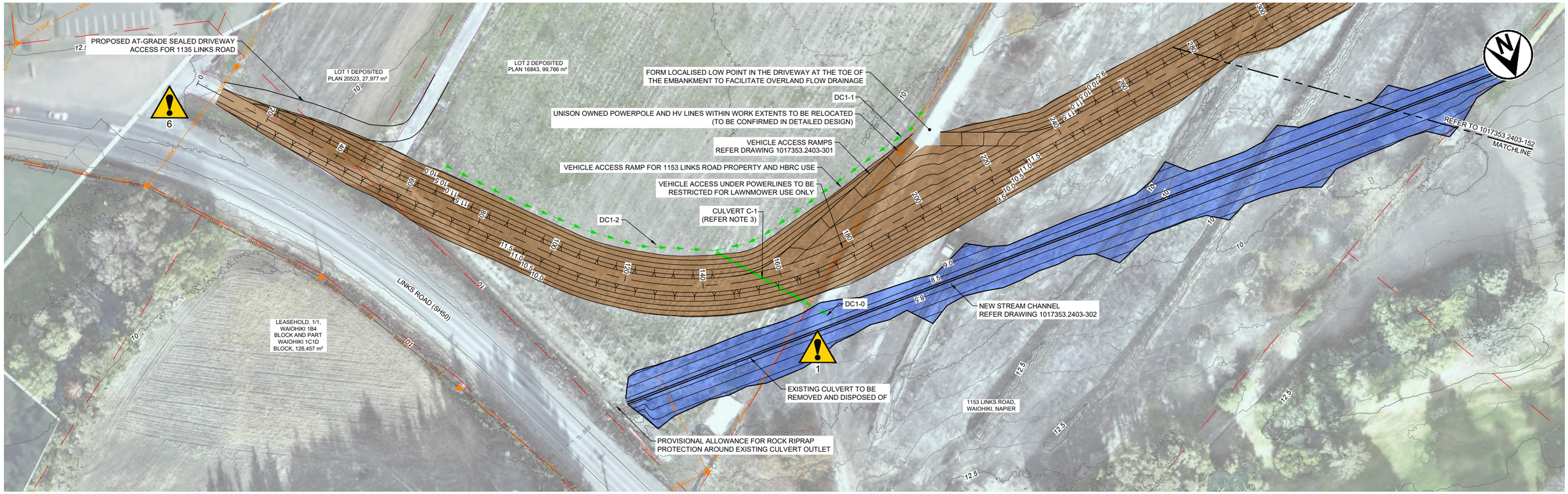



## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.

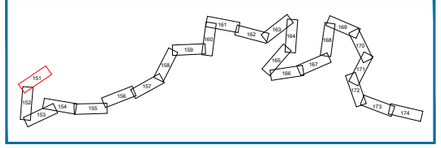
## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

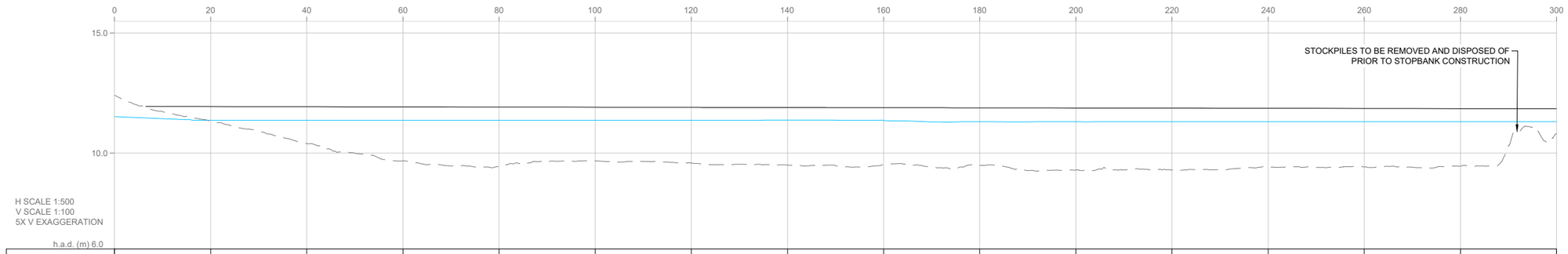
## KEY PLAN (N.T.S.)



## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 1 | WORKS UNDER OVERHEAD POWERLINES |
| 6 | TRAFFICKING INTO AND OUT OF SITE AREAS (BLIND CORNERS, BUSY INTERSECTIONS). |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 |
| h.a.d. (m) 6.0 | | | | | | | | | | | | | | | | |
| EXISTING GROUND LEVEL | 12.401 | 11.340 | 10.398 | 9.679 | 9.470 | 9.679 | 9.587 | 9.502 | 9.513 | 9.495 | 9.300 | 9.305 | 9.396 | 9.429 | 9.464 | 10.828 |
| DESIGN CREST CL LEVEL | | 11.937 | 11.930 | 11.924 | 11.917 | 11.910 | 11.904 | 11.897 | 11.891 | 11.884 | 11.878 | 11.871 | 11.864 | 11.858 | 11.851 | |
| CUT / FILL DEPTH | | 0.597 | 1.532 | 2.245 | 2.447 | 2.232 | 2.317 | 2.395 | 2.378 | 2.389 | 2.577 | 2.566 | 2.468 | 2.429 | 2.387 | 1.017 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)

0 12.5 25 m H=1:500 V=1:100
0 2.5 5

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

NOT FOR CONSTRUCTION

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CLIENT HAWKE'S BAY REGIONAL COUNCIL
PROJECT PĀKŌWHAI SECONDARY STOPBANK
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 1
SCALE (A1) AS SHOWN DWG No. 1017353.2403-151 REV 1

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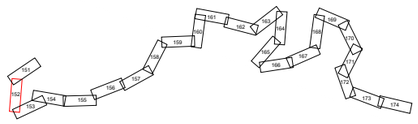
## KEY PLAN (N.T.S.)



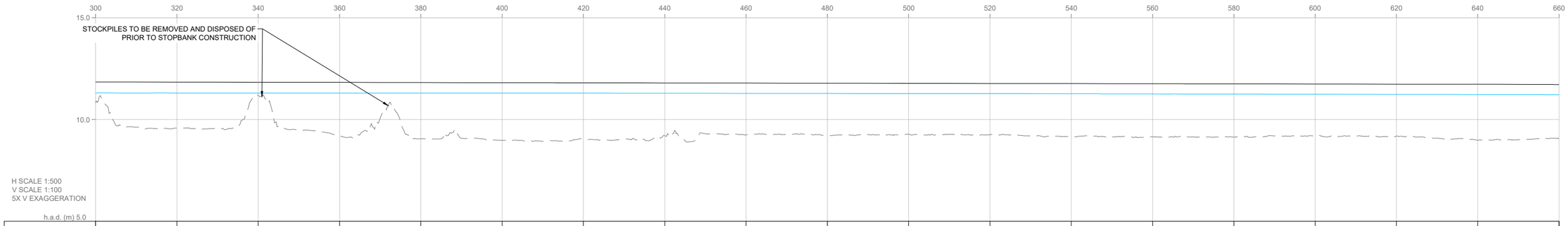



## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE | 300 | 320 | 340 | 360 | 380 | 400 | 420 | 440 | 460 | 480 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 |
| CUT / FILL DEPTH | 1.017 | 2.258 | 0.643 | 2.635 | 2.770 | 2.836 | 2.776 | 2.596 | 2.543 | 2.570 | 2.502 | 2.525 | 2.601 | 2.610 | 2.620 | 2.550 | 2.554 | 2.753 | 2.648 |
| DESIGN CREST CL LEVEL | 11.845 | 11.838 | 11.832 | 11.825 | 11.818 | 11.812 | 11.805 | 11.799 | 11.792 | 11.786 | 11.779 | 11.772 | 11.766 | 11.759 | 11.753 | 11.746 | 11.739 | 11.733 | |
| EXISTING GROUND LEVEL | 10.828 | 9.580 | 11.189 | 9.190 | 9.049 | 8.976 | 9.029 | 9.203 | 9.249 | 9.215 | 9.277 | 9.248 | 9.165 | 9.149 | 9.133 | 9.196 | 9.185 | 8.980 | 9.074 |

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | PRELIMINARY DRAFT |
| DRAWN | KATU | JUN.25 | | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | PRELIMINARY DESIGN |
| DRAWING CHECKED | HUGO | SEP.25 | | |

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APPROVED DATE

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**

PROJECT **PĀKŌWHAI SECONDARY STOPBANK**

TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 2

SCALE (A1) AS SHOWN DWG No. 1017353.2403-152 REV 1

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## KEY PLAN (N.T.S.)

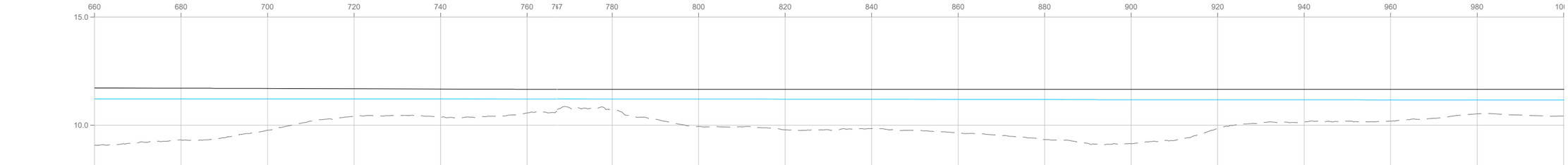


## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| CHAINAGE | 660 | 680 | 700 | 720 | 740 | 760 | 780 | 800 | 820 | 840 | 860 | 880 | 900 | 920 | 940 | 960 | 980 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 9.074 | 9.315 | 9.768 | 10.394 | 10.380 | 10.568 | 10.697 | 9.937 | 9.783 | 9.844 | 9.634 | 9.331 | 9.146 | 9.854 | 10.151 | 10.190 | 10.525 | 10.427 |
| DESIGN CREST CL LEVEL | 11.722 | 11.710 | 11.698 | 11.685 | 11.673 | 11.661 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 |
| CUT / FILL DEPTH | 2.648 | 2.394 | 1.930 | 1.291 | 1.293 | 1.093 | 0.959 | 1.719 | 1.873 | 1.812 | 2.022 | 2.325 | 2.510 | 1.803 | 1.505 | 1.467 | 1.132 | 1.230 |

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

NOT FOR CONSTRUCTION

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APPROVED DATE

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 3
SCALE (A1) AS SHOWN DWG No. 1017353.2403-153 REV 1

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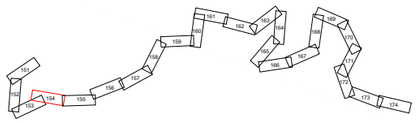
## KEY PLAN (N.T.S.)



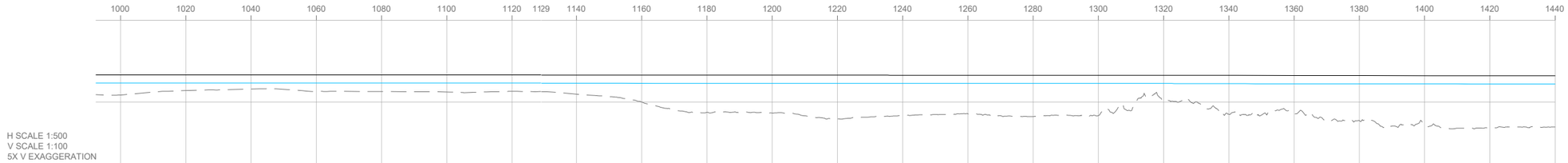



## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE | 1000 | 1020 | 1040 | 1060 | 1080 | 1100 | 1120 | 1129 | 1140 | 1160 | 1180 | 1200 | 1220 | 1240 | 1260 | 1280 | 1300 | 1320 | 1340 | 1360 | 1380 | 1400 | 1420 | 1440 |
| EXISTING GROUND LEVEL | 10.427 | 10.696 | 10.795 | 10.648 | 10.640 | 10.612 | 10.650 | | 10.487 | 10.004 | 9.373 | 9.332 | 8.964 | 9.182 | 9.281 | 9.115 | 9.181 | 10.128 | 9.252 | 9.319 | 8.864 | 8.721 | 8.426 | 8.480 |
| DESIGN CREST CL LEVEL | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | 11.657 | | 11.656 | 11.654 | 11.652 | 11.650 | 11.648 | 11.646 | 11.644 | 11.642 | 11.640 | 11.638 | 11.636 | 11.631 | 11.626 | 11.621 | 11.616 | |
| CUT / FILL DEPTH | 1.230 | 0.961 | 0.862 | 1.009 | 1.017 | 1.044 | 1.006 | | 1.168 | 1.650 | 2.278 | 2.318 | 2.683 | 2.464 | 2.362 | 2.527 | 2.458 | 1.510 | 2.383 | 2.312 | 2.761 | 2.900 | 3.189 | 3.131 |

## STOPBANK LONG SECTION

SCALE (A1) 1:750 (H) 1:150 (V)
SCALE (A3) 1:1500 (H) 1:300 (V)

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 18.75 37.5 m H=1:750 V=1:150
0 3.75 7.5

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | PRELIMINARY DRAFT |
| DRAWN | KATU | JUN.25 | | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | PRELIMINARY DESIGN |
| DRAWING CHECKED | HUGO | SEP.25 | | |

NOT FOR CONSTRUCTION

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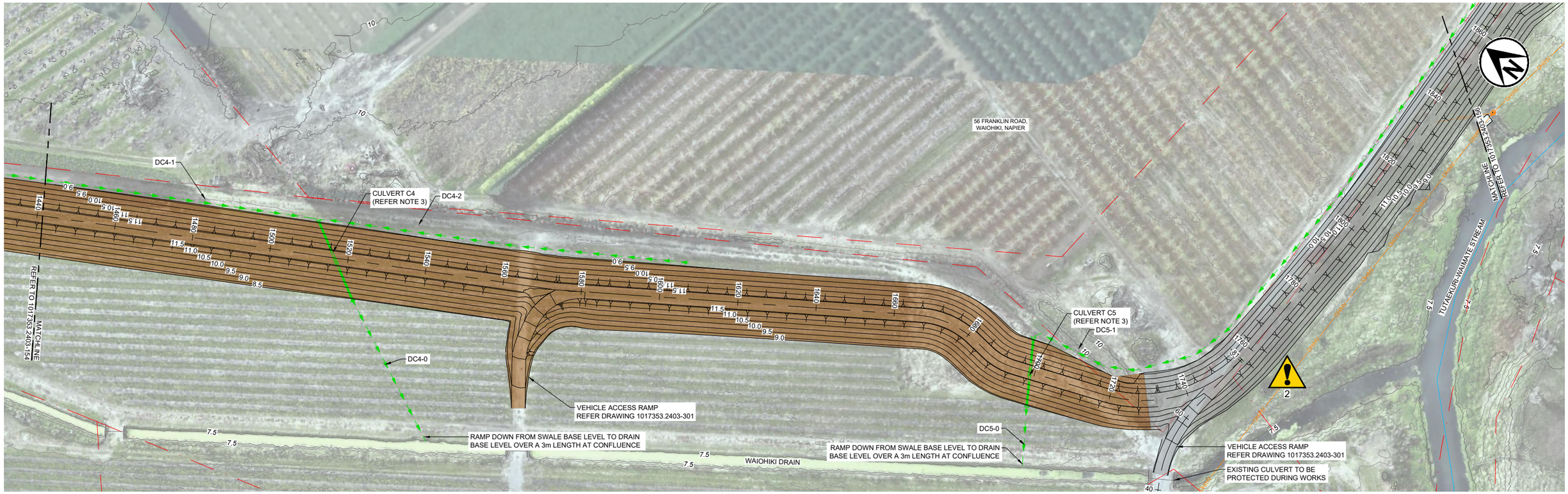
APPROVED DATE

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 4
SCALE (A1) AS SHOWN DWG No. 1017353.2403-154 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-151_158.dwg 2025-Sep-04 1:29:14 pm Plotted By: KATU




## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.

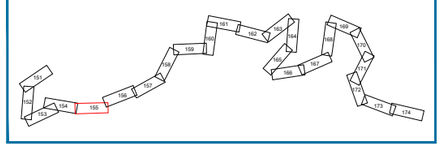
## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

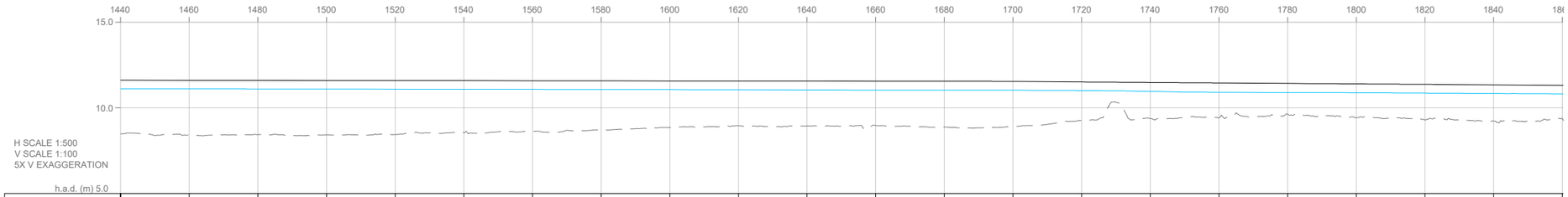
## KEY PLAN (N.T.S.)



## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 2 | WORKS IN CLOSE PROXIMITY TO OVERHEAD POWERLINES |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | 1440 | 1460 | 1480 | 1500 | 1520 | 1540 | 1560 | 1580 | 1600 | 1620 | 1640 | 1660 | 1680 | 1700 | 1720 | 1740 | 1760 | 1780 | 1800 | 1820 | 1840 | 1860 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 8.480 | 8.412 | 8.433 | 8.420 | 8.443 | 8.556 | 8.640 | 8.706 | 8.855 | 8.958 | 8.944 | 8.970 | 8.889 | 8.921 | 9.264 | 9.376 | 9.420 | 9.630 | 9.418 | 9.300 | 9.233 | 9.365 |
| DESIGN CREST CL LEVEL | 11.611 | 11.606 | 11.601 | 11.596 | 11.591 | 11.586 | 11.581 | 11.576 | 11.570 | 11.565 | 11.560 | 11.555 | 11.550 | 11.538 | 11.510 | 11.481 | 11.455 | 11.427 | 11.399 | 11.371 | 11.344 | 11.316 |
| CUT / FILL DEPTH | 3.131 | 3.194 | 3.167 | 3.175 | 3.148 | 3.029 | 2.940 | 2.870 | 2.715 | 2.607 | 2.616 | 2.585 | 2.661 | 2.617 | 2.246 | 2.106 | 2.035 | 1.797 | 1.981 | 2.072 | 2.110 | 1.950 |
| CHAINAGE | 1440 | 1460 | 1480 | 1500 | 1520 | 1540 | 1560 | 1580 | 1600 | 1620 | 1640 | 1660 | 1680 | 1700 | 1720 | 1740 | 1760 | 1780 | 1800 | 1820 | 1840 | 1860 |

## STOPBANK LONG SECTION

SCALE (A1) 1:750 (H) 1:100 (V)
SCALE (A3) 1:1500 (H) 1:200 (V)

0 12.5 25 m 1:500 (A1) 1:1000 (A3)

0 18.75 37.5 m H=1:750 V=1:100
0 2.5 5

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

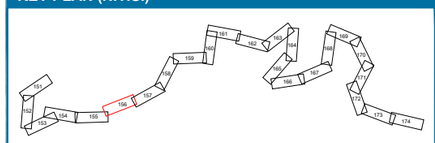
NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 5
SCALE (A1) AS SHOWN DWG No. 1017353.2403-155 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-151_158.dwg 2025-Sep-04 1:29:32 pm Plotted By: KATU

## KEY PLAN (N.T.S.)






## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.
4. REFER TO DRAWING 1017353.2403-213 FOR SHEETPILE SIZING.

## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

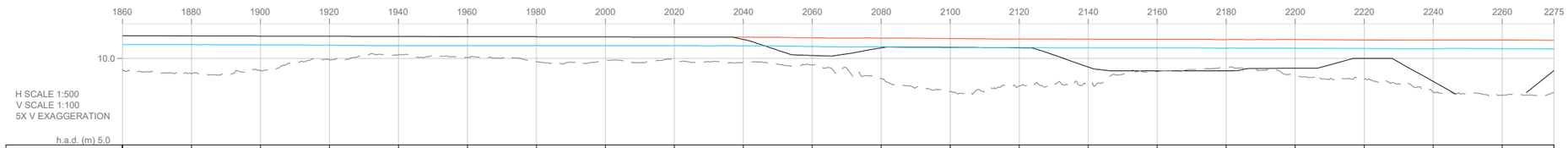
## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 1 | WORKS UNDER OVERHEAD POWERLINES |
| 2 | WORKS IN CLOSE PROXIMITY TO OVERHEAD POWERLINES |
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |
| 4 | UNMAPPED UNDERGROUND UTILITIES EXPECTED WITHIN VICINITY |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| CHAINAGE | 1860 | 1880 | 1900 | 1920 | 1940 | 1960 | 1980 | 2000 | 2020 | 2040 | 2060 | 2080 | 2100 | 2120 | 2140 | 2160 | 2180 | 2200 | 2220 | 2240 | 2260 | 2275 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIGN CREST CL LEVEL | 11.316 | 11.304 | 11.294 | 11.285 | 11.276 | 11.266 | 11.257 | 11.248 | 11.241 | 11.102 | 10.171 | 10.613 | 10.644 | 10.624 | 9.508 | 9.284 | 9.284 | 9.433 | 10.000 | 8.868 | | 9.292 |
| EXISTING GROUND LEVEL | 9.365 | 9.132 | 9.292 | 9.928 | 10.216 | 10.058 | 9.805 | 9.880 | 9.891 | 9.798 | 9.624 | 8.836 | 8.102 | 8.413 | 8.435 | 9.239 | 9.470 | 9.017 | 8.796 | 8.046 | 7.869 | 8.037 |
| CUT / FILL DEPTH | 1.950 | 2.172 | 2.003 | 1.357 | 1.059 | 1.208 | 1.452 | 1.367 | 1.350 | 1.304 | 0.547 | 1.777 | 2.542 | 2.211 | 1.073 | 0.045 | -0.186 | 0.417 | 1.204 | 0.622 | | 1.255 |
| TOP WALL LEVEL | 11.312 | 11.303 | 11.286 | 11.265 | 11.239 | 11.239 | 11.243 | 11.243 | 11.238 | 11.233 | 11.194 | 11.178 | 11.151 | 11.120 | 11.116 | 11.114 | 11.094 | 11.091 | 11.073 | 11.065 | 11.069 | 11.052 |
| WALL HEIGHT | -0.004 | -0.001 | -0.008 | -0.020 | -0.037 | -0.027 | -0.014 | -0.004 | -0.003 | 0.131 | 1.023 | 0.565 | 0.507 | 0.497 | 1.608 | 1.829 | 1.810 | 1.658 | 1.073 | 2.397 | 3.200 | 1.760 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)

0 18.75 37.5 m H=1:750 V=1:100
0 2.5 5

## STOPBANK LONG SECTION

SCALE (A1) 1:750 (H) 1:100 (V)
SCALE (A3) 1:1500 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

NOT FOR CONSTRUCTION

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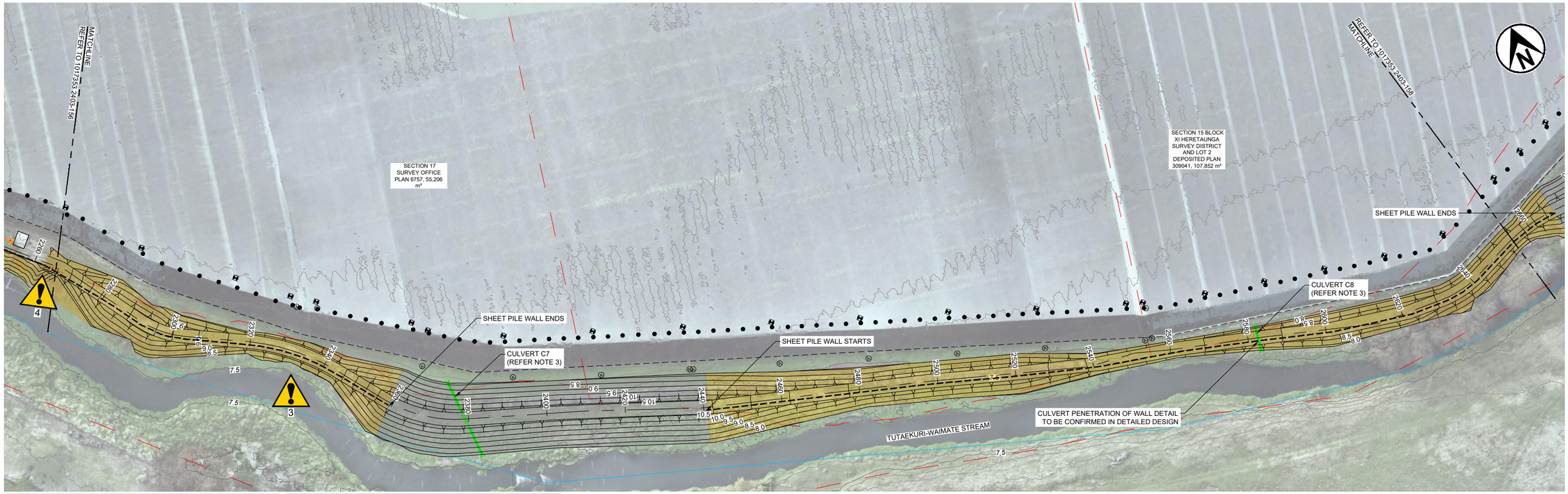
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 6
SCALE (A1) AS SHOWN DWG No. 1017353.2403-156 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-151_158.dwg 2025-Sep-04 1:30:08 pm Plotted By: KATU




## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.
4. REFER TO DRAWING 1017353.2403-213 FOR SHEETPILE SIZING.

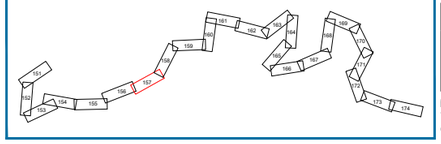
## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

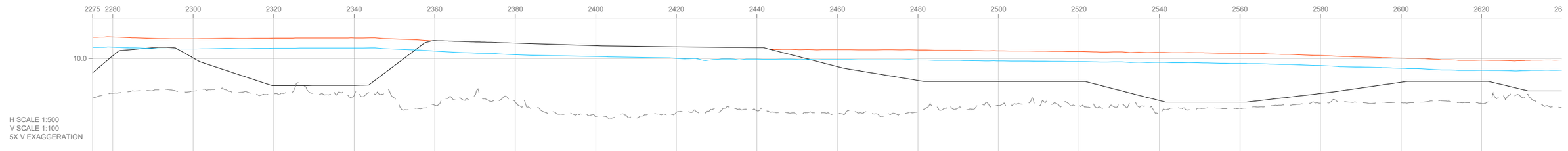
## KEY PLAN (N.T.S.)



## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |
| 4 | UNMAPPED UNDERGROUND UTILITIES EXPECTED WITHIN VICINITY |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIGN CREST CL LEVEL | 9.292 | 10.128 | 10.023 | 8.650 | 8.665 | 10.888 | 10.762 | 10.637 | 10.576 | 10.541 | 9.597 | 8.908 | 8.856 | 8.856 | 7.910 | 7.830 | 8.258 | 8.822 | 8.867 | 8.392 |
| EXISTING GROUND LEVEL | 8.037 | 8.274 | 8.381 | 8.244 | 8.184 | 7.673 | 7.841 | 7.120 | 7.320 | 7.405 | 7.294 | 7.341 | 7.663 | 7.665 | 7.192 | 7.529 | 7.784 | 7.802 | 7.767 | 7.542 |
| CUT / FILL DEPTH | 1.255 | 1.854 | 1.642 | 0.406 | 0.481 | 3.215 | 2.921 | 3.516 | 3.257 | 3.136 | 2.303 | 1.567 | 1.194 | 1.191 | 0.718 | 0.301 | 0.474 | 1.020 | 1.100 | 0.851 |
| TOP WALL LEVEL | 11.052 | 11.061 | 10.974 | 11.004 | 11.018 | 10.868 | 10.689 | 10.593 | 10.503 | 10.459 | 10.440 | 10.425 | 10.382 | 10.349 | 10.300 | 10.252 | 10.150 | 10.013 | 9.914 | 9.924 |
| WALL HEIGHT | 1.760 | 0.933 | 0.950 | 2.354 | 2.353 | | | | | | 0.844 | 1.517 | 1.526 | 1.492 | 2.390 | 2.422 | 1.892 | 1.191 | 1.047 | 1.531 |
| CHAINAGE | 2275 | 2280 | 2300 | 2320 | 2340 | 2360 | 2380 | 2400 | 2420 | 2440 | 2460 | 2480 | 2500 | 2520 | 2540 | 2560 | 2580 | 2600 | 2620 | 2640 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN | |

NOT FOR CONSTRUCTION

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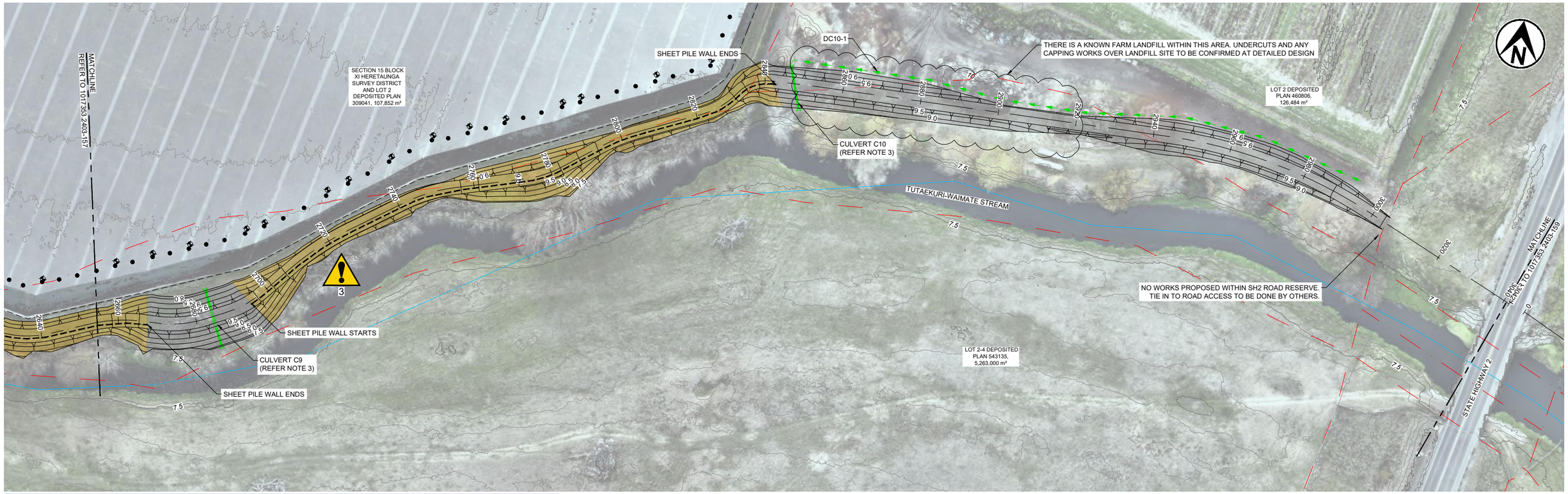
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 7
SCALE (A1) AS SHOWN DWG No. 1017353.2403-157 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-151_158.dwg 2025-Sep-04 1:30:43 pm Plotted By: KATU




## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.
4. REFER TO DRAWING 1017353.2403-213 FOR SHEETPILE SIZING.

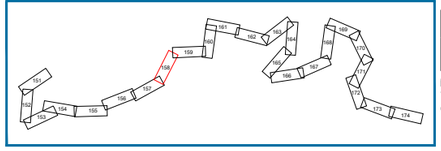
## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

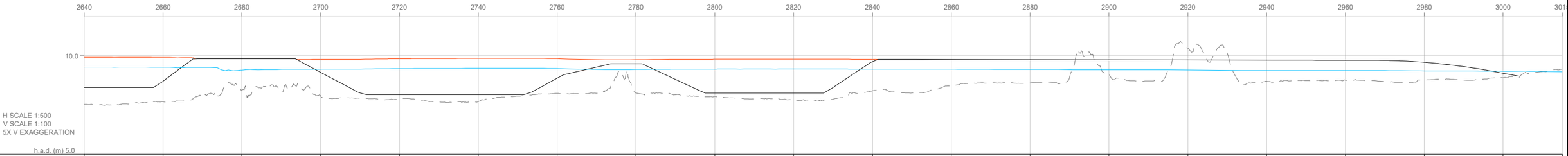
## KEY PLAN (N.T.S.)



## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | 2640 | 2660 | 2680 | 2700 | 2720 | 2740 | 2760 | 2780 | 2800 | 2820 | 2840 | 2860 | 2880 | 2900 | 2920 | 2940 | 2960 | 2980 | 3000 | 3015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIGN CREST CL LEVEL | 8.392 | 8.711 | 9.850 | 9.163 | 8.028 | 8.029 | 8.867 | 9.595 | 8.112 | 8.113 | 9.702 | 9.820 | 9.811 | 9.802 | 9.793 | 9.784 | 9.774 | 9.672 | 9.118 | |
| EXISTING GROUND LEVEL | 7.542 | 7.676 | 8.271 | 7.970 | 7.810 | 7.678 | 8.094 | 8.117 | 7.938 | 7.729 | 8.227 | 8.509 | 8.627 | 9.059 | 10.400 | 8.708 | 8.761 | 8.782 | 8.889 | 9.328 |
| CUT / FILL DEPTH | 0.851 | 1.034 | 1.579 | 1.193 | 0.218 | 0.350 | 0.773 | 1.478 | 0.174 | 0.384 | 1.475 | 1.311 | 1.184 | 0.743 | -0.608 | 1.075 | 1.014 | 0.890 | 0.229 | |
| TOP WALL LEVEL | 9.924 | 9.916 | 9.777 | 9.821 | 9.851 | 9.866 | 9.858 | 9.804 | 9.829 | 9.830 | 9.826 | 9.822 | 9.808 | 9.794 | 9.783 | 9.754 | 9.758 | 9.736 | 9.720 | 9.689 |
| WALL HEIGHT | 1.531 | 1.206 | -0.073 | 0.658 | 1.823 | 1.838 | 0.991 | 0.209 | 1.717 | 1.718 | 0.124 | 0.002 | -0.003 | -0.008 | -0.010 | -0.030 | -0.017 | 0.065 | 0.601 | |
| CHAINAGE | 2640 | 2660 | 2680 | 2700 | 2720 | 2740 | 2760 | 2780 | 2800 | 2820 | 2840 | 2860 | 2880 | 2900 | 2920 | 2940 | 2960 | 2980 | 3000 | 3015 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 12.5 25 m H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN | |

NOT FOR CONSTRUCTION

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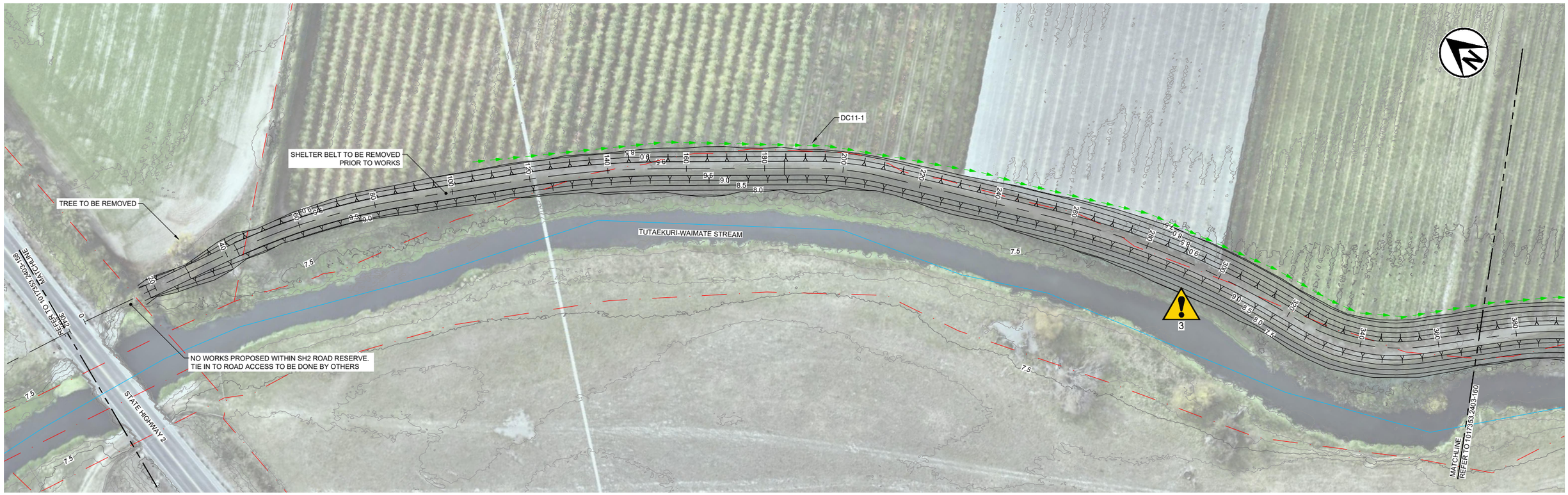
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 8
SCALE (A1) AS SHOWN DWG No. 1017353.2403-158 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:36:07 pm Plotted By: KATU



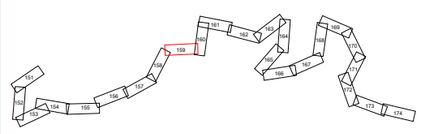

## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## KEY PLAN (N.T.S.)



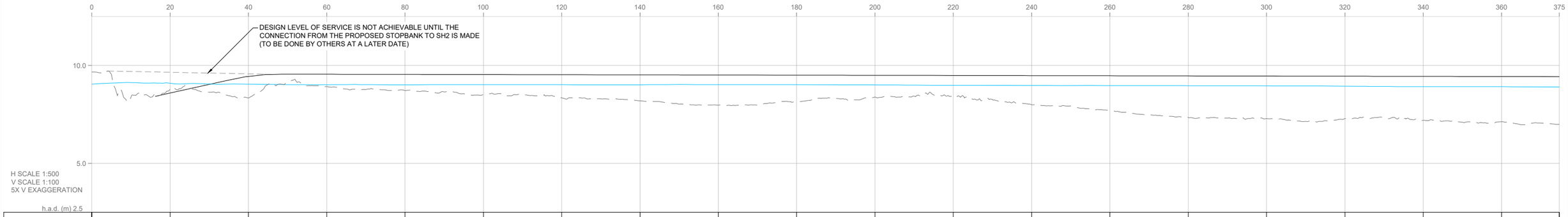
## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| CHAINAGE | EXISTING GROUND LEVEL | DESIGN CREST CL LEVEL | CUT / FILL DEPTH |
|---|---|---|---|
| 0 | 9.663 | | |
| 20 | 8.798 | 8.589 | -0.209 |
| 40 | 8.340 | 9.436 | 1.096 |
| 60 | 8.917 | 9.548 | 0.631 |
| 80 | 8.718 | 9.540 | 0.822 |
| 100 | 8.516 | 9.533 | 1.016 |
| 120 | 8.344 | 9.525 | 1.181 |
| 140 | 8.192 | 9.517 | 1.326 |
| 160 | 7.973 | 9.510 | 1.536 |
| 180 | 8.140 | 9.502 | 1.362 |
| 200 | 8.382 | 9.494 | 1.112 |
| 220 | 8.394 | 9.487 | 1.093 |
| 240 | 7.995 | 9.479 | 1.484 |
| 260 | 7.704 | 9.471 | 1.767 |
| 280 | 7.343 | 9.463 | 2.121 |
| 300 | 7.281 | 9.456 | 2.175 |
| 320 | 7.284 | 9.448 | 2.164 |
| 340 | 7.194 | 9.440 | 2.246 |
| 360 | 7.122 | 9.433 | 2.311 |
| 375 | 6.990 | | 2.437 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 12.5 25 m 0 2.5 5 H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | |
|---|---|---|
| DESIGNED | JEMC | JUN.25 |
| DRAWN | KATU | JUN.25 |
| DESIGN CHECKED | JWY | SEP.25 |
| DRAWING CHECKED | HUGO | SEP.25 |

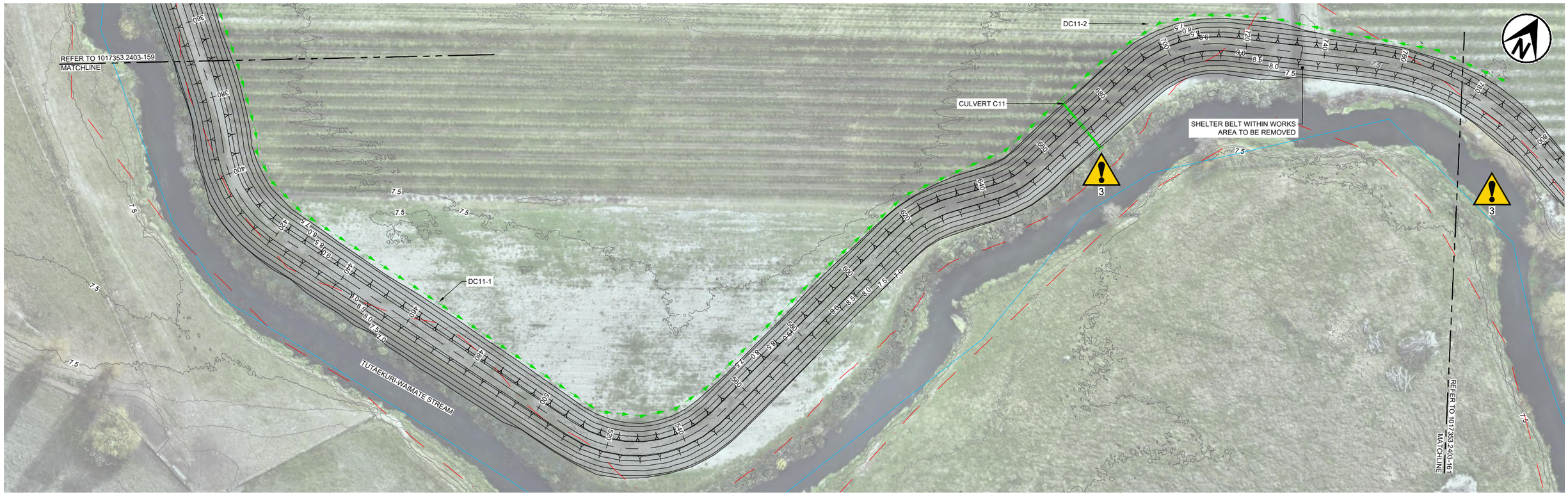
DRAWING STATUS: PRELIMINARY DRAFT
PROJECT PHASE: PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 9
SCALE (A1) AS SHOWN DWG No. 1017353.2403-159 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:36:40 pm Plotted By: KATU



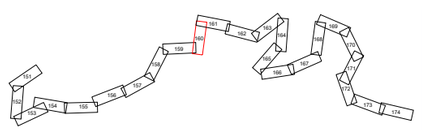

## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## KEY PLAN (N.T.S.)



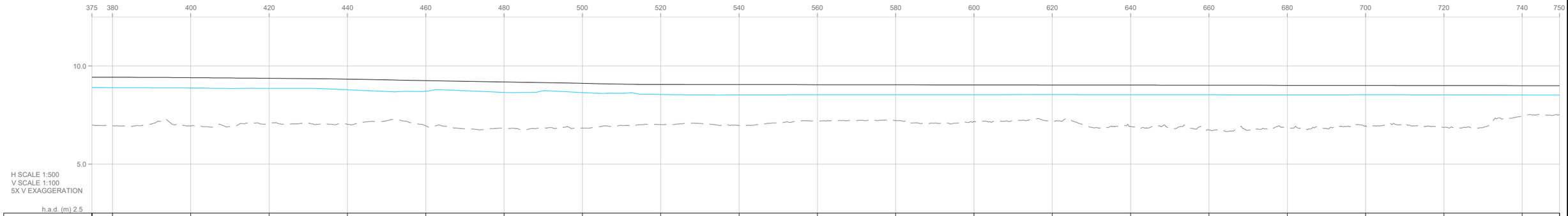
## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 6.990 | 6.958 | 6.942 | 7.094 | 7.022 | 6.951 | 6.822 | 6.836 | 7.015 | 6.970 | 7.195 | 7.219 | 7.168 | 7.186 | 6.911 | 6.740 | 6.824 | 6.950 | 6.872 | 7.451 | 7.524 |
| DESIGN CREST CL LEVEL | 9.427 | 9.425 | 9.406 | 9.375 | 9.330 | 9.258 | 9.187 | 9.116 | 9.060 | 9.055 | 9.049 | 9.043 | 9.038 | 9.032 | 9.026 | 9.021 | 9.015 | 9.010 | 9.004 | 8.999 | |
| CUT / FILL DEPTH | 2.437 | 2.467 | 2.463 | 2.281 | 2.308 | 2.307 | 2.365 | 2.280 | 2.046 | 2.084 | 1.854 | 1.824 | 1.870 | 1.846 | 2.116 | 2.280 | 2.192 | 2.059 | 2.132 | 1.548 | 1.472 |
| CHAINAGE | 375 | 380 | 400 | 420 | 440 | 460 | 480 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 | 680 | 700 | 720 | 740 | 750 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | |
|---|---|---|
| DESIGNED | JEMC | JUN.25 |
| DRAWN | KATU | JUN.25 |
| DESIGN CHECKED | JWY | SEP.25 |
| DRAWING CHECKED | HUGO | SEP.25 |

DRAWING STATUS: PRELIMINARY DRAFT
PROJECT PHASE: PRELIMINARY DESIGN

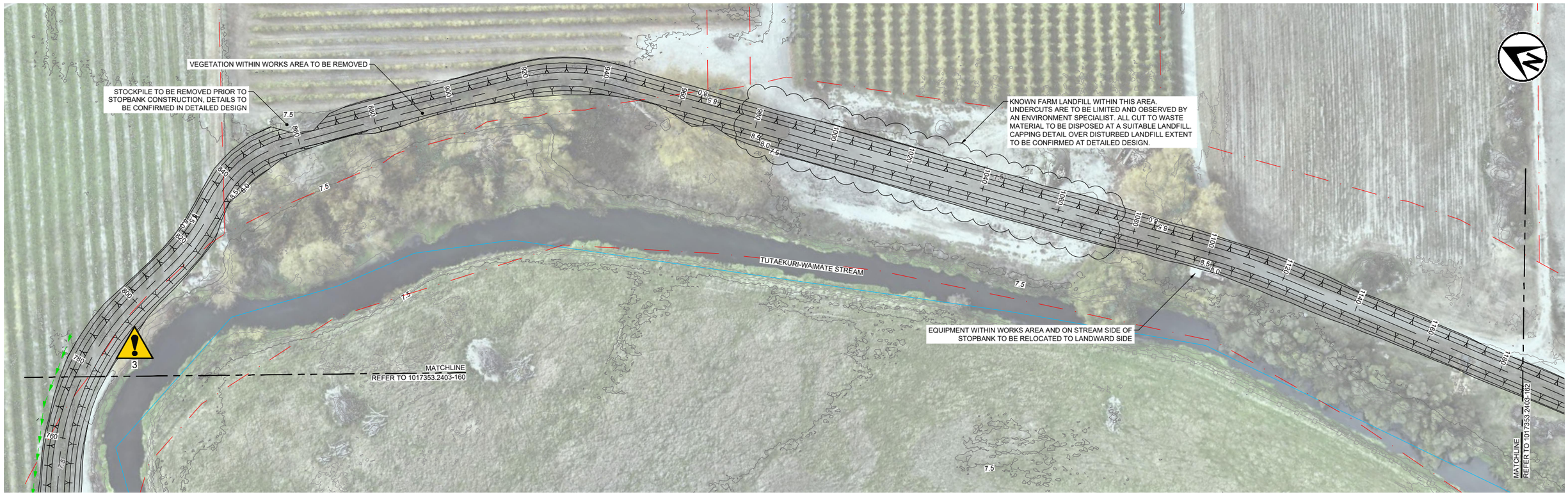
NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 10
SCALE (A1) AS SHOWN DWG No. 1017353.2403-160 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:37:16 pm Plotted By: KATU




## NOTES

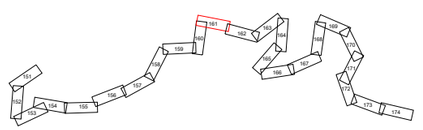
1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## LEGEND

HAZARD LOCATION - REFER TABLE 1

ID

## KEY PLAN (N.T.S.)



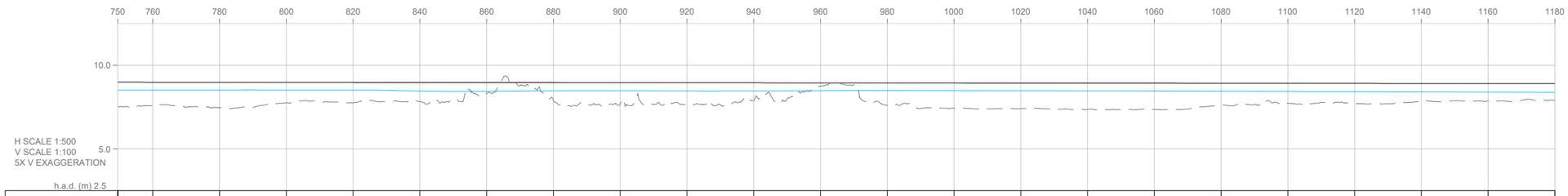
## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | 750 | 760 | 780 | 800 | 820 | 840 | 860 | 880 | 900 | 920 | 940 | 960 | 980 | 1000 | 1020 | 1040 | 1060 | 1080 | 1100 | 1120 | 1140 | 1160 | 1180 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 7.524 | 7.581 | 7.468 | 7.756 | 7.757 | 7.831 | 8.314 | 7.902 | 7.702 | 7.670 | 7.884 | 8.757 | 7.616 | 7.431 | 7.412 | 7.365 | 7.364 | 7.622 | 7.733 | 7.715 | 7.816 | 7.865 | 7.925 |
| CREST CL LEVEL | 8.997 | 8.995 | 8.991 | 8.986 | 8.982 | 8.978 | 8.974 | 8.970 | 8.966 | 8.962 | 8.957 | 8.953 | 8.949 | 8.945 | 8.941 | 8.937 | 8.933 | 8.928 | 8.924 | 8.920 | 8.916 | 8.912 | |
| CUT / FILL DEPTH | 1.472 | 1.413 | 1.522 | 1.231 | 1.226 | 1.147 | 0.660 | 1.068 | 1.264 | 1.292 | 1.073 | 0.197 | 1.334 | 1.514 | 1.529 | 1.572 | 1.569 | 1.306 | 1.191 | 1.205 | 1.100 | 1.047 | 0.983 |
| CHAINAGE | 750 | 760 | 780 | 800 | 820 | 840 | 860 | 880 | 900 | 920 | 940 | 960 | 980 | 1000 | 1020 | 1040 | 1060 | 1080 | 1100 | 1120 | 1140 | 1160 | 1180 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)

0 18.75 37.5 m H=1:750 V=1:100
0 2.5 5

## STOPBANK LONG SECTION

SCALE (A1) 1:750 (H) 1:100 (V)
SCALE (A3) 1:1500 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS: PRELIMINARY DRAFT |
| DRAWN | KATU | JUN.25 | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE: PRELIMINARY DESIGN |
| DRAWING CHECKED | HUGO | SEP.25 | |

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

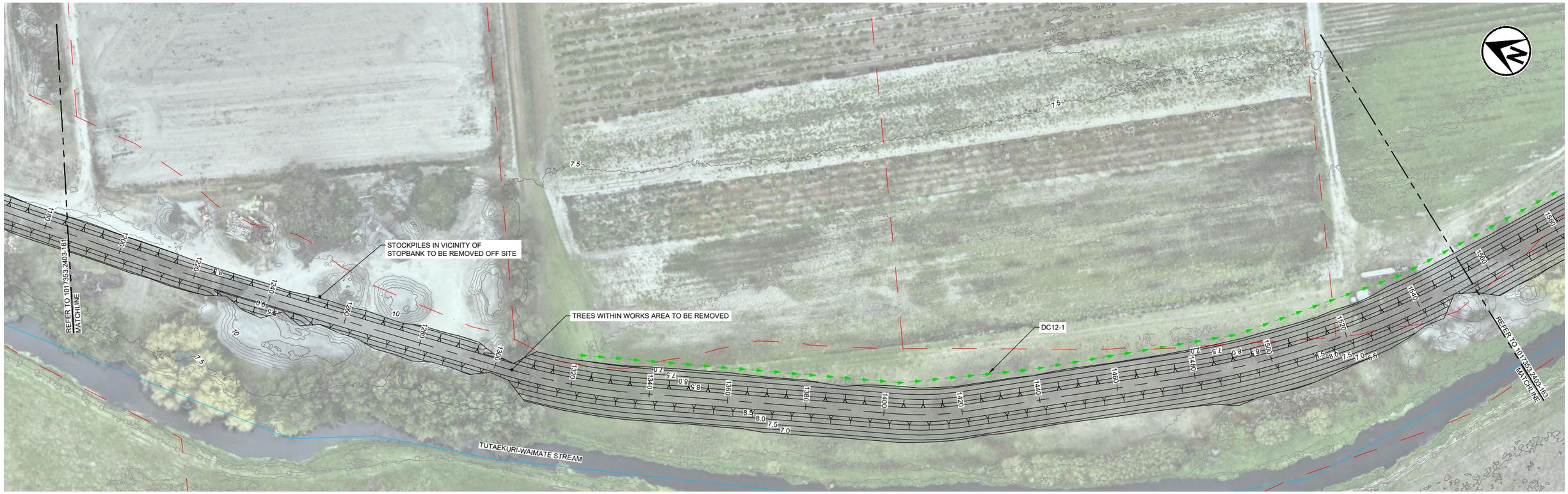
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**

PROJECT **PĀKŌWHAI SECONDARY STOPBANK**

TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 11

SCALE (A1) AS SHOWN DWG No. 1017353.2403-161 REV 1

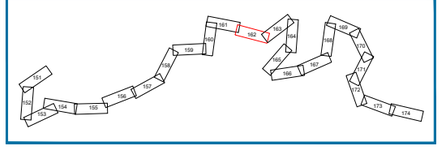
C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:37:40 pm Plotted By: KATU




## NOTES

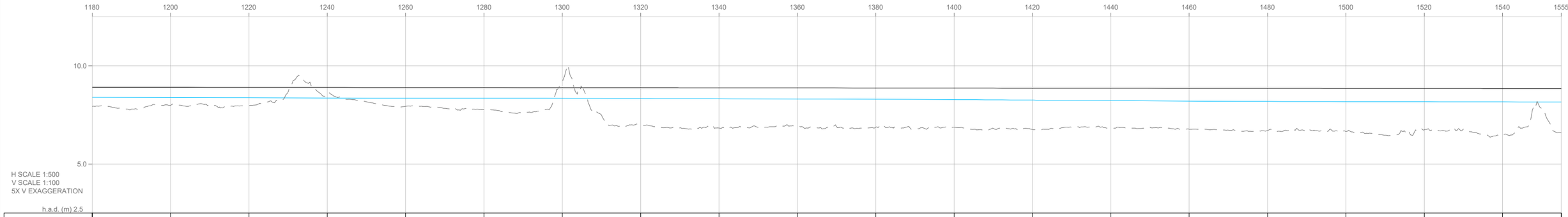
1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## KEY PLAN (N.T.S.)



## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 7.925 | 7.987 | 7.960 | 8.506 | 7.933 | 7.767 | 9.171 | 6.979 | 6.835 | 6.945 | 6.872 | 6.872 | 6.759 | 6.819 | 6.773 | 6.698 | 6.653 | 6.736 | 6.463 | 6.587 | | | |
| DESIGN CREST CL LEVEL | 8.908 | 8.904 | 8.900 | 8.895 | 8.891 | 8.887 | 8.883 | 8.879 | 8.875 | 8.871 | 8.866 | 8.862 | 8.858 | 8.854 | 8.850 | 8.846 | 8.842 | 8.838 | 8.833 | | | | |
| CUT / FILL DEPTH | 0.983 | 0.917 | 0.939 | 0.389 | 0.958 | 1.121 | -0.288 | 1.900 | 2.039 | 1.926 | 1.995 | 1.990 | 2.099 | 2.035 | 2.077 | 2.148 | 2.189 | 2.101 | 2.370 | 2.243 | | | |
| CHAINAGE | 1180 | 1200 | 1220 | 1240 | 1260 | 1280 | 1300 | 1320 | 1340 | 1360 | 1380 | 1400 | 1420 | 1440 | 1460 | 1480 | 1500 | 1520 | 1540 | 1555 | | | |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 12.5 25 m H=1:500 V=1:100
0 2.5 5

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

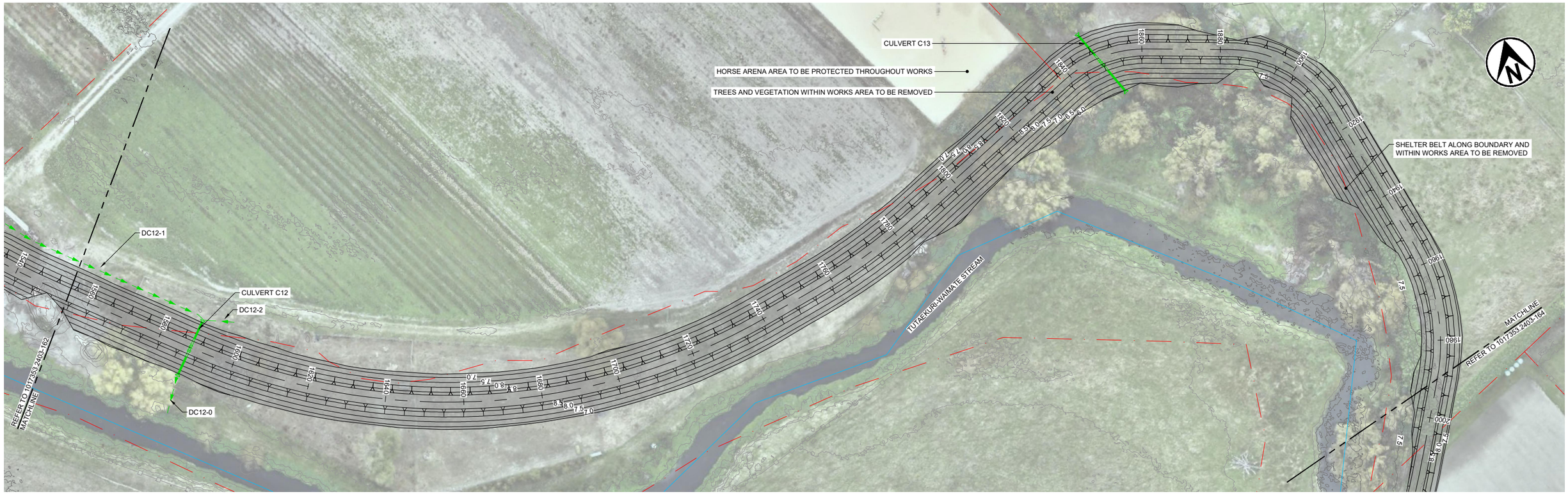
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**

PROJECT **PĀKŌWHAI SECONDARY STOPBANK**

TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 12

SCALE (A1) AS SHOWN DWG No. 1017353.2403-162 REV 1

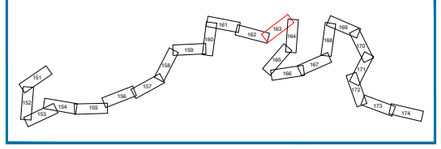
C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:38:03 pm Plotted By: KATU




## NOTES

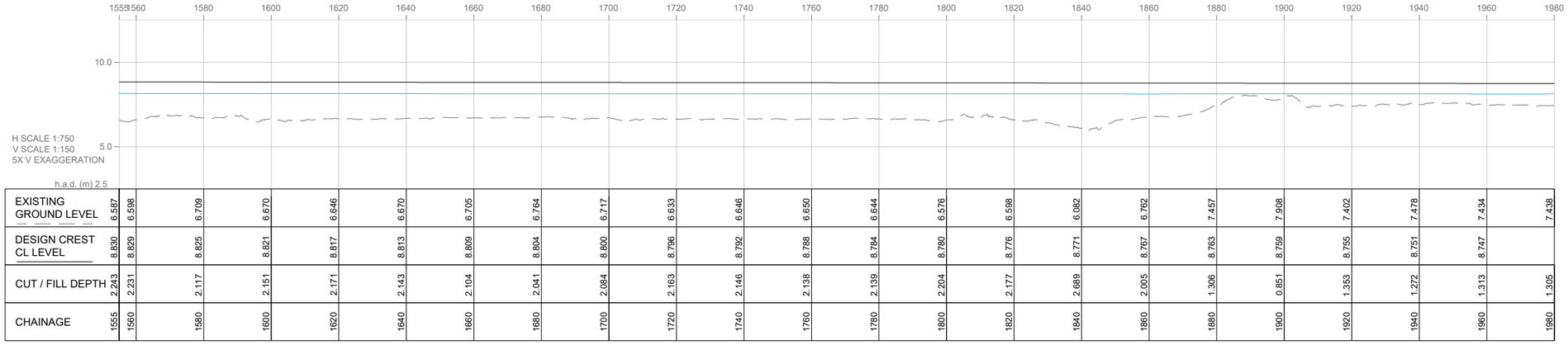
1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.

## KEY PLAN (N.T.S.)



## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE | 1555 | 1560 | 1580 | 1600 | 1620 | 1640 | 1660 | 1680 | 1700 | 1720 | 1740 | 1760 | 1780 | 1800 | 1820 | 1840 | 1860 | 1880 | 1900 | 1920 | 1940 | 1960 | 1980 |
| EXISTING GROUND LEVEL | 6.587 | 6.598 | 6.709 | 6.670 | 6.646 | 6.670 | 6.705 | 6.764 | 6.717 | 6.633 | 6.646 | 6.650 | 6.644 | 6.576 | 6.598 | 6.082 | 6.762 | 7.457 | 7.908 | 7.402 | 7.478 | 7.434 | 7.438 |
| DESIGN CREST CL LEVEL | 8.830 | 8.829 | 8.825 | 8.821 | 8.817 | 8.813 | 8.809 | 8.804 | 8.800 | 8.796 | 8.792 | 8.788 | 8.784 | 8.780 | 8.776 | 8.771 | 8.767 | 8.763 | 8.759 | 8.755 | 8.751 | 8.747 | |
| CUT / FILL DEPTH | 2.243 | 2.231 | 2.117 | 2.151 | 2.171 | 2.143 | 2.104 | 2.041 | 2.084 | 2.163 | 2.146 | 2.138 | 2.139 | 2.204 | 2.177 | 2.689 | 2.005 | 1.306 | 0.851 | 1.353 | 1.272 | 1.313 | 1.305 |

## STOPBANK LONG SECTION

SCALE (A1) 1:750 (H) 1:150 (V)
SCALE (A3) 1:1500 (H) 1:300 (V)

0 12.5 25 m 1:500 (A1) 1:1000 (A3)

0 18.75 37.5 m H=1:750 V=1:150
0 3.75 7.5

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

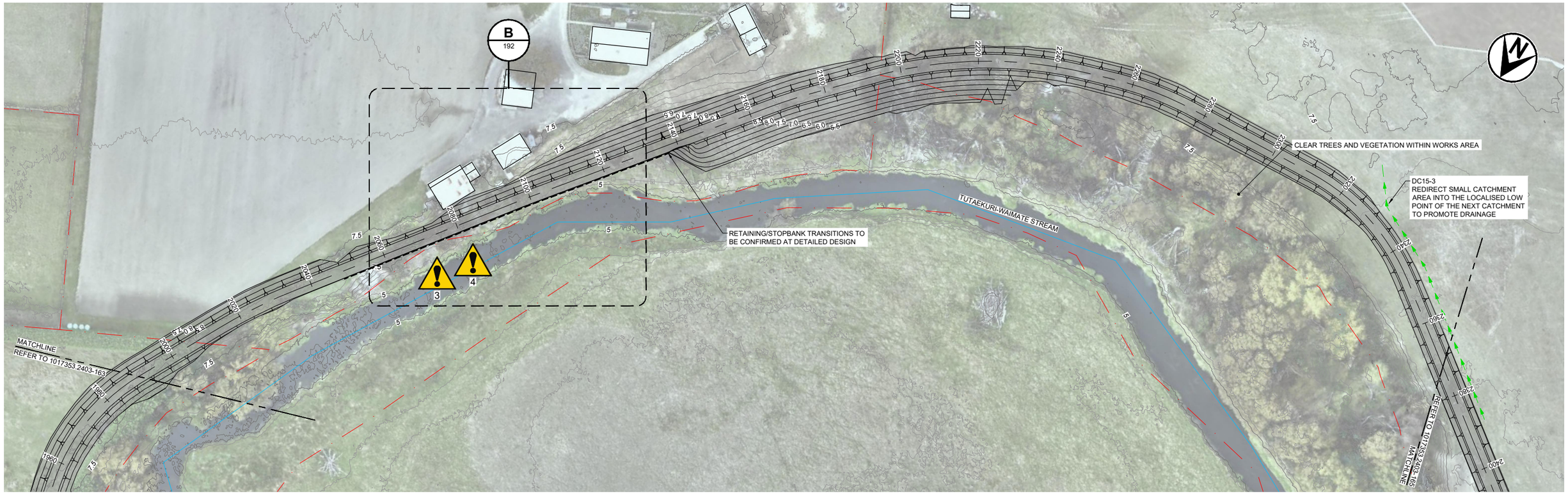
NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT HAWKE'S BAY REGIONAL COUNCIL
PROJECT PĀKŌWHAI SECONDARY STOPBANK
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 13
SCALE (A1) AS SHOWN DWG No. 1017353.2403-163 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:38:38 pm Plotted By: KATU



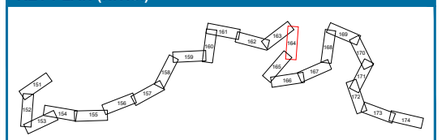

## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## KEY PLAN (N.T.S.)



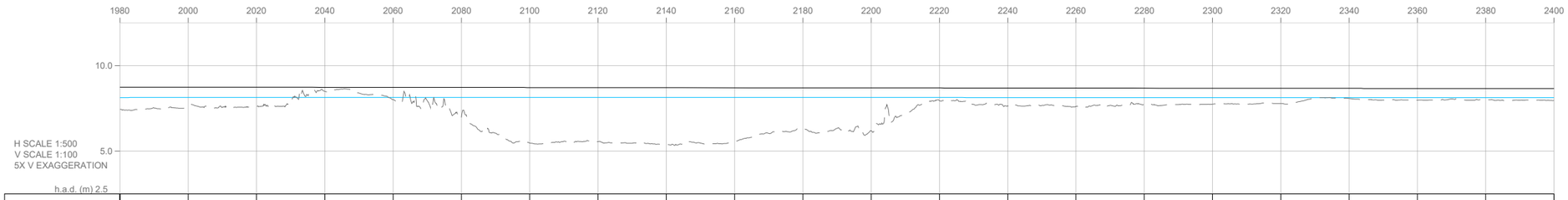
## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |
| 4 | UNMAPPED UNDERGROUND UTILITIES EXPECTED WITHIN VICINITY |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 7.438 | 7.639 | 7.603 | 8.494 | 8.014 | 6.974 | 5.473 | 5.557 | 5.382 | 5.547 | 6.341 | 6.191 | 7.946 | 7.641 | 7.607 | 7.729 | 7.751 | 7.788 | 8.078 | 7.980 | 7.987 | 7.959 |
| DESIGN CREST CL LEVEL | 8.742 | 8.738 | 8.734 | 8.730 | 8.726 | 8.722 | 8.718 | 8.713 | 8.709 | 8.705 | 8.701 | 8.697 | 8.693 | 8.689 | 8.685 | 8.680 | 8.676 | 8.672 | 8.668 | 8.664 | 8.660 | |
| CUT / FILL DEPTH | 1.305 | 1.100 | 1.131 | 0.236 | 0.712 | 1.748 | 3.245 | 3.156 | 3.327 | 3.158 | 2.360 | 2.506 | 0.747 | 1.048 | 1.078 | 0.951 | 0.926 | 0.884 | 0.590 | 0.684 | 0.673 | 0.697 |
| CHAINAGE | 1980 | 2000 | 2020 | 2040 | 2060 | 2080 | 2100 | 2120 | 2140 | 2160 | 2180 | 2200 | 2220 | 2240 | 2260 | 2280 | 2300 | 2320 | 2340 | 2360 | 2380 | 2400 |

## STOPBANK LONG SECTION

SCALE (A1) 1:750 (H) 1:100 (V)
SCALE (A3) 1:1500 (H) 1:200 (V)

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 18.75 37.5 m H=1:750 V=1:1500
0 37.5 75

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| REV | DESCRIPTION | CAD | CHK | DATE |
|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | PRELIMINARY DRAFT |
| DRAWN | KATU | JUN.25 | | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | PRELIMINARY DESIGN |
| DRAWING CHECKED | HUGO | SEP.25 | | |

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

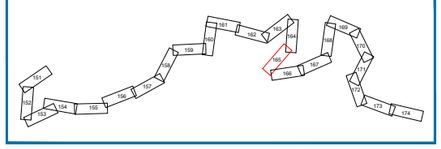
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 14
SCALE (A1) AS SHOWN DWG No. 1017353.2403-164 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:39:02 pm Plotted By: KATU


## NOTES

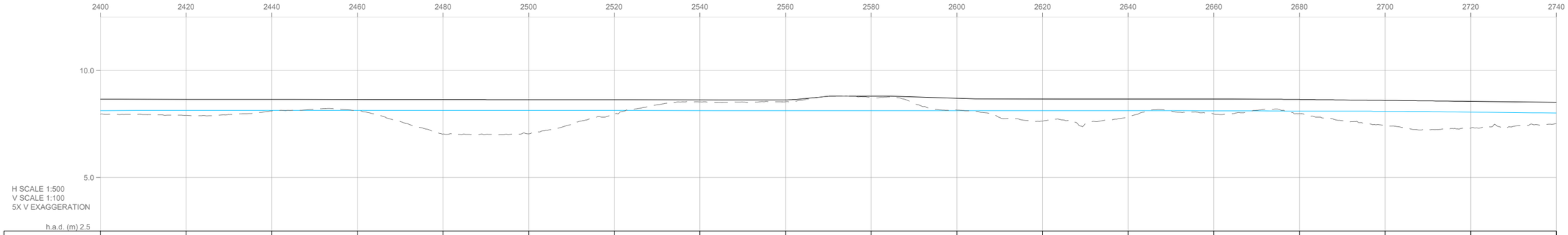
1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## KEY PLAN (N.T.S.)



## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 7.959 | 7.905 | 8.103 | 8.122 | 7.030 | 7.035 | 7.924 | 8.535 | 8.540 | 8.739 | 8.150 | 7.635 | 7.839 | 7.966 | 7.984 | 7.430 | 7.308 | 7.526 |
| DESIGN CREST CL LEVEL | 8.656 | 8.651 | 8.647 | 8.643 | 8.639 | 8.635 | 8.631 | 8.627 | 8.623 | 8.802 | 8.701 | 8.671 | 8.667 | 8.664 | 8.646 | 8.602 | 8.559 | |
| CUT / FILL DEPTH | 0.697 | 0.747 | 0.545 | 0.521 | 1.610 | 1.600 | 0.706 | 0.092 | 0.083 | 0.062 | 0.551 | 1.036 | 0.829 | 0.698 | 0.662 | 1.172 | 1.251 | 0.989 |
| CHAINAGE | 2400 | 2420 | 2440 | 2460 | 2480 | 2500 | 2520 | 2540 | 2560 | 2580 | 2600 | 2620 | 2640 | 2660 | 2680 | 2700 | 2720 | 2740 |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN | |

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

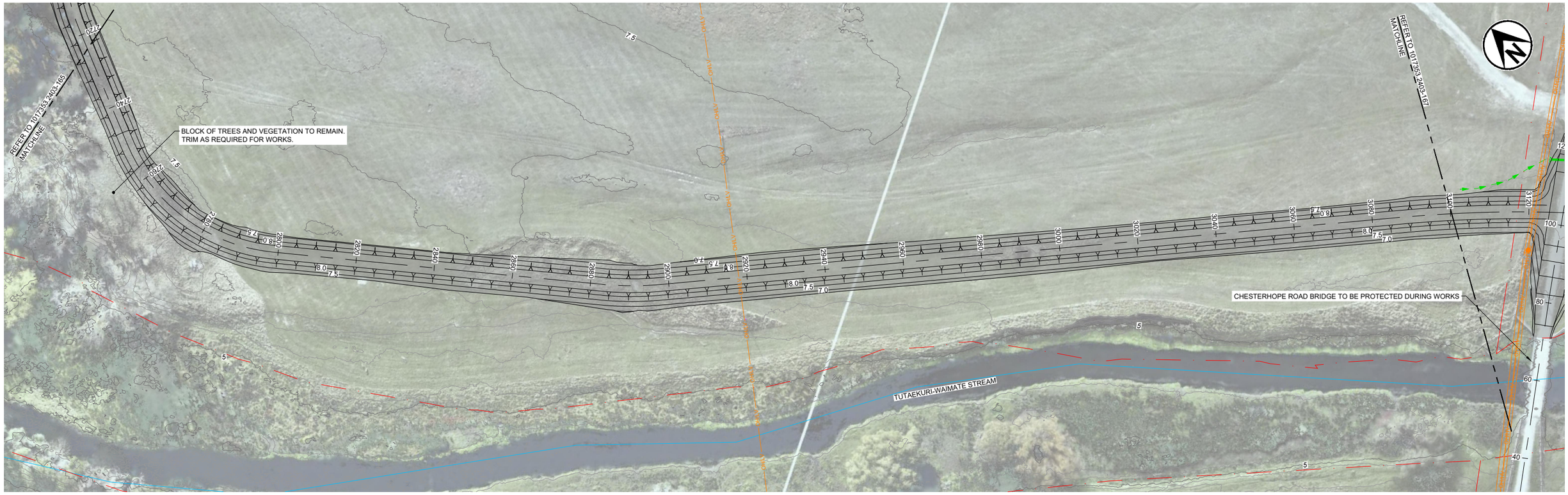
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**

PROJECT **PĀKŌWHAI SECONDARY STOPBANK**

TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 15

SCALE (A1) AS SHOWN DWG No. 1017353.2403-165 REV 1

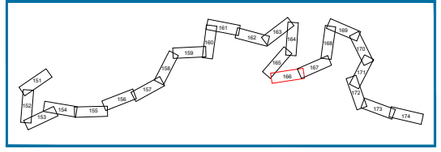
C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-159_166.dwg 2025-Sep-04 1:39:27 pm Plotted By: KATU




## NOTES

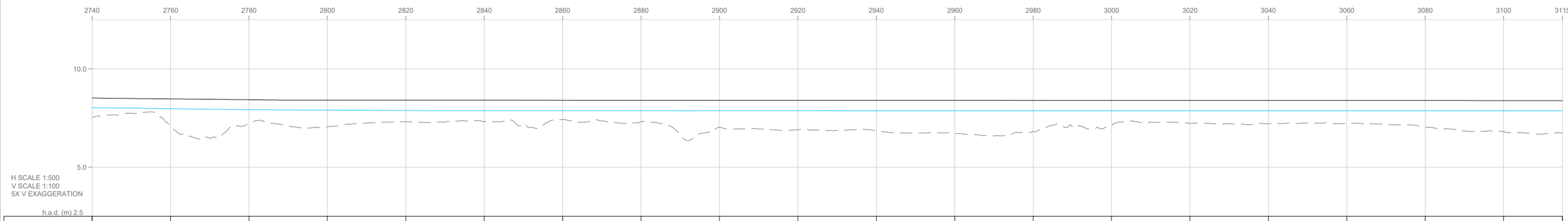
1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.

## KEY PLAN (N.T.S.)



## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000




| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 7.526 | 7.084 | 7.180 | 7.047 | 7.306 | 7.321 | 7.414 | 7.312 | 7.027 | 6.906 | 6.852 | 6.716 | 6.821 | 7.119 | 7.233 | 7.214 | 7.228 | 7.050 | 6.797 | 6.745 | |
| DESIGN CREST CL LEVEL | 8.515 | 8.472 | 8.428 | 8.409 | 8.408 | 8.406 | 8.405 | 8.403 | 8.402 | 8.400 | 8.399 | 8.397 | 8.396 | 8.394 | 8.393 | 8.392 | 8.390 | 8.389 | 8.387 | | |
| CUT / FILL DEPTH | 0.989 | 1.387 | 1.248 | 1.362 | 1.102 | 1.085 | 0.991 | 1.091 | 1.375 | 1.494 | 1.547 | 1.682 | 1.575 | 1.276 | 1.160 | 1.177 | 1.162 | 1.339 | 1.590 | 1.641 | |
| CHAINAGE | 2740 | 2760 | 2780 | 2800 | 2820 | 2840 | 2860 | 2880 | 2900 | 2920 | 2940 | 2960 | 2980 | 3000 | 3020 | 3040 | 3060 | 3080 | 3100 | 3115 | |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | | |
|---|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS | |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT | |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE | |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN | |

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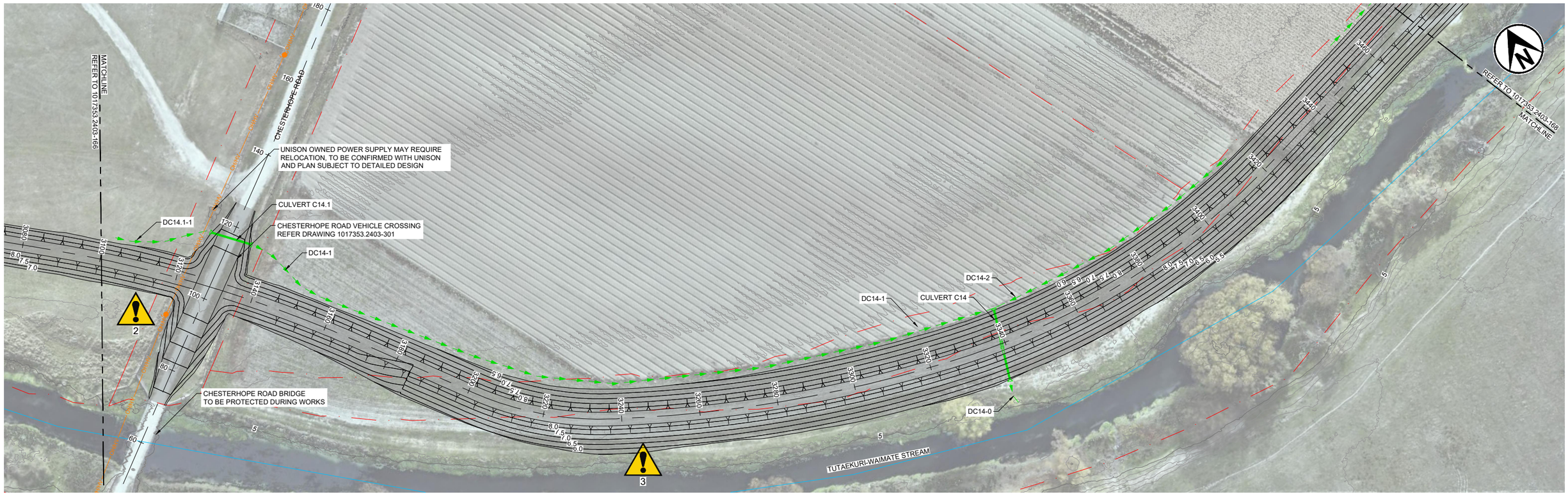
CLIENT **HAWKE'S BAY REGIONAL COUNCIL**

PROJECT **PĀKŌWHAI SECONDARY STOPBANK**

TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 16

SCALE (A1) AS SHOWN DWG No. 1017353.2403-166 REV 1

C:\12dSynergy\data\ALBTCAD\Pakowhai Secondary Stopbank_1629\CAD\DWG\1017353.2403-167_174.dwg 2025-Sep-04 1:45:07 pm Plotted By: KATU




## NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. REFER DRAWING 1017353.2403-002 FOR GENERAL NOTES AND LEGEND.
3. REFER DRAWING 1017353.2403-311 FOR CULVERT DESIGN DETAILS. RIPRAP EROISN PROTECTION TO BE INSTALLED AT EVERY CULVERT OUTLET AND NOT SHOWN FOR CLARITY, REFER TO DRAWING 1017353.2403-313 FOR DETAILS.

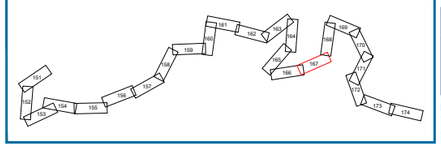
## LEGEND

ID — HAZARD LOCATION - REFER TABLE 1

## STOPBANK PLAN

SCALE (A1) 1:500
SCALE (A3) 1:1000

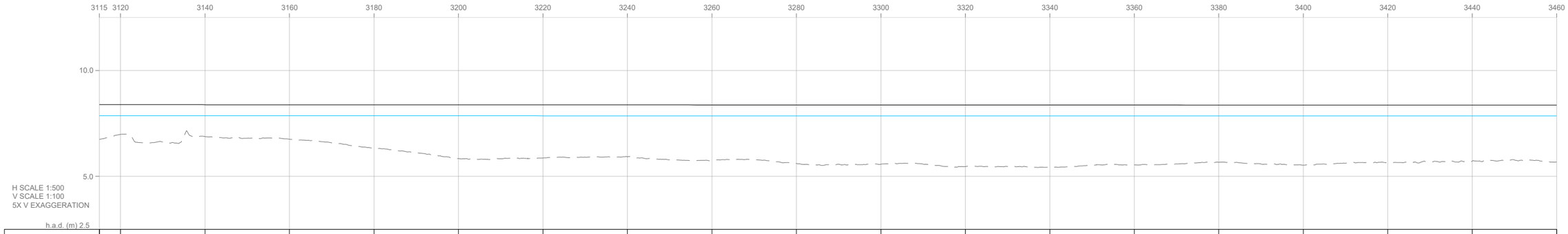
## KEY PLAN (N.T.S.)



## TABLE 1:SITE HAZARDS TABLE

| ID | DESCRIPTION |
|---|---|
| 2 | WORKS IN CLOSE PROXIMITY TO OVERHEAD POWER LINES |
| 3 | STOPBANK WORKS IN CLOSE PROXIMITY TO STREAM AND STREAM BANK |

NOTE: THIS TABLE IS NOT AN EXHAUSTIVE LIST OF HAZARDS BUT IS INTENDED TO HIGHLIGHT SITE RISKS IDENTIFIED DURING THE DESIGN TO AID THE CONTRACTOR IN THEIR HAZARD AND RISK ASSESSMENT.




| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING GROUND LEVEL | 6.745 | 6.985 | 6.880 | 6.752 | 6.327 | 5.839 | 5.870 | 5.922 | 5.763 | 5.609 | 5.574 | 5.463 | 5.440 | 5.544 | 5.667 | 5.523 | 5.641 | 5.723 | 5.682 | | | |
| DESIGN CREST CL LEVEL | 8.386 | 8.386 | 8.384 | 8.383 | 8.381 | 8.380 | 8.378 | 8.377 | 8.375 | 8.374 | 8.372 | 8.371 | 8.370 | 8.368 | 8.367 | 8.365 | 8.364 | 8.362 | | | | |
| CUT / FILL DEPTH | 1.641 | 1.400 | 1.505 | 1.631 | 2.054 | 2.541 | 2.508 | 2.455 | 2.613 | 2.765 | 2.799 | 2.908 | 2.929 | 2.824 | 2.700 | 2.842 | 2.723 | 2.639 | 2.679 | | | |
| CHAINAGE | 3115 | 3120 | 3140 | 3160 | 3180 | 3200 | 3220 | 3240 | 3260 | 3280 | 3300 | 3320 | 3340 | 3360 | 3380 | 3400 | 3420 | 3440 | 3460 | | | |

0 12.5 25 m 1:500 (A1) 1:1000 (A3)
0 2.5 5 m H=1:500 V=1:100

## STOPBANK LONG SECTION

SCALE (A1) 1:500 (H) 1:100 (V)
SCALE (A3) 1:1000 (H) 1:200 (V)

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| REV | DESCRIPTION | CAD | CHK | DATE | APPROVED | DATE |
|---|---|---|---|---|---|---|
| 1 | PRELIMINARY DESIGN | KATU | JEMC | 04.09.25 | | |

| | | | |
|---|---|---|---|
| DESIGNED | JEMC | JUN.25 | DRAWING STATUS |
| DRAWN | KATU | JUN.25 | PRELIMINARY DRAFT |
| DESIGN CHECKED | JWY | SEP.25 | PROJECT PHASE |
| DRAWING CHECKED | HUGO | SEP.25 | PRELIMINARY DESIGN |

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CLIENT **HAWKE'S BAY REGIONAL COUNCIL**
PROJECT **PĀKŌWHAI SECONDARY STOPBANK**
TITLE GENERAL ARRANGEMENT
STOPBANK PLAN AND LONG SECTION - SHEET 17
SCALE (A1) AS SHOWN DWG No. 1017353.2403-167 REV 1