Christchurch City Council

Temporary Stopbank Management (LDRP507) Detailed Design and Construction Management

Detailed Design Report

December 2018

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1. Introduction

1.1 Purpose of the Report

This report relates to the detailed design of the Temporary Stopbank Management (LDRP 507). This project was commissioned by Christchurch City Council (Council), who wish to upgrade the existing temporary stopbanks so they can continue to provide river and tidal flood protection until decisions are made around the long term measures.

The primary objectives of the project were:

- Review of studies to date, confirm (or otherwise) the validity of the conclusions (including hydraulic modelling), and to undertake any gap analysis required;
- Restoration of the downstream sections of the temporary stopbanks (chainage 14,500 to Bridge Street) to a constant level (11.2 m Christchurch Drainage Datum) to prevent tidal overtopping;
- Raising of the middle section (chainage 12,100 to 14,500) to 11.3 m to provide more protection against flood overtopping;
- Strengthening of the sections as necessary to allow continued functionality (including oversteepened or eroding sections);
- Extension the stopbanks around PS205 (where required) to prevent water overtopping the canal downstream of the pump station;
- Finishing of the stopbanks to the standard agreed to in consultation with Council staff, including any topsoiling and/or planting;
- Investigation of the condition of all pipes passing through the temporary stopbanks and repair as required;
- Ensure that the local drainage network is not compromised by the temporary stopbanks repair and/or add new pipe and inlet network as necessary;
- Update the Avon River Stopbank Project Emergency Response Plan
- Development of a Temporary Stopbank Operation and Maintenance Manual

In addition, the project was extended to include:

- Construction of a new stopbank South of Bridge Street.
- Raising the level of the stopbank from Evans Avenue to Bridge Street to 11.4 m.

Figure 1 shows the location of the existing and new temporary stopbanks on both sides of Avon River, which run from Swanns Road to just south of Bridge Street, and the proximity of the Residential Red Zoned (RRZ). The green lines are the existing stopbank that will be upgraded and the yellow lines are the new temporary stopbanks.

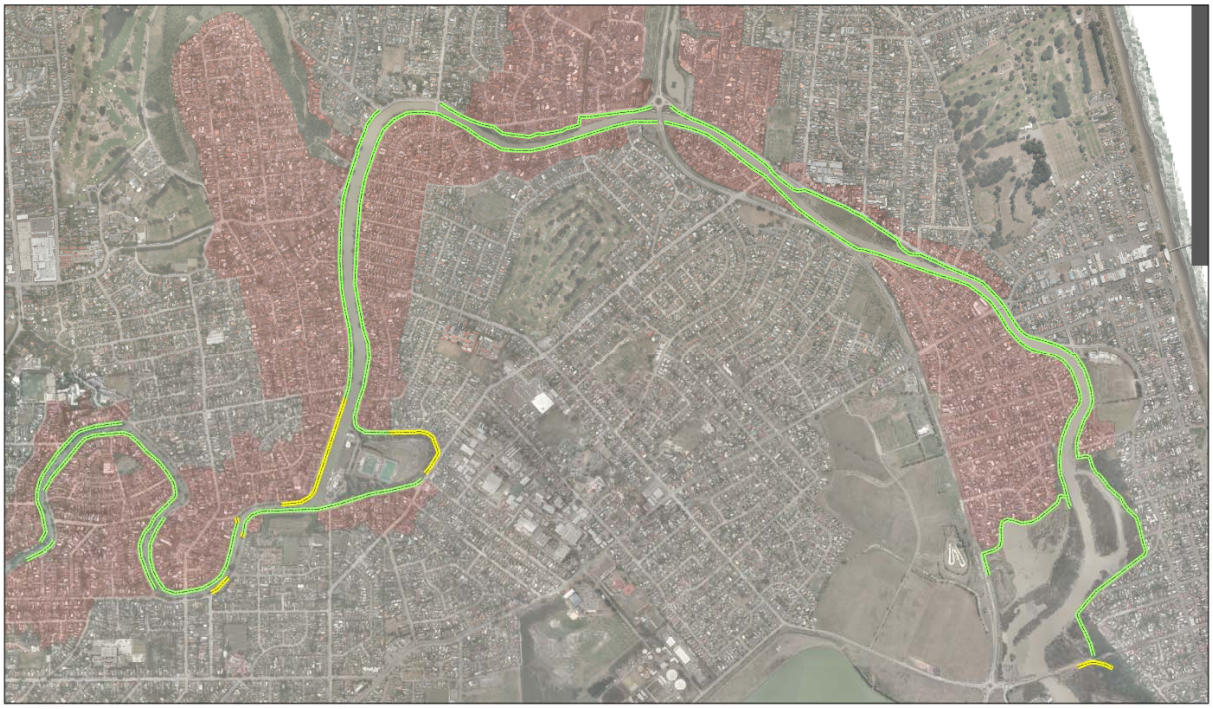

Figure 1: Existing and New Stopbanks Locations

1.2 Extent of work

This report covers the outcomes of the detailed design phase. It includes:

- Alignment and profile for the upgraded temporary stopbanks and the new stopbanks
- Provision of geotechnical assessment of areas requiring strengthening
- Consent requirements and compliance for the works along the Avon River

In addition to the above, the report also includes the work dealing with the three waters services, trees and landscape, local drainage, Utilities (Orion, Vodafone, Chorus and Enable)

1.3 Communication Records

1.3.1 Council Communications:

- Confirmation of design levels based on the 50 year flood event for the fluvial section of the stopbank – email on 23 August 2016
- Seismic consideration not included in the design – email on 6 August 2016
- Scope of providing for local drainage – discussed in the Preliminary Design review
- Providing information on the floor level of 544 Avonside Drive and confirmation that the 1 in 10 year flood event is not to be modelled - email on 12 October 2016.

1.3.2 Utilities Communications:

The following communications utilities confirmed that the services need not be relocated. Copy of the correspondences are found in Appendix A.

- Email between GHD and Vodafone on 7 October 2016
- Email between GHD and Chorus on 12 October 2016

- Email between GHD and Enable on 6 October 2016

A meeting was held with Orion Mike Miles on 2 November with the key items discussed as follows:

- Overhead power lines
    - Will be shifted in any location where there is insufficient clearance as defined in the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34:2001)
    - Power poles can stay within the stopbank as long as where possible the lines will be kept above ground
- Underground cables
    - Assets will need to be surveyed to confirm location during design of relocation
    - Maximum cover of cables is ~800 mm or are required to be de-rated, cable to be shifted if final design cover is greater than 800 mm
    - Where there are terramesh (wire basket retaining units) units or the asset is within the stopbank on the river side of the crest the cable will be relocated
    - In tidal dominated reach, cables need to be relocated from under crest regardless of depth
    - Consideration to future use and location in RRZ may be included in relocation design
- Lamp posts are Council owned but the cables servicing them are Orion and impacts need to be considered
- Future increased maintenance
    - For future maintenance by Orion within the stopbank area, an agreement could be made for additional costs to be carried by Council rather than shifting the assets immediately.

1.4 Supporting Documents

The following are the supporting documents for this detailed design report and were issued as separate documents as part of this project.

- Preliminary Geotechnical Assessment Report – peer reviewed by Jacobs
- Geotechnical Assessment Report – peer reviewed by Jacobs

1.5 Scope and Limitations

This report: has been prepared by GHD for Christchurch City Council and may only be used and relied on by Council for the purpose agreed between GHD and Council as set out in Section 1.1 of this report.

GHD has prepared this report on the basis of information provided by Council and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information

2. Design Standards and Criteria

The various design assumptions are set out below however the key overall assumption is that the temporary stopbanks will have a design life limited to 20 years.

2.1 Design Standards

The design standards are:

- CCC Waterways, Wetlands and Drainage Guide
- CCC Infrastructure Design Standards (IDS)
- CCC Construction Standard Specifications (CSS)

2.2 Hydraulic Design

Design Flood Levels are based on the modelling by DHI using the Avon River Model (see section 3).

The design brief required upgrading of stopbanks from Gayhurst Bridge. This was based on previous risk assessment and was supported by modelling results. The modelling initially assumed “glass walls” along all stopbank reaches with levels defined to retain all flows. The “glass wall” assumption constrains the flood level within the stopbanks assuming an infinitely tall stopbank in these locations. This was incorporated into the design by increasing crest height above modelled flow levels. For areas upstream of Gayhurst Bridge previous risk assessment and modelling results showed inundation was contained within the Residential Red Zone (RRZ), giving a low property and life risk. The model results with the glass wall removed from the upper section (Swanns Rd to Gayhurst bridge) confirmed this assumption. Figure 2 shows the extent of inundation when the highest modelled water level of 11.8 m is applied to the upper section.

The final hydraulic design, therefore, assumed all flows are contained by stopbank downstream of Gayhurst road on the true right bank, and downstream of Glenarm Road on the true left bank.

A request was received from Council, during detailed design, to extend the stopbank approximately 170 m downstream of Bridge Street with this section of bank and the stopbank between Evans Road and Bridge Street to increase the design crest level to 11.4 m

It is understood a number of properties are still occupied in the Red Zone. A review was conducted of the modelling results and topography against a plan of occupied properties, provided by Council. Only one property (see Figure 2) will be affected by flooding due to the design event. One property potentially affected is 544 Avonside Drive. The floor level (bottom of door) is at 11.79 m and 1 in 50-year flood event level near this property is 11.6 m (including 200 mm free board), which is below the property’s floor level. Confirmation for the protection for the 1 in 10 year flood event is however, not included in this project.

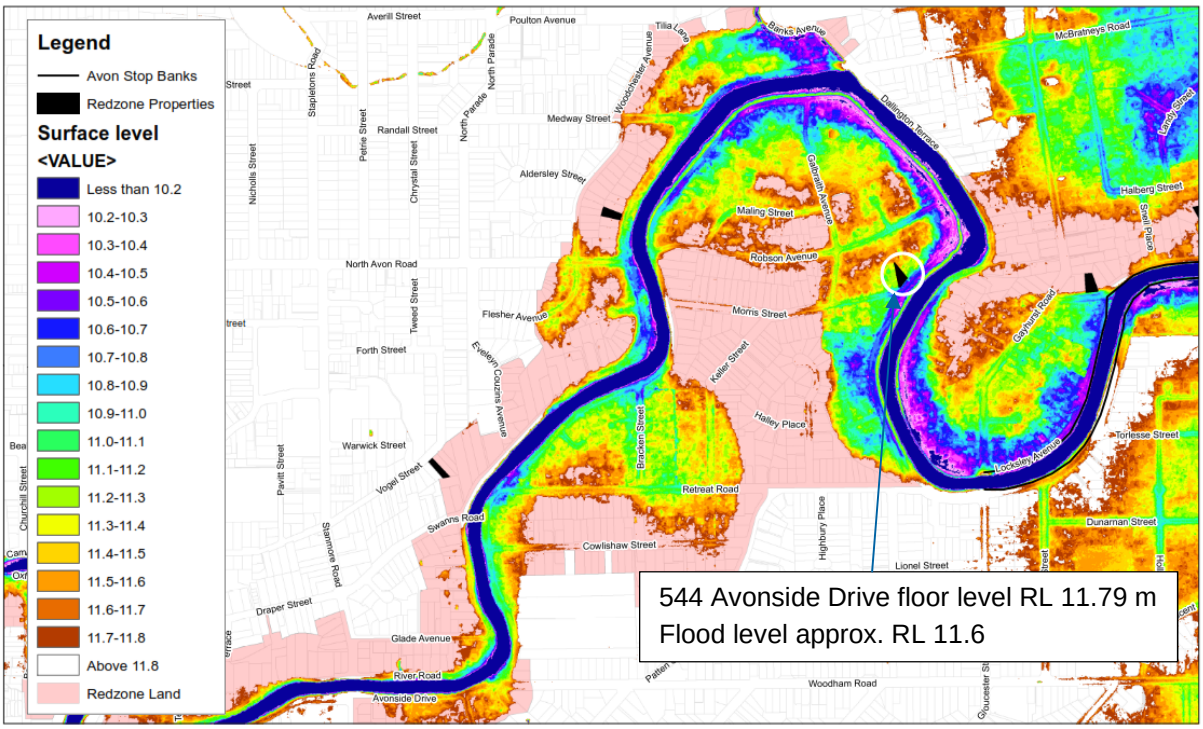

Figure 2: Upper area extent of inundation for max design water level

2.3 Geotechnical

The detailed design was based on the following:

- The standard trapezoidal stopbank profile with 1 in 3 slopes and a minimum crest width of 1 m has been superimposed along the crest of the existing stopbanks and applied where possible mechanical reinforcement has been utilised where steeper slope angles are required
- Where possible, existing stopbanks are to be locally raised by topping up and reshaped rather than being completely reconstructed
- Stopbank stability under seismic conditions has not been considered for the following reasons:
    - The stopbanks are temporary and have a limited design life
    - The existing temporary stopbanks, constructed under emergency works (and later topped up as temporary works) were not designed for seismic loading. Therefore, as confirmed with Council, it is unrealistic to apply this retrospectively
    - Seismically stable banks are likely to be cost prohibitive (deep ground improvements) or require positioning on road corridor or non-Council owned land because underlying soils are prone to liquefaction and lateral spreading. Seismic design will also necessitate significant utility relocations.
    - Topping up will not alter the liquefaction potential of the native ground and no further liquefaction analysis will be undertaken
    - Seismic stability of the stopbanks and the foundation (native ground) was not identified by the previous risk study as being the primary risk to the stopbanks

- Local raising of the stopbanks should not detrimentally alter the seepage or piping potential
- Resilience to seismic damage of the natural ground (liquefaction/lateral spread) is provided by a stopbank design that is easily repaired i.e. granular bunds can be reshaped or further material added to bund following a seismic event.

2.4 Services

2.4.1 Upstream Section from Swanns Road to Gayhurst Bridge

There is no modification or upgrade works on the existing stopbank except for landscaping in this section. The only utility affected in this section is one site for Chorus and they have not indicated any considerations required for retaining assets under the existing temporary stopbank, as per communications in Section 1.3.

The wastewater and stormwater utilities were assessed and designed similar to the rest of the stopbank.

2.4.2 Downstream Section of Gayhurst Bridge

The Chorus, Enable and Orion utilities assessed for this section. Vodafone has assets listed on B4UDig but advised they did not have assets in the identified area. Chorus and Enable did not have any objection to the existing temporary stopbank being on top of their cables as per communications in Section 1.3.

For the existing pipe assets, the majority crossing or in proximity to the stopbanks are in the Residential Red Zone. These assets were left in a state of “out of service” since the 2011 Canterbury earthquakes. There was little or no maintenance of these assets and limited assessment of their condition. Detailed design of these assets are as follows where the asset poses a potential risk to the stopbank:

- If WW assets are out of service, these are abandoned in accordance with CCC CSS
- If SW assets are in service, these are repaired or replaced as required
- If SW assets are in roads restricted from public use, these are abandoned if not required for local drainage.

SCIRT is assumed to have addressed services still required to service Green Zoned land. Where SCIRT identified actions they are deemed to have been dealt with. Where SCIRT have deferred action then no action is deemed to have taken place and pipes have been evaluated for risk to stopbank. Confirmation of abandonment methodology is required where SCIRT have abandoned assets. This confirmation is required as SCIRT typical method of abandonment is plugging of but ends which is insufficient and assets need to be fully grouted.

Where SCIRT did not assess the asset, CCTV inspections and pipe assessment were undertaken to obtain the condition of the asset and design remedial actions, as required. Approximately 24 CCTV assets were abandoned due to issues with isolating asset from flow and were removed from scope. Assets with abandoned CCTV will be assessed on a case by case basis. Where there is a significant risk to the stopbanks temporary work will be required during construction for investigation of these assets.

2.5 Drainage

The preliminary design assumed that ponding near or adjacent to the stopbanks is due to drainage issues rather than seepage and is due to loss of grade or maintenance of kerb and

channel and associated drainage infrastructure, hence this was assumed to be a roading issue and generally outside the scope of this project.

Detailed design has been limited to resolution of drainage issues that cause a risk to the stopbank or are required to prevent nuisance caused by the upgrade of the stopbanks.

3. Hydraulic Modelling

Hydraulic modelling for the project was carried out by DHI, using Mike Urban, Mike 11 and Mike Flood packages. Report, Model Status and outputs are shown in Appendix B.

- Model version Avon_PostEQ_FINAL v.2014 SP3
- A maximum probable development scenario was included
- No allowance for climate change or sea level rise has been included

4. Stopbank Design

4.1 Design Level

As agreed with the Council, different the stopbank levels were adopted based on the governing factors, either the 50-year flood event or tidal flooding (the higher of the two) with 200 mm freeboard.

- Between chainages 11700 (Gayhurst Bridge) and 14500 (approximately Lake Terrace Road), known as the middle section the 50-year flood even level governs. For this section, a uniform grade was adopted for constructability
- Between chainage 14500 to chainage 18759 (approximately South of Evans Avenue), tidal inundation is the dominant factor and a uniform level of 11.2 m was adopted in the design.
- Below chainage 18700 (Approximately Evans Avenue to South of Bridge Street), tidal inundation is also the dominant factor. However, Council instructed that this section be designed to level of 11.4 m.

In the preliminary design report, the effect of the 50 year and 100 year events to Brittans Drain, non-compliance of the 200-year event were discussed and consultation with Council as per Section 1.3 confirmed that they were prepared to accept small areas of increased flood risk for the 200-year event.

The design level is the finished crest level which includes the 100 mm topsoil layer.

4.2 Alignment

The detailed design maintained the alignment of the existing temporary stopbank where this exists. Generally, the existing alignment is outside of the road carriageway except for the following areas where there is encroachment to the road:

True right bank:

- Avonside Dr (d/s of Porrit Park, Chainage 3560 & 4400-4500,4700-6000 mainly where stopbank has eroded out into kerb/road edge)

- Hulverstone Dr (between Avondale Rd and ANZAC Dr, Chainage 6300-7200, predominately between Avondale and Mervyn Dr)
- Wairoa St (from Orari St d/s Chainage 9250-9400)

True left bank:

- River Rd (d/s of Medway St, Chainage 1000-1100)
- Dallington Tce (immediately u/s of Gayhust Rd, Chainage 2150-2400)
- New Brighton Rd (between Bower Ave & Pages Rd, Chainage 7500-8600)
- Owles Tce (Immediately d/s of Pages Rd & part of the sand bag section, Chainage 8700-9000)
- Makeshift ramp on to stopbank at bottom of Evans Ave (Chainage 9580)

New stopbanks are provided along Porritt Park and South of Bridge Street and are outside of the road carriageway.

4.3 Profiles and Cross Sections

The stopbank profiles for this project are similar to the Sandbag Replacement Project (LDRP 507) with a general bank slope of 1 in 3 (minimum of 1 in 2.5) and a crest width of 1 m. Where site constraints do not provide sufficient width, alternative profiles, such as the Terramesh reinforced profile was adopted in the design.

In the section of the stopbank on the right bank from North of Porritt Park to Anzac Drive, the crest width was increased to 1.5 m wide provided for the access of the Rowing Club coaches.

4.4 Trees and Landscaping

The general finish of the stopbank embank is grass apart from the following locations:

- Section of embankment widened for access for the rowing club the stopbank
- 1.5 m crest stopbank with a gravel surface from North of Porritt Park to Anzac Drive
- Spawning areas where Council are providing planting plans
- Areas of riprap due to potential erosion
- Access across stopbank south of Bridge St

The alignment of the stopbank was finalised in liaison with the Council Arborist with respect to the trees (refer to meeting minutes Appendix A). The key items considered in the design were:

- Trees that were dead or in poor health were removed, if tree could potentially recover and not in a high risk location in the stopbank was retained with a higher monitoring frequency was allocated to the tree. Some poplars were removed due to potential sucker growth.
- Where there was conflict with mature trees, the alignment was modified where possible
- The construction methodology around the tree will be adapted to minimise risk to the tree
    - Minimise excavation around roots
    - Protect roots from compaction where possible with retaining wall
    - Install a gravel collar around trunk to protect against moisture and biological attack from topsoil
- The tree was removed if there is no alternative available

- Where trees are retained and protected, methodology of monitoring is provided in the O & M Manual

4.5 PS 205

PS 205 canal stopbanks was raised to the design level of the stopbanks along New Brighton Road with an additional 200 mm to provide for head loss for the discharge of water from the canal to Avon River. The design level then is 11.361 m + 200 mm = 11.561 m. Raising of PS 205 structure is not part of the scope of this project.

The right bank of the canal will tie in with the wall of the diesel tank adjacent to the pump station while the left bank will tie into the weir on Horseshoe Lake. Design of the left bank is in conjunction with the land drainage project looking at the condition of PS205. Resolution of the blocked drainage from the carpark of PS 205 is not included in this scope.

4.6 Boat Ramp at Hardy Street

The boat ramp at Hardy Street is below the design level of the adjacent embankment and requires extension to bring it up to the required height. Plan 51-34150-C129 shows the detail for this extension acknowledging that some confirmation of the exact alignment and extent of the concrete surface is required at the time of construction. The existing boat ramp crest level will be raised to the design level of 11.28 m and ties into the centreline of the stopbank. The new boat ramp extension consists of a 225 mm reinforced concrete slab with a grooved surface to aid traction.

4.7 Entrance to Rowing Club

The temporary stopbank will cross Hockey Lane, the entrance to Canterbury Rowing Club, and requires an increase in level to provide the required level of flood protection. The entrance to the Rowing Club was designed in accordance AS/NZS 2890 for a twin axle trailer with an 8m drawbar length (towball to centreline of axle). The rise has been set back from the intersection so that vehicles can safely stop/give way at the intersection with Avonside drive. Details of the entrance to the Rowing Club are shown in Plan 51-34150-C233

4.8 South of Bridge Street

This is a new section of temporary stopbank with an approximate length of 190 m. The alignment runs from the bottom of the Bridge Street bridge abutment and doglegs in to Bridge Street reserve. This stopbank is designed to a finished crest level of 11.5 m (to allow for settlement to 11.4 m) with a profile similar to that of the main temporary stopbanks but with an average slope of 1:4. The road facing section of the stopbank will use a terramesh basket profile so as to avoid the existing utilities as well as the Coastal Marine Area (CMA).

The existing gravel path way shall be reinstated over the new stopbank slightly to the east of its existing alignment. The path way will be widened to allow for both pedestrian and light maintenance vehicle use over the stopbank. The ramp angles shall be gentle enough to allow for pedestrians, cyclists, light vehicles and mobility scooters to enter and exit the reserve safely. The ramp will be chained off on the road side so no public vehicle access can be made. A gap shall be incorporated to allow for pedestrian, cycle and mobility scooter access.

The landscaping of the stopbank shall be a mixture of grass and native species to match in with the existing environment. The form of the stopbank shall be softened through the use of a varied slope angle (no greater than 1:3) to avoid a uniform appearance and reduce the visual impact. The terramesh basket section shall be partially hidden by planting low native species

between the bank and the road. All planting shall be finalised in conjunction with Council Parks personnel.

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5. Construction

The contract is cost and value contract.

Construction is provisionally scheduled over a seven-month period, however, an additional allowance may be required for construction during winter and coordination with existing Council projects in the area and any service relocations/modifications required. Consideration will also need to be given to the following:

- Managing work sites due to change in weather conditions and tides
- Fish and inanga spawning and specific elements needs to be scheduled to avoid impact on these sites
- Working in proximity to water
- Working in marine traffic (such as rowing events) and proximity to road traffic
- Managing public access
- Working in areas where there are Orion services relocation

The main construction elements of the work include:

- Upgrade and strengthening earthworks:
    - Construction or topping up existing profile based on the design profile
    - Construction of Terramesh steepened sections
    - Hydro seeding of grass bunds using geotextile product for steeper profiles
- Services
    - Repair, removal or replacement of existing in-service stormwater pipelines
    - Construction of stormwater pipelines and sumps associated with providing local drainage to new stopbanks
    - Repair or replacement of wastewater pipelines associated with sound assets that service green zoned areas. These are assets deferred by SCIRT but needs to be repaired
    - Abandonment of out of service wastewater pipes under Section 5.3 of the CCC CSS
    - Relocation of power poles, lamp posts and underground power cables
- Landscaping of existing stopbanks not being upgraded
    - Re-profiling to original shape
    - Topsoiling and hydro-seeding of stopbanks
- Tree removals
    - Liaison with Council's Arborist for tree removals and appropriate protection measures where required.

6. Safety in Design

A Safety in Design was conducted on 20 October 2016. The discussion was centred around the safety of activities during construction, O & M and the long term use of the temporary stopbank. Key Safety in Design criteria that were agreed and have been incorporated into the design are:

- Priority given to the river side where possible to give gentle slope and space for maintenance. Secondary priority given to road side slope and set back where possible
- Phasing of construction works is expected to be critical to successful construction of the works with topsoiling and grassing possibly delayed/restricted to periods when conditions for establishment of a healthy cover are optimal
- A Safety in Design (SiD) Register is to be completed and given to contractor outlining safety issues
- Specific requirements for contractor methodology regarding public interfaces and working in river and tidal areas
- Monitoring points to be included the density and frequency of these points outside identified areas of instability still requires guidance
- In order to promote subtle dissuasion of access to stopbanks, the landscape finish for the stopbank is grass for areas apart from the areas discussed in Section 4.4
- Where 1.5 m gravel crest diverts around tree pits hand rail to be installed

Safety in Design Workshop minutes and comments from Council are found in Appendix C.

7. Operations and Maintenance

An Operations and Maintenance Manual has been developed as part of this project. The manual describes the operations and maintenance procedures for the upkeep and maintenance of the temporary stopbanks so that they continue to provide flood protection to the design standard for the life of the stopbanks. The O & M manual is issued as a separate document.

CCC's Emergency Response Plan was updated. This document includes basic recommendations regarding how to plan and prepare for high water or seismic events and identifies some practical steps that could be considered before, during, and after such events. The document also provides some basic guidance on emergency measures that can be carried out in high water events to mitigate damage or potential failure scenarios. Priority areas are also identified for monitoring for the respective events along with respective parties responsible for emergency response. A copy of the CCC's Emergency Response Plan is issued as a separate document.

8. Schedule of Quantities and Cost Estimate

The schedule of quantities and cost estimate are found in Appendix D.

The Provisional Sums and Items include:

- Stopbank to entrance of Rowing Club
- Hardy Street Boat Ramp

- Removal of trees
- Relocation of Orion services
- Repair, renewal and abandonment of Stormwater and Wastewater services

The project estimate will be finalised on completion of the detailed design review.

9. Specifications

The Specification is are included in Appendix E.

10. Project Risks

A copy of the Risk Register identifying risks, impacts extent of risks and mitigation measures is provided in Appendix F. The key risks identified in the register are:

Land, Drainage and Flooding

- Land availability and easements
- Flooding in Red Zone stayers' properties
- Failure of stopbank due to ponding or flood behind the stopbank after heavy rainfall

Geotechnical

- Stopbank stability due to earthquake movement or liquefaction
- Stopbank stability due to unsuitable ground conditions

Environmental and Consenting

- Spawning seasons during construction
- Compliance to consent conditions

Construction

- High river levels during construction due to tides and inclement weather
- Working near overhead cables and buried services
- Working adjacent to the river
- Discharges to the river
- Seismic events during construction

Programme

- Delay due relocation of Orion services

11. Consent Application

Two draft resource consent applications have been prepared for the temporary stopbanks project. The first application relates to work between Swanns Road and Evans Avenue which is predominantly comprised of repair activity. The second application relates to works between Evans Avenue and South of Bridge Street.

11.1 Swanns Road to Evans Avenue Upgrade

A draft resource consent application has been prepared and issued as a separate document. This includes an application for a full suite of consents from Christchurch City Council and Canterbury Regional Council, including:

- Filling in flood management area
- Construction of stopbanks in Open Space zone
- Construction of stopbanks in High Flood Hazard Management Area
- Construction of stopbanks in Avon River Significant Landscape Area
- Earthworks in riparian margins
- Discharge of construction phase stormwater

The application includes a detailed Assessment of Environmental Effects which addresses positive effects; landscape and visual amenity, water quality and ecology, soil quality, groundwater quality, construction phase effects, flood flows and drainage, recreation, vegetation and natural and cultural heritage including Tangata Whenua values.

We anticipate lodging this consent application as soon as possible after Council review and upon receipt of final inputs. We will provide draft consent conditions for review as soon as these are received – anticipated to be 2-3 weeks after lodgement.

11.2 Evans Avenue to South of Bridge Street New Stopbank

A draft consent application has been prepared for the proposed stopbanks between Evans Avenue and South of Bridge Street. This section is more complex and includes both new stopbanks and works in the Coastal Marine Area. An application for a full suite of consents has been included and a detailed Assessment of Environmental Effects has been prepared. An ecological assessment is also being commissioned to support the application.

We will provide a final draft of this application once the design has been finalised and the application has been updated. We will also provide draft consent conditions for review as soon as these are made available following lodgement of the application.

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Appendices

Appendix A – Communications Records

Salve Velasco

From: Hyde, Karissa <Karissa.Hyde@ccc.govt.nz>
Sent: Tuesday, 23 August 2016 11:01 a.m.
To: Salve Velasco
Cc: George Lidgett
Subject: Re: 50 yr results presentation and notes from today meeting..

Yes please continue. We are happy with the results presented.

Sent from my Samsung Galaxy smartphone.

-------- Original message --------
From: Salve Velasco <Salve.Velasco@ghd.com>
Date: 23/08/16 10:43 (GMT+12:00)
To: "Hyde, Karissa" <Karissa.Hyde@ccc.govt.nz>
Cc: George Lidgett <George.Lidgett@ghd.com>
Subject: RE: 50 yr results presentation and notes from today meeting..

Hi Karissa

Sorry to be reiterating the need for the confirmation of the Action from Tim's email below. Do you have any feedback for this one please?

Action: Council to confirm satisfaction with the 50yr results presentation and confirm no further analysis or consideration required, (for GHD to then determine design top levels).

We are going to start the 12d prelim design today. I am away this afternoon, appreciate if you can please include George in the reply.

Thanks!
Regards
Salve Velasco
Senior Civil Engineer
Working days: Mondays to Thursdays

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From: Tim Preston
Sent: Wednesday, 17 August 2016 2:10 p.m.
To: Peter Christensen (InTouch); Hyde, Karissa (Karissa.Hyde@ccc.govt.nz); Salve Velasco
Cc: Martin Dasler

Subject: 50 yr results presentation and notes from today meeting..

Hi all,

1. We presented the new results in tabular M11 chainage / level format as well as the 100 yr results in a flood depth map.

2. There was some discussion about expected negative impacts on the tailwater levels for Brittens drain area, as the elevated temporary stopbanks will raise water levels (perhaps by 200mm in the 100 yr event). Council were comfortable with the 100yr results presented, based on understanding that they were more concerned about the 50 yr result given the temporary nature of the proposed stopbanks. The 50yr M11 glasswalled results showed only relatively minor overtopping of the old 11.2m level, so elevating stopbank above this 11.2 level would have minimal impact on the Brittens drain 50yr tailwater levels. Council were interested to see the 50 yr results (attached herewith) to confirm no further analysis or consideration required.

3. Overall results indicate need to raise the design stopbank levels by up to 150mm in order to meet design criteria. GHD were asked to determine and recommend suitable design top levels to meet the design criteria downstream of Gayhurst Road. Council desire simple a design geometry such as 100mm or 50mm flat steps, or perhaps long lengths of uniform grade between end levels. GHD recommendation should consider locations where the ground level already exceeds design level and what design levels are therefore logical from a construction practicality point of view. Design levels therefore could vary marginally between left and right banks. Council need these design top levels with some urgency as sandbag area contract works are imminent and will need to be varied to match.

4. Council confirmed that they are comfortable with the 200yr results presented 2-3 weeks ago showing small areas of worsening flood risk and that these do not motivate any redesign or further assessment.

Postscript:

· Looking at the 50 yr results (attached) the inland flood extent and depths are very similar. Detailed comparison of the surface levels suggests that the impact of the river tailwater level on flood surface level is reasonably localised within 100m of the river and becomes negligible (approx. 25mm when 200m south and approx. 15mm when 500m south of the river).

· This suggests that flooding in this area is complex and driven by more than the river level and is also significantly driven by local drainage constraints and surface storage.

Action: Council to confirm satisfaction with the 50yr results presentation and confirm no further analysis or consideration required, (for GHD to then determine design top levels).

Regards
Tim Preston
Senior Water Industry Engineer

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WATER<http://www.ghd.com/global/markets/water/> | ENERGY &
RESOURCES<http://www.ghd.com/global/sectors/energy--resources/> |
ENVIRONMENT<http://www.ghd.com/global/markets/environment/> | PROPERTY &
BUILDINGS<http://www.ghd.com/global/markets/property--buildings/> |
TRANSPORTATION<http://www.ghd.com/global/markets/transportation/>

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Salve Velasco

From: Hyde, Karissa <Karissa.Hyde@ccc.govt.nz>
Sent: Tuesday, 6 September 2016 3:18 p.m.
To: Salve Velasco
Subject: RE: Avon River Temporary Stopbanks Peer Review

Hi Salve,

As per the Consultant's Briefing during the tender period, seismic design consideration of the temporary stopbanks is not required.

Regards

Karissa Hyde

Project Manager BE (Hons) PMP GIPENZ
Stormwater and Land Drainage Rebuild

DDI 03 941 5998

Mobile 021 277 3054

Email karissa.hyde@ccc.govt.nz

Web www.ccc.govt.nz

Christchurch City Council
Civic Offices, 53 Hereford Street, Christchurch
PO Box 73011, Christchurch, 8154

From: Salve Velasco [mailto:Salve.Velasco@ghd.com]
Sent: Tuesday, 6 September 2016 2:56 p.m.
To: Hyde, Karissa
Subject: FW: Avon River Temporary Stopbanks Peer Review

Hi Karissa

Following on from yesterday's meeting, an action from the Council is to confirm that seismic design consideration is not required. Would you be able to confirm this please in this email or is the meeting minutes okay as a confirmation?

Thanks

Regards

Salve Velasco
Senior Civil Engineer
Working days: Mondays to Thursdays

GHD
T: +64 3 378 0997 | V: 510997 | E: salve.velasco@ghd.com
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---

From: Darren Woods
Sent: Friday, 2 September 2016 2:57 p.m.
To: Hyde, Karissa (Karissa.Hyde@ccc.govt.nz); Charlie.Watts@jacobs.com
Cc: Salve Velasco; Julia Riding; Samantha Webb
Subject: RE: Avon River Temporary Stopbanks Peer Review

Hi Karissa and Charlie
Please see GHD response to the peer review comments.

1. When GHD responded to the RFP we made the assumption that seismic stability assessment was not required for this project. This was based on our communication with Ian Wright, Christchurch City Council's Senior Geotechnical Engineer, (email dated 25/05/2016) during the Sandbag Replacement Detailed Design.
   This was further confirmed during the Consultants Workshop (30 May 2016). Item 6 of the Consultants Workshop Summary (TD15/16-305);
   "Design to a specific earthquake standard is not required, although consultants should consider where additional resilience could be offered for minimal additional cost. The rationale for this approach is that the temporary stopbanks are located on the edge of
   the river bank with significant risk of lateral spread. Mitigation of lateral spread is not part of this project, although again consultants should consider where reduction of lateral spread risk is possible with minimal additional cost."
   We believe that seismic stability assessment will not provide additional resilience for minimal additional cost. In general, we follow the logic behind the suggested seismic stability analyses and acceptance criteria for modelling the seismic stability to meet NZS1170 criteria as proposed by Jacobs.
   However, if the CCC require seismic resilience stability assessment to be included., GHD would consider this assessment as a variation to the current project.

2. No comment required.

3. Throughout our studies on the temporary stopbanks, GHD has taken the pragmatic approach that lateral spread will occur in the natural soils of the river bank and not within the stopbank itself. Since no ground treatment is proposed the ability to influence the performance of the temporary stopbanks due to effects of lateral spread is limited. Lateral spread was addressed during the risk assessment phase of the project. Because we believe numerical calculation of lateral spread is unreliable, we propose an updated lateral spread risk assessment is estimated using data and research collected following the events of the Canterbury Earthquake Sequence.
4. Agreed, following confirmation from CCC regarding Item 1 a design code should be agreed.

5. Item (b) A definitive cause for ongoing settlement of these areas has not been identified. Investigations into cause of instability to be undertaken as described by Item (e) of the GHD Geotech Design Philosophy document.
   Item (d) Agreed
   Item (e) Awaiting CCC decision as discussed above

Regards

Darren Woods
Engineering Geologist

GHD
DDI: 64 3 378 0907 | T: 64 3 378 0900 | F: 64 3 377 8575 | M: 027 6464 159 | E: darren.woods@ghd.com
226 Antigua Street, PO Box 13-468, Christchurch 8141 | www.ghd.com

From: Salve Velasco
Sent: Tuesday, 30 August 2016 1:04 p.m.
To: Julia Riding <Julia.Riding@ghd.com>; Darren Woods <Darren.Woods@ghd.com>; Samantha Webb <Samantha.Webb@ghd.com>
Subject: FW: Avon River Temporary Stopbanks Peer Review

Hello All

Forwarding the peer review by Jacobs.

Regards

Salve Velasco
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From: Hyde, Karissa [mailto:Karissa.Hyde@ccc.govt.nz]
Sent: Monday, 29 August 2016 12:41 p.m.
To: Salve Velasco
Cc: Allen Ingles; 'Watts, Charlie'
Subject: FW: Avon River Temporary Stopbanks Peer Review

Hi Salve,

Please find attached the draft copy of the peer review of the design philosophy statement. Can you please have your geotech team review and respond to myself and Charlie (Jacobs).

Regards

Karissa Hyde

Project Manager BE (Hons) PMP GIPENZ
Stormwater and Land Drainage Rebuild

DDI 03 941 5998

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Web www.ccc.govt.nz

Christchurch City Council
Civic Offices, 53 Hereford Street, Christchurch
PO Box 73011, Christchurch, 8154

From: Watts, Charlie [mailto:Charlie.Watts@jacobs.com]
Sent: Monday, 29 August 2016 11:52 a.m.
To: Hyde, Karissa
Cc: Christensen, Peter; Peacock, Hamish; Froggatt, Ian; Contawe, Annalisa
Subject: RE: Avon River Temporary Stopbanks Peer Review

Hi Karissa,

Please find attached a draft copy of our Peer Review of the Geotechnical Design Philosophy Statement for your comment.

Please let Ian or I know if you would like to discuss this document further.

Thanks
Charlie

Charlie Watts | **Jacobs** | Lead Geotechnical Engineer
Tel: +64 3 940 4957 | Mobile: +64 21 754219
Charlie.Watts@jacobs.com | www.jacobs.com

From: Hyde, Karissa [mailto:Karissa.Hyde@ccc.govt.nz]
Sent: Monday, 29 August 2016 10:48 AM
To: Watts, Charlie
Cc: Christensen, Peter; Peacock, Hamish
Subject: RE: Avon River Temporary Stopbanks Peer Review

Hi Charlie,

Can I please have your comments on the design philosophy ASAP.

Regards

Karissa Hyde

Project Manager BE (Hons) PMP GIPENZ
Stormwater and Land Drainage Rebuild

DDI 03 941 5998

Mobile 021 277 3054

Email karissa.hyde@ccc.govt.nz

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Salve Velasco

From: Mohammed, Bob <Bob.Mohammed@ccc.govt.nz>
Sent: Friday, 21 October 2016 2:11 p.m.
To: Salve Velasco
Subject: RE: Preliminary Design Review Minutes

Hi Salve

Pls see below.

Let me know if you have any queries.

Thanks

Bob

From: Salve Velasco [mailto:Salve.Velasco@ghd.com]
Sent: Wednesday, 19 October 2016 4:31 p.m.
To: Mohammed, Bob
Subject: RE: Preliminary Design Review Minutes

Hi Bob

Do you have an update on the CCC actions below please?

If it would help, I will summarise all the actions from CCC and I will send them to you, rather than you going through each and every email.

Cheers

Regards

Salve Velasco
Senior Civil Engineer
Working days: Mondays to Thursdays

GHD
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From: Salve Velasco
Sent: Wednesday, 12 October 2016 11:50 a.m.
To: Mohammed, Bob (Bob.Mohammed@ccc.govt.nz) <Bob.Mohammed@ccc.govt.nz>
Subject: Preliminary Design Review Minutes

Hi Bob

Please find attached the minutes. Sorry for the late delivery.

Summary of actions for CCC:

- Consultation with the 544 Avonside Drvie property will be led by CCC

level to the bottom of the door yesterday.
RL (bottom of door): 11.79m
Datum: CDD Jan 2014
Absolute Accuracy: +-30mm

- Parks requirement of stopbank landscape to be provided to GHD –

There is likely to be some planting near the Inanga spawning area. This should be affecting your current approach and timings at all. If it is please let me know. I think we can overlay the areas where any special planting will be required.

- Confirmation about providing protection for 544 Avonside Drive for 10 year flood event. Are we going to run a model for this? No

Thanks

Regards

Salve Velasco
Senior Civil Engineer
Working days: Mondays to Thursdays

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Joshua Bird

From: Joshua Bird
Sent: Tuesday, 18 October 2016 10:41 a.m.
To: Salve Velasco; Mohammed, Bob; 'Gordon, Laurie'
Cc: George Lidgett
Subject: Summary of discussion with Arborist

Hi Salve, Bob

Laurie and I had a productive meeting and hope to be able to progress the trees part of the design. Laurie can you have a quick read and make sure it all makes sense?

We went through a number of cases and have a reasonable idea of the trees that can be removed. In general for design if the tree survey says remove then it is acceptable for GHD to remove, if retain or TBC then will need to consult with arborist but can likely be removed or protected

Considerations

- Damage to Trees
    - Where excavating topsoil – scraping of roots – mainly close in, and large trees (even in top 100 mm of top soil can cause damage)
    - Compaction damage to root system (where root system is approx. 10x trunk diameter)
    - Soil or water around depressions at trunk creating decay in trunk
    - Reduction of permeability of soil due to compaction
- Damage to Stopbank
    - Decayed trees/roots creating flow path under stopbank or collapse/fall
        - Small trees unlikely to be major concern to structural failure
    - Sucker growth exacerbated from compaction damage to root system creating flow paths
- Design Hierarchy
    - 100 – 200 mm (topsoil and hydro seeding) increase in depth around tree trunk is unlikely to cause any damage and no design consideration is required
    - Tress less than 6 m can be removed/constructed around with minimal consideration (check for any special species using replacement plan doc “Natural & Culture Heritage – Topic 9.4”)
    - Some species – mainly poplars with prevalent sucker growth are unsuitable on stopbank – should be removed
    - If excavating around roots try to move alignment away from truck to avoid scraping damage
    - If tree is healthy and robust then keep and raise stopbank around
        - If in middle of stop bank detail a stone “collar to protect from soil damage)
        - If inside of stopbank and increased depth greater than 300 mm retaining structure protection unless there is insufficient room
        - If depth increase is less than 300 mm then fill around tree should be okay
    - If insufficient room to provide protection remove tree
    - If tree is in poor condition should be removed
    - If tree is linked in a group and only one needs to be removed will need to consult with arborist about impact on others in cluster
- Construction and O&M
    - Create a list of trees to be observed and monitored for quick decline based on those unhealthy trees in survey, but are not required to be removed as part of design works
- Consent
    - Trees less than 6 m are non-notified
    - Stopbanks likely to be property and trees can be removed if damaging property and no other solution
    - Will provide full list to community board (or boards if work in more than one boundary)

Next stages are

1. Laurie to do quick inspection of trees upstream of Gayhurst bridge to make sure there are no immediate risks from decayed/dead trees
2. GHD to provide Arborist (by wed morning) with list of all trees to be impacted by stopbank to be listed as
    a. Remove
    b. Retain
    c. Protect where
        i. Method of protection to be confirmed by Arborist
3. Arborist (Laurie in conjunction with Chris Taylor the area arborist) to confirm suitability of design actions
4. GHD to incorporate tree actions into design – symbolise in construction drawings action for all trees
5. Arborist to confirm list of trees that should be on an observation list for O & M
6. Arborist and CCC to approach local community board with submission for removal of trees

Please let me know if there is anything else

Regards,

Joshua Bird
Engineer - Civil
Water

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138 Victoria Street, PO Box 13 468, Christchurch 8141, New Zealand | www.ghd.com

Joshua Bird

From: Joshua Bird
Sent: Thursday, 6 October 2016 11:00 a.m.
To: Salve Velasco
Subject: Notification of Design in proximity to Enable Utilities

Just to record phone conversation with Enable – "as long as we are not excavating we are okay at this location"

1. Avonside Drive on the opposite side of the river to Glenarm Tce.
    a. Fibre Optics cable crossing under river and existing temporary stopbank on the South/East bank
    b. Proposed design is to increase the height of stop bank by ~0.45 m to a height of ~0.9 m above surrounding ground level.

Note there other locations where your services cross the stop bank. At these locations the design is minimal cover with topsoil and grassing, please advise if this may cause any issues we need to consider during design.

Regards,

Joshua Bird
Engineer - Civil
Water

GHD
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138 Victoria Street, PO Box 13 468, Christchurch 8141, New Zealand | www.ghd.com

Joshua Bird

From: Smit, Eddie, Vodafone NZ <Eddie.SMIT@vodafone.com>
Sent: Friday, 7 October 2016 2:11 p.m.
To: Joshua Bird
Cc: Sheldon, Neil, Vodafone NZ; Schoeman, Richard, Vodafone NZ; Miller, Barry, Vodafone NZ
Subject: RE: Notification of Design in proximity to Vodafone Utilities

Hello Joshua,

Vodafone does not have cabling at the address stated.

Kind Regards

Eddie Smit

Eddie Smit
Access Network Engineer
Transmission South
Networks & Services
Vodafone New Zealand Ltd.
Mobile: +64 29 982 6023
DDI: +64 3 9826023
Email: eddie.smit@vodafone.com

Vodafone New Zealand Limited,
Vodafone InnoV8
213 – 221 Tuam St
CHCH 8011
PO Box 4584
Christchurch New Zealand
vodafone.co.nz

From: Schoeman, Richard, Vodafone NZ
Sent: Friday, 7 October 2016 7:29 a.m.
To: Smit, Eddie, Vodafone NZ <Eddie.SMIT@vodafone.com>
Subject: FW: Notification of Design in proximity to Vodafone Utilities

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From: Miller, Barry, Vodafone NZ
Sent: Thursday, 6 October 2016 2:07 p.m.
To: Schoeman, Richard, Vodafone NZ <Richard.SCHOEMAN@vodafone.com>
Subject: FW: Notification of Design in proximity to Vodafone Utilities

Heya mate.
More info for you but picking you're already across this?
Cheers
B

Barry Miller
Manager Fixed Access Design & Build
0299826079

-----Original Message-----
From: Sheldon, Neil, Vodafone NZ [Neil.Sheldon@vodafone.com]

Received: Thursday, 06 Oct 2016, 1:58PM
To: Miller, Barry, Vodafone NZ [Barry.MILLER@vodafone.com]
Subject: FW: Notification of Design in proximity to Vodafone Utilities

Hi Barry ,

One for you .

Can't say I never give you anything .

Cheers

Neil

From: Vodafone NZ NOC
Sent: Thursday, 6 October 2016 11:00 a.m.
To: Sheldon, Neil, Vodafone NZ <Neil.Sheldon@vodafone.com>; Tait, Robert, Vodafone NZ <Robert.TAIT@vodafone.com>
Cc: Joshua.Bird@ghd.com; Vodafone NZ NOC <noc.nz@vodafone.com>
Subject: FW: Notification of Design in proximity to Vodafone Utilities

Hi Guys, Are you able to assist?

Regards

Bong

From: Joshua Bird [mailto:Joshua.Bird@ghd.com]
Sent: Thursday, 6 October 2016 10:53 a.m.
To: Vodafone NZ NOC <noc.nz@vodafone.com>
Cc: Salve Velasco <Salve.Velasco@ghd.com>
Subject: Notification of Design in proximity to Vodafone Utilities

Hi

GHD are currently designing upgrades to the Avon River temporary stopbanks along the lower Avon river from Swans Rd to Evans Rd. As part of these works we are proposing to increase the height of stopbanks over your utilities. Could you please pass this on to the appropriate person to evaluate any potential issues or confirm that the works will not impact you. The following locations have been identified as being impacted by our works:

1. The canal at 205-211 New Brighton Rd
    a. We are looking to provide a flood barrier along the culvert serving the pumps station at 205 New Brighton Rd
    b. Can you please confirm if there are any design considerations for work over the Culvert?
    c. Note at this location there is a Vodafone (Black) and a Chorus cable (purple)

Note there other locations where your services cross the stop bank. At these locations the design is minimal cover with topsoil (150mm) and grassing, please advise if this may cause any issues we need to consider during design.

Regards,

Joshua Bird
Engineer - Civil
Water

GHD
T: +64 3 378 0948 | V: 510948 | E: joshua.bird@ghd.com
138 Victoria Street, PO Box 13 468, Christchurch 8141, New Zealand | www.ghd.com

Joshua Bird

From: Network Services <NetworkServices@chorus.co.nz>
Sent: Wednesday, 12 October 2016 3:45 p.m.
To: Joshua Bird
Subject: RE: Notification of Design in proximity to Chorus Utilities

Hi Joshua,

Only considerations you need to take into account is working with care around the Chorus network and making sure that if there is any damage to the Chorus network that it gets reported to Chorus on 0800 463 896 Opt.2

Regards,

Jono Tutty | Network Services Coordinator
Chorus | **T :** 0800 463 896 opt 3 | **E :** networkservices@chorus.co.nz

---

From: Joshua Bird [mailto:Joshua.Bird@ghd.com]
Sent: Friday, 7 October 2016 2:14 p.m.
To: Network Services <NetworkServices@chorus.co.nz>
Cc: Salve Velasco <Salve.Velasco@ghd.com>
Subject: RE: Notification of Design in proximity to Chorus Utilities

Hi Jono

Thank you for the reply. I have BeforeUdig maps which I used to identify the locations we were doing work over your utilities. None of the network will be in our way as we are not excavating just increasing the stopbanks above the asset (max 1.5 m). If there are no network consideration I need to keep in mind then I will assume that the cables are fine where they are.

Regards,

Joshua Bird
Engineer - Civil
Water

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T: +64 3 378 0948 | V: 510948 | E: joshua.bird@ghd.com
138 Victoria Street, PO Box 13 468, Christchurch 8141, New Zealand | www.ghd.com

---

From: Network Services [mailto:NetworkServices@chorus.co.nz]
Sent: Thursday, 6 October 2016 11:02 a.m.
To: Joshua Bird <Joshua.Bird@ghd.com>

Cc: Salve Velasco <Salve.Velasco@ghd.com>
Subject: RE: Notification of Design in proximity to Chorus Utilities

Hi Joshua,

Is any of the Chorus network in the areas you are working going to be in the way of your design and required to be relocated? If you require any plans or a cable locate to show the Chorus network in area of works you are able to request this through BeforeUdig.co.nz .

If there is Chorus network you require to be relocated please fill out the information and return to networkservices@chorus.co.nz and we will log a request to have the required works done.

Network Modification

Are you a Contractor?
Who are you working for, or contracted to? (Local Council, Utility or Private Developer)?
Requestor name?

Billing details:
Postal Address?
Email (compulsory)?
Mobile number?

Site Contact Details:
Site contact name?
Mobile number?
Alternate Number?
Alternate Site contact?
Alternate Site contact Number?

Work Details:
Address where work is required?
What work has been requested?
Reason why this Chorus Network Element is required to be modified?
Is this property owned by the requestor?
Any additional information?

Kind regards

Jono Tutty | Network Services Coordinator
Chorus | **T :** 0800 463 896 opt 3 | **E :** networkservices@chorus.co.nz

---

From: Joshua Bird [mailto:Joshua.Bird@ghd.com]
Sent: Thursday, 6 October 2016 10:54 a.m.
To: Network Services <NetworkServices@chorus.co.nz>
Cc: Salve Velasco <Salve.Velasco@ghd.com>
Subject: Notification of Design in proximity to Chorus Utilities

Hi

GHD are currently designing upgrades to the Avon River temporary stopbanks along the lower Avon river from Swans Rd to Evans Rd. As part of these works we are proposing to increase the height of stopbanks over your utilities. Could you please pass this on to the appropriate person to evaluate any potential issues or confirm that the works will not impact you. The following locations have been identified as being impacted by our works:

1. The Canterbury rowing club entrance on Hockey Ln off Avonside Drive opposite Kerrs Rd
    a. Telecom cable crossing to rowing club boat sheds
    b. Proposed design is increase the height of the stopbank to ~0.6 m above road level, A raised entrance or temporary flood barrier will be constructed across the road
    c. It appears that there is some ground damage has already occured where the cable crosses the culvert.

2. The canal at 205-211 New Brighton Rd
    a. We are looking to provide a flood barrier along the culvert serving the pumps station at 205 New Brighton Rd
    b. Can you please confirm if there are any design considerations for work over the Culvert?
    c. Also a vodafone stand at this location

3. New Brighton Rd from approximately Rawsons St to Pages Rd
    a. Telecom cable already under existing stopbank main conflict opposite Pratt St
    b. Proposed design is increase the height of the stopbank by less than .25m

Note there other locations where your services cross the stop bank. At these locations the design is minimal cover with topsoil and grassing, please advise if this may cause any issues we need to consider during design.

Regards,

Joshua Bird
Engineer - Civil
Water

GHD
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Appendix B – DHI Modelling Results

Water Level	50yr Glass	100yr Glass	200yr 11pt2	200yr special	design stopbank level	50yr comparison	100yr comparison	Note
AVON 9265	11.678	11.824	12.0089064	12.01379108	11.2	0.678 above	0.624 above	
AVON 9314.12	11.665	11.811	12.004529	12.00101376	11.2	0.665 above	0.611 above	
AVON 9363.23	11.644	11.791	11.9750061	11.98170567	11.2	0.644 above	0.591 above	
AVON 9381.53	11.657	11.805	11.9902992	11.99620056	11.2	0.657 above	0.605 above	
AVON 9428.28	11.65	11.798	11.9838591	11.99015331	11.2	0.65 above	0.598 above	
AVON 9475.02	11.643	11.791	11.9769325	11.98324299	11.2	0.643 above	0.591 above	
AVON 9521.76	11.634	11.782	11.9672995	11.97460842	11.2	0.634 above	0.582 above	
AVON 9568.5	11.622	11.771	11.956	11.964	11.2	0.622 above	0.571 above	start of glass wall stopbanks
AVON 9609.44	11.615	11.765	11.95	11.958	11.2	0.615 above	0.565 above	
AVON 9650.37	11.609	11.759	11.943	11.953	11.2	0.609 above	0.559 above	The above or below
AVON 9703.3	11.6	11.751	11.935	11.945	11.2	0.6 above	0.551 above	indication represents
AVON 9756.23	11.591	11.742	11.925	11.936	11.2	0.591 above	0.542 above	wether the flood level is
AVON 9809.16	11.581	11.732	11.914	11.926	11.2	0.581 above	0.532 above	above or below the
AVON 9862.08	11.571	11.723	11.904	11.917	11.2	0.571 above	0.523 above	design criteria.
AVON 9894.51	11.566	11.719	11.899	11.913	11.2	0.566 above	0.519 above	
AVON 9926.94	11.562	11.715	11.896	11.91	11.2	0.562 above	0.515 above	For the 50 year the level
AVON 9979.11	11.552	11.707	11.888	11.902	11.2	0.552 above	0.507 above	needs to be at least
AVON 10031.3	11.543	11.7	11.88	11.896	11.2	0.543 above	0.5 above	200mm below the
AVON 10083.4	11.533	11.693	11.873	11.889	11.2	0.533 above	0.493 above	stobank level to be
AVON 10135.6	11.524	11.687	11.866	11.883	11.2	0.524 above	0.487 above	marked as "Below"
AVON 10187.8	11.515	11.681	11.86	11.878	11.2	0.515 above	0.481 above	
AVON 10229.5	11.509	11.678	11.857	11.875	11.2	0.509 above	0.478 above	
AVON 10260.2	11.507	11.677	11.855	11.873	11.2	0.507 above	0.477 above	
AVON 10291	11.505	11.675	11.853	11.871	11.2	0.505 above	0.475 above	
AVON 10326.8	11.502	11.673	11.851	11.87	11.2	0.502 above	0.473 above	For the 100yr the
AVON 10362.6	11.499	11.672	11.849	11.868	11.2	0.499 above	0.472 above	level needs to be
AVON 10411.9	11.494	11.668	11.845	11.864	11.2	0.494 above	0.468 above	below the stopbank
AVON 10458	11.488	11.665	11.841	11.86	11.2	0.488 above	0.465 above	level
AVON 10504.1	11.482	11.661	11.836	11.856	11.2	0.482 above	0.461 above	
AVON 10550.2	11.475	11.657	11.831	11.851	11.2	0.475 above	0.457 above	
AVON 10596.3	11.47	11.653	11.825	11.846	11.2	0.47 above	0.453 above	
AVON 10616.6	11.458	11.64	11.806	11.829	11.2	0.458 above	0.44 above	
AVON 10625.5	11.457	11.638	11.804	11.827	11.2	0.457 above	0.438 above	
AVON 10625.5	11.457	11.638	11.804	11.827	11.2	0.457 above	0.438 above	
AVON 10676.3	11.447	11.629	11.792	11.816	11.2	0.447 above	0.429 above	
AVON 10727.1	11.44	11.622	11.782	11.807	11.2	0.44 above	0.422 above	
AVON 10778	11.434	11.616	11.774	11.8	11.2	0.434 above	0.416 above	
AVON 10834	11.426	11.608	11.763	11.79	11.2	0.426 above	0.408 above	
AVON 10890	11.419	11.601	11.753	11.781	11.2	0.419 above	0.401 above	
AVON 10936.4	11.414	11.596	11.746	11.775	11.2	0.414 above	0.396 above	
AVON 10982.8	11.41	11.592	11.74	11.769	11.2	0.41 above	0.392 above	
AVON 11029.2	11.406	11.588	11.734	11.764	11.2	0.406 above	0.388 above	
AVON 11082.3	11.402	11.583	11.726	11.758	11.2	0.402 above	0.383 above	
AVON 11135.5	11.397	11.578	11.719	11.751	11.2	0.397 above	0.378 above	
AVON 11180.4	11.393	11.574	11.713	11.745	11.2	0.393 above	0.374 above	
AVON 11225.4	11.388	11.57	11.707	11.74	11.2	0.388 above	0.37 above	
AVON 11270.3	11.384	11.565	11.701	11.735	11.2	0.384 above	0.365 above	
AVON 11315.3	11.378	11.56	11.694	11.729	11.2	0.378 above	0.36 above	
AVON 11372.3	11.369	11.551	11.684	11.719	11.2	0.369 above	0.351 above	
AVON 11429.4	11.357	11.54	11.669	11.705	11.2	0.357 above	0.34 above	
AVON 11475	11.35	11.532	11.656	11.694	11.2	0.35 above	0.332 above	
AVON 11520.6	11.342	11.523	11.643	11.682	11.2	0.342 above	0.323 above	
AVON 11566.2	11.335	11.516	11.631	11.672	11.2	0.335 above	0.316 above	
AVON 11611.8	11.328	11.508	11.62	11.661	11.2	0.328 above	0.308 above	
AVON 11654.8	11.322	11.502	11.609	11.652	11.2	0.322 above	0.302 above	
AVON 11654.8	11.322	11.502	11.609	11.652	11.2	0.322 above	0.302 above	
AVON 11654.9	11.322	11.502	11.609	11.652	11.2	0.322 above	0.302 above	
AVON 11710	11.305	11.482	11.581	11.625	11.2	0.305 above	0.282 above	
AVON 11726.7	11.303	11.481	11.58	11.624	11.2	0.303 above	0.281 above	
AVON 11785.6	11.295	11.472	11.567	11.612	11.2	0.295 above	0.272 above	
AVON 11844.6	11.286	11.464	11.553	11.6	11.2	0.286 above	0.264 above	
AVON 11903.6	11.278	11.455	11.538	11.587	11.2	0.278 above	0.255 above	
AVON 11948	11.271	11.448	11.526	11.575	11.2	0.271 above	0.248 above	
AVON 11992.5	11.263	11.439	11.512	11.562	11.2	0.263 above	0.239 above	
AVON 12047.7	11.255	11.431	11.498	11.55	11.2	0.255 above	0.231 above	
AVON 12102.8	11.248	11.423	11.484	11.539	11.3	0.148 above	0.123 above	
AVON 12157.9	11.241	11.415	11.471	11.527	11.3	0.141 above	0.115 above	
AVON 12214.1	11.228	11.399	11.441	11.5	11.3	0.128 above	0.099 above	
AVON 12270.4	11.215	11.381	11.406	11.468	11.3	0.115 above	0.081 above	
AVON 12323.5	11.206	11.37	11.385	11.45	11.3	0.106 above	0.07 above	
AVON 12376.7	11.197	11.36	11.364	11.431	11.3	0.097 above	0.06 above	
AVON 12431.1	11.19	11.351	11.347	11.416	11.3	0.09 above	0.051 above	
AVON 12485.4	11.184	11.344	11.331	11.404	11.3	0.084 above	0.044 above	
AVON 12512.8	11.185	11.346	11.335	11.408	11.3	0.085 above	0.046 above	
AVON 12512.8	11.185	11.346	11.335	11.408	11.3	0.085 above	0.046 above	
AVON 12580.9	11.184	11.346	11.333	11.407	11.3	0.084 above	0.046 above	
AVON 12629.9	11.183	11.344	11.329	11.404	11.3	0.083 above	0.044 above	
AVON 12678.9	11.182	11.343	11.327	11.402	11.3	0.082 above	0.043 above	
AVON 12736.9	11.18	11.341	11.323	11.399	11.3	0.08 above	0.041 above	
AVON 12794.8	11.179	11.339	11.319	11.396	11.3	0.079 above	0.039 above	
AVON 12852.7	11.177	11.338	11.316	11.393	11.3	0.077 above	0.038 above	
AVON 12906.1	11.176	11.337	11.314	11.391	11.3	0.076 above	0.037 above	
AVON 12959.6	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above	
AVON 12959.6	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above	
AVON 12975.8	11.176	11.336	11.311	11.39	11.3	0.076 above	0.036 above	
AVON 13022.6	11.175	11.334	11.309	11.388	11.3	0.075 above	0.034 above	
AVON 13069.3	11.174	11.333	11.307	11.386	11.3	0.074 above	0.033 above	

AVON 13116.1	11.173	11.332	11.305	11.384	11.3	0.073	above	0.032 above
AVON 13166.6	11.173	11.332	11.305	11.384	11.3	0.073	above	0.032 above
AVON 13217.1	11.173	11.332	11.304	11.383	11.3	0.073	above	0.032 above
AVON 13267.5	11.172	11.331	11.304	11.383	11.3	0.072	above	0.031 above
AVON 13313.2	11.172	11.33	11.303	11.382	11.3	0.072	above	0.03 above
AVON 13358.8	11.171	11.33	11.301	11.38	11.3	0.071	above	0.03 above
AVON 13419.6	11.171	11.329	11.3	11.379	11.3	0.071	above	0.029 above
AVON 13480.5	11.17	11.327	11.299	11.377	11.3	0.07	above	0.027 above
AVON 13545.6	11.169	11.327	11.298	11.376	11.3	0.069	above	0.027 above
AVON 13610.8	11.169	11.326	11.297	11.374	11.3	0.069	above	0.026 above
AVON 13663.3	11.168	11.325	11.297	11.373	11.3	0.068	above	0.025 above
AVON 13715.9	11.167	11.324	11.296	11.372	11.3	0.067	above	0.024 above
AVON 13768.5	11.167	11.324	11.296	11.371	11.3	0.067	above	0.024 above
AVON 13832.9	11.166	11.323	11.295	11.369	11.3	0.066	above	0.023 above
AVON 13897.3	11.165	11.322	11.294	11.368	11.3	0.065	above	0.022 above
AVON 13951.3	11.165	11.321	11.293	11.366	11.3	0.065	above	0.021 above
AVON 14005.3	11.164	11.32	11.293	11.365	11.3	0.064	above	0.02 above
AVON 14059.2	11.163	11.319	11.292	11.363	11.3	0.063	above	0.019 above
AVON 14128.8	11.162	11.318	11.291	11.361	11.3	0.062	above	0.018 above
AVON 14198.4	11.161	11.317	11.291	11.359	11.3	0.061	above	0.017 above
AVON 14214.4	11.161	11.316	11.291	11.358	11.3	0.061	above	0.016 above
AVON 14214.4	11.161	11.316	11.291	11.358	11.3	0.061	above	0.016 above
AVON 14264.5	11.16	11.315	11.289	11.356	11.3	0.06	above	0.015 above
AVON 14314.6	11.158	11.313	11.288	11.354	11.3	0.058	above	0.013 above
AVON 14364.8	11.157	11.311	11.287	11.351	11.3	0.057	above	0.011 above
AVON 14420.5	11.155	11.309	11.286	11.348	11.3	0.055	above	0.009 above
AVON 14476.2	11.153	11.306	11.284	11.343	11.3	0.053	above	0.006 above
AVON 14539	11.15	11.302	11.281	11.338	11.2	0.15	above	0.102 above
AVON 14601.8	11.147	11.298	11.279	11.334	11.2	0.147	above	0.098 above
AVON 14653.4	11.147	11.298	11.279	11.335	11.2	0.147	above	0.098 above
AVON 14705	11.147	11.298	11.279	11.336	11.2	0.147	above	0.098 above
AVON 14775	11.137	11.288	11.27	11.322	11.2	0.137	above	0.088 above
AVON 14831.1	11.126	11.273	11.26	11.305	11.2	0.126	above	0.073 above
AVON 14891.4	11.12	11.266	11.255	11.299	11.2	0.12	above	0.066 above
AVON 14951.7	11.114	11.259	11.251	11.296	11.2	0.114	above	0.059 above
AVON 15005.4	11.111	11.256	11.248	11.295	11.2	0.111	above	0.056 above
AVON 15059.1	11.107	11.252	11.246	11.292	11.2	0.107	above	0.052 above
AVON 15112.8	11.104	11.248	11.243	11.29	11.2	0.104	above	0.048 above
AVON 15179.4	11.095	11.237	11.236	11.282	11.2	0.095	above	0.037 above
AVON 15246	11.083	11.223	11.226	11.271	11.2	0.083	above	0.023 above
AVON 15309.4	11.077	11.214	11.22	11.264	11.2	0.077	above	0.014 above
AVON 15372.7	11.071	11.207	11.215	11.259	11.2	0.071	above	0.007 above
AVON 15438.1	11.072	11.208	11.215	11.259	11.2	0.072	above	0.008 above
AVON 15503.5	11.071	11.208	11.214	11.259	11.2	0.071	above	0.008 above
AVON 15547.7	11.067	11.203	11.21	11.254	11.2	0.067	above	0.003 above
AVON 15591.9	11.059	11.194	11.203	11.245	11.2	0.059	above	-0.006 below 100yr meets design criteria
AVON 15648.2	11.056	11.19	11.2	11.243	11.2	0.056	above	-0.01 below
AVON 15704.4	11.052	11.187	11.197	11.239	11.2	0.052	above	-0.013 below
AVON 15754.6	11.052	11.186	11.196	11.239	11.2	0.052	above	-0.014 below
AVON 15804.8	11.051	11.185	11.196	11.238	11.2	0.051	above	-0.015 below
AVON 15855	11.051	11.185	11.196	11.238	11.2	0.051	above	-0.015 below
AVON 15920	11.043	11.176	11.187	11.229	11.2	0.043	above	-0.024 below
AVON 15986.4	11.036	11.168	11.181	11.222	11.2	0.036	above	-0.032 below
AVON 15986.4	11.036	11.168	11.181	11.222	11.2	0.036	above	-0.032 below
AVON 16035	11.031	11.162	11.177	11.217	11.2	0.031	above	-0.038 below
AVON 16083.5	11.025	11.155	11.171	11.21	11.2	0.025	above	-0.045 below
AVON 16132.1	11.018	11.146	11.163	11.202	11.2	0.018	above	-0.054 below
AVON 16187.6	11.014	11.141	11.16	11.198	11.2	0.014	above	-0.059 below
AVON 16243.1	11.009	11.136	11.155	11.193	11.2	0.009	above	-0.064 below
AVON 16291.2	11.004	11.129	11.15	11.187	11.2	0.004	above	-0.071 below
AVON 16339.2	10.999	11.123	11.145	11.181	11.2	-0.001	below	-0.077 below 50yr meets design criteria
AVON 16403.6	10.996	11.118	11.141	11.177	11.2	-0.004	below	-0.082 below
AVON 16468	10.993	11.114	11.138	11.173	11.2	-0.007	below	-0.086 below
AVON 16508	10.961	11.071	11.099	11.128	11.2	-0.039	below	-0.129 below
AVON 16564	10.958	11.067	11.095	11.124	11.2	-0.042	below	-0.133 below
AVON 16620	10.954	11.062	11.092	11.119	11.2	-0.046	below	-0.138 below
AVON 16684.3	10.951	11.058	11.088	11.115	11.2	-0.049	below	-0.142 below
AVON 16748.6	10.948	11.055	11.085	11.112	11.2	-0.052	below	-0.145 below
AVON 16800.7	10.945	11.05	11.081	11.107	11.2	-0.055	below	-0.15 below
AVON 16852.9	10.941	11.044	11.075	11.101	11.2	-0.059	below	-0.156 below
AVON 16905	10.935	11.037	11.069	11.094	11.2	-0.065	below	-0.163 below
AVON 16952	10.932	11.033	11.066	11.09	11.2	-0.068	below	-0.167 below
AVON 16998.9	10.929	11.029	11.062	11.086	11.2	-0.071	below	-0.171 below
AVON 17045.9	10.926	11.025	11.058	11.082	11.2	-0.074	below	-0.175 below
AVON 17100.5	10.923	11.02	11.054	11.077	11.2	-0.077	below	-0.18 below
AVON 17155.1	10.92	11.016	11.05	11.073	11.2	-0.08	below	-0.184 below
AVON 17216.3	10.915	11.01	11.045	11.067	11.2	-0.085	below	-0.19 below
AVON 17277.5	10.909	11.003	11.038	11.059	11.2	-0.091	below	-0.197 below
AVON 17338.7	10.901	10.994	11.03	11.05	11.2	-0.099	below	-0.206 below
AVON 17394.2	10.894	10.984	11.021	11.04	11.2	-0.106	below	-0.216 below
AVON 17449.6	10.887	10.974	11.012	11.03	11.2	-0.113	below	-0.226 below
AVON 17505.1	10.88	10.964	11.002	11.018	11.2	-0.12	below	-0.236 below
AVON 17574.2	10.875	10.958	10.996	11.012	11.2	-0.125	below	-0.242 below
AVON 17643.4	10.872	10.954	10.992	11.007	11.2	-0.128	below	-0.246 below
AVON 17706.7	10.868	10.947	10.986	11	11.2	-0.132	below	-0.253 below
AVON 17770	10.863	10.94	10.98	10.993	11.2	-0.137	below	-0.26 below
AVON 17830	10.835	10.902	10.941	10.95	11.2	-0.165	below	-0.298 below

AVON 17887.9	10.834	10.9	10.939	10.948	11.2	-0.166 below	-0.3 below
AVON 17930.2	10.833	10.898	10.937	10.945	11.2	-0.167 below	-0.302 below
AVON 17982.7	10.831	10.896	10.936	10.944	11.2	-0.169 below	-0.304 below
AVON 18035.2	10.83	10.895	10.934	10.942	11.2	-0.17 below	-0.305 below
AVON 18078.9	10.828	10.892	10.932	10.939	11.2	-0.172 below	-0.308 below
AVON 18122.7	10.827	10.89	10.929	10.936	11.2	-0.173 below	-0.31 below
AVON 18164.4	10.825	10.888	10.927	10.934	11.2	-0.175 below	-0.312 below
AVON 18206.2	10.824	10.886	10.926	10.932	11.2	-0.176 below	-0.314 below
AVON 18274.3	10.821	10.883	10.922	10.928	11.2	-0.179 below	-0.317 below
AVON 18342.5	10.818	10.879	10.918	10.924	11.2	-0.182 below	-0.321 below
AVON 18410.6	10.816	10.876	10.915	10.92	11.2	-0.184 below	-0.324 below
AVON 18478.8	10.813	10.872	10.911	10.916	11.2	-0.187 below	-0.328 below
AVON 18531.9	10.812	10.871	10.91	10.915	11.2	-0.188 below	-0.329 below
AVON 18585	10.811	10.869	10.909	10.913	11.2	-0.189 below	-0.331 below
AVON 18638.1	10.81	10.868	10.907	10.912	11.2	-0.19 below	-0.332 below
AVON 18698.4	10.809	10.867	10.907	10.911	11.2	-0.191 below	-0.333 below
AVON 18758.7	10.809	10.867	10.907	10.911	11.2	-0.191 below	-0.333 below
AVON 18795.4	10.806	10.863	10.903	10.907	11.2	-0.194 below	-0.337 below
AVON 18832	10.801	10.856	10.895	10.898	11.2	-0.199 below	-0.344 below
AVON 18832	10.801	10.856	10.895	10.898	11.2	-0.199 below	-0.344 below
AVON 18900.3	10.8	10.855	10.894	10.897	11.2	-0.2 below	-0.345 below
AVON 18968.7	10.799	10.854	10.893	10.895	11.2	-0.201 below	-0.346 below
AVON 19037	10.799	10.853	10.892	10.894	11.2	-0.201 below	-0.347 below
AVON 19105.4	10.798	10.851	10.891	10.893	11.2	-0.202 below	-0.349 below
AVON 19173.7	10.796	10.85	10.889	10.891	11.2	-0.204 below	-0.35 below
AVON 19242.1	10.795	10.848	10.887	10.889	11.2	-0.205 below	-0.352 below
AVON 19310.5	10.794	10.847	10.886	10.887	11.2	-0.206 below	-0.353 below
AVON 19378.8	10.793	10.845	10.884	10.885	11.2	-0.207 below	-0.355 below
AVON 19447.2	10.792	10.843	10.882	10.883	11.2	-0.208 below	-0.357 below
AVON 19447.2	10.792	10.843	10.882	10.883	11.2	-0.208 below	-0.357 below
AVON 19507	10.789	10.839	10.879	10.879	11.2	-0.211 below	-0.361 below
AVON 19566.8	10.786	10.835	10.875	10.874	11.2	-0.214 below	-0.365 below
AVON 19626.6	10.783	10.831	10.87	10.869	11.2	-0.217 below	-0.369 below
AVON 19676.4	10.786	10.835	10.875	10.875	11.2	-0.214 below	-0.365 below
AVON 19726.2	10.787	10.837	10.877	10.877	11.2	-0.213 below	-0.363 below
AVON 19776	10.787	10.837	10.877	10.878	11.2	-0.213 below	-0.363 below
AVON 19840	10.787	10.837	10.877	10.878	11.2	-0.213 below	-0.363 below
AVON 19895	10.78	10.829	10.869	10.869	11.2	-0.22 below	-0.371 below
AVON_DWNSTR_LOOP 0	10.801	10.856	10.895	10.898	11.2	-0.199 below	-0.344 below
AVON_DWNSTR_LOOP 19.3512	10.801	10.856	10.895	10.898	11.2	-0.199 below	-0.344 below
AVON_DWNSTR_LOOP 38.7025	10.801	10.856	10.895	10.898	11.2	-0.199 below	-0.344 below
AVON_DWNSTR_LOOP 58.0537	10.801	10.856	10.895	10.897	11.2	-0.199 below	-0.344 below
AVON_DWNSTR_LOOP 77.405	10.801	10.855	10.895	10.897	11.2	-0.199 below	-0.345 below
AVON_DWNSTR_LOOP 96.7562	10.801	10.855	10.895	10.897	11.2	-0.199 below	-0.345 below
AVON_DWNSTR_LOOP 116.107	10.801	10.855	10.894	10.897	11.2	-0.199 below	-0.345 below
AVON_DWNSTR_LOOP 135.459	10.8	10.855	10.894	10.897	11.2	-0.2 below	-0.345 below
AVON_DWNSTR_LOOP 154.81	10.8	10.855	10.894	10.896	11.2	-0.2 below	-0.345 below
AVON_DWNSTR_LOOP 174.161	10.8	10.854	10.894	10.896	11.2	-0.2 below	-0.346 below
AVON_DWNSTR_LOOP 193.512	10.8	10.854	10.893	10.896	11.2	-0.2 below	-0.346 below
AVON_DWNSTR_LOOP 212.864	10.799	10.854	10.893	10.895	11.2	-0.201 below	-0.346 below
AVON_DWNSTR_LOOP 232.215	10.799	10.853	10.892	10.894	11.2	-0.201 below	-0.347 below
AVON_DWNSTR_LOOP 251.566	10.798	10.852	10.892	10.894	11.2	-0.202 below	-0.348 below
AVON_DWNSTR_LOOP 270.918	10.798	10.851	10.89	10.892	11.2	-0.202 below	-0.349 below
AVON_DWNSTR_LOOP 290.269	10.797	10.85	10.889	10.891	11.2	-0.203 below	-0.35 below
AVON_DWNSTR_LOOP 309.62	10.795	10.848	10.887	10.888	11.2	-0.205 below	-0.352 below
AVON_DWNSTR_LOOP 329.586	10.795	10.847	10.886	10.887	11.2	-0.205 below	-0.353 below
AVON_DWNSTR_LOOP 349.551	10.794	10.846	10.885	10.887	11.2	-0.206 below	-0.354 below
AVON_DWNSTR_LOOP 369.517	10.794	10.846	10.885	10.886	11.2	-0.206 below	-0.354 below
AVON_DWNSTR_LOOP 389.482	10.794	10.846	10.885	10.886	11.2	-0.206 below	-0.354 below
AVON_DWNSTR_LOOP 409.448	10.793	10.845	10.884	10.886	11.2	-0.207 below	-0.355 below
AVON_DWNSTR_LOOP 429.413	10.793	10.845	10.884	10.885	11.2	-0.207 below	-0.355 below
AVON_DWNSTR_LOOP 449.379	10.793	10.845	10.884	10.885	11.2	-0.207 below	-0.355 below
AVON_DWNSTR_LOOP 469.344	10.793	10.845	10.884	10.885	11.2	-0.207 below	-0.355 below
AVON_DWNSTR_LOOP 489.31	10.793	10.844	10.884	10.885	11.2	-0.207 below	-0.356 below
AVON_DWNSTR_LOOP 509.276	10.793	10.844	10.883	10.885	11.2	-0.207 below	-0.356 below
AVON_DWNSTR_LOOP 529.241	10.793	10.844	10.883	10.884	11.2	-0.207 below	-0.356 below
AVON_DWNSTR_LOOP 549.207	10.792	10.844	10.883	10.884	11.2	-0.208 below	-0.356 below
AVON_DWNSTR_LOOP 569.172	10.792	10.844	10.883	10.884	11.2	-0.208 below	-0.356 below
AVON_DWNSTR_LOOP 589.138	10.792	10.844	10.883	10.884	11.2	-0.208 below	-0.356 below
AVON_DWNSTR_LOOP 609.103	10.792	10.843	10.883	10.884	11.2	-0.208 below	-0.357 below
AVON_DWNSTR_LOOP 629.069	10.792	10.843	10.883	10.884	11.2	-0.208 below	-0.357 below
AVON_DWNSTR_LOOP 649.034	10.792	10.843	10.882	10.884	11.2	-0.208 below	-0.357 below
AVON_DWNSTR_LOOP 669	10.792	10.843	10.882	10.883	11.2	-0.208 below	-0.357 below
AVON_LOOP 0	11.185	11.346	11.335	11.408	11.3	0.085 above	0.046 above
AVON_LOOP 19.837	11.184	11.345	11.333	11.407	11.3	0.084 above	0.045 above
AVON_LOOP 36.79	11.183	11.344	11.333	11.406	11.3	0.083 above	0.044 above
AVON_LOOP 53.743	11.183	11.344	11.332	11.406	11.3	0.083 above	0.044 above
AVON_LOOP 69.46	11.182	11.344	11.332	11.405	11.3	0.082 above	0.044 above
AVON_LOOP 89.2316	11.182	11.343	11.331	11.405	11.3	0.082 above	0.043 above
AVON_LOOP 109.003	11.182	11.343	11.331	11.404	11.3	0.082 above	0.043 above
AVON_LOOP 128.775	11.182	11.342	11.33	11.403	11.3	0.082 above	0.042 above
AVON_LOOP 148.546	11.181	11.342	11.33	11.403	11.3	0.081 above	0.042 above
AVON_LOOP 168.318	11.181	11.342	11.329	11.402	11.3	0.081 above	0.042 above
AVON_LOOP 188.089	11.181	11.341	11.329	11.402	11.3	0.081 above	0.041 above
AVON_LOOP 207.861	11.181	11.341	11.329	11.401	11.3	0.081 above	0.041 above
AVON_LOOP 227.633	11.181	11.341	11.328	11.401	11.3	0.081 above	0.041 above
AVON_LOOP 247.404	11.181	11.341	11.328	11.4	11.3	0.081 above	0.041 above
AVON_LOOP 267.176	11.181	11.34	11.328	11.4	11.3	0.081 above	0.04 above

AVON_LOOP 286.947	11.181	11.34	11.327	11.399	11.3	0.081 above	0.04 above
AVON_LOOP 306.719	11.18	11.34	11.327	11.399	11.3	0.08 above	0.04 above
AVON_LOOP 326.49	11.18	11.34	11.326	11.398	11.3	0.08 above	0.04 above
AVON_LOOP 346.262	11.18	11.34	11.325	11.398	11.3	0.08 above	0.04 above
AVON_LOOP 366.034	11.18	11.34	11.323	11.397	11.3	0.08 above	0.04 above
AVON_LOOP 385.805	11.18	11.339	11.322	11.396	11.3	0.08 above	0.039 above
AVON_LOOP 405.577	11.18	11.339	11.321	11.396	11.3	0.08 above	0.039 above
AVON_LOOP 425.348	11.18	11.339	11.321	11.395	11.3	0.08 above	0.039 above
AVON_LOOP 445.12	11.179	11.339	11.32	11.395	11.3	0.079 above	0.039 above
AVON_LOOP 464.891	11.179	11.339	11.32	11.395	11.3	0.079 above	0.039 above
AVON_LOOP 484.663	11.179	11.339	11.319	11.394	11.3	0.079 above	0.039 above
AVON_LOOP 504.434	11.179	11.339	11.318	11.394	11.3	0.079 above	0.039 above
AVON_LOOP 524.206	11.179	11.339	11.318	11.393	11.3	0.079 above	0.039 above
AVON_LOOP 543.978	11.179	11.338	11.318	11.393	11.3	0.079 above	0.038 above
AVON_LOOP 563.749	11.179	11.338	11.317	11.393	11.3	0.079 above	0.038 above
AVON_LOOP 583.521	11.179	11.338	11.317	11.393	11.3	0.079 above	0.038 above
AVON_LOOP 603.292	11.178	11.338	11.316	11.392	11.3	0.078 above	0.038 above
AVON_LOOP 623.064	11.178	11.338	11.316	11.392	11.3	0.078 above	0.038 above
AVON_LOOP 642.835	11.178	11.338	11.316	11.392	11.3	0.078 above	0.038 above
AVON_LOOP 662.607	11.178	11.338	11.316	11.392	11.3	0.078 above	0.038 above
AVON_LOOP 682.379	11.178	11.338	11.315	11.391	11.3	0.078 above	0.038 above
AVON_LOOP 702.15	11.178	11.338	11.315	11.391	11.3	0.078 above	0.038 above
AVON_LOOP 721.922	11.178	11.338	11.315	11.391	11.3	0.078 above	0.038 above
AVON_LOOP 741.693	11.178	11.338	11.315	11.391	11.3	0.078 above	0.038 above
AVON_LOOP 761.465	11.178	11.338	11.315	11.391	11.3	0.078 above	0.038 above
AVON_LOOP 781.236	11.177	11.337	11.315	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 801.008	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 820.531	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 840.055	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 859.578	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 879.102	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 898.625	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 918.149	11.177	11.337	11.314	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 937.672	11.177	11.337	11.313	11.391	11.3	0.077 above	0.037 above
AVON_LOOP 957.195	11.176	11.337	11.313	11.391	11.3	0.076 above	0.037 above
AVON_LOOP 976.719	11.176	11.337	11.313	11.391	11.3	0.076 above	0.037 above
AVON_LOOP 996.242	11.176	11.337	11.313	11.391	11.3	0.076 above	0.037 above
AVON_LOOP 1015.77	11.176	11.337	11.313	11.39	11.3	0.076 above	0.037 above
AVON_LOOP 1035.29	11.176	11.337	11.313	11.39	11.3	0.076 above	0.037 above
AVON_LOOP 1054.81	11.176	11.336	11.313	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1074.34	11.176	11.336	11.313	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1093.86	11.176	11.336	11.313	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1113.38	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1132.91	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1152.43	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1171.95	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1191.48	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above
AVON_LOOP 1211	11.176	11.336	11.312	11.39	11.3	0.076 above	0.036 above

Appendix C – Safety in Design Minutes

Minutes

28 October 2016

Project	Temporary Stopbank Management (LDRP 507) Detailed Design and Construction Management	From	Joshua Bird
Subject	Safety in Design Meeting Minutes	Tel	
Venue/Date/Time	CCC M6.04.8 6th Floor / 20 October / 12.30-2.00 pm	Job No	5134150//
Copies to	All attendees and Name (Company)		
Attendees	CCC: Bob Mohammad, Peter Christensen, Chris Mance, Stephen Bensberg , Graham Harrington, Ian Wright GHD: Allen ingles, Salve Velasco, Joshua Bird	Apologies	Name (Company) Name (Company)

Minutes

Items Discussed

Key Safety in Design Philosophy

- Agreed - Priority given to the river side where possible to give gentle slope and space for maintenance
    - Secondary priority given to road side slope and set back where possible
- CCC to give feedback on landscaping based on there being recreational use of the top of the stopbanks that cannot be controlled, regardless of treatment it is foreseeable that public will use the stopbanks
    - Grassing the top will create additional safety concerns but passive discouragement for use as a footpath
    - Gravel path will give impression that the top of the stopbanks are for use as afootpath
    - Signage may cover the liability aspect but given the multiple entry points on the stopbank would result in significant signage requirements
- Agreed - Phasing of construction works is critical to maintain stability of stopbanks e.g. gravel construct all stop bank and top soil, etc. when weather and grass growing conditions are optimal
- Agreed - A Safety in Design (SiD) Register is to be completed and given to contractor outlining safety issues
- Agreed – Specific requirements for contractor methodology regarding public interfaces and working in river and tidal areas

Minutes

Items Discussed

- Agreed – monitoring points to be included the density and frequency of these points outside identified areas of instability still requires guidance

Actions

- CCC to review the tables below and complete feedback for Environmental and Decommissioning tables
- CCC to provide instruction on the landscaping and treatments relating to public use
    - Given that it is foreseeable that the public will make use of the stopbanks as footpaths regardless of treatment consideration must be made toward safe design or appropriate display of risk
- CCC to confirm parks and maintenance input (no parks representative in attendance)
- GHD to include consideration of decommissioning (see table attached for comment)
- GHD to update SiD register with discussion of outcomes
- GHD to contact Colin Hill to confirm how to deal with sumps that may be under or near stopbanks

Joshua Bird
Civil Engineer

Minutes

NOTE: existing entries in table are in italics and entries during meeting are in bold

CONSTRUCTION Activity	Hazard/Risk	Mitigation	Comments • Confirmed that the Building act does not apply to stopbanks • Phasing of construction works is critical to maintain stability of stopbanks
Working in proximity to traffic	• ***Worker safety*** • ***Public safety***	• ***Setback where possible*** • ***Construction controls*** • **Scheduling** • **Coordination with other events**	• **Construction methodology incorporated into SiD register and procurement documents**

Working on existing stopbanks	• ***Steep slopes***
	• ***Limited space***
	• **Collapse due to heavy equipment**
		• ***Consideration of construction plant / methodology***	• **Construction methodology incorporated into SiD register and procurement documents**
			• **Assessment of stability has only included the 4 areas of settlement.**
			• **Are restrictions required on plant type?**
			  ◦ **The size and space available should limit the size of plant able to go on stopbank**
			  ◦ **It is envisioned that most work will be conducted from the roadside and will not include any access to the river or estuary**
			• **SiD register to include stability issues to make contractor aware**

Managing public access	• ***Injury from Mobile Plant*** • **Variety of Community groups** • **Security of red zone** • **Community Events e.g. Marathon**	• ***Timing /staged construction*** • ***Early Notifications / controls*** • **Alternative routes that avoid Red zone** • **Fencing of access through and to red zone**	• **Construction methodology incorporated into SiD register and procurement documents** • **Seasonal events e.g. marathon to be advised and scheduled for** • **Prevent public movement from being diverted into red zone e.g previous works in Dallington** • **There are some schools/at risk community groups in proximity, these need to be communicated to and educated on the risks and alternative paths**

Construction around services	• ***Service strike*** • **Overhead power significant hazard**	• ***Obtained service information during design*** • ***Design minimises excavation*** • ***Locate and identify service*** • **Permanent Relocate power cables & lines**	• **Construction methodology incorporated into SiD register and procurement documents** • **GHD awaiting guidance on extent of Relocation of power lines** • **Some power lines removed as part of sandbag replacement** • **GHD to speak to Colin Hill with regards to existing sumps etc. under stopbanks**
Working in proximity to water	• ***Slip into water/drowning***	• ***Minimise waterside slope*** • ***considered tidal influence*** • **Minimise waterside slope and maximise space on the riverside**	• **Construction methodology incorporated into SiD register and procurement documents** • **Contractor to cover issue during construction – have appropriate PPE etc**
Flooding during construction	• ***Inundation of public homes*** • **Inundation of all private dwellings** • **Key areas of protection schools, emergency services, substations etc.**	• ***Minimise need to remove existing bank*** • **Identify and communicate high risk/critical areas to contractor** • **Contractor to put in response to natural and emergency events during construction**	• **Maintaining existing service – contractor to be aware of high/seasonal** • **Interaction with the tide/flap valve** • **Progressive sign off (Staged practical completion)→during construction, EQ** • **Rowing events** • **specific to tide works**
Marine traffic	• **Rowing** • **Kayaking** • **River Maintenance**	• **Make river side hazards/sediment screens visible to marine traffic**	• **Marine Traffic volume low particularly near stopbanks/river edge**
Contaminate	• **Construction material**	• **Use of Clean fill** • **Control of topsoil supply and additives**	

Salve Velasco

From: Mohammed, Bob <Bob.Mohammed@ccc.govt.nz>
Sent: Friday, 4 November 2016 3:16 p.m.
To: Salve Velasco
Subject: SiD feedback

Hi Salve

Please see below:

1. There is nothing extra I would like to add except a query on the following statement?

    - Signage may cover the liability aspect but given the multiple entry points on the stopbank would result in significant signage requirements

I am not sure whether we have any standard procedure or precedent for providing signs or other deterrents around hazards? Do we need to seek an opinion from our legal gurus to check this?

2. Main comment is that, based on our discussions with parks previously, that we should have grass topped stopbanks as the default. I would argue that putting gravel on top increases the risk by encouraging people to go up there. We have plenty of grass banks around the city (think Avon in central city, Heathcote River) that are fine.

Parks advice has been to keep it grass

Nothing more to add.

Please carry on as planned.

Regards

Bob

Salve Velasco

From: Mohammed, Bob <Bob.Mohammed@ccc.govt.nz>
Sent: Monday, 7 November 2016 11:43 a.m.
To: Salve Velasco
Subject: FW: SiD meeting minutes

Hi Salve

Please see Stephen's comments below and your info and action.

Thanks

Bob

From: Bensberg, Stephen
Sent: Monday, 7 November 2016 11:36 a.m.
To: Mohammed, Bob
Subject: RE: SiD meeting minutes

Hi Moh

I understand the design is for temporary stop banks, however the design report needs to state that the Temporary stop bank work is being undertaken on top of previous temporary stop banks, who design and construction details are not fully known. And that all of these works are sitting on river banks which are geotechnically unstable, especially during seismic events.

Regards

Stephen Bensberg
Water Resources Engineer Consultant
Water & Waste Technical Services & Design Team
Technical Services & Design Team, OP-Assets and Network Unit
Civic Offices 1st Floor PO Box 73011

Mobile 027-2499328

From: Mohammed, Bob
Sent: Friday, 4 November 2016 4:00 p.m.
To: Bensberg, Stephen
Subject: FW: SiD meeting minutes

As requested please see original email you missed replying to below.

Cheers

Bob

From: Mohammed, Bob
Sent: Friday, 28 October 2016 4:40 p.m.
To: Graham Harrington (Graham.Harrington@ccc.govt.nz); Stephen Bensberg (Stephen.Bensberg@ccc.govt.nz);

Appendix D – Schedule of Quantities and Cost Estimate

SCHEDULE OF QUANTITIES (INCLUDING DAYWORKS)

LDRP 507 Temporary Stopbank Management

TENDER NUMBER TD16/17-18089476

ITEM	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
	SUMMARY				
1.0	**PRELIMINARY AND GENERAL**				$
2.0	**EARTHWORKS**				$
3.0	**LANDSCAPING**				$
4.0	**PROVISIONAL SUMS**				$
5.0	**DAYWORKS**				$
	TENDER TOTAL (exclusive of GST)				**$**
1.0	**PRELIMINARY AND GENERAL**				
1.01	Site establishment, including Contractor facilities, sign boards, etc.	1	LS		
1.02	Contract management	1	LS		
1.03	Insurances and bonds	1	LS		
1.04	Consents and/or permits	1	LS		
1.05	Identification and implementation of health and safety documentation and requirements, including provision and implementation of site specific safety plan	1	LS		
1.06	Provision of quality assurance documents and implementation of quality assurance. Quality assurance testing and reporting. Includes all tests and reporting required to comply with the specification, including material grade testing and compaction testing. Includes attendance at site inspections as required.	1	LS		
1.07	Implementation of environmental documentation and requirements. Including erosion control, sediment control, noise, dust, etc.	1	LS	30%	
1.08	Community liaison and liaison with others/stakeholders	1	LS		
1.09	Traffic management including preparation and implementation of traffic management plans	1	LS		
1.10	Management of all existing services	1	LS		
1.11	Location (including potholing where required) and protection of services	1	LS		
1.12	Site survey and setting out	1	LS		
1.13	Temporary works and Contractor's design	1	LS		
1.14	Security of the works	1	LS		
1.15	Flood defence maintenance	1	LS		
1.16	As-built records/plans and GIS data by contractor	1	LS		
1.17	Guarantees and warrantees	1	LS		
1.18	Clean up and disestablishment on completion	1	LS		
	Sub-total				
2.0	**EARTHWORKS**				
	Rates to include material, labour, plant/machinery and disposal costs as required				
2.01	Site Clearance	17,500	m^2		
	Topsoil stripping				
2.02	Strip topsoil, avg. 100mm deep	0	m^3		
	Excavation				
2.03	For foundation 0.3m deep - Stopbank Type 1 and Stopbank Type 3	1,028	m^3		
2.04	For foundation 0.3m deep - Stopbank Type 2	186	m^3		
2.05	Strip existing surface for new 1.5m wide path 100mm deep	2,844	m		
2.06	Strip existing surface for new asphalt path 1m wide by 100mm deep Porrit Park / Wainoni Road	60	m		
2.07	Strip existing surface for new asphalt path 1m wide by 100mm deep Locksley Tce (redzone) + NB Rd (u/s of SB replacement Site 3)	673	m		
	Filling				
	Supply and place fill material (material as Specification)				
	Foundation fill for stopbank				
2.08	Stopbank Type 1 and Stopbank Type 3	1,028	m^3		
2.09	Stopbank Type 2 - Terramesh	186	m^3		
	Stopbank fill				
2.10	Stopbank Type 1 - New fill	1,425	m^3		
2.11	Stopbank Type 2 - Terramesh	282	m^3		
2.12	Stopbank Type 3 - Top up existing	45	m^3		
2.13	Monitoring pegs	212	ea		
	Roading &Paving				
2.14	Place 25mm compacted depth AP5 on 75mm compacted depth CCC SAP20 or TNZ M/4:AP20 (as SD609) including timber edge for new 1.5m wide path	2,844	m		
2.15	Place 20mm compacted depth asphaltic concrete CCC AC5 on 75mm CCC SAP20 or TNZ M/4:AP20 (as SD607) including timber edge for new path Porrit Park / Wainoni Road assume 1m wide	60	m		
2.16	Place 20mm compacted depth asphaltic concrete CCC AC5 on 75mm CCC SAP20 or TNZ M/4:AP20 (as SD607) including timber edge for new path Locksley Tce (redzone) + NB Rd (u/s of SB replacement Site 3) assume 1m wide	673	m		
2.17	Concrete Road edge protection detail (provisional Quantity)	1,000	m		
2.18	Provide new paved access over stopbank at entrance to Avon Rowing Club. Reshape road, new kerbline, new surface. Extent to be determined on site.	1	LS		
2.19	Hardy Street boat ramp, including new concrete slab and new pavement detail, tie boat ramp into stopbank	1	LS		
	Topsoil				
	Supply and place topsoil in layer 100 mm thick				
	New stopbank surface				
2.20	Supply and place topsoil Stopbank Type 1 - New fill	1,551	m^3		
2.21	Supply and place topsoil Stopbank Type 2 - Terramesh	35	m^3		
2.22	Supply and place topsoil Stopbank Type 3 - Top up existing	116	m^3		
	Existing stopbank surface				
2.23	Supply and place topsoil	7,232	m^3		
	Bank protection				
2.24	Place boulders/riprap d50 = 300mm in a 400mm thick layer on wet face of stopbank	80	m^2		
	Ground Improvements				
	Rates to include material, labour and plant rental				
2.25	Supply and place geogrid (Stopbank Type 3)	2,211	m^2		
2.26	Supply and place Biomac/Enkamat erosion control mat (Stopbank Type 3)	1,161	m^2		
2.27	Install Green Terramesh System Stopbank - single height 2 Terramesh units to make single 600mm lift	173	ea		
	Sub-total				
3.0	**LANDSCAPING**				
	Tree protection				
3.01	Tree protection retaining walls	12	m^2		
3.02	Gravel protection to trees	450	ea		
	Grassing				
	Including all maintenance, establishment, germination, watering etc through to establishment of grass cover				
3.03	Grass - sowing - stopbanks, swales, all other required areas	0	m^2		
3.04	Grass - hydroseeding as required (New Surfaces - Stopbanks)	17,468	m^2		
	Sundry				
3.05	Guardrailing	40	m		
	Sub-total				
4.0	**PROVISIONAL ITEMS and SUMS**				
4.01	Remove tree and stump - small tree, <150mm dia trunk (Provisional)	5	ea		
4.02	Remove tree and stump - medium tree, 150 - 300mm dia trunk (Provisional)	10	ea		
4.03	Remove tree - large tree, >300mm dia trunk (tree and stump) (Provisional)	5	ea		
4.04	Removal of stumps and sub-surface objects (Provisional)	10	ea		
4.05	Relocation of existing utilities	1	PS		
4.06	Repair of existing services	1	PS		
4.07	Renewal of existing services	1	PS		
4.08	Abandon existing services beneath stopbank	1	PS		
4.09	Undercut and replacement of unsuitable material (Provisional)	100	m^3		
4.10	Supply and place geotextile - Bidim A64 or equivalent (Provisional)	100	m^2		
4.11	Supply and place geogrid - Triax TX160 or equivalent (Provisional)	100	m^2		
	Sub-total				
5.0	**DAYWORKS**				
5.01	Arborist	16	hrs		
	Labour				
5.02	Labourer	80	hrs		
5.03	Working Foreman	32	hrs		
5.04	Tradesman	16	hrs		
	Plant (including operator)				
5.05	Excavator 20 tonne	32	hrs		
5.06	Loader	16	hrs		
5.07	Truck > $8m^3$	16	hrs		
5.08	Water cart (5000 litres)	16	hrs		
5.09	Cherry Picker	16	hrs		
	Sub-total				

NOMINATED PERCENTAGES FOR VALUING VARIATIONS

Allowance for On-site Overheads (P&G)	15	%
Allowance for Off-site Overheads and Profit (Margin)	10	%

1. Basis of Payment, Specification and Drawings

1.1 Basis of Payment

Key to Schedule Units

The units described in the schedule are as follows:

LS	Lump Sum	Payment will be a “Lump Sum” for the entire item.
ea.	Each	Payment will be for each individual unit completed as described in the item
m	Metre	Payment will be made at the rate for linear measure completed measured in metres – measured from centres of structures where appropriate.
m^2	Square Metre	Payment will be made at the rate for area completed measured in square metres.
m^3	Cubic Metre	Payment will be made at the rate for volume completed, measured solid in cubic metres.
PS	Provisional Sum	Payment will be for the item, only if the Contractor is specifically directed by the Engineer to complete the works for the item.
Provisional Item		Payment for items denoted as Provisional shall be treated as for Provisional Sums, i.e., that payment will only be made for work specifically directed in writing by the Engineer.

	Item	Description
1.0	**PRELIMINARY AND GENERAL**	
1.01	Site establishment, including Contractor facilities, sign boards, etc	Payment to be made for all costs associated with site establishment and disestablishment. It shall also cover the Contractor's site facilities and all other costs not directly chargeable to specific items in the schedule. To be paid on a pro-rata basis throughout the contract period.
1.02	Contract Management	Payment to be made for all costs associated with management of the contract. It shall also cover the Contractor's business overheads, programme updates, preparation of variations, claims and all other costs associated with managing the Contract. To be paid on a pro-rata basis throughout the contract period.
1.03	Insurances and Bonds	Payment to be made for all costs associated with provision of insurances, bonds, permit fees and other associated costs. To be paid on a pro-rata basis throughout the contract period.
1.04	Consents and/or Permits	Payment to be made for all costs associated with provision of permit fees and other associated costs. To be paid on a pro-rata basis throughout the contract period.
1.05	Identification and implementation of health and safety documentation and requirements, including provision and implementation of site specific safety plan	Payment to be made for preparation of site specific safety plan and implementation of all health and safety aspects of the Contract including all of the Contractors responsibilities to provide a save site for employees and all other persons on site or who may be affected by the Contract Works. To be paid on a pro-rata basis throughout the Contract period.
1.06	Provision of quality assurance documents and implementation of quality assurance. Quality assurance testing and reporting. Includes all tests and reporting required to comply with the specification, including foundation testing, material grade testing and compaction testing. Includes attendance at site inspections as required	Payment to be made for all costs associated with preparation of the contract quality plan and inspection and testing plan and all costs associated with site quality assurance testing and reporting. To include pressure tests, pipe weld testing, materials testing, compaction testing, pavement testing, CCTV inspection and all other testing and reporting required by the Contract Documents and the Specification. To be paid on a pro-rata basis throughout the contract period.
1.07	Implementation of environmental documentation and requirements. Including erosion control, sediment control, noise, dust, etc	Payment to be made for preparation and implementation of Environmental Compliance Plan including sediment control and all other costs related to compliance with resource consents and the Resource Management Act 1991 and to address all environmental issues specific to the Contract. To be paid on a pro-rata basis throughout the Contract period.
1.08	Community liaison and liaison with others/stakeholders	Payment to be made for all costs associated with the liaison with the Principal, affected parties, landowners, the Principals maintenance contractor, other contractors who may be using the site. To be paid on a pro-rata basis throughout the contract period.
1.09	Traffic management including preparation and implementation of traffic management plans	Payment to be made for all Traffic Management Plan Documents submitted to the Engineer, and inclusive of all signs, materials, and labour required to provide

		traffic control and protection of the public as detailed in the specification. To be paid on a pro-rata basis throughout the contract period.
1.10	Management of all existing services	Payment to be made for location and protection of all existing services (including power, telecom, water, sewer, stormwater, water races and survey marks) by the relevant services authorities that may be affected by the works prior to undertaking of the construction works. To be paid on completion of the services location work. To cover all coordination with service providers, physical location on site including potholing as required and support and protection of services during the physical works. Excludes relocation of services. To be paid on a pro-rata basis throughout the contract period.
1.11	Location (including potholing where required) and protection of services	Payment to be made for location and protection of all existing services (including power, telecom, water, sewer, stormwater, and survey marks) by the relevant services authorities that may be affected by the works prior to undertaking of the construction works. To cover all coordination with service providers, physical location on site including potholing as required and support and protection of services during the physical works. Excludes relocation of services. To be paid on a pro-rata basis throughout the Contract period.
1.12	Site survey and setting out	Payment to be made for site set out including vertical alignment of roads, embankments andpipelines as per the Contract Drawings. To include a registered surveyor where required by the Contract documents. To be paid on a pro-rata basis throughout the Contract period.
1.13	Temporary works and Contractor's design	Payment to be made for provision of all temporary works and Contractors design of temporary works required for the completion of the Contract Works. To include a registered engineers design of temporary works where required. To be paid on a pro-rata basis throughout the Contract period.
1.14	Security of the works	Payment to be made for provision of all equipment and materials to secure the works including at night where required. To be paid on a pro-rata basis throughout the Contract period.
1.15	Flood defence maintenance	Payment to be made for temporary works or other works as required, to maintain flood defence effectiveness during the Contract Works. To include all costs for temporary work, preparation and implementation of Flood Contingency Plan. To include costs associated with suspension of work due to high tide or flood levels. To be paid on a pro-rata basis throughout the Contract period.
1.16	As-built records/plans and GIS data by contractor	Payment to be made for provision of as-built plans and GIS data as required by the Contract documents. To be paid as a lump sum following approval of the final as-built records and GIS data by the Engineer.
1.17	Guarantees and warrantees	Payment to be made for all expenses to the Contractor for provision of Guarantees and Warranties as required by the Contract and Specification.

		To be paid as a lump sum on Practical Completion
1.18	Clean up and disestablishment on completion	Payment to be made for successful completion of the Contract Works, and tidy up of the site on completion to the satisfaction of the Engineer. All detritus, rubbish, and stockpiles of materials and/or waste to be removed from the site. All areas affected by construction to be reinstated as specified in the Contract Documents. To be paid as a lump sum on issue of the Practical Completion Certificate.
2.0	**EARTHWORKS**	
2.01	Site Clearance	Payment to be made for all costs associated with clearance of site including removal of stumps, logs, scrub, grass, roots, decayed vegetable and coarse vegetation and dispose at the Contractor's expense and in a manner approved by the Engineer. To be paid as a m^2 area cleared.
	Topsoil Stripping	
2.02	Strip topsoil, avg. 100mm deep	Payment to be made for all costs associated with the stripping of topsoil as shown on the Drawings. To include excavation of material and transport to stockpile for re-use. To be paid as a m^3 rate solid measure excavated.
	Excavation	
2.03	For foundation 0.3m deep - Stopbank Type 1 and Stopbank Type 3	Payment to be made for all costs associated with the excavation to stopbank foundation level as shown on the Drawings. To include all excavation of material, shaping and trimming, removal and disposal of material off site. To be paid as a m^3 rate solid measure excavated.
2.04	For foundation 0.3m deep - Stopbank Type 2	Payment to be made for all costs associated with the excavation to stopbank foundation level as shown on the Drawings. To include all excavation of material, shaping and trimming, removal and disposal of material off site. To be paid as a m^3 rate solid measure excavated.
2.05	Strip existing surface for new 1.5m wide path 100mm deep	Payment to be made for all costs associated with the excavation as shown on the Drawings. To include all excavation of material, shaping and trimming, removal and disposal of material off site. To be paid as a m length excavated.
2.06	Strip existing surface for new asphalt path 1m wide by 100mm deep Porrit Park / Wainoni Road	Payment to be made for all costs associated with the excavation as shown on the Drawings. To include all excavation of material, shaping and trimming, removal and disposal of material off site. To be paid as a m length excavated.
2.07	Strip existing surface for new asphalt path 1m wide by 100mm deep Locksley Tce (redzone) + NB Rd (u/s of SB replacement Site 3)	Payment to be made for all costs associated with the excavation as shown on the Drawings. To include all excavation of material, shaping and trimming, removal and disposal of material off site. To be paid as a m length excavated.
	Foundation Fill for Stopbank	
2.08	Stopbank Type 1 and Stopbank Type 3	Payment to be made for all costs to supply to site stopbank fill material as per the Specification and place to form foundation including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. To include uplift of topsoil from stockpile or supply of additional topsoil to site and place as required to bring stopbank to final level and profile.

		To be paid as a m^3 rate solid measure placed.
2.09	Stopbank Type 2 - Terramesh	Payment to be made for all costs to supply to site stopbank fill material as per the Specification and place to form foundation including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. To include uplift of topsoil from stockpile or supply of additional topsoil to site and place as required to bring stopbank to final level and profile. To be paid as a m^3 rate solid measure placed.
	Stopbank Fill	
2.10	Stopbank Type 1 - New fill	Payment to be made for all costs to supply to site stopbank fill material as per the Specification and place to form embankment stopbank including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. To be paid as a m^3 rate solid measure placed.
2.11	Stopbank Type 2 - Terramesh	Payment to be made for all costs to supply to site Terramesh fill material as per the Specification and place to fill Terramesh units as per the specification including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. To be paid as a m^3 rate solid measure placed.
2.12	Stopbank Type 3 - Top up existing	Payment to be made for all costs to supply to site stopbank fill material as per the Specification and place to raise existing stopbank including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. To be paid as a m^3 rate solid measure placed.
2.13	Monitoring pegs	Payment to be made for all costs associated with the installation of the monitoring pegs. To include all excavation, supply of materials, installation and restoration To be paid as a per unit.
	Roading & Paving	
2.14	Place 25mm compacted depth AP5 on 75mm compacted depth CCC SAP20 or TNZ M/4:AP20 (as SD609) for new 1.5m wide path	Payment to be made for all costs to supply to site AP5, SAP20 or NNZ M/4:AP20 as shown on drawings and as per the Specification and place including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. To be paid as a m length of footpath.
2.15	Place 20mm compacted depth asphaltic concrete CCC AC5 on 75mm CCC SAP20 or TNZ M/4:AP20 (as SD607) for new path Porrit Park / Wainoni Road	Payment to be made for all costs to supply to site AP5, SAP20 or NNZ M/4:AP20 as shown on drawings and as per the Specification and place including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. Also includes saw cutting, timber edging and supply and place 20mm AC pavement layer. To be paid as a m length of footpath.
2.16	Place 20mm compacted depth asphaltic concrete CCC AC5 on 75mm CCC SAP20 or TNZ M/4:AP20 (as SD607) for new path Locksley Tce (redzone) +	Payment to be made for all costs to supply to site AP5, SAP20 or NNZ M/4:AP20 as shown on drawings and as per the Specification and place including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to

	New Brighton Rd (u/s of SB replacement Site 3)	design levels and profiles and shaping. Also includes saw cutting, timber edging and supply and place 20mm AC pavement layer. To be paid as a m length of footpath.
2.17	Concrete Road edge protection detail	Payment to be made for all costs associated with the pavement cutting, excavation supply and installation of concrete units including fixings and bitumen bandage To be paid as a m length of protection.
2.18	Provide new trafficable access over stopbank at entrance to Avon Rowing Club	Payment to be made for all plant labour and materials required to provide new trafficable access over the stopbank as directed by the Engineer. Payment to be pro rata based on agreed percentage complete.
2.19	Hardy Street boat ramp, including new concrete slab and new pavement detail, tie boat ramp into stopbank	Payment to be made for all plant labour and materials required to provide new boat ramp over the stopbank as directed by the Engineer. Payment to be pro rata based on agreed percentage complete.
	Topsoil	
2.20	Supply and place topsoil Stopbank Type 1 - New fill	Payment to be made for all costs to supply to site topsoil as per the Specification and place and compact, trim to design levels and profiles and shaping as required to bring stopbank to final level and profile. To be paid as a m^3 rate solid measure placed.
2.21	Supply and place topsoil Stopbank Type 2 - Terramesh	Payment to be made for all costs to supply to site topsoil as per the Specification and place and compact in Terramesh units as per the drawings and the Specification, trim to design levels and profiles and shaping as required to bring Terramesh stopbank to final level and profile. To be paid as a m^3 rate solid measure placed.
2.22	Supply and place topsoil Stopbank Type 3 - Top up existing	Payment to be made for all costs to supply to site topsoil as per the Specification and place and compact, trim to design levels and profiles and shaping as required to raise existing stopbank to final level and profile. To be paid as a m^3 rate solid measure placed.
2.23	Supply and place topsoil	Payment to be made for all costs to supply to site topsoil as per the Specification and place and compact on existing stopbank as required to bring stopbank to final level and profile. To be paid as a m^3 rate solid measure placed.
	Bank Protection	
2.24	Place boulders/riprap d50 = 300mm in a 400mm in a 400mm thick layer on wet face of stopbank	Payment to be made for all costs to install rock armour as shown on the drawings. Includes excavation and trimming to level and disposal of excess material, supply and installation of geotextile and supply to site and installation of rock armour as shown on the Drawings. To be paid as a m^2 area placed.
	Ground Improvements	
2.25	Supply and place geogrid (Stopbank Type 3)	Payment to be made for all costs to supply and place geogrid wrap around embankment fill as shown on the drawings and as detailed in the Specification. To be paid as a m^2 rate placed, including allowance for overlap at edges as required.
2.26	Supply and place Biomac/Enkamat erosion control mat (Stopbank Type 3)	Payment to be made for all costs to supply and place Biomac/Enkamat and nail to slope as shown on the drawings and as detailed in the Specification. To be paid as a m^2 rate placed, including allowance for overlap at edges as required.

2.27	Install Green Terramesh System Stopbank - single height 2 Terramesh units to make single 600mm lift	Payment to be made to supply to site Green Terramesh System and Biomac Grass Strike and install on site to form Type 1 (single lift with two Terramesh units) MSE stopbank as shown on the Drawings and detailed in the Specification. To be paid per m length of stopbank.
3.0	**LANDSCAPING**	
3.01	Tree protection retaining walls	Payment to be made for all costs to supply and place block retaining wall as shown on the drawings and as detailed in the Specification. To be paid as a m^2 of wall face,
3.02	Gravel protection to trees	Payment to be made for all costs associated with the installation of the gravel protection around trees as per the detail provided. To include all excavation, supply of materials, and installation. To be paid as a per unit.
3.03	Grass - sowing - stopbanks, swales, all other required areas	Payment to be made to prepare seed bed, apply fertiliser and sow and maintain grass until the end of the defects notification period. To be paid as a m^2 rate for area of grass sown.
3.04	Grass - hydroseeding as required (New Surfaces - Stopbanks)	Payment to be made to prepare seed bed and hydroseed area as per the specification and maintain grass until the end of the defects notification period. To be paid as a m^2 rate for area hydroseeded.
3.05	Guardrailing	Payment to be made for all costs associated with the supply and installation of the guardrails as per the drgs including fixings and foundations. To be paid as per m length of completed guardrail.
4.0	**PROVISIONAL ITEMS and SUMS**	
4.01	Remove tree and stump - small tree, <150mm dia trunk	Payment to be made to cut down tree, remove and dispose off site. To include removal of stump and excavation and removal of roots as described in the Specification. Provisional Item to be paid only on written instruction from the Engineer to complete the work. To be paid for each tree removed.
4.02	Remove tree and stump - medium tree, 150 - 300mm dia trunk	Payment to be made to cut down tree, remove and dispose off site. To include removal of stump and excavation and removal of roots as described in the Specification. Provisional Item to be paid only on written instruction from the Engineer to complete the work. To be paid for each tree removed.
4.03	Remove tree - large tree, >300mm dia trunk (tree and stump)	Payment to be made to cut down tree, remove and dispose off site. To include removal of stump and excavation and removal of roots as described in the Specification. Provisional Item to be paid only on written instruction from the Engineer to complete the work. To be paid for each tree removed.
4.04	Removal of stumps and sub-surface objects	Payment to be made to remove stump or other sub-surface object and dispose off site. To include removal of stump and excavation and removal of roots as described in the Specification. Provisional Item to be paid only on written instruction from the Engineer to complete the work. To be paid for each tree removed.
4.05	Relocation of existing utilities	Payment to be made for all plant labour and materials required to liaise with the relevant authority and relocate an existing utility as directed by the Engineer. Provisional Sum to be paid only on written instruction from the Engineer to complete the work.
4.06	Repair of existing services	Payment to be made for all plant labour and materials required to liaise with the relevant authority and repair an existing service as directed by the Engineer.

		Provisional Sum to be paid only on written instruction from the Engineer to complete the work.
4.07	Renewal of existing services	Payment to be made for all plant labour and materials required to liaise with the relevant authority and renew an existing service as directed by the Engineer. Provisional Sum to be paid only on written instruction from the Engineer to complete the work.
4.08	Abandon existing services beneath stopbank	Payment to be made for all plant labour and materials required to liaise with the relevant authority and abandon an existing service as directed by the Engineer. Provisional Sum to be paid only on written instruction from the Engineer to complete the work.
4.09	Undercut and replacement of unsuitable material	Payment to be made for all costs to excavate and dispose off site unsuitable foundation material and supply, place and compact fill material as per the Specification, including dewatering or drainage control as necessary, wetting or drying, placement and compaction in layers, trimming to design levels and profiles and shaping. Provisional item to be carried out where directed by the Engineer. To be paid as a m^3 rate solid measure placed.
4.10	Supply and place geotextile - Bidim A64 or equivalent	Payment to be made for all costs to supply and place specified geotextile approved by the Engineer. Provisional item to be carried out where directed by the Engineer. To be paid as a m^2 for geotextile placed, including allowance for overlap at edges as required.
4.11	Supply and place geogrid - Triax TX160 or equivalent	Payment to be made for all costs to supply and place specified geogrid approved by the Engineer. Provisional item to be carried out where directed by the Engineer. To be paid as a m^2 for geogrid placed, including allowance for overlap at edges as required.
5.0	**DAYWORKS**	
5.01-5.09	Dayworks	These items shall be paid only on written instruction from the Engineer.

Appendix E – Specifications

Christchurch City Council

LDRP 507 Temporary Stopbank Management Project Specification

April 2017

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Appendices

1. Preliminary and general

1.1 Project description

This Specification applies to the construction of the project commissioned by Christchurch City Council to upgrade the existing Avon River temporary stopbanks (LDRP507), to provide continuing river and tidal flood protection to the project area, pending decisions around its long term future use. Figure 1 shows the existing stopbanks to be increased in height and topsoiled in green and new sections of stopbank in yellow

Figure 1 Existing stopbank location

The project involves:

- Restoring the temporary stopbanks in the lower reaches to the initial design level to prevent tidal overtopping
- Raising the banks in the middle reaches to provide the required protection against flood overtopping
- Extending the stopbanks (where required) around Pump Station 205 (PS205) to prevent overtopping of the discharge canal
- Strengthening sections as necessary to allow continued functionality
- Investigating the condition of pipes passing through the temporary stopbanks and repairing them as required
- Updating the Avon River Stopbank Project Emergency Response Plan
- Updating the Temporary Stopbank Operation and Maintenance Manual

1.2 The Contract Works

The Contract Works include the supply of all labour, materials, plant and other requirements for the construction of the works as described in this Specification and as detailed on the Contract

Drawings. The Contract Works shall also include the supply, fabrication, manufacture, construction, setting out, installation, testing and commissioning and provision of Contractor's documentation as described in the Contract Documents.

Included in the Contract Works are:

- Approximately 18,640 m of new and restored compacted fill stopbanks
- 345 m of new Terramesh reinforced stopbanks
- Approximately 2845 m of new pathway
- Repair and renewal of damaged stormwater and wastewater assets beneath stopbanks
- Abandonment of redundant wastewater and stormwater assets beneath stopbanks
- Identifying and relocating existing utilities
- Landscaping and removal / replacement of trees
- All other miscellaneous design elements indicated on the Contract Drawings and in this Specification

1.3 Basis of Contract

The General Conditions of Contract applicable to this Contract are those set out in NZS3910:2013 "Conditions of Contract for Building and Civil Engineering Construction" as amended by the Schedules to the General Conditions of Contract.

1.4 Specifications, Drawings and Set out

The Specifications are divided into sections for convenience and reference only. No claims will be accepted in respect of work not specifically mentioned in a particular section but which is provided for, expressed or implied elsewhere in the Specifications or the Drawings.

The Contractor shall carry out all work in accordance with the following Specifications and Drawings:

1. This Specification
2. The Drawings
3. Christchurch City Council's (CCC) Construction Standard Specification (CSS) Parts 1 to 7 https://www.ccc.govt.nz/consents-and-licences/construction-requirements/construction-standard-specifications/
4. Christchurch City Council's (CCC) Approved Materials List http://www.ccc.govt.nz/consents-and-licences/construction-requirements/approved-materials-list/search/
5. Christchurch City Council's (CCC) Infrastructure Design (IDS) Parts 1 to 12: 2015 https://www.ccc.govt.nz/consents-and-licences/construction-requirements/infrastructure-design-standards/

The Specifications and Drawings shall be taken as mutually explanatory, but in the case of ambiguity or conflict the priority of documents shall be as listed above, with each document prevailing over a document lower in the list.

Any ambiguities in the Specification or on the Drawings, or discrepancy between this Specification and the Drawings, or any other documentation, shall be brought to the attention of the Engineer for clarification prior to materials being ordered or related construction commencing.

The Drawings forming part of the Contract Documents are as listed in Appendix A. The Contractor shall be responsible for verifying and confirming all existing dimensions shown on the Drawings by checking against actual site measurements.

Where shown on drawings, existing services are indicative only and must be verified prior to any works commencing on site.

Where the Contractor's offer does not comply with the requirements of this Specification, the Contractor shall list and fully describe the extent of the non-compliance with the Specification.

Other documents that shall be read in conjunction with the Specifications include:

- Code of Practice for Temporary Traffic Management https://www.nzta.govt.nz/resources/code-temp-traffic-management/copttm.html#manual
- Christchurch Traffic Operations Centre CTOC Local Operating Procedures (LOPs) v4 2014

  http://tmpforchch.co.nz/wp-content/uploads/2014/09/CTOC-LOP_v4_FINAL_20140919.pdf

1.4.1 Set out

Further to clause 5.8, NZS 3910:2013, the Contractor shall be responsible for setting out the whole of the works.

The Designer shall provide the following electronic setout information:

- Setout control strings in 3d – dwg format
- Use of digital content form
- Setout Tracker Document

Conditions of use of digital content:

1. The electronic data is for reference and must be verified by the recipient against the approved construction drawings.
2. The setout tracker document records previous versions of supplied electronic data and confirms which versions are up to date. All redundant electronic files must not be used for any further setout activities.
3. The "Setout control line" file contains the main 3d alignment, as shown on the approved drawings.

1.5 Standards

All plant and materials shall be new and be the best of their respective kinds complying with the relevant New Zealand Standards (NZS) or British Standards (BS) where appropriate NZS do not exist, or other Standards called for in the Specification. Reference to any Standard shall include any amendment thereto or any Standard in substitution thereof.

Standards from the following sources are referred to herein, by the abbreviations indicated.

- Standards Association of New Zealand (NZS)
- Australian Standards (AS)
- British Standards Institute (BS)
- ASTM (ASTM)

- NZ Dam Safety Guidelines May 2015 (NZSOLD)

Wherever Standards are referred to they shall be considered to be part of this Specification insofar as they apply. Where a Standard is referred to in documents such as CSS, this shall be deemed to include any other Standard referred to therein. Standards where referred to shall be deemed to include the latest amendments.

Where a conflict exists between the requirements of any New Zealand Standard referred to in the Contract Documents and the requirements of this Specification, the requirements of this Specification shall prevail.

Where the Contractor's standard equipment does not comply with the requirements of the Specification, the Contractor shall list and fully describe the extent of non-compliance (including specific reference to the Specification clause) and suggest alternative Specifications or Standards including reference to appropriate national or international Standards.

Compliance with an equivalent alternative national or international Standard may be accepted in lieu of the Standard called for in the Specification, at the sole discretion of the Engineer.

Ensure that all equipment supplied under an alternative Standard is wholly suited for the service duty and complies with all relevant NZ regulations.

Wherever a Standard is called for in the Specification, it shall be deemed that all other Standards called up in that Standard shall be incorporated by cascade, and in the case of NZS shall include any current amendments or superseding NZS declared or endorsed in terms of the Standards Act 1988.

1.6 Work Shown and Included

The Specifications and Drawings show the extent of the work, but there is no warranty expressed or implied that they show each and every minor detail or item required to be included by the Contractor. Should any material, work or member appear to be inadequately described, yet obviously necessary for the neat and satisfactory completion of the whole works, the Contractor shall be deemed to have allowed for this in its Tender.

1.7 Reference Documents

All works covered under this Contract shall comply with the requirements of all relevant NZ Statutory Acts, Regulations and Bylaws.

1.8 Quality System

The Contractors quality system shall comply with the requirements of the IDS and CSS Part 1.

The Contractor shall maintain an independently audited quality system that meets the requirements of AS/NZS9001.

The quality system shall cover all work under the Contract, including work undertaken by Subcontractors.

The Contractor shall submit for approval by the Engineer:

- A controlled copy of a Contract Quality Plan. This is required within ten working days of the Date of Acceptance of Tender. The Engineer will advise acceptance of the Quality Plan, or indicate amendments that are required, within five working days of receipt
- Specific quality procedures/descriptions relating to the work to be undertaken. These are required at least ten working days prior to commencement of that work. However, for

works proposed at the commencement of the Contract for which ten working days is not possible a period of four working days will be accepted.

1.8.1 Control of Non-Conforming Work

All non-conformances requiring the agreement of the Engineer shall be promptly reported to the Engineer via Non-Conformance Reports.

1.8.2 Surveillance and Audits by Engineer

The Contractor shall, upon being given reasonable notice by the Engineer, make or arrange to be available all facilities, documentation, records and personnel, including those of any Subcontractors in the Contract Quality Plan and shall fulfil all the quality obligations of the Contract.

The Engineer will carry out audit and surveillance of the work of all Subcontractors and Suppliers as the Engineer sees fit, in the same way that the Engineer may carry out audit and surveillance of all work done and materials supplied by the Contractor.

Compliance by the Contractor with the Contract's quality assurance requirements shall not relieve the Contractor in any way from compliance with any of the other requirements of the Contract. Knowledge of, or involvement in, the Contract's quality assurance system or the provision of any apparent approval resulting therefore, by the Engineer, shall not in itself release the Contractor from any requirements of the Contract.

1.8.3 Inspection and Testing

Inspection and test plans shall be prepared, as a minimum, for the supply of materials, the varying construction activities, and the specific activities being approved by the Engineer. All inspection and test plans shall incorporate checklists for monitoring construction activities. The inspection and test plans shall be prepared by the Contractor and submitted to the Engineer for review ten working days prior to work being commenced.

The Engineer shall have the right to identify hold points on the inspection and test plans and work shall not progress past such identified hold points until the agreement by the Engineer. Alternatively, the Engineer may identify a witness point and the Contractor shall give two working days' notice of the time that the witness point will be reached but the Contractor shall be entitled to proceed past the witness point if the Engineer is not in attendance at the advised time.

The Contractor shall identify all test results with the precise locations to which they relate. The frequency of testing shall be adequate to demonstrate compliance with the Specification.

All completed checklists, test certificates and other referenced documents on the inspection and test plans shall be made available for the Engineer's perusal upon the Engineer's request.

1.9 Environmental Management

The environmental management system will comply with the requirements of the CSS Part 1 and the Conditions of Contract.

The Contractor shall prepare and submit to the Engineer for review and approval an Environmental Compliance Plan complying with the Conditions of Contract and the CSS, that addresses environmental issues specific to the Contract and complies with the Resource Management Act 1991. This includes the management of all environmental issues arising from the works or other sources as a result of this work.

The Environmental Compliance Plan is required within ten working days of the Date of Acceptance of Tender. The Engineer will advise acceptance of the Environmental Compliance Plan, or indicate amendments that are required, within five working days of receipt.

Specific environmental compliance procedures relating to the work to be undertaken, including erosion and sediment control procedures, shall be submitted for review by the Engineer at least ten working days prior to commencement of that work. However, for works proposed at the commencement of the Contract for which ten working days is not possible a period of four working days will be accepted.

The Contractor shall carry out work in accordance with the Environmental Compliance Plan. Should the need arise for the Contractor to revise its Environmental Compliance Plan then such revision shall be submitted for acceptance of the Engineer.

Where work is undertaken by the Contractor not being in accordance with the Contractor's approved Environmental Compliance Plan, the Engineer reserves the right to stop construction until the work can be undertaken in accordance with the approved Environmental Compliance Plan. Such delay shall not entitle the Contractor to an Extension of Time or Variation under the Contract.

The Environmental Compliance Plan shall include sections that address noise, odour, dust, dewatering water and sediment control, works within waterways, liquid spill containment, management of contaminated material and site tidiness and cleanliness.

1.9.1 Noise

Noise shall be limited to comply with the requirements of NZS 6803:1999 'Acoustics — Construction Noise'. The Contractor shall minimise the effects of noise generation by including in the planning of the work factors such as; placing of plant, programming the sequence of operations and other management functions.

Mechanical equipment required to remain on continuous duty during construction (e.g. dewatering pumps), shall be sound-proofed or otherwise treated to ensure that noise levels comply with NZS 6802.

Notwithstanding the above, the Contractor shall discuss with the affected residents any noise generation liable to constitute a problem. The Contractor shall explain to them the means being used to minimise excessive noise and establish with them the timings most suitable for the noise generating work to be carried out.

Notwithstanding the noise standards specified above, the Council reserves the power conferred on it under the relevant sections of the Resource Management Act 1991, the Health Act 1956 and the Bylaws and District Plan to control any noise which contravenes the provisions of the above mentioned Acts and Bylaws.

1.9.2 Dust

Any dust nuisance that arises as a result of the works shall be controlled and rectified by the Contractor as directed by the Engineer.

1.9.3 Consent Conditions, Dewatering Water and Sediment Control

Information of consents is included in Appendix B. The Contractor shall carry out all construction activities in compliance with the conditions of the consents obtained for the Contract Works.

The Principal holds existing global consents (CRC1121310 and CRC121211, refer Appendix B) from Canterbury Regional Council to take and use groundwater for site dewatering purposes

and to discharge dewatering water to land then to water. All site dewatering shall be undertaken in compliance with the conditions of these consents.

The Contractor shall make allowance for the control of all ground or surface water and sediment, and shall provide details of the measures that will be put in place to deal with any issues, and shall include details of sediment control tanks, including capacities and efficiencies.

The Contractor shall include in the Environmental Compliance Plan a section detailing specific erosion and sediment control measures to be implemented. This shall include the development of an erosion and sediment control plan that is specifically tailored to their proposed construction methodology and staging of the works. The erosion and sediment control measures shall comply with the conditions of the resource consents obtained for the Contract works and relevant global consents held by Council and with ECAN Erosion and Sediment Control Guideline 2007
http://ecan.govt.nz/publications/General/FullErosionandSedimentControlGuideline.pdf.

A copy of the Contractors Sediment and Erosion Control Plan is provided to the Engineer for review at least 5 working days prior to commencing earthworks operations a

Erosion and sediment control will be properly maintained throughout the construction period. This maintenance will involve regular checks and immediate maintenance following any event that damages any sediment control structure. Maintenance checks and upgrades will be documented and reported to the Engineer.

1.9.4 Works within Waterways

CCC holds an existing global consent (CRC146620 refer Appendix B) from Canterbury Regional Council for works within the beds and margins of waterways. All Contract Works within the beds and margins of waterways will be undertaken in accordance with the conditions of CRC146620.

1.9.5 Site Tidiness and Cleanliness

The Contractor shall be responsible for maintaining the site (including all other areas disturbed by the work) in a clean and tidy condition throughout the Contract. Materials are to be kept within the perimeters of the site. All redundant materials and waste are to be removed from the site daily. No stockpiling of excess excavated material is allowed on site. Clean up is required at the end of each working day and at the end of the job.

1.9.6 Management of Contaminated Material

The Environmental Compliance Plan shall outline how the Contractor shall manage contaminated materials and/or land. The Contractor must manage all contaminated material and carry out all reasonable precautions to mitigate this hazard.

1.9.7 Other

Further consideration within the Environmental Compliance Plan shall be included for the management of the habitats (including Inanga spawing) and natural resources of the local environment, including, but not limited to: stream beds; stream flows; vegetation disturbance and the envisaged effects of flooding on the construction.

1.10 Site Safety

The Contractor is responsible for the Health and Safety of all persons on the site, all persons who may be affected by the carrying out of the Contract Works by the Contractor, its employees and subcontractors.

In carrying out the works the Contractor shall at all times exercise all necessary precautions for the safety of employees appropriate to the nature of the work and the conditions under which the work is to be performed, and in compliance with all statuary requirements and such directions as the Engineer may from time to time consider necessary or desirable.

1.10.1 Compliance with the Health and Safety at Work Act

The Contractor shall comply with the provisions of the Health and Safety at Work Act 2015. Specifically, the Contractor shall take all practical steps to:

- Provide and maintain a safe working environment
- Provide and maintain facilities for the safety and health of employees
- Ensure that machinery and equipment is designed to be used and maintained safe for employees
- Ensure that employees are not exposed to hazards in the course of their work
- Manage hazards so that employees are working in a safe environment
- Provide a register of all accidents, incidents and potential accidents and incidents.
- Develop procedures for dealing with emergencies that may arise while employees are at work.

1.10.2 Site Specific Safety Plan

The Contractor shall submit for approval to the Engineer for review a Site Specific Safety Plan a minimum of five working days prior to commencement of work. This Site Specific Safety Plan shall sufficiently incorporate all health and safety matters to comply with the Contractor's obligations under this Contract.

1.10.3 Audits

The Contractor is required to audit and inspect the Contract Works on a weekly basis as a minimum to ensure the sites compliance with:

- The safety requirements of the Health and Safety at Work Act
- The health and safety requirements of their Site Specific Safety Plan and
- This Specification

1.10.4 Safety Supervisor

Before commencing work on the Contract, the Contractor shall notify the Engineer of the name of the person designated as Safety Supervisor. The Safety Supervisor shall be the primary point of contact on all Health and Safety matters.

1.10.5 Notification

The Contractor shall advise Occupational Safety & Health of all notifiable works, copying all approvals to the Engineer. The Contractor shall comply with all Occupational Safety & Health requirements.

The Contractor shall give to the Principal, through the Engineer, a copy of any report which the Contractor is required to make to a public authority on any accident which is associated with the carrying out of the Contract Works and results in serious harm to any person.

Where work is vitally necessary for the saving of life or property or for assuring the safety of the works, such work shall be carried out by the Contractor immediately by day or by night, and the

Contractor shall advise the Engineer of the situation immediately. Should the Contractor not be in a position to undertake immediately such works, the Principal reserves the right to carry out such works by their own or other agencies and to deduct the costs arising there from monies which may become due to the Contractor under Contract.

1.10.6 Public Safety

The Engineer may order all works to be stopped immediately in the event of any reported breach of Occupational Safety & Health standards. Investigation shall be made without delay and the basis of the reported breach established. Works shall only recommence with the approval of the Engineer. Stoppages ordered by the Engineer for a breach of Occupational Safety & Health standards shall not entitle the Contractor to an extension of time for completion under clause 10.3 of NZS3910.

The Contractor shall provide and maintain all protection for the public, including barricades, lights and the like, as required by the Local Authority and the law. The adequacy of such temporary work shall at all times be the entire responsibility of the Contractor.

All work areas shall be separated from pedestrian areas by physical barriers.

The Contractor shall confine its operation to the construction site and shall not store equipment or stockpiles outside the site.

1.10.7 Maintenance of Flood Defence Effectiveness

The Contractor shall sequence and carry out their work to maintain the effectiveness of the existing flood defences throughout the duration of the Contract Works.

In general, where the works require lowering or excavation through the stopbank, this will require the Contractor to carry out the work in short sections allowing reconstruction in the same working day, or alternatively construct Temporary Works that will perform the same flood defence function as the existing stopbank while the works are constructed.

The Contractor shall prepare a construction methodology that details how the Contractor shall maintain the effectiveness of the existing flood defences during construction. The methodology shall describe the Contractors sequence of work, temporary works and the Contractors flood contingency plan (tidal and fluvial) which will incorporate procedures which will be carried out to ensure that adjacent property and infrastructure are not put at risk of flooding while the construction phase of the work is in progress.

The Contractor shall submit the construction methodology to the Engineer for review and approval at least ten working days prior to commencement of work. The Engineer shall also forward the construction methodology to the Principal for their review and approval.

The Contractor shall make resources available at all times during the period of the Contract Works to carry out emergency works and flood contingency works in accordance with clause 6.8 of NZS 3910. The notification of emergency or flood contingency works may be by phone from either the Engineer or a representative of the Principal. Phone notification shall be followed up at the earliest opportunity with written notification in accordance with clause 6.8.1 of NZS 3910.

1.10.8 Suspension of Work and Delayed Access

All operations must be suspended during weather which may affect the quality and/or safety of the work in progress and suitable precautions shall be taken to protect the works in accordance with clause 6.7 of NZS 3910.

All operations shall be suspended when a tide sufficiently high to affect the Contract Works or a flood event in the river is predicted. The Contractor in this case shall carry out emergency

works to restore the effectiveness of flood defences in accordance with 1.10.7 and clause 6.7 and clause 6.8 of NZS 3910. Where suspension of work is of an urgent nature due to a predicted flood event or high tide the Engineer or a representative of the Principal may notify the Contractor by phone and be followed up at the earliest opportunity with written notification in accordance with clause 6.7.1 of NZS 3910.

The project works will require the relocation of electrical services, to be carried out under a separate contract. The relocations are as follows:

Underground

- 772 – 884 Avonside Dr
- 279 Locksley Ave to parallel with 185 New Brighton Rd
- 309 – 335 New Brighton Rd
- 67 – 53 Hulverstone Drive
- New Brighton Rd from Lake Kate Sheppard Inlet to Waygreen Ave Intersection
- 518 – 521 New Brighton Rd
- Anzac Dr from 44 Eureka to 66 Bexley Rd
- End Hardy Street to Owles Terrace Pontoon

Overhead

- River side of Avonside Dr/Kerrs Road/Hockey Lane intersection
- Two poles on Avonside Dr before Wainoni Road int. (78 Wainoni)
- Pole opposite 950 Avonside Dr
- 309– 341 New Brighton Rd
- Opposite 345 New Brighton Rd
- New Brighton Rd from Brooker Reserve to last pole before roundabout
- Barkers Lane to 475 New Brighton Rd
- Anzac Dr from 52 Eureka to 66 Bexley Rd
- 126 – 53 Owles Terrace

The Contractor is to include within their costs for liaison with CCC and Orion to determine the order and programme for these relocations. The contractor shall allow for the relocation work when developing their construction programme and allow for possible delays in access to specific areas of the works.

1.10.9 Design of Temporary Works

The Contractor shall submit to the Engineer for review copies of the detailed plans of Temporary Works, including dewatering details, at least ten working days in advance of construction of Temporary Works commencing.

Before submission to the Engineer, the Contractor's proposals for all temporary works and erection methods shall have been checked, and have a signed certificate, by a Chartered Professional Engineer (CPEng) who has proven experience in the design of works of this nature.

Temporary Works designs shall prevent any movement of the Contract Works, preserve the effectiveness of the existing flood defences and take into account possible extreme tide or flood events occurring during the Contract Works.

All costs associated with temporary works design, checking and other such activities shall be met by the Contractor.

All temporary works shall be removed at the completion of the respective work unless otherwise approved by the Engineer.

1.11 Disruption

The Contractor shall plan and execute the Contract Works such that interference with any affected parties' activities on and adjacent to the site is kept to a minimum, and all reasonable requests by the affected parties to that end are met.

Affected parties shall include but are not necessarily limited to:

- The Principal
- Other Local Authorities
- Regional Authorities
- Private property owners
- Residents
- Utility owners i.e. power, gas, Telecom, etc.

The Contractor shall recognise the following obligations arising from this Contract:

- Public safety should be a primary consideration at all times
- Work sites must be kept as tidy as possible
- Pedestrian and vehicular access past work sites must be provided for in accordance with CoPTTM
- Noise from Contractor's equipment and personnel should be kept to a practical minimum
- Contractor's personnel are asked to be courteous to members of the public
- Care should be taken to avoid damage to public and private property and if accidental damage occurs, property must be reinstated to its original condition as soon as practical

1.12 Public Notification

Notification of the works prior to commencement shall be as per the CSS.

The Contractor shall provide the Engineer, on a weekly basis, current information on the progress of the work and on work intentions for the following week. The Engineer may use this information to prepare information bulletins that the Principal may choose to issue to the news media to inform the public of the work and to suggest a detour if this is necessary.

The Contractor shall not make statements to the media.

All complaints and enquiries shall be referred to the Principal.

1.13 Confidentiality

The Contractor shall treat the details of the Contract Works as private and confidential, (save insofar as may be necessary for any purpose of execution thereof), and shall not publish or

disclose the same or any particulars in any trade or technical paper or elsewhere without the consent in writing of the Principal.

1.14 Traffic Control

All traffic control will comply with the requirements of the CSS Part 1 and any other conditions set out in any Corridor Access Request (CAR).

1.15 Site Access

The Contractor shall submit to the Engineer for approval, the proposed methodology to gain access from the legal road into the site. Haul roads proposed along the permanent road alignment will be subject to approval of the Engineer where the Contractor shall demonstrate that the temporary pavement design will not compromise the permanent pavement on proposed road subgrade.

The Contractor shall maintain access roads to prevent dust nuisance and tracking of soil onto public roads.

The Contractor shall ensure that access, including temporary pedestrian and vehicular access, to public and private property affected by the Contract Works is maintained at all times. The Contractor shall liaise with private property owners to ensure that access is maintained as required.

The Contractor shall obtain private property owner permission to access the private property for the Contract Works. Refer to Section 1.22 and the CSS.

All works are to be programmed to avoid working in private property on weekends or public holidays or during adverse weather conditions.

1.16 Contractor's Programme

The Contractor shall prepare and submit as part of the Tender a complete programme of operations for the Contract Works. The programme shall provide for the orderly performance of the work within the times specified.

1.16.1 Comprehensive Programme

Within twenty working days of the Date of Acceptance of Tender, the Contractor shall submit for approval by the Engineer:

- A Comprehensive Programme
- A projected financial statement indicating the payments that the Contractor expects the Principal will need to make under the Contract
- The expected on-site resource requirements in the form of man-hour histograms for the execution of the Contract Works

This programme shall be a logic linked time-scaled bar chart arranged on a weekly time-scale including, but not be limited to, the following:

- Identifying the Contract critical path
- The restraint of any activity on any other activity
- Key milestones such as documentation submissions and approvals required
- Off-Site activities such as material lead times
- Allowances for the Principal's staging requirements

1.16.2 Updated Programme

Monthly, the Contractor shall deliver to the Engineer a statement of the status of the works, together with an updated Comprehensive Programme indicating the progress of the Contract Works and further work to be completed to achieve completion by the Due Date for Completion. Such updated programme shall be subject to the approval of the Engineer. The approval of the Engineer of the updated program will not be deemed to relieve the Contractor of any of its obligations under the Contract.

If, in the opinion of the Engineer, the Contractor falls behind the programme, the Contractor shall take such steps as considered necessary by the Engineer to improve progress. The Contractor shall submit a revised program in an approved form indicating the manner in which the works shall be completed including as necessary what additional resources are to be utilised within the specified time. No additional cost shall be incurred by the Principal due to such measures.

1.17 Contractor's Management

The Contractor shall submit to the Engineer an organisation chart as well as contact details of the following key personnel:

- Contractor's Representative - responsible for the co-ordination of all aspects of the Contract
- Contract Manager
- Quality Manager - sets up and ensures the implementation of the quality system and quality plan for this Contract
- Site Representative - on site at all times that construction activities are being undertaken.
- Safety Supervisor - primary point of contact on all health and safety matters
- Site Traffic Management Supervisor
- Traffic Controller
- Environmental Supervisor
- Community Liaison Officer - responsible for all liaison with the community, including attendance at public meetings, distributing of Start Work Notices and receiving, recording and actioning complaints and enquiries. They are also responsible for referring all complaints and enquiries to the Principal and informing the Engineer
- Emergency contact details for after hours communication

1.18 Site Meetings

Site meetings will be conducted on a fortnightly basis at a location chosen by the Engineer. The Principal, Contractor's Representative and Engineer's Representative will attend.

1.19 Subcontractors, Trades and Other Contractors Cooperation

The Contractor shall provide all necessary coordination, administration and supervision to ensure that the work of other Trades and Subcontractors is carried out efficiently. Where necessary he shall coordinate and cooperate with other contractors to the Council.

1.20 Review and Inspection by the Engineer

For the purposes of the Specification, review by the Engineer shall mean a general review of the documents, design, materials and equipment selected by the Contractor for its compliance with the Contract requirements.

Review of Contractor's pre-manufacture sketches, drawings, and diagrams shall mean only a review of the general performance, layout, principles and techniques involved, and shall not be construed as implying in any way that the Contract Works, if supplied and constructed in accordance with supplied information, will necessarily perform in the required manner, nor that the co-ordination and setting out is correct, the responsibility for which remains wholly with the Contractor.

Review by the Engineer when used in relation to matters other than above shall mean a general review for apparent compliance with the Contract requirements.

Inspection by the Engineer, when used in relation to on or off site inspections, shall mean routine observation to ascertain whether the Contract Works are being carried out in general accordance with the Contract Documents. Such reviews or inspections with "no exceptions taken" shall not relieve the Contractor of any of its obligations for producing materials, equipment and workmanship which are in compliance with this Contract and its requirements. Any such approval or comment that may be given shall not relieve the Contractor from any obligation or responsibility.

1.21 Construction Photographs

Before commencing and during the progress of any part of the work the Contractor shall arrange, and if required shall render assistance, in the taking of such photographs as the Engineer may require.

1.22 Consents and Permits

Appendix B contains consent information.

The Contractor is to arrange and pay for all necessary consents/permits as may be required to complete the Contract Works. Should the Contractor become aware of any conditions of the consenting authorities, that cannot be met or that may be breached, they shall obtain, at their own cost, the appropriate consent from the consenting authority.

1.22.1 Private Property Owner Consents

Where the works require the Contractor to access private property the Contractor shall obtain the property owners consent. The Contractor shall not enter any property until consent is received from the property owner.

Private property work will comply with the requirements of the CSS.

1.23 Geotechnical Information

Where the stopbank is to be constructed on natural ground, the Contractor shall carry out investigation and testing as set out in Cl 3.1.11

The Contractor shall carry out investigations as the Contractor considers necessary. Information from any subsequent investigations undertaken by the Contractor shall be supplied to the Principal.

1.24 Historical Artefacts and Archaeological Discovery

Any discovery will comply with the requirements of the CSS Part 1.

1.25 Tree Management

All works near trees are to be carried out in accordance with CSS Part 1 and the Christchurch City Council Global Consent for Works Affecting Protected Vegetation (RMA92019127). Refer also to the notes on the drawings for additional requirements. All vegetation removal or trimming from such sites shall comply with the above documents unless approved otherwise by the Engineer.

Trees to be removed have been identified in consultation with the Arborist. Consult the Engineer and Arborist prior to the removal of any trees. Guidance for the reinstatement of trees shall be supplied by the Arborist as required.

All new plantings are to be carried out in accordance with CSS Part 7.

1.26 Hours of Work

The hours of work adopted for any portion of the work shall be in accordance with the CSS, Part 1. No work shall be undertaken on Sundays, Public Holidays, or outside the hours of 7:00 am to 6:00 pm without the Engineers prior approval. If approval is granted for work outside the above hours and noise complaints or other complaints are received, the Contractor must stop the work causing the complaint until the complaint has been dealt with in a manner satisfactory to the Engineer.

The Contractor shall arrange their operations and hours of work so as to avoid causing a public nuisance.

1.27 Survey Setting Out and Levels

Further to clause 5.8.3 of NZS 3910, legal and engineering survey marks shall not be disturbed without the prior written approval of the Engineer. Legal marks disturbed during the work shall be replaced by a Registered Surveyor at the Contractor's expense.

The Contractor shall be responsible for the true and proper setting out of the entire works on the site from the information supplied on the Drawings (or from such further Drawings as may be supplied as the work proceeds), for the correctness of the position, levels, dimensions and alignments of all parts of the works and for the provision of all necessary instruments and labour.

The Contractor shall engage a Registered Surveyor to set out any of the co-ordinated points or any temporary benchmarks.

1.27.1 Legal Boundary Survey

Where the contract works are close to private properties easement, the Contractor shall have a legal boundary survey undertaken by a Registered Surveyor with the proposed limits of the contract works set out. If the Contractor considers that boundary surveys are required, it shall notify the Engineer when setting out the works.

1.28 Temporary Works

The Contractor shall design and execute all temporary work whether of a special or general nature required for the Contract Works, and protection and safety of the general public, property or stock. Refer also to clause 1.10.9.

All temporary works shall be removed at the completion of the respective work unless otherwise approved by the Engineer.

1.29 Services and Property

In addition to complying with the requirements of the General Conditions of Contract and the CSS, the Contractor is solely responsible for arranging for the alteration, temporary support or relocation of any services and their associated structures affected by the Contract Works.

The Contractor shall be entirely responsible for the accurate location and protection of all services and private property in the area affected by the Contract Works, and shall take all steps to that end which may be required by the relevant authorities. The Contractor shall liaise with appropriate authorities and property owners, for details of exact locations of the services. Should the Contractor pothole any services within the work area, the Contractor shall accurately record the location and reduced level of each service and submit to the Engineer a potholing record, including sketch details.

Following location of the existing services, the Engineer may direct the Contractor as to any minor modifications in the alignment of the proposed infrastructure to avoid disturbing existing services.

Should the Contractor damage any existing service, including overhead services, or private property they shall immediately advise the relevant service authority and/or property owner of the damage and arrange for their repair, making such plant, labour and other assistance available as the service authority may require until the repair has been satisfactorily completed. The cost of such a repair will be met by the Contractor.

The Contractor shall take all practicable steps to mitigate settlement caused by construction activities from affecting services and private property in the area.

1.30 Access

The Contractor shall ensure that access, including temporary pedestrian and vehicular access, to public and private properties affected by the Contract Works is maintained at all times. The Contractor shall liaise with private property owners to ensure that access is maintained as required.

The Contractor shall obtain private property owner permission to access the private property for the Contract Works. Refer to Section 1.22 and the CSS.

All works are to be programmed to avoid working in private properties on weekends or public holidays or during adverse weather conditions.

1.31 Testing and Commissioning

The Contractor shall, in the presence of the Engineer, carry out testing and commissioning to clearly demonstrate and record that the Contract Works meet the specification

1.31.1 Testing Equipment

The Contractor shall provide and maintain in good order on the site, approved foundation and compaction testing equipment for the purpose of verifying the compaction of fill material.

1.32 As-Built Drawings and Metadata

The Contractor is to provide complete and comprehensive as-built drawings and metadata set showing checked, and certified correct by the Contractor, final dimensions, lines, levels etc. for the Contract Works.

As-built drawings and metadata shall comply with the Principal's requirements in a format acceptable to the Principal. Refer to the Conditions of Contract, COP: Part 12 - As-Built Records and to the relevant sections of the CSS.

All as-built drawings shall be prepared using the New Zealand Transverse Mercator 2000 (NZTM2000) coordinate system and Christchurch Drainage Datum.

The Contractor shall provide two copies of the draft as-built drawings and metadata for review by the Engineer not later than ten working days prior to the Due Date for Practical Completion. The Engineer shall review the as-built drawings and metadata and return one copy to the Contractor not later than five working days prior to the Due Date for Practical Completion. The Contractor shall update and re-submit three copies of the draft as-built drawings and metadata for the Engineers consent prior to Practical Completion. The Practical Completion Certificate will not be issued until the Engineer has approved the draft as-built drawings and confirmed that metadata complies with the requirements of the Contract and the Specifications.

Final as-built drawings and metadata shall be provided as detailed in the Conditions of Contract.

1.33 Completion and Clean-up

On completion of the Contract Works (except for maintenance work), the Contractor shall clear away and remove from site all materials and equipment. Included in this requirement is the removal and disposal off-site of stockpiles, site fences, site huts, signs, surplus excavated materials, demolition materials, nails, pieces of timber, empty containers etc. The whole site shall be left clean and ready for immediate occupation and use by the Principal.

All of the area occupied or worked over by the Contractor in execution of this Contract, both within and beyond the area shown as available for the work, is to be reinstated to profile and condition acceptable to the Engineer.

1.34 Defects Notification Period

The Contractor shall maintain the works for the Defects Notification Period as set out in the Conditions of Contract. All defects that occur after construction shall be repaired to the satisfaction of the Engineer.

During the Defects Notification Period the Contractor shall inspect all Contract Works at 3 monthly intervals. The Contractor is to complete an inspection report and submit it to the Engineer within three working days of the inspection. The cost of inspections is deemed to be allowed for in the Contractors Tender Price and shall not be treated as a Variation.

Should the Contractor not inspect and remedy defects of the Contract Works to the required standard as directed by the Engineer, the Engineer may arrange for the work to be undertaken by others. The cost of this work shall be recoverable by the Principal from the Contractor as detailed in the Conditions of Contract.

1.35 Settlement monitoring

Install settlement monitoring pins on the stopbank crests at centres as identified on the Drawings. The survey pin shall be a galvanised steel rod 0.5 m in length inserted vertically into the stopbanks with a concrete surround. The concrete surround shall be a 300 mm diameter circle with a depth of 200 mm.

2. Materials

2.1 Materials supplied by the contractor

All materials, labour and plant necessary for the installation of the Contract Works shall be provided by the Contractor. All materials proposed by the Contractor are to be approved by the Engineer before purchase or installation. Notwithstanding any brand stipulation, all materials supplied by the Contractor must be approved for use for their given purpose. All materials shall be new unless otherwise approved by the Engineer.

Materials shall be delivered to site with the Manufacturer's identification and corresponding certificates of compliance and data sheets. On receiving materials, the Contractor shall ensure that they are correct, complete and undamaged before proceeding with installation.

All materials shall be clearly identified as conforming to the Specification including the CCC Approved Materials List where applicable.

All Materials shall be new, unless otherwise specified, and in accordance with the requirements of the Specifications. Where a particular Standard is not called for in the Specifications, materials shall comply with the relevant New Zealand Standards (NZS). Where appropriate New Zealand Standards do not exist, Australian (AS) or British Standards (BS) may be used. Reference to any Standard in the Specifications shall include any amendment to or substitution for the referenced Standard.

Where an item is mentioned by a trade name or other specific reference, it shall be deemed to mean the type of item so mentioned, or any other equivalent thereto in quality, finish, durability and serviceability for the purpose intended. The quoting of a trade name shall not be construed as any desire to restrict the use of a competitor's materials, and the Contractor is at liberty to offer for the Engineer's approval any materials considered by the Contractor to be of equivalent quality. Approval or otherwise of offered alternatives shall be at the Engineer's discretion. No warranty is expressed or implied that materials specified are regularly stocked by merchants.

2.1.1 Alternatives

Where any item is mentioned by a trade name or by any other specific reference, it shall be deemed to mean the type of article or material so mentioned, or any other approved by the Engineer as equal thereto in price, quality, finish, durability and serviceability for the purpose intended. Should any materials, equipment etc., shown in the Drawings and/or Specifications not be available, the Contractor shall list all such items with their tender.

The Contractor shall be responsible for placing orders for materials so as to ensure their availability on site when required.

Materials or equipment which are nominated in the Tender shall not be substituted without the written approval of the Engineer. Any such substitution shall not be inferior in any respect to that proposed in the Tender and shall meet the Contract requirements.

2.2 Care of supplied materials

Upon acceptance of materials from the Supplier(s), the Contractor shall be responsible for their protection and safety. Any damage sustained to materials after acceptance shall be made good by the Contractor at the Contractor's expense.

2.3 Surplus materials

The cost of removal of surplus materials to the nearest landfill and associated “tip” fees shall be included in the rates in the Schedule of Prices for the relevant section of work. The area shall be restored to a standard in accordance with this Specification.

3. Stopbank construction

3.1 Earthworks

Earthworks include all plant, labour, equipment, appliances, and materials as required or necessary to excavate, fill, compact and grade for the construction of all structures as detailed on the Contract Drawings and in this Specification.

All earthworks shall comply with the CSS and NZS 4431.

3.1.1 Standards

The following documents apply to this section:

NZS 4402	Methods of testing soils for civil engineering purposes
NZS 4404	Land Development and Subdivision Infrastructure
NZS 4407	Methods of sampling and testing road aggregates
NZS 4431	Code of practice for Earth Fill for Residential Development
TNZ F/1	Specification for earthworks construction
TNZ F/7	Specification for geotextiles
NZTA P39	Standard Specification for Highway Landscape Treatments

3.1.2 Temporary Support

If earthworks are likely to undermine, cause a slip, or otherwise damage any completed work, adjoining property, street or private way, carry out adequate measures to prevent such damage occurring.

3.1.3 Temporary Stockpiling

Temporary stockpiling of cut material shall be the responsibility of the Contractor. Any such temporary stockpiling shall be located and constructed to ensure the stability of the stockpiled material and underlying ground. No stockpiled material shall be placed within the drip line of any tree to be retained, nor against any fence or structure. Stockpiles shall not block overland flow paths, cause ponding behind the stockpile, cause nuisance to private property or flooding of road. Refer also to the requirements of clause 1.9.3.

3.1.4 Groundwater Drainage

No groundwater drainage will be installed within the base of an excavation.

3.1.5 Surface Drainage

At all times, cuts and fills shall be maintained with adequate falls and drainage to minimise any penetration of water and to allow the ready runoff of water.

During construction, surface water flowing towards fill areas shall be either diverted away from the fill area by means of contouring the ground surfaces or channelled into a suitable drainage system.

Take all necessary measures to prevent excessive water-logging of surface materials yet to be excavated or compacted or both, and to prevent fill material from being eroded and re-deposited at lower levels.

3.1.6 Disposal of Surplus Excavated Material

Excess excavated material shall be disposed of by the Contractor at the Contractor's expense.

3.1.7 Imported Topsoil

Imported topsoil shall be second class topsoil complying with CSS Part 1 clause 35.2.

3.1.8 Stopbank Fill

Determine the Maximum Dry Density, Optimum Water Content, Grading and soil permeability through Laboratory Testing prior to works commencing. The Laboratory shall be IANZ Accredited. MDD test results from the material supplier may be submitted provided these are tested by an IANZ Accredited Laboratory. Supply results of the testing to the Engineer for review and approval prior to construction.

The maximum dry density shall be determined in accordance with NZS 4402.4.1.1 "New Zealand Standard Compaction test".

Stopbank fill material shall comply with the criteria in the following sub-clauses.

(1) General Fill

Standard stopbank fill material shall be a silty sandy gravel with a maximum particle size of 100 mm and permeability of less than 10^{-6} m/s. Permeability is to be proven by laboratory testing prior to beginning of works. This material shall be:

- Reasonably well graded
- Placed and compacted to 95% of maximum modified dry density
- Free of organic matter
- Free of any inorganic contaminants such as broken glass, demolition material etc.

This material can be sourced from more than one quarry and blended.

(2) Structural Fill (Mechanically Stabilised Earth)

The mechanically stabilised earth backfill shall be a silty sandy gravel with a maximum particle size of 75 mm and permeability of less than 10^{-6} m/s. Permeability is to be proven by laboratory testing prior to beginning of works. This material shall be:

- Reasonably well graded
- Placed and compacted to 95% of maximum modified dry density
- Free of organic matter
- Free of any inorganic contaminants such as broken glass, demolition material etc.
- pH not less than 5.0.

This material can be sourced from more than one quarry and blended.

3.1.9 Clearing

Carry out clearing for earthworks construction to TNZ F/1 clause 3.

Clearing shall include the complete removal of material including sand, stumps, trees, logs, scrub, grass, roots, decayed vegetable and coarse vegetation and disposal of at the Contractor's expense and in a manner approved by the Engineer. Burning or burying waste materials is not permitted.

Remove tree stumps such that no roots exceeding 100 mm remain. Stumps that are 'chipped' shall have chipping material removed from the site.

Clearing shall be carried out in such a manner so as to ensure minimal impact on the environment.

Materials of value shall be salvaged and stacked on site as directed by the Engineer. They remain the property of the Principal unless otherwise stated.

3.1.10 Excavation

All excavation shall be carried out to the required lengths, breadths, depths, inclinations and curvatures as may be necessary for the construction of the works or as shown on the Drawings. Excavations shall be true to line and grade. The bottom of excavations shall be trimmed to provide a sound foundation.

Remove topsoil and soil containing organic matter from all cut areas, plus other specified areas, and stockpile on site at convenient locations to facilitate the intended work sequence and for future respreading of topsoil. Recover the maximum amount of clean soil for re-use.

All wet or spongy material and topsoil should be removed from the stopbank foundation so that a natural undisturbed surface suitable as a solid base for the proposed works is provided.

Neatly cut batters to the slopes indicated on the drawings and trim to give a regular and smooth appearance once finished.

Care is to be taken when excavating in proximity to trees to avoid damage to tree roots.

Where stopbank earthworks are not on an existing gravel stopbank, and are within the dripline of an existing tree, excavation shall be limited to scraping of the vegetation to prevent damage to the tree roots.

If the ground cleared of vegetation does not conform to the minimum requirements outlined in 3.1.11 below, the Engineer shall be notified to provide further instruction.

Care is to be taken when operating machinery in close proximity to trees to avoid damage to trunks and overhanging branches.

Where fill is to be placed on the existing temporary stopbank structure the surface shall be cut back to remove all vegetation and organic material and the surface scarified to allow keying in of new fill material.

Where fill is to be placed to side batters the existing batter slopes will be cut back to allow keying in and compaction of fill to the required profile.

3.1.11 Subgrade Testing and Undercut of Unsuitable Material

Where fill or stopbank structures are not being placed on top an existing gravel stopbank it shall be founded on suitable excavated ground to the Engineer’s approval. Scala penetrometer testing and shear vane tests, as per CSS, shall be required to confirm the suitability of the ground.

This testing shall be undertaken as follows:

Test every 10 m length of stopbank at the centreline and at both sides of the proposed stopbank, at any change in ground material and at other locations required by the Engineer

Testing shall be to a minimum depth of 500 mm

- A minimum of 2 blows per 100 mm depth shall be achieved for granular material using a scala penetrometer

- A minimum peak shear vane value of 15 kPa shall be achieved for cohesive fine grained material
- All testing shall be recorded and submitted to the Engineer

Unsuitable material encountered shall be undercut to a maximum depth as specified by the Engineer. Removal of unsuitable material shall only be undertaken with approval of the Engineer who will confirm the extent and depth of undercut.

All undercut material shall be replaced with stopbank fill, refer Section 3.1.8, compacted to 95% of maximum dry density in accordance with NZS 4402.4.1.1.

Geotextile then geogrid is to be placed at the base of the stopbank foundation.

The Engineer may instruct the placement of additional geo-grid along with or in place of undercut of unsuitable sub-grade.

Where fill is being placed on an existing gravel stopbank the surface shall be trimmed to remove all vegetation and organic material and the surface scarified to allow keying in of new fill material.

3.1.12 Geotextile

Geotextile fabric shall be placed at locations shown on the Drawings and identified in the Specification. Supply and place geotextiles in accordance with TNZ F/7.

Geotextile shall be Bidim A29 or equivalent non-woven, needle-punched fabric of synthetic polymer fibres in accordance with TNZ F/7.

Remove all sharp objects and large stones before placing geotextiles. Cut shrubs shall be flush with the ground surface.

Geotextiles shall be placed just ahead of associated advancing construction work and be covered by relevant construction materials or suitable protective sheeting within 48 hours of being placed and without punctures or tears.

Lap geotextile minimum of 500 mm at ends and edges.

No construction equipment shall stand or travel directly on the laid geotextile without the Engineer's approval. A minimum cover of 200 mm (uncompacted) of cover material shall be placed over the geotextile prior to construction equipment travelling over the area concerned.

The mechanical equipment used by the contractor shall be selected and operated so as not to result in rupture of the geotextile. Unless otherwise approved in writing by the Engineer, vibratory and heavy compaction plant shall not be used on the initial lifts of filling materials to avoid damage to geotextiles.

3.1.13 Geogrid

Geogrid shall be placed at locations shown on the Drawings and identified in the Specification. Supply and place geogrid in accordance with manufacturer's guidelines.

Geogrid shall be Tensar Triax 160 or Engineer approved equivalent.

The geogrid should be placed above the geotextile (so that the placed fill can interlock with the apertures of the geogrid).

The minimum overlap shall be 300 mm and the maximum normally required shall be 600 mm or as specified by the Engineer.

Overlaps must be secured and maintained during the filling operation. This is generally achieved by placing small heaps of granular fill locally over the overlaps ahead of the main filling operation.

Granular fill material shall be tipped into stockpiles on placed fill and not tipped directly onto the geogrid. The fill stockpiles shall be spread by mechanical plant which causes the aggregate to cascade onto the geogrid, such as an excavator bucket or dozer with an opening bucket.

Fill shall be spread in layers of not greater than 150 mm thickness.

Care shall be taken to avoid damage to the geogrid. No traffic or site plant shall be permitted to travel on the geogrid prior to covering it with a layer of granular fill.

3.1.14 Placing of Fill Material

The Contractor shall submit to the Engineer details of the proposed compaction methods, and details and capacities of the compacting equipment before filling commences. The compaction methods must be such as to achieve a uniform density throughout the fill as well as the required minimum density.

The base of the excavation shall be level, undisturbed and free of water.

The method of excavation, transport and depositing of fill material shall ensure the fill is as uniform a mixture as possible. The Contractor shall vary the path of transporting plant over the top of the compacted fill surface. The Contractor shall place fill in a systematic manner, with near horizontal layers of uniform thickness of material being deposited progressively across the full area of a fill. The uncompacted thickness of each layer shall be no greater than 200 mm loose thickness, and shall be limited to ensure that the bottom of each layer can be adequately compacted.

If, during or after placement, any material has become contaminated by topsoil or other unsuitable material from the passage of construction machinery, or by other means, the contaminated material shall be entirely removed and the Contractor shall not be entitled to any additional payment.

Fill batters steeper than 1 vertical to 3 horizontal shall be overfilled and subsequently trimmed to the design lines. This is required to ensure that the specified compaction standards are achieved over the full design embankment cross section.

If at any stage of the placing and compaction the Engineer is not satisfied with the compaction they may order the work in that area to cease until tests have been carried out to determine whether the specific compaction is being achieved.

Do not place, spread or compact fill during or immediately following wet weather, snow, when the ground is frozen or when tides or flood waters have covered the fill area. Where any interruption in the earthmoving operation has resulted in drying out or cutting up of previously compacted layers, rework these layers prior to placement of new fill by scarifying and recompacting to the specified density and moisture content.

If the moisture content is below optimum, or the existing surface is too dry or smooth to bond properly with the layer of material to be placed, it shall be moistened with a fine spray to reduce non-uniform distribution and worked with a harrow, scarifier or other suitable equipment, in an approved manner to a sufficient depth to provide a satisfactory bonding surface before the next layer is placed.

If the moisture content is above optimum, or is too wet for proper compaction and bonding to the underlying layer of material, it shall be removed, allowed to dry or worked with a harrow, scarifier or other suitable equipment to reduce the moisture content to the required level and

then re-compacted to provide a satisfactory bonding surface before the next layer of material is placed.

If the surface of a previously placed and compacted layer has been sealed or has been left for some time and has dried out or wetted up, the surface shall be treated by scarifying and watering or drying to the satisfaction of the Engineer.

Compact all fill to 95% of maximum dry density in accordance with NZS 4402.4.1.1.

3.1.15 Testing

Perform compaction testing using a Nuclear Density Gauge (NDG) of each layer of fill at a minimum frequency of 1 test for each 50 m^2 or a minimum of 1 test for each layer of fill for each 10 m length of stopbank. Refer also to clause 1.8.3.

3.1.16 Tolerances

Earthworks shall be finished to a reasonably smooth surface that conforms to the lines, grades and cross-sections shown on the Drawings or as directed by the Engineer.

Tolerance limits are as follows:

Crest levels:

- Minimum level: Design level as shown on the Drawings
- Maximum average level: Design level + 100 mm

Batters:

- No steeper than specified.

Crest width:

- + 200 mm – 0 mm

Topsoil thickness:

- + 25 mm – 0 mm

Base width:

- + 500 mm – 0 mm

3.1.17 Topsoiling and Grassing

Areas to be top-soiled shall be finished 100 mm below finished surface level so that after the topsoil is placed and has consolidated the finished surface level conforms to that specified.

Topsoil shall be placed on the batters and surfaces to a uniform depth of 100 mm (once consolidated) and areas, when finished, shall present smooth surfaces, free of stones, timber and lumps of soil, gradually blending into adjoining ground and left ready for grassing.

Topsoil shall not be placed until the Engineer has checked the lines and levels of the embankment and approved the bank.

Surfaces shall be grassed using Berm Mix in compliance with CSS Part 1 Clause 34.2 sown at a rate of 30 grams per square metre complying with CSS Part 7 Clause 13.3. Fertiliser shall be spread immediately prior to sowing by the application of a mixture of 3 parts sulphate of ammonia to 1 part superphosphate at the rate of 60 grams per square metre. Fertiliser shall be worked into the top surface of the topsoil.

Hydroseeding shall be carried out in compliance with CSS Part 7 and NZTA P39. The Contractor is to supply a hydroseed mix and application methodology to the Engineer for review and approval prior to application.

Inanga fish spawning reach

The Inanga fish spawning reach of the Avon River, which runs from approximately Breezes Road to 150 m downstream of the ANZAC Drive Bridge, is to have a special grassing treatment where topsoiling of the stopbank is required. Tall fescue grass seed (*Scheddonorus Arundinaceus*) is to be used in place of the standard Berm Mix on the river-side banks below an R.L. of 10.7 m. Sowing and preparation shall be as per the specification outlined above.

The Contractor is responsible for establishment of grass as set out in CSS part 7 Clause 13.7.

3.1.18 Mechanically Stabilised Earth (MSE) Stopbank

MSE Stopbank is to be Green Terramesh System as specified by Maccaferri with Biomac Grasstrike facing. Refer to the Drawings, for construction and installation details.

The Terramesh units shall be placed at the correct elevation and alignment as shown on the Drawings.

Prior to installing the assembled units, the foundation shall be prepared to the correct lines and grades. Surface irregularities, loose material, and vegetation shall be removed as part of the preparation of the foundation.

The Contractor shall test foundation as specified in 3.1.11 prior to placement of the assembled units.

Terramesh fill materials shall comply with 3.1.8(2) and topsoil shall comply with 3.1.7. Place and compact fill material as specified in 3.1.14. Backfill shall be placed up to 300 mm of the face in maximum 200 mm vertical lifts and compacted to 95% of maximum dry density in accordance with NZS 4402.4.1.1.

Topsoil shall be placed in a 100-200 mm thick layer on the outside section of the structure, behind the Green Terramesh and Biomac Grasstrike R300 face. Firmly compact topsoil by plate or small machine compactor. Overfill topsoil zone by 5% by height to allow for some local settlement topsoil.

Place 100 mm thick layer of topsoil on top of the upper Terramesh unit. Firmly compact topsoil by plate or small machine compactor to the design stopbank top level as shown on the Drawings. Lace together securely the top tie-back sections of the Terramesh units on each side of the MSE stopbank.

Hydoseed the sides and top of the MSE stopbank following construction.

3.2 Reinstatement

All surfaces shall be reinstated to the satisfaction of the Engineer and the requirements as set out in the CSS.

Finished surfaces shall conform with adjacent undisturbed surfaces and shall be smooth, compacted and free from irregularities.

4. Pipe laying

Pipe laying shall be carried out only by competent workers approved by the Engineer.

Pipe laying shall be in accordance with CSS Part 3 and the CCC approved materials list. Pipe materials and minimum pipe class is as shown on the Drawings and otherwise complying with the CCC Approved Materials List.

The following project specific clauses shall apply.

4.1 Redundant and abandoned services

Pipes to be abandoned shall be treated in accordance with CSS Part 3 Clause 5.3.

Pipes that cross under stopbanks that are to be abandoned and treated shall only be treated by filling. They shall be filled with a highly flowable fill or foam concrete with a minimum strength of 1.5 MPa and maximum strength of 3.0 MPa. A suitable construction methodology shall be provided to the Engineer for approval.

Abandoned pipelines not crossing under the stopbank shall be sealed with a concrete plug at all points where they are cut and at all structures. Concrete plugs shall have a minimum length which is the greater of 500 mm or the pipe diameter and be watertight.

Where specified on the Drawings, outfall pipes shall be removed for a minimum of 500 mm from the face of the embankment and sealed using a concrete plug.

5. Structures

This clause applies to all new sumps, manholes, inspection chambers, headwalls and any further concrete structures as specified in the Contract Works and Drawings, and where required to enable access to facilitate lining works as noted in Section 6.5.

Structures will be in accordance with CSS Part 3 Clause 12.0.

6. Pipe Lining

6.1 Scope

This section covers:

1. Technical Specification for the rehabilitation and repair of existing pipes and laterals using:
    - Cured in Place Pipe (CIPP) lining, which is cured either by ambient cure or by circulating hot water or introducing controlled steam within the tube
    - Lining with spiral-wound profile strip, with or without grouting
    - No Dig Spot Repair (NDSR) patching using CIPP
    - Lateral Junction Repair (LJR) patches
    - Folded PVC lining (for pipes DN375 and smaller only)
2. Deliverables
3. Testing and inspection

This Specification is based on the Specification for Pipe Lining prepared by SCIRT (Revision 9, November 2014).

This Specification does not apply to rehabilitation of pipes that are not circular.

Because of the risk of excessive wrinkling, bends over 45 degrees (in any direction) are not to be lined. A consequence of this restriction is that vertical lateral droppers are not to be lined.

6.2 Rehabilitation System Requirements

6.2.1 General

The installed rehabilitation system shall have a minimum service life of fifty years under the design conditions detailed in this Specification.

Liners are to be continuous and jointless from manhole to manhole and, for laterals (see Section 6.9), from the property boundary inspection point to the main or the top of the vertical dropper. Locks that connect profile strips in spiral wound liners are not considered to be joints for the purposes of this Specification clause.

6.2.2 Serviceability

The rehabilitation system is to be chemically and biologically resistant to internal exposure to sewage, sewage related gases, and mild concentrations of industrial effluent, for the service life of the lining. Chemical resistance shall include satisfactory performance in the presence of concentrations of carbon monoxide, carbon dioxide, methane, hydrogen sulphide, traces of mercaptans, gasoline, vegetable oil, petrol, kerosene, tap water (pH 5.5 – 9), saturation with moisture, detergent, soap, and dilute concentrations of sulphuric, nitric and phosphoric acid. Test procedures for determining the chemical-resistance properties of the liner and minimum chemical resistance standards are defined in Section X2 of ASTM F1216-09.

The rehabilitation system is not to be subject to shrinkage, thermal contraction, recovery or reversion, or loss of sealing at end terminations that may adversely affect the water tightness, strength or hydraulic performance of the lining following installation.

The material properties of the rehabilitation system are to remain stable within a range of temperatures from -10°C to +40°C.

The lining is to be resistant to external exposure to soil bacteria and any chemical attack that may be due to residues remaining on the pipe wall or materials in the surrounding ground.

The rehabilitation system is to be resistant to abrasion from the migration of silt, sand and debris along the pipe.

The rehabilitation system is to be sufficiently robust to withstand a minimum of twelve (12) pipeline cleaning operations a year using water jetting nozzles operating at up to 170 Bar, as may be required to remove blockages or debris accumulation in the pipeline.

6.2.3 Physical properties and characteristic of the finished liner

The thickness and physical properties of the installed liner are to meet or exceed those specified in the approved structural design.

The installed liner is not to reduce the internal diameter of the pipe by more than 10%. This permitted reduction is in addition to the reduction allowed for minor protrusions and deformations. For laterals, installation of the liner into a lateral is not to reduce the internal diameter of the pipe by more than 15%. This permitted reduction is inclusive of wrinkles, protrusions and deformations. In addition, following installation of the liner there must be no significant obstruction to flow through the pipe or any obstruction to the passage of cleaning or inspection equipment. This is particularly important for the lining of laterals.

The finished liner is to comply with the requirements outlined in Section 6.5.4(4).

6.3 Design

6.3.1 Structural Design

The Specialist Lining Contractor shall design the liner and shall be responsible for:

- selection of the particular rehabilitation technique to be used
- confirming the pipe and laterals are suitable for lining, i.e. that the host pipe can be prepared in accordance with Section 6.5.3 and the installed liner will meet the standard of finish requirements of Section 6.5.4(4).
- design of the liner
- determining the extent of works required to prepare the pipe prior to lining, and undertaking these works
- determining the installation methodology and installing the liner
- quality assurance
- preparation of as-built drawings

Design calculations are to be prepared in accordance with the following design cases. Design Cases 1 and 2 assume a fully deteriorated host pipe and are to be considered for all pipe diameters. Design Case 2 is applicable where the ground around the liner is subject to liquefaction.

Consider also Design Case 3 for a partially deteriorated host for pipes larger than DN375.

Select the liner that satisfies the more conservative of the design cases.

Design Case 1

Design the liner for the fully deteriorated condition in accordance with the following parameters:

- Soil density – 20 kN/m^3
- Soil Modulus – 2 MPa for pipes DN375 and smaller
  – 2 MPa or 4 MPa (Note: use a soil modulus of 4 MPa only with Spiral PVC Lining of pipe larger than DN375 and with the annulus between the liner and the host pipe grouted)
- Traffic loading – HN-HO-72 traffic loading
- Water table – at ground level
- Factors of Safety – at least 2
- Existing pipe ovality – 2%
- Liner properties – as specified in the relevant ASTM Standard (typically long-term properties)

Design Case 2

Design the liner for the fully deteriorated condition in accordance with the following parameters and select the liner that satisfies the more conservative of the two design cases.

- Soil density – 18 kN/m^3
- Soil Modulus – 0.5 MPa
- Traffic loading – Nil
- Water table – at ground level
- Factors of Safety – at least 2
- Existing pipe ovality – 2%
- Liner properties – short term properties

Design Case 3 (for pipes larger than DN375)

Design the liner for the partially deteriorated condition in accordance with the following parameters:

- Liquefied material – liquefied layer assumed to act as a fluid extending to the ground surface with density of 18 kN/m^3
- Factors of Safety – at least 4
- Existing pipe ovality – 2%
- Liner properties – short-term properties to be used

For the fully deteriorated condition, the liner is designed as a flexible pipe capable of supporting all imposed loads in its own right.

The design is to assume that there is no bond between the liner and the existing pipe.

Designs are to be in accordance with the relevant ASTM Standards.

6.3.2 Design Input Parameters – Material Properties

The material properties used in the design are to be consistent with the composition of the lining material utilised in the rehabilitation. Test certificates issued by IANZ-accredited laboratories or recognised test laboratories for tests conducted on comparable samples taken from previous installations are to be provided to justify the material properties nominated.

Where material properties under load vary with time, use the material properties of the lining at the end of the fifty-year service life in the design calculations. The exception to this is design of the lining for loads applied only during installation, which may be based on short-term material properties.

The two-year values for ring-bending stiffness of the lining, as determined by long-term testing, may be used as representative values for the fifty-year buried pipe stiffness.

If testing has not been carried out, assume the long-term material properties are 50% of the short- term values except for epoxy liners, where assume that the long-term material properties are 33% of the short-term values.

6.3.3 Design Calculations

The Contractor shall provide design calculations to demonstrate the adequacy of the liner.

Provide design calculations in sufficient detail to allow for the calculation to be checked and verified.

Each calculation is to be complete, showing the following details:

- Definition of terms used in the calculation
- All input data values
- References to test results to justify material properties
- All units of measurement and conversion factors, where applicable
- Calculation formulae, with references to the equation numbers or relevant clauses given in the standard
- Details of any proposed deviation from the design standard

6.4 Lateral Replacement

Further to Clause 11.0, CSS Part 3 – Utility Drainage, if a wastewater main is being renewed (by dig-and-lay or lining) also renew the wastewater lateral from the inspection point (usually just on the private property side of the true boundary) to the main unless there is sound reason not to (e.g. it is constructed of plastic materials, it has been installed in recent years and is in good order).

Where a lateral is to be lined and the connection to the main is by way of a vertical dropper, do not line the vertical dropper. If damaged, the vertical dropper is to be replaced.

Where no inspection point is found within 1 m inside of the private property boundary, install a new inspection point at approximately 600 mm, but not greater than 1 m, inside the private property boundary.

Within the project area there may be multiple live connections to an individual property.

For properties that have been, or are to be demolished, provide one lateral connection at the property boundary and where a property is accessible from multiple street frontages (i.e. corner section) provide an on-line capped junction on the additional street frontages outside the property.

6.5 Lining Process

6.5.1 General

Personnel are not to enter the pipe at any stage either before, after or during the lining process. Select the rehabilitation system to be installed and, with the Specialist Lining Contractor, establish a methodology that will ensure that the finished liner complies with the requirements of this specification.

Measure the dimensions of the pipeline to be lined and inspect the pipeline to establish the extent of preparation works required.

If either the dimensions of the pipeline or the scope of works identified on site differ from what is shown on the drawings obtain the advice of the Engineer.

6.5.2 Lining Sequence

The works are to generally be carried out in accordance with the following sequence of works:

- Clean and inspect the existing pipe
- Confirm the dimensions and condition of the pipe, and its suitability for lining
- Identify all live and dead laterals and confirm which laterals connections are to be reopened after lining
- Install and test flow management, if required
- Remove all material likely to cause protrusions in the finished line. All roots, fat and loose debris that may damage or weaken the finished liner are to be removed
- CCTV survey cleaned pipe and log location of laterals and faults if patch repair only is required
- Install patches if necessary
- Install pre-liner, if necessary, to meet site-specific installation conditions
- Install liner
- Undertake air test
- Re-open live laterals
- Install lateral junction repairs on all lateral connections, unless stated otherwise in Section 6.10. This can be done either before or after the laterals are lined.
- Line laterals (if required)
- CCTV survey main pipe and laterals on completion of lining

6.5.3 Pre-Installation Activities

(1) General

Have the Specialist Lining Contractor confirm the suitability of each pipeline section for lining, and assess the preparation works required, prior to starting preparation of the pipeline for lining.

(2) Determination of Liner Size

Measure the dimensions of the host pipe. View the existing CCTV inspection to identify variances in diameter along the pipeline, e.g. those due to earthquake damage, corrosion and

deformation. Undertake this prior to the lining material being ordered. Keep a record of the location and sizes of any variances in diameter and any protrusions and deformations.

Size the liner to the minimum and maximum dimensions of the host pipe. Make allowance, where appropriate, for longitudinal and circumferential stretching of the liner during installation, so that a neat fit is achieved in the host pipe, without an excessively long tail of liner material in the receiving manhole.

(3) Cleaning & Preparation of Pipeline

Clean the pipeline immediately prior to lining. Remove all internal debris, loose material and obstructions. All roots, other than small hairline roots, are to be removed.

For main lines, remove protrusions and deformations that reduce the diameter of the host pipe by percentages in excess of the values indicated in Table 1 below. The permitted reduction in diameter is exclusive of liner thickness and the thickness of the LJR where one is installed.

Table 1 Maximum Values for Protrusions and Deformations for Main

Host pipe original diameter	Maximum reduction in diameter
≤ 500 mm	10%
500 mm and above	5%

For laterals, remove protrusions and deformations that will result in the overall reduction of diameter exceeding that permitted in Section 6.2.3.

For both mains and laterals, also remove any other protrusions or sharp edged obstructions that may obstruct the liner installation, or cause damage to the liner during or after installation.

Rectify, prior to installation, any other conditions that may prevent the proper installation of the liner or affect the quality of the finished liner, such as collapsed sections, offset joints, running infiltration etc. Note these works on the as-built drawings. The rectification might involve:

- Localised repairs to sections of the host pipe
- Installing local no-dig spot repairs (NDSRs) to stabilise defects in specific locations
- Installing a pre-liner to restrict circumferential stretching of the liner, and/or to smooth transitions at displaced joints

Complete a CCTV inspection to confirm that the pipe has been properly prepared. Retain a copy of the CCTV inspection and log sheet which should identify all protrusions and deformations.

Determine and record on the as-built drawings the location, orientation and status (live/dead) of all lateral connections.

(4) Flow Management

Install flow management that is adequate to ensure that service through the system is maintained, including that the properties will not experience any backflow, whilst the pipe is being prepared and the liner is being installed. Ensure that there is enough suitable equipment to allow for breakdowns or equipment outages.

Lateral connections may be plugged only after reasonable notification has been given to the affected residents and may not remain plugged overnight. Reasonable notice is considered to be receipt of a notification letter at least three working days prior.

6.5.4 Installation

(1) General

Wherever possible, use existing manholes as launch and reception points. Obtain the agreement of the Engineer prior to the installation of any new manholes, or removal or modification of any existing manholes.

Carry out CCTV inspection immediately prior to installation to check if any debris or contamination has entered the pipeline or the host pipe has changed since it was last inspected. Rectify any issues before the liner is installed.

Carry out installation in accordance with the methodology and quality assurance processes defined in the submitted methodology.

(2) Discharge of Cure Process Water

Do not release curing water into the stormwater system. It is to be tankered away for disposal or released into the wastewater system.

Curing water released into the wastewater system is to be below 40°C. The quantity of styrene in the discharged water is not to exceed 25 ppm.

(3) Manholes and Reconnection of Existing Services

After lining, ensure that liners are flush with manhole and chamber inside walls or as flush as practically possible. Seal all end terminations at manholes and chambers with a suitable grade of epoxy mortar to prevent infiltration. The epoxy mortar material is to be compatible with the liner materials and the host pipe, and is to have a service life matching the liner. Smooth the transition between the manhole or chamber entry or exit and the liner end to minimise any level differences or other irregularities that may cause debris, silt, rags, and similar materials to accumulate.

On the day of the lining, open all live lateral connections and any others specified by the Designer. For pipes DN375 and smaller open by robotic means. For pipes of larger diameter, opening laterals robotically is preferred; alternatively, laterals may be opened by digging down and opening the lateral from the outside of the pipe, carrying out the opening and reconnection of the lateral. Do not reopen dead or blank laterals, unless specified otherwise.

The opening cut in the liner at the lateral connection is to be flush with the inner surface of the lateral pipe. The cutting tool is to leave a smooth, bevelled edge free of any protrusions that may inhibit flow or catch solid material. Do not damage the existing lateral during the reopening.

Install Lateral Junction Repairs (LJR) at opened lateral connections unless specified otherwise (refer Section 6.10).

(4) Standard of Finish

The installed liner is to be a close fit against the host pipe along the whole length.

The finished liner is to be free of all defects that affect hydraulic performance or structural adequacy. This is to include defects arising from substandard materials, faulty or inaccurate manufacture, inadequate pipe preparation, faulty installation or workmanship, or inadequate curing.

6.5.5 Post-installation Testing, Inspections and Deliverables

(1) Leak Testing

Test all main pipes DN600 and smaller for leaks before the lateral connections are reopened. The test is to be in accordance with CSS: Part 3 – Utility Drainage.

In the case of CIPP liners, this test may be substituted by a leakage test during the cooling phase of the cure process.

(2) Post-lining CCTV

Undertake a post-lining CCTV inspection of all liners in mainlines and laterals (including DN100 laterals) once all works have been completed. The CCTV inspection is to be in accordance with CSS: Part 3 – Utility Drainage and the Christchurch City Council Specification: CCTV for Christchurch City Council Earthquake Recovery.

During the CCTV inspection, plug or divert base flows so that there is no flow coming from the upstream manhole. Flows from live laterals into the pipe being surveyed should result in a flow in the pipe no more than 10 mm deep so that the full circumference of the pipe is visible.

Where CCTV does not capture the completed connection at a manhole or chamber, photographic evidence that clearly shows the sealing of the end termination is acceptable.

(3) Quality Assurance

Have the completed liner assessed by a person experienced in the quality assurance of pipe rehabilitation to confirm that the installed liner meets the requirements of this Specification. It is expected that this review will be completed within one week of the work being completed. This assessment will involve a review of the following items (as a minimum):

- Pre- and post-lining CCTV footage and log sheets
- Photographs of completed laterals at the boundary inspection points
- Quality assurance check sheets
- Material data sheets for all materials used in the lining process
- Records/notes of visual inspections
- Marked up drawings to show the as-built works
- Sampling and certificates of test results
- Details of any remedial works undertaken

Submit the quality assurance documentation and CCTV to the Engineer for review.

6.5.6 Defects

The following are considered to be unacceptable:

- Liner installed over debris
- Liner installed over unacceptable protrusions or deformations in the host pipe
- Under-strength finished liner materials – short term flexural strength or modulus is less than the respective design value declared in the methodology
- Defective joints e.g. popped lock in spiral wound lining

- Excessive annular gap between liner and host pipe – annular gap results in the physical properties of the installed liner not meeting those used in the structural design of the liner (diameter, ovality), or leakage, or deformation that could trap debris
- Foreign inclusions
- Leakage observed through the liner
- Leak test does not comply with requirements of this Specification
- Inadequate material curing – soft spots visible in CCTV, test results indicate that short term flexural strength or modulus is less than the respective design value declared in the methodology
- Inadequate resin impregnation – soft spots visible in CCTV, test results indicate that short term flexural strength or modulus is less than the respective design value declared in the methodology
- Dry spots, bubbles, cracks or de-laminations – none permitted in liner material. Debonding of the internal coating on CIPP liners is acceptable, but this should be minimised
- Pinholes
- Poor quality cut outs
- Inadequate seals at manholes
- Liner thickness less than specified design value (refer to specific requirements for CIPP liners)
- Annular grout, if required to be used, does not fill annular space
- Excessive wrinkling of the liner. The extent of wrinkling is to be kept to a minimum.
- Excessive wrinkling is defined as:
    - For pipes DN375 and smaller:
        - Wrinkling > 5% of the nominal diameter of pipe
        - Any wrinkling that significantly obstructs flow through the pipe or obstructs the passage of cleaning or inspection equipment
    - For pipes larger than DN375
        - Wrinkling > 20 mm

The following features may indicate the presence of defects. If present, investigate to determine if a defect is present.

- Irregularity in liner, e.g. reduction in diameter, bulge or protrusion. This could be an indication of unacceptable preparation of the host pipe, inadequate material curing or inadequate resin impregnation.
- Excessive resin loss during installation, e.g. excessive resin slugs in laterals. This could be an indication that the liner thickness is less than the specified design value.
- Excessive annular gap. This could be an indication of incorrect liner sizing, inadequate material curing or inadequate resin impregnation.

6.6 CIPP Lining

6.6.1 Codes and Standards

Carry out installation in accordance with:

ASTM F-1216-09	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F1743-08	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

6.6.2 Rehabilitation System Requirements

(1) Liner Fabric

The liner material is to be capable of stretching to fit irregular pipe sections and negotiate bends. The liner tube is to be fabricated to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. Allowance is to be made for circumferential stretching during inversion.

The minimum wall thickness of the installed liner is to comply with the following, as well as the minimum thickness required to meet design loading requirements:

- DN100 pipelines 3.0 mm
- DN150 pipelines 4.0 mm
- DN225 or larger pipelines 6.0 mm

(2) Pre-liner

Install a pre-liner if there is significant infiltration into the pipeline that could wash out the liner resin before it is cured. The pre-liner is to have sufficient strength to withstand the hydrostatic and mechanical forces imposed on it prior to and during the installation of both the pre-liner and liner.

6.6.3 Monitoring During Installation

Install thermocouples at the top and bottom of each liner at the entry and receiving manholes, and at intermediate manholes, and continuously monitor them during curing and cool down. The thermocouples are to gauge the temperature of the incoming and outgoing water supply and the temperature at various points on the surface of the liner. Record temperature.

Temperatures monitored during the curing period and cool down periods are to meet the requirements of the resin manufacturer as noted in the Lining Contractors Methodology.

6.6.4 Testing and Inspections

Take and retain samples from each installation shot. Cut samples from a section of liner that has been installed through a like section of pipe, e.g. through a mould installed in an intermediate manhole. For liners in pipes larger than 300 mm diameter, plate samples for testing may be prepared by suspending sections cut from the impregnated liner in the curing water, such that they are cured in the same manner as the liner.

Test samples from each installation. Have the samples tested by an IANZ-accredited laboratory, in accordance with F1216-09, to determine the following properties:

- Liner thickness – to comply with F1216-09 Clause 8.6

- Short term flexural strength and modulus are not to be less than the respective design value declared in the Methodology

6.7 Spiral Lining

6.7.1 Codes and Standards

Carry out installation in accordance with:

ASTM F1697-09	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Strip for Machine Spiral-Wound Liner Pipe Rehabilitation of Existing Sewers and Conduit
ASTM F1741-08	Standard Practice for Installation of Machine Spiral-Wound Poly (Vinyl Chloride) (PVC) Liner Pipe Rehabilitation of Existing Sewers and Conduit

6.7.2 Rehabilitation System Requirements (Pipes Larger Than DN375)

Typically, grouting of the annulus between the liner and the host pipe will not be required. In some cases grouting may be required to satisfy structural design requirements.

6.7.3 Design for Pipes Larger Than DN375

For Design Case 1, if the annulus is grouted use a soil modulus of 4 MPa. If the annulus is not grouted use a soil modulus of 2 MPa.

For Design Case 3, if the annulus is grouted use an enhancement factor ‘K’ value of 7. If the annulus is not grouted use a ‘K’ value of 4.

6.7.4 Installation

(1) Liner Installation

The liner is to fit neatly inside the host pipe, with the liner generally being in contact with the host pipe.

(2) End Terminations at Manholes and Chambers

Seal the annulus between the line and the host pipe at manholes and chambers by application of epoxy prior to expansion of the liner. For pipes DN375 and smaller the length of annulus sealed with epoxy is to be a minimum of 200 mm. For larger pipes the length of annulus sealed with epoxy is to be a minimum of 500 mm.

(3) Grouting for Pipes Larger than DN375

Undertake grouting annulus between the liner and the host pipe, where required, in accordance with F1741 – 08. The application methodology is to ensure that the grout fills the annular space around the liner.

6.7.5 Testing and Inspections

Retain a sample of the profile from each liner section and record the batch number of the profile.

If grouting is undertaken (on pipes larger than DN375), sample and test in accordance with F1741–08.

6.8 Folded PVC Pipe (For Pipes DN375 and Smaller Only)

6.8.1 Codes and Standards

Carry out design and installation in accordance with:

ASTM F1504-10	Standard Specification for Folded Poly (Vinyl Chloride)(PVC) Pipe for Existing Sewer and Conduit Rehabilitation
ASTM F1947-10	Standard Practice for Installation of Folded Poly (Vinyl Chloride) (PVC) Pipe into Existing Sewers and Conduit

6.8.2 Materials

The materials compromising the folded PVC lining system are to comply with ASTM F1504-10.

6.8.3 Liner Installation

Seal or otherwise control running/gushing infiltration. Undertake measures so that water is not running in through laterals during installation.

The cool down process is to take account of the ambient temperature and ensure that the liner is not excessively stressed, particularly on cold days.

The liner is to fit neatly inside the host pipe, with the liner being in contact with the host pipe.

After the liner has been inserted into the host pipe, relieve any stress imparted to the liner during the insertion in a manner proscribed in the manufacturer's installation instructions.

After the formed pipe has cooled down, trim the terminating ends to a minimum of 75 mm beyond the existing pipe as an allowance for possible shrinkage during cooling to ground temperature. Once all shrinkage has taken place, the ends of the liner are to be trimmed flush with the manhole walls and the ends sealed with epoxy mortar to prevent infiltration.

6.8.4 Testing and Inspections

Prepare a rounded pipe sample from each liner section in accordance with Section 10 of ASTM F1504-10. Retain the sample and record the batch number of the liner. Test each sample in accordance with Section 11 of ASTM F1504-10.

6.9 Lateral Lining

Lateral liners are to be continuous and jointless from the property boundary inspection point to the main or the top of a vertical dropper. Vertical droppers are not to be lined. Where no boundary inspection point is found within 1 m inside of the private property boundary, install a new inspection point at approximately 600 mm, but not greater than 1 m, inside the private property boundary.

Where there is a vertical dropper to the main, check that the vertical section of lateral has not dropped into the main, that CCTV inspection shows that the vertical section appears to be in good order and that the connection at the top of the vertical section is not broken. If these conditions are not met, replace the vertical dropper.

Line laterals with CIPP lining in accordance with this Specification with the following additional requirements:

- The rehabilitation system is to use a resin that has low susceptibility to shrinkage and provides a bond between the liner and the host pipe, demonstrated by the fact that there is to be no visible annulus gap between the liner and host pipe. Polyester resins are not suitable as they will not satisfy these requirements.

- The fabric used for the lateral liner is to be flexible enough to mould to the host pipe, such that the liner can be installed through tight radius bends and lateral, providing a smooth finish, with minimal wrinkling or thinning of the liner.
- The fabric tube is to be flexible, without wrinkling.
- The installation method utilised is to enable the liner to be installed as a “blind shot” with access from one end only.
- The lateral liner is to overlap the lateral junction repair, if one is to be installed, by at least 100 mm, except where a vertical dropper is not lined.
- If there is no LJR installed, the downstream end of the installed liner is to be within 100 mm of the connection with the mainline. If the liner extends into the mainline then it is to be trimmed back flush. Where the liner terminates at a vertical dropper, the liner is to terminate at least 100 mm past the connection joint.
- Take and retains samples from each installation. Test each sample in accordance with Section 6.6.4.

On completion of the lining of a lateral, take photographs of the completed lining at the property boundary inspection point prior to backfilling.

6.10 Laterals Junction Repairs

Achieve sealing of lateral connections by installing a short-form cured-in-place liner. Use the following process:

- Insert a resin impregnated junction liner within the existing pipeline to the junction position with the lateral.
- Force the resin impregnated junction liner against the host pipe.
- Cure the resin impregnated liner in place, thereby joining the cured liner to the existing adjacent lateral pipeline, and sealing the installed liner at lateral openings.

Lateral Junction Repairs (LJR) are to be comprised of either:

- A short tee that bonds to the full circumference of the main pipe liner or host pipe, and the lateral pipe; or
- A ’Top Hat‘, consisting of a tube that seals to the lateral pipeline and a ’brim‘ that seals to the liner or host pipe around the lateral opening

The LJR is to extend up the lateral pipe to at least 50 mm past the first joint. If the lateral is to be lined, then the lateral lining is to overlap the LJR by 100 mm.

The LJR is to be made of a resin that has low susceptibility to shrinkage and provides a bond between the LJR and the host pipe or liner, demonstrated by the fact that there is to be no visible annulus gap around the installed LJR. Polyester resins are not suitable as they will not satisfy these requirements.

The fabric used for the LJR is to be flexible enough to mould to the host pipe and lateral, providing a smooth finish, with minimal wrinkles.

6.11 Patch Repairs

Form patches from sections of CIPP lining in accordance with this Specification with the following additional requirements:

- Patches are to have a minimum length of 1200 mm and are to extend a minimum of 400 mm either side of the fault being repaired

- Patches are to be made using a resin that has low susceptibility to shrinkage and provides a bond between the patch and either the host pipe or liner that the patch is installed within, demonstrated be the fact that there is to be no visible annulus gap around the installed patch. Polyester resins are not suitable as they will not satisfy these requirements.
- If glass reinforcement is used in the patch, then the glass is to be resistant to exposure to sewage, sewage related gases, and mild concentrations of industrial effluent, for the service life of the lining.

For patches Section 6.6.4 Testing and Inspections does not apply.

7. Roading and Footpaths

Roading, footpaths, kerb and channel and paved surfaces shall be constructed in accordance with Christchurch City Council Construction Standard Specification (CSS) part 6 unless indicated otherwise on the drawings.

Appendices

Appendix A – Drawings

- Refer to drawings attached

Appendix B – Consents

- Consent between Swanns Road and Evans Avenue is attached
- Consent between Evans Avenue and South of Bridge Street

17 March 2017

Christchurch City Council
Attn To: Bob Mohammed
PO Box 73014
Orchard Road
Christchurch 8154

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Dear Sir/Madam

Notice of Resource Consent Decision
Record Number(s): CRC173549
Applicant Name: Christchurch City Council
Activity Description: To discharge construction phase stormwater to land and surface water associated with the repair, upgrade and construction of temporary stopbanks.
Decision: Granted

Decision

The decision of Environment Canterbury is to grant your application on the terms and conditions specified in the attached resource consent document. The reasons for the decision are:

1. The activity will achieve the purpose of the Act.

Commencement of consent

Your resource consent commences from the date of this letter advising you of the decision.
If you object to or appeal this decision, the commencement date will then be the date on which the decision on the appeal is determined.

Lapsing of consent

This resource consent will lapse if the activity is not established or used before the lapse date specified on your consent document. Application may be made under Section 125 of the Resource Management Act 1991 to extend this period.

Your rights of objection and appeal

- **Objection to Decision**
  If you do not agree with the decision of the consent authority, you may object to the whole or any part in accordance with Section 357A(1)(g) of the Resource Management Act 1991 (RMA). Notice of any objection must be in writing and lodged with Environment Canterbury **within 15 working days** of receipt of this decision in accordance with Section 357C(1) of the RMA.

- **Right to Appeal**
  You may appeal the decision of the consent authority to the Environment Court in accordance with section 12 of the RMA. , The notice of appeal must be lodged with the Court within 15 working days of receipt of this decision, at PO Box 2069, Christchurch. A copy of the appeal should also be forwarded to Environment Canterbury within the same timeframe.

If you are in any doubt about the correct procedures, you should seek legal advice.

- **Objection to Costs**
  Section 357B of the RMA allows you to object to costs. Your objection must be received **within 15 working days** of the date on which you receive your invoice. Your objection must be in writing and should clearly explain the reasons for your objection as detailed in section 357C of the RMA.

Monitoring of conditions

It is important that all conditions of consent are complied with, and that the consent holder continues to comply with all conditions, to ensure that the activity remains lawfully established.
You can find online Information regarding the monitoring of your consent at www.ecan.govt.nz/monitoringconsent.pdf.

Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.

Further information about your consent

For some activities a report is prepared, with officer recommendations, to provide information to the decision makers. If you require a copy of the report please contact our Customer Services section. You can find online information about your consent document at www.ecan.govt.nz/yourconsent.pdf.

Queries

For all queries please contact Customer Services Section quoting your CRC number noted above.

Thank you for helping us make Canterbury a great place to live

Yours sincerely

Consents Planning Section

cc:
GHD Limited, Christchurch
Attn To: Bill Harrington
PO Box 13468
Armagh
Christchurch 8141

RESOURCE CONSENT CRC173549

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO:	Christchurch City Council
A DISCHARGE PERMIT (S15):	To discharge construction phase stormwater to land and surface water associated with the repair, upgrade and construction of temporary stopbanks.
COMMENCEMENT DATE:	17 Mar 2017
EXPIRY DATE:	17 Mar 2022
LOCATION:	Avon River margins from Swanns Road to Evans Avenue, Christchurch

SUBJECT TO THE FOLLOWING CONDITIONS:

LIMITS

1 The discharge shall be only construction phase stormwater generated from exposed areas to land and surface water associated with the temporary stop bank repair and upgrade works required on the banks adjacent to the Avon River between Swanns Road and Evans Avenue, as shown on Plan CRC173549A, attached to and forming part of this resource consent.

2 During construction all practicable measures shall be undertaken to minimise discharge of sediment-laden stormwater into the Avon River and beyond the boundaries of the site.

3 The discharge into the Avon River shall not at any time result in:

a. The production of floatable or suspended materials; or

b. A change in visual clarity (as measured by a clarity tube) of more than 20 percent in the Avon River.

PRIOR TO COMMENCING DISCHARGES

4 Prior to the commencement of works the consent holder shall ensure that all personnel working on the site are made aware of and have access to the contents of this consent document and all associated erosion and sediment control plans and methodology.

5 The Canterbury Regional Council shall be notified no less than 48 hours prior to the commencement of works.

EROSION AND SEDIMENT CONTROL

6 The discharges during the construction phase of the development shall occur in accordance with the Erosion and Sediment Control Plan (ESCP):

a. The ESCP shall detail the sediment control measures that will be taken to ensure compliance with this consent; and

b. The ESCP shall be prepared in accordance with Environment Canterbury's "Erosion and Sediment Control Guidelines for the Canterbury Region" Report No. CRC R06/23, February 2007 (ESGC).

7 The ESCP shall include, but not be limited to

a. A map showing the location of all works;

b. Detailed plans showing the location of sediment control measures, on-site catchment boundaries, and sources of runoff;

c. Drawings and specifications of designated sediment control measures including a silt fence and floating boom in the Avon River adjacent to the work site;

d. A programme of works, which includes but is not limited to, a proposed timeframe for the works;

e. Inspection and maintenance of the sediment control measures;

f. Sampling procedures and protocols;

g. Defined discharge points where stormwater leaves the site;

h. The description of dust mitigation to be used and details of best practicable options to be applied to mitigate dust and sediment discharge beyond the site boundary;

i. The methodology for stabilising the site if works are abandoned; and

j. The methodology for stabilising the site and decommissioning erosion and sediment control measures after works have been completed.

8 The ESCP shall be submitted to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, at least ten working days prior to construction commencing, for certification that it complies with Environment Canterbury's Erosion and Sediment Control Guidelines for the Canterbury Region and the conditions of this consent.

a. The discharge shall not commence until the consent holder has received the certification from the Canterbury Regional Council that it consistent with the ESCG and the conditions of this consent.

b. Notwithstanding Condition (8)(a) if the consent holder has not received the certification within ten working days of the Regional Leader - Monitoring and Compliance receiving the ESCP, the discharge may commence.

9 The ESCP may be amended at any time. Any amendments shall be:

a. Only for the purpose of improving the efficacy of the erosion and sediment control measures and shall not result in reduced discharge quality; and
b. Consistent with the conditions of this resource consent; and
c. Submitted in writing to the Canterbury Regional Council, Attention: Regional Leader - Monitoring and Compliance, prior to any amendment being implemented.
d. The applicant shall apply best practice and all practicable measures to mitigate dust and sediment transport off-site.

SPILLS

10 All practicable measures shall be undertaken to prevent oil and fuel leaks from vehicles and machinery, including but not limited to:

a. Not storing fuel or refuelling of vehicles within 20 metres of the bed of the Avon River and excavated areas;

b. Vehicles and machinery shall not enter flowing water; and

c. Storing fuel securely or removed them from sites overnight.

11 All practicable measures shall be taken to avoid spills of fuel or any other hazardous substances within the site. In the event of a spill of fuel or any other hazardous substance, the consent holder shall:

a. Clean up the spill as soon as practicable, inspect and clean the spill area, and take measures to prevent a recurrence;

b. Inform the Canterbury Regional Council's Regional Leader - Monitoring and Compliance 24 hours of a spill event and provide the following information:

i. The date, time, location and estimated volume of the spill.

ii. The cause of the spill;

iii. The type of hazardous substance(s) spilled;

iv. Clean up procedure undertaken including evidence of appropriate disposal;

v. Details of the steps taken to control and remediate the effects of the spill on the receiving environment.

vi. An assessment of any potential effects of the spill; and

vii. Measures to be undertaken to prevent a recurrence.

ADMINISTRATION

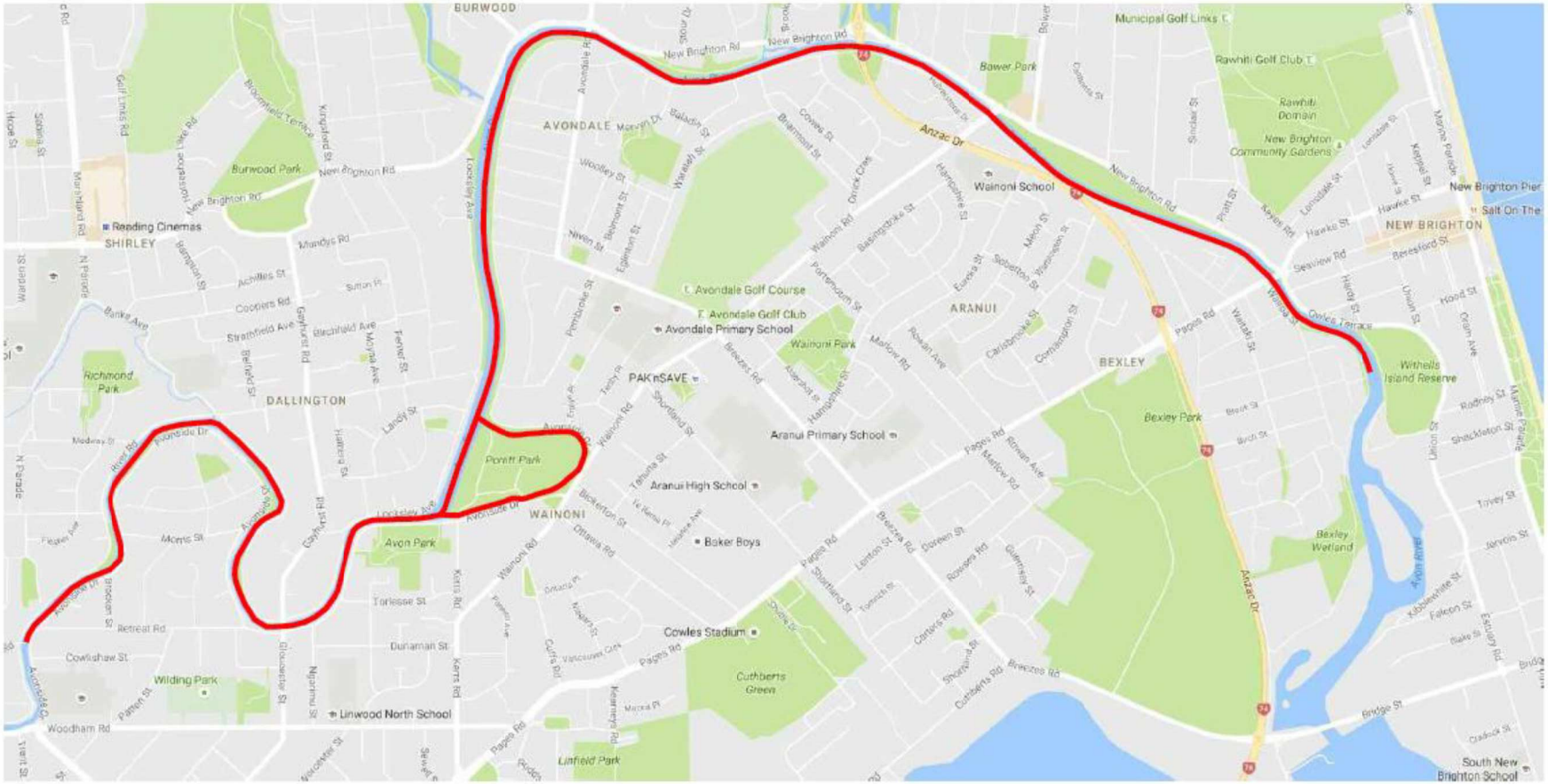
12 The Canterbury Regional Council may annually, on the last five working days of May or November, serve notice of its intention to review the conditions of this consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of this consent; or

b. Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

Issued at Christchurch on 17 March 2017

Canterbury Regional Council



Plan CRC173549A

Exercising of resource consent CRC173549

It is important that you notify Environment Canterbury when you first start using your consent.

GRANTED TO:	Christchurch City Council
A DISCHARGE PERMIT (S15):	To discharge construction phase stormwater to land and surface water associated with the repair, upgrade and construction of temporary stopbanks.
LOCATION:	Avon River margins from Swanns Road to Evans Avenue, Christchurch

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Even if the consent is replacing a previous consent for the same activity, you need to complete and return this page.

Providing this information will:

- Validate your consent through to its expiry date
- Minimise compliance monitoring charges
- Help provide an accurate picture of the state of the environment.

If consent CRC173549 is not used before 17 Mar 2022 this consent will lapse and no longer be valid.

Declaration:

I have started using this resource consent.

Action taken: (e.g. pasture irrigated, discharge from septic tank/boiler/spray booth etc).

_____

Approximate start date (***Note: this may be different to the date the consent was granted):***: _____

Signed: _____ **Date:** _____

Full name of person signing (please print)**:** _____

Please return to:

Environmental Protection - Administration
Environment Canterbury
PO Box 345
Christchurch 8140

File: CRC173549

17 March 2017

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Christchurch City Council
Attn To: Bob Mohammed
PO Box 73014
Orchard Road
Christchurch 8154

Dear Sir/Madam

Notice of Resource Consent Decision
Record Number(s): CRC173551
Applicant Name: Christchurch City Council
Activity Description: To undertake earthworks within the Avon River riparian margins.
Decision: Granted

Decision

The decision of Environment Canterbury is to grant your application on the terms and conditions specified in the attached resource consent document. The reasons for the decision are:

1. The activity will achieve the purpose of the Act.

Commencement of consent

Your resource consent commences from the date of this letter advising you of the decision.
If you object to or appeal this decision, the commencement date will then be the date on which the decision on the appeal is determined.

Lapsing of consent

This resource consent will lapse if the activity is not established or used before the lapse date specified on your consent document. Application may be made under Section 125 of the Resource Management Act 1991 to extend this period.

Your rights of objection and appeal

- **Objection to Decision**
  If you do not agree with the decision of the consent authority, you may object to the whole or any part in accordance with Section 357A(1)(g) of the Resource Management Act 1991 (RMA). Notice of any objection must be in writing and lodged with Environment Canterbury **within 15 working days** of receipt of this decision in accordance with Section 357C(1) of the RMA.

- **Right to Appeal**
  You may appeal the decision of the consent authority to the Environment Court in accordance with section 12 of the RMA. , The notice of appeal must be lodged with the Court within 15 working days of receipt of this decision, at PO Box 2069, Christchurch. A copy of the appeal should also be forwarded to Environment Canterbury within the same timeframe.

If you are in any doubt about the correct procedures, you should seek legal advice.

- **Objection to Costs**
  Section 357B of the RMA allows you to object to costs. Your objection must be received **within 15 working days** of the date on which you receive your invoice. Your objection must be in writing and should clearly explain the reasons for your objection as detailed in section 357C of the RMA.

Monitoring of conditions

It is important that all conditions of consent are complied with, and that the consent holder continues to comply with all conditions, to ensure that the activity remains lawfully established.
You can find online Information regarding the monitoring of your consent at www.ecan.govt.nz/monitoringconsent.pdf.

Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.

Further information about your consent

For some activities a report is prepared, with officer recommendations, to provide information to the decision makers. If you require a copy of the report please contact our Customer Services section. You can find online information about your consent document at www.ecan.govt.nz/yourconsent.pdf.

Queries

For all queries please contact Customer Services Section quoting your CRC number noted above.

Thank you for helping us make Canterbury a great place to live

Yours sincerely

Consents Planning Section

cc:
GHD Limited, Christchurch
Attn To: Bill Harrington
PO Box 13468
Armagh
Christchurch 8141

RESOURCE CONSENT CRC173551

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO:	Christchurch City Council
A LAND USE CONSENT (S9):	To undertake earthworks within the Avon River riparian margins.
COMMENCEMENT DATE:	17 Mar 2017
EXPIRY DATE:	17 Mar 2022
LOCATION:	Avon River margins from Swanns Road to Evans Avenue, Christchurch

SUBJECT TO THE FOLLOWING CONDITIONS:

LIMITS

1 The landuse shall be limited to the excavation of land within 50 metres of the Avon River associated with the temporary stopbank repair and upgrade works required on the banks adjacent to the Avon River between Swanns Road and Evans Avenue, as shown on Plan CRC173551A, attached to and forming part of this resource consent.

Advice Note: This resource consent does not authorise the take of groundwater for the purpose of dewatering.

2 Excavation and disturbance of land authorised by this consent shall not exceed a maximum depth of 1 metre below ground level.

3 No excavation works shall be undertaken on the banks of the Avon River labelled as 'Inanga Spawning Habitats' on Plan CRC173250B, attached to and forming part of this resource consent, during the Inanga spawning period between 1 March and 1 June inclusive unless the area has been surveyed by a suitably qualified ecologist and the survey results show there is unsuitable habitat for inanga spawning or the proposed works pose minimal risk to inanga spawning.

4 If groundwater is encountered during excavation, all excavations at the site shall cease until such time as groundwater recedes. If groundwater does not recede naturally after 48 hours, the excavation shall be backfilled with clean gravels.

5 The consent holder shall adopt the best practicable options to minimise soil disturbance, the discharge of dust and sediment transport offsite.

6 All waste material shall be removed from the site on completion of works.

7 Any excavated material removed off-site shall be disposed of at a facility authorised to receive such material.

PRIOR TO COMMENCING LANDUSE

8 The Consent Holder shall inform the Canterbury Regional Council, Attention: Regional Leader – Monitoring and Compliance, at least ten working days prior to the commencement of works under this consent.

9 Prior to commencing works, a copy of this resource consent shall be given to all persons undertaking activities authorised by this consent.

a. Details of the steps taken to control and remediate the effects of the spill on the receiving environment.

b. An assessment of any potential effects of the spill; and

c. Measures to be undertaken to prevent a recurrence.

ACCDIENTIAL DISCOVERY OF CONTAMINATED SOIL

10 In the event that contaminated soil is detected (by sight or odour) during site works, all works within 10 metres of the potentially contaminated soil or material shall cease immediately. Work must not recommence until a Suitably Qualified and Experienced Practitioner (SQEP) has assessed the contamination and advised of the appropriate remediation and/or disposal options for these soils.

11 The Canterbury Regional Council, Attention Contaminated Sites Manager, shall be notified within 24 hours of the discovery of potentially contaminated soil as described in Condition (20). All records and documentation associated with the discovery, remediation, and any material disposal shall be kept and copies shall be provided to the Canterbury Regional Council on request.

SPILLS

12 All practicable measures shall be undertaken to prevent oil and fuel leaks from vehicles and machinery, including but not limited to:

a. Not storing fuel or refuelling of vehicles within 20 metres of the bed of the Avon River and excavated areas;

b. Vehicles and machinery shall not enter flowing water; and

c. Storing fuel securely or removed them from sites overnight.

13 All practicable measures shall be taken to avoid spills of fuel or any other hazardous substances within the site. In the event of a spill of fuel or any other hazardous substance, the consent holder shall:

a. Clean up the spill as soon as practicable, inspect and clean the spill area, and take measures to prevent a recurrence;

b. Inform the Canterbury Regional Council's Regional Leader - Monitoring and Compliance 24 hours of a spill event and provide the following information:

i. The date, time, location and estimated volume of the spill;

ii. The cause of the spill;

iii. The type of hazardous substance(s) spilled;

iv. Clean up procedure undertaken including evidence of appropriate disposal;

v. Details of the steps taken to control and remediate the effects of the spill on the receiving environment;

vi. An assessment of any potential effects of the spill; and

vii. Measures to be undertaken to prevent a recurrence.

ADMINISTRATION

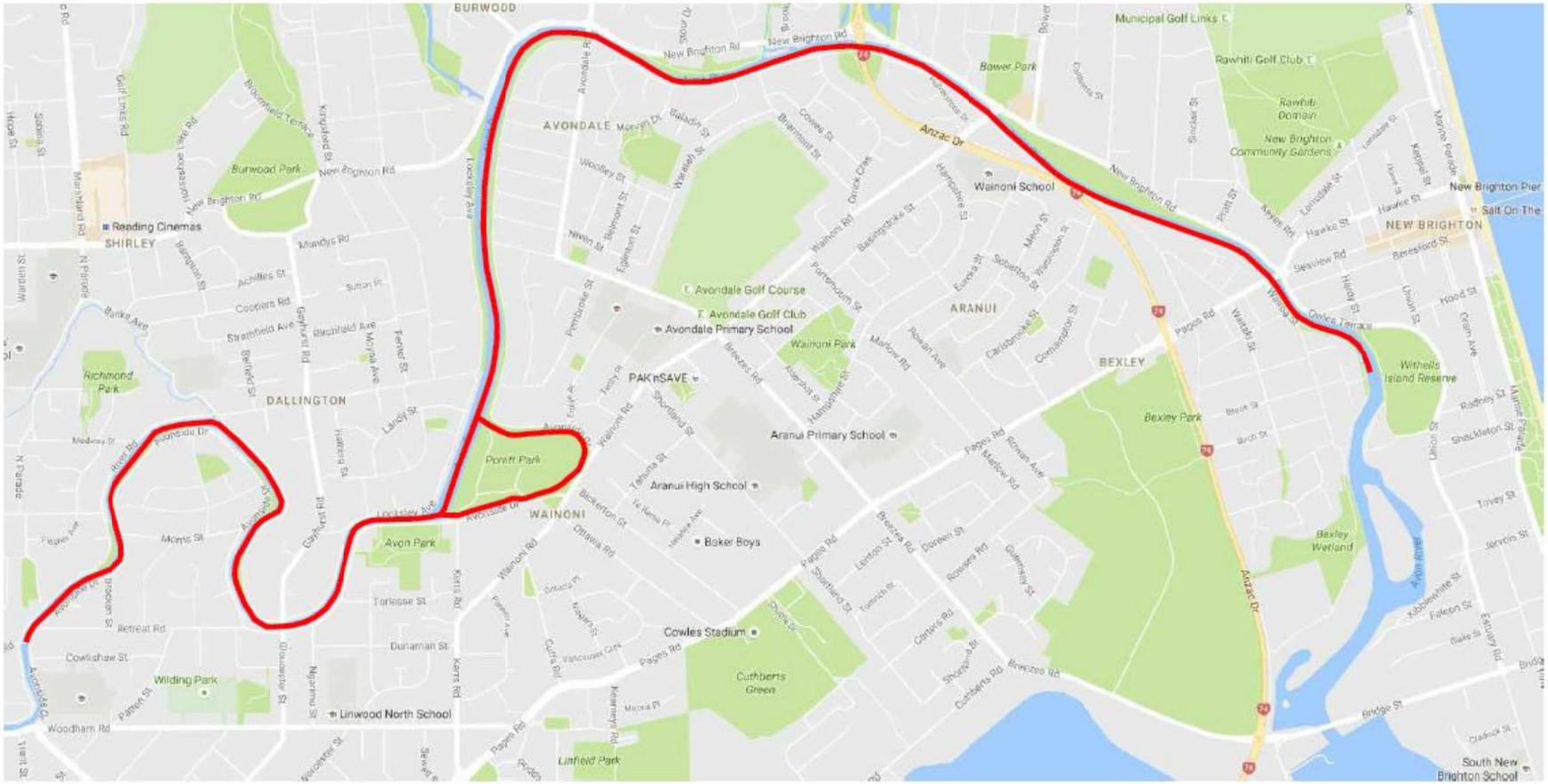
14 The Canterbury Regional Council may annually on the last five working days of May or November each year, serve notice of its intention to review the conditions of this resource consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of this onset and which it is appropriate to deal with at a later stage; or

b. Requiring the consent holder to carry out monitoring and reporting instead of, or in addition to, that required by the consent.

Issued at Christchurch on 17 March 2017

Canterbury Regional Council



Plan CRC173551A

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

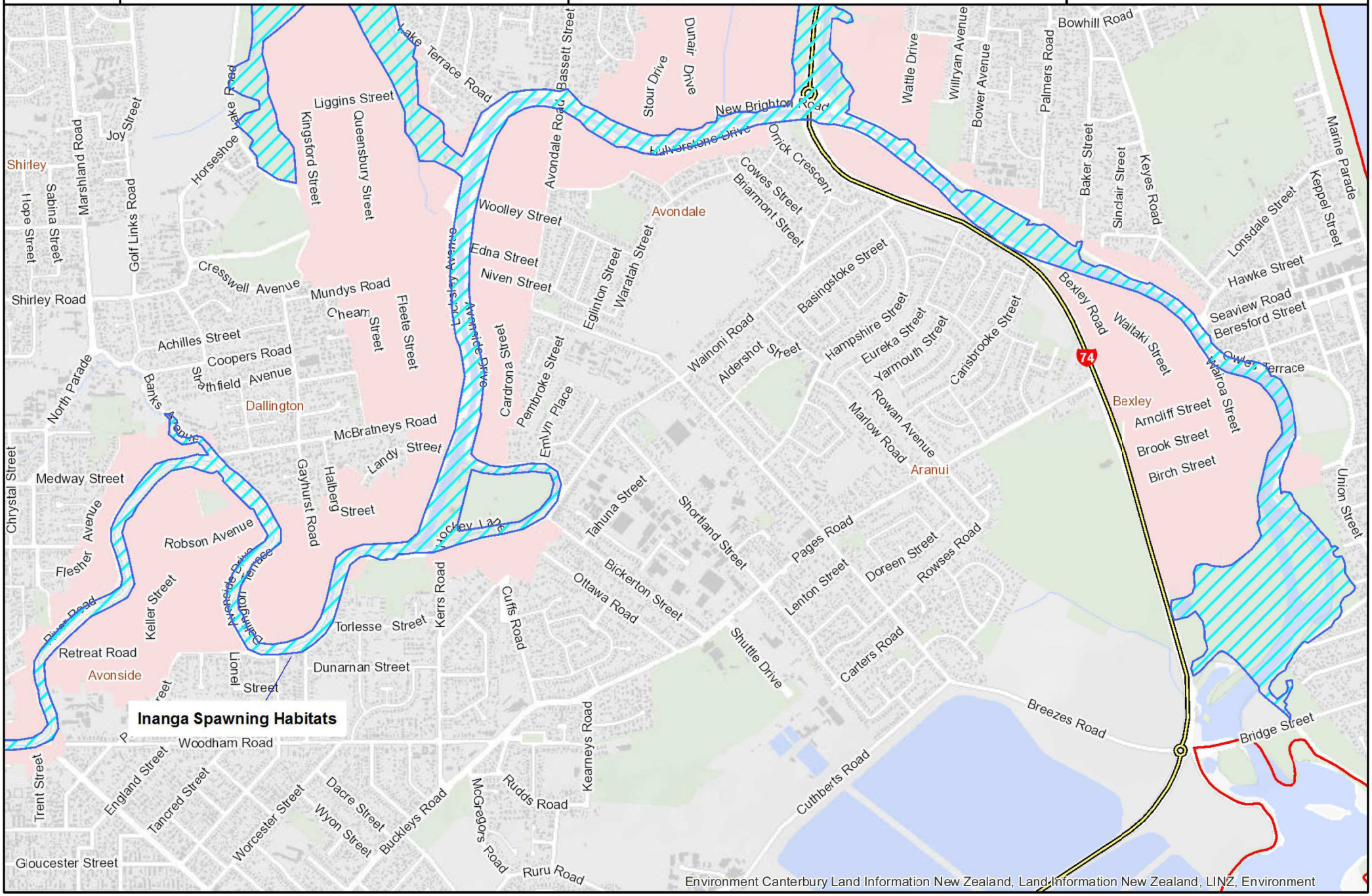
Plan CRC173551B

N

0 0.2 0.4 0.6 0.8 Kilometres

Scale: 1:20,000 @A4

Map Created by Environment Canterbury on 3/02/2017



Exercising of resource consent CRC173551

It is important that you notify Environment Canterbury when you first start using your consent.

GRANTED TO:	Christchurch City Council
A LAND USE CONSENT (S9):	To undertake earthworks within the Avon River riparian margins.
LOCATION:	Avon River margins from Swanns Road to Evans Avenue, Christchurch

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Even if the consent is replacing a previous consent for the same activity, you need to complete and return this page.

Providing this information will:

- Validate your consent through to its expiry date
- Minimise compliance monitoring charges
- Help provide an accurate picture of the state of the environment.

If consent CRC173551 is not used before 17 Mar 2022 this consent will lapse and no longer be valid.

Declaration:

I have started using this resource consent.

Action taken: (e.g. pasture irrigated, discharge from septic tank/boiler/spray booth etc).

_____

Approximate start date (***Note: this may be different to the date the consent was granted):***: _____

Signed: _____ **Date:** _____

Full name of person signing (please print)**:** _____

Please return to:

Environmental Protection - Administration
Environment Canterbury
PO Box 345
Christchurch 8140

File: CRC173551

Resource Management Act 1991

Christchurch City Council

Report / Decision on a Non-notified Resource Consent Application

(Sections 95A, 95B, 104 / 104C & 133a)

Application Number:	**RMA/2016/3454**
Applicant:	**Christchurch City Council**
Site address:	**Avon River banks (both sides) between Swanns Road & Evans Ave**
Legal Description:	**Various**
Zoning:	**Christchurch District Plan: Specific Purpose Flat Land Recovery Zone, Open Space Natural Zone & Open Space Water and Margins.**
Overlays and map notations:	Avon River Significant Landscape overlay, High Flood Hazard Management Area, Natural Hazards Overlays-Flood Hazard & Fixed Floor Level
Activity Status:	**Christchurch District Plan:** Non-complying
Description of Application:	**To construct, repair and upgrade stop banks**

Introduction- Section 133a- minor variation to approved application

Council granted resource consent for this activity on the 4th May 2016. The decision was made by an independent Commissioner Mr David Mountfort on behalf of Council's subcommittee. On the 9th May Council received a request from the applicants' consultant to provide clarification on several of the conditions of consent. Subsequently, following discussions between Council staff and the applicants' consultant, the consultant requested that 2 of the approved conditions be deleted and 2 conditions be revised. Council has agreed to vary conditions 8 and 28 of the approved consent and to delete conditions 17 and 21 under Section 133a of the Resource Management Act 1991. Section 133a allows Council to consider the issuing of an amended consent that corrects minor mistakes or defects in the consent.

Condition 8 of the Councils issued decision requires that prior to (any) earthworks commencing the applicant is to provide an acceptance certificate to Council that certifies that all of the approved erosion and sediment control measures (approved under condition 7) are in place.

As written the applicant has suggested that to comply with condition 8, the approved erosion and sediment control measures would need to be installed along the full length of the Avon River where work is to occur on the stopbanks at the same time. The total length of the proposed working area is 5.58 km. If installed in this manner, the applicant would it be at some considerable cost in time and money, with in my opinion little or no benefit on the environment overall. As the applicant intends to schedule the work at different locations over the coming months, it would be much more practical and financially prudent to install the approved erosion and sediment control measures when and where required.

The suggested rewording for condition 8 is:

The erosion and sediment control measures contained in the ESCP required by Condition 7 shall be put in place/constructed prior to commencement of each area of works.

In my opinion the revised wording will achieve the same environmental result i.e. sedimentation entering the Avon River. Installing the sediment control measures where and when required rather than along the entire site length not only reduce cost to the applicant but should reduce the overall duration of the works program. In addition I believe installing the control measures at each area of work will ensure the measures are appropriate for the different situations that the contractors are likely encounter at each working area.

Condition 28 of the decision as issued requires that a suitably qualified and approved archaeologist and a member of Ngai Tuahuriri be onsite at all times during the undertaking of any excavation to monitor earthworks.

The applicant has requested that the condition be reworded so that the member of Ngai Tuahuriri is only required to be onsite to monitor earthworks that are being undertaken on undisturbed ground rather than being onsite at all times any earthworks are to occur. As the works involve almost continuous 'excavations' the member of Ngai Tuahuriri would be required onsite virtually continuously. The applicant has raised a potential issue with this aspect of the condition as it is unclear if scheduled excavations could proceed without the member of Ngai Tuahuriri being on site due to sickness or other commitments. If required to be on site at all times and presuming that unless that person is, then site works would need to be delayed until the member was available. This could therefore extend the duration of the works which may delay the ability of the stopbank system to achieve the anticipated level of flood protection when required.

The applicant has also highlighted that the only excavations of undisturbed ground that are proposed are for the construction of the 2 new sections of stopbanks which are around Pump Station 205 (located at 205 New Brighton Road) & alongside the southern edge of Porritt Park. All of the other excavations are associated with all of the existing stopbanks which are not considered to be undisturbed ground. The proposed excavations associated with the existing stopbanks typically involve reshaping the material that forms the existing stopbank (aggregate / topsoil) or adding more aggregate / topsoil to the stopbank so that an overall the stopbanks have a consistent height and contour.

In order to remove this uncertain and provide clarity, the applicant has suggested that condition 28 be revised to read as:

A suitably qualified and approved archaeologist and a member of Ngai Tuahuriri be onsite at all times during the undertaking of any excavation in undisturbed ground.

I have reviewed the information provided and agree with the proposed revised text. I also note that at the time the application was processed the emergency authority had not been approved by Heritage New Zealand Pouhere Taonga. This has now been approved and a copy provided to Council. The emergency authority also requires the authority holder comply with several conditions which include ensuring that any earthworks that may affect any archaeological site be monitored by an archaeologist approved by Heritage New Zealand and that if any archaeological work is undertaken, this work must conform with any Maori protocols as per the statement provided by Te Ngai Tuahuriri Runanga which accompanied the application.

In my opinion the revised text to condition 28 will not change the purpose of the consent condition. Any earthworks that involve the disturbance of undisturbed ground will still require the presence of a member of Ngai Tuahuriri, however when the excavations do not involve ground that has not been disturbed that member is not required to be on site. If the ground has been disturbed previously as is the case with all of the existing stopbanks (including the ground immediately under the stopbank) it is very unlikely that there are still undisturbed archaeological sites. Even if in the unlikely event that an archaeological site is disturbed, the consent holder and contractor is required to cease work immediately and contact the approved archaeologist (as required by the emergency order & condition 29 of this consent).

In addition to the two changes already discussed, the applicant has also requested that approved conditions 17 and 21 be deleted.

Condition 17 requires that only one 10 metre section of the stopbank be worked at any one time.

The applicant has suggested that while the application did indicate that the work schedule would be restricted to specific sections of stopbank at any one time, the reference to a 10 metre section of stopbank was only noted in regard to the installation of the new stop bank along the southern edge of Porritt Park. On further analysis of the application documentation I can confirm that although not entirely clear, the text does appear to support the applicants position and I therefore accept that condition 17 can be deleted from the approved conditions of consent.

I do not believe that this change in the consent conditions will cause any new adverse effects or increase the level of effects that this condition sought to manage. The applicant has already stated that the proposed earthworks associated with the installation of the new stopbank alongside Porritt Park will be undertaken in 10 metres sections only. As this location is also directly opposite occupied residential dwellings, I consider this appropriate as may contribute to the mitigation of amenity effects associated with the proposed works. It is also noted however that the applicant is still required to ensure that noise and dust levels are appropriately managed so that Council's compliance staff are not contacted to investigate possible breaches to the Christchurch District Plan performance levels.

The applicant has also requested that condition 21 of the issued consent be deleted. Condition 21 stated:

No works are to undertaken within the banks of the Avon River.

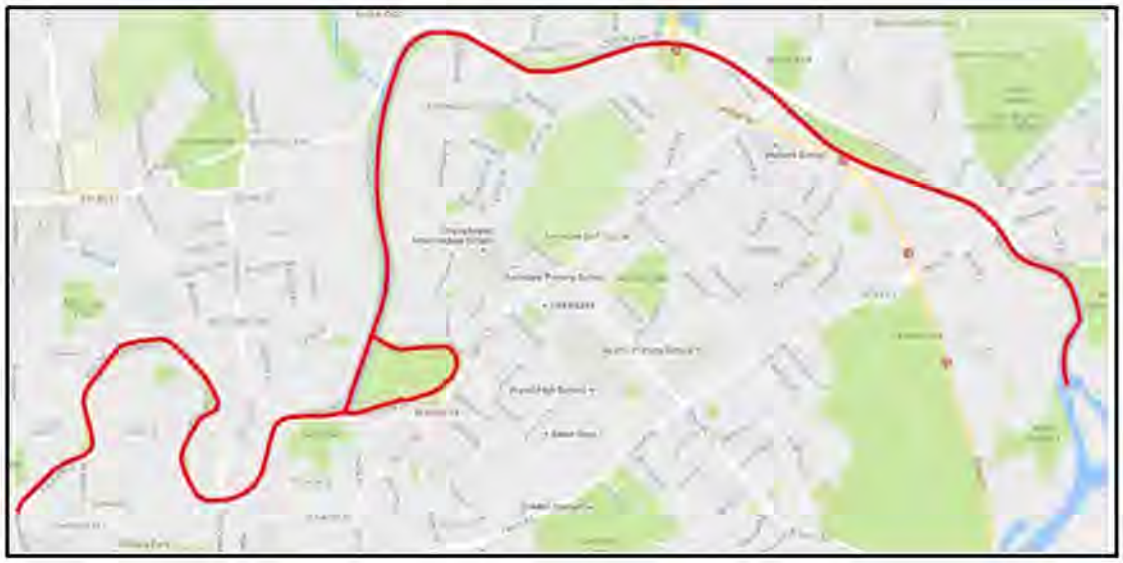
The applicant has highlighted that as the works program involves working on the stopbanks which are located on the banks of the Avon River, this condition is unworkable. What the condition was attempting to convey was that there was to be no earthworks undertaken within that part of the river where water is conveyed i.e the river itself.

The applicant's application report confirms that there is no intention or need for the proposed earthworks to extend into the Avon River where water is conveyed therefore the applicant suggests that the condition or a revised condition clarifying what the condition was intending to convey is not required.

On further analysis I agree with the applicant's suggestion and can confirm that I support the deletion of condition 21 and recorded in the original decision.

Introduction- RMA/2016/3454

The applicant seeks approval to undertake the construction of, the repair, and upgrade to the stop banks that are located on both sides of the Avon River between Swanns Road – Avonside and Evans Avenue – New Brighton. The plan below shows the location of the proposed stopbank works.



The stopbanks alongside the Avon River have been in place for many years. The majority of the Avon River margins comprise grassed banks that are interspersed with established trees. Since the earthquakes, minimal maintenance of these areas have occurred, resulting in a generally scruffy appearance with grass and other vegetation become scrappy and overgrown.

During the recent earthquakes, sections of the stopbanks became damaged and needed urgent repairs to ensure their overall effectiveness to manage the risk of flooding posed by the Avon River. While these works were undertaken, there was some variation to overall stopbank levels and to the quality of the design.

The purpose of this application is ensure that all of the stopbank(s) (as identified in this application) are to a consistent height and design that will ensure that the stopbanks are able to provide flood protection from the 1 in 50 year (2% AEP) flood event combined with a high tide.

This will be achieved by undertaking some repairs, some upgrading, and in some cases constructing new sections of stopbank that previously did not exist. Overall, the maximum lifespan of the stopbank is 20 years once this work is complete.

The total length of the repair, the upgrade and the new stopbanks is approximately 5500 metres for the true right bank and some 3080 metres for the works on the true left bank of the Avon River. The proposed construction methodology is to undertake the earthworks in approximately 10 metres sections at one time.

Once the main earthworks construction phase has been completed the stopbanks will be topsoiled and hyrdoseeded with grass as soon as is practical.

Approximately 16,500m3 of earthworks (1500m3 cut and 15,000m3 fill) are to take place over a period of 6 months duration.

The applicant has identified a sensitive ecological area that is used by Inanga for spawning. This occurs alongside the banks of the Avon River and is shown on a plan supplied (appendix B). The spawning area is located from the intersection of Anzac Drive in the east to Breezes Road to the west and occur on both sides of the Avon River (true left and true right banks).

The applicant has indicated that to reduce the potential impacts on these spawning areas, there will be no work on the stopbanks that adjoin this area during the Inanga's spawning period which has been stated as occurring between the months of January to May inclusive. All proposed works that are to be covered by this consent are only to occur in this identified area between the months of June and October inclusively. In addition this spawning habitat will be enhanced by allowing the rank grass to grow on the respective banks.

While the applicant has not provided a comprehensive erosion and sediment control plan, they have indicated that appropriate erosion and sediment controls will be established and installed in accordance with the Canterbury Regional guidelines. These controls will include the installation of silt fencing as well as using a floating boom on the river adjacent the work site.

In addition, to manage the potential for dust being generated and becoming a nuisance to residential property owners during dry weather, the contractors will be using water sprinklers to dampen the bare soils until the hydroseeding process has been carried out and the potential for dust generation is no longer an issue.

Spill kits will also be on site and available at all times. Daily checks of the machinery being used on site will be carried out to minimise the potential risk of accidental discharges of contaminants from these vehicles which if not managed appropriately could adversely affect water quality and ecology in the Avon River.

Construction traffic to and from the work site will comprise of the contractors' personal vehicles and trucks. The trucks will deliver and reassign the earthworks machinery and will also deliver new clean fill and removing any excavated fill that is not required to be used on site.

While large sections of the roading network that provide access to the stopbanks are within the red zone where there is no public use, and therefore minimal impact on the existing transport networks, there are still some sections of the roading network that are fully operational that do boarder the stopbanks that need to be repaired. Submitted photos suggest that there is little or no buffer in some locations where stopbank works are to occur between where the stopbank finishes and the formed carriageway of the road begins. These sections will require careful traffic managed to ensure that public safety is retained.

While the applicant has not prepared a traffic management plan, they have indicated that a temporary traffic management plan will be prepared for the sections of roadway that are fully operational and boarder the proposed stopbank work areas.

As noted earlier, while the majority of the proposed works on the stopbanks are either repair works or upgrades, there is to be two new sections of stopbanks constructed.

One new section is to be constructed around Pump Station 205 which is located at 205 New Brighton Road. The pump station controls stormwater from the Horse Shoe Lake Reserve. The total length of this new section is approximately 180m and will consist of a low earth bund. Final design details have yet to been confirmed.

The second section of new bund is to be located along the eastern section of Porritt Park and beside Avonside Drive. Approximately 140 metres of new stopbank is proposed and will sit directly opposite no's 902 – 916 Avonside Drive (7 residential properties). The stopbank will comprise a Terramesh basket of some 0.7m in height and some 1.5m in width at the base.

As part of the project, approximately 200 trees will need to be removed. Of this number, 50 are already dead. The final number and locations of these trees are currently being finalised with the City Arborist. The tree removal process will be undertaken using an existing resource consent (RMA92019127 – Vegetation removal and disturbance of non-heritage trees). Where trees can be retained, concrete block walls will be installed to protect the trunk of the tree and to ensure long term survival. Once the works have been completed, tree planting will be undertaken by the City Arborist in consultation with local community boards.

No works are proposed in the bed of the Avon River or the Coastal Marine Area (CMA). However, the applicant has also indicated that while unlikely, if the proposed earthworks do involve the excavation and or filling within the bed of the Avon River or the Coastal Marine Area and the disturbance of contaminated soils, global resource consent RMA92020520 will be relied upon as appropriate approval for this proposal.

Temporary stopbanks south of Evans Avenue around the Avon Heathcote Estuary and within the CMA are currently being designed and will be the subject of a separate application.

Given the historical human association with the Avon River and its margins an archaeological appraisal and archaeological authority application have been prepared for this proposal and has lodged with Heritage New Zealand. This application and the associated Cultural Values Statement (prepared in consultation with Ngāi Tahu) indicate that there are several archaeological sites located in the vicinity of the proposed works, and therefore there is potential to discover other sites during the earthworks.

To ensure that if any new archaeological sites are discovered and are appropriate managed, the applicant has indicated that a qualified archaeologist and a member of Ngai Tuahuriri will be available to monitor the earthworks at all times.

In addition to this consent application, the applicant has also lodged resource consent applications with the Canterbury Regional Council for other activities that are administered by the Canterbury Regional Council.

Planning Framework

The operative Christchurch City Plan and the Banks Peninsula District Plan are under review. The Independent Hearings Panel has made a number of decisions on specific parts of the Proposed Replacement District Plan, including the residential, natural hazards and transport chapters. These rules have legal effect pursuant to section 86B of the Resource Management Act, and treated as operative pursuant to section 86F of the Act. The rules applicable to this proposal have been assessed and the breaches are identified below. Relevant objectives and policies are discussion in a later section of this report.

Christchurch Replacement District Plans

The proposed stopbank earthworks are to be undertaken on both sides of the Avon River and are to extend from Swanns Road – Avonside and Evans Avenue – New Brighton.

The majority of the stopbanks are located on land that is zoned **Specific Purpose Flat Land Recovery Zone**.

This zoning provides for the:

maintenance, repair, relocation and removal of flood protection and bank erosion protection works undertaken or authorised by the Crown, the Regional Council or Christchurch City Council is a permitted activity under Rule 21.11.4.1.1. (P10) with no activity specific standards.

Therefore all of the proposed repair activities to the existing stopbanks are a **permitted activity within the Specific Purpose Flat Land Recovery Zone.**

The proposed new stopbank on Porritt Park that is to be located alongside Avon Side Drive is also located on land zoned Specific Purpose Flat Land Recovery and is also a permitted activity under Rule 21.11.4.1.1 (P9) provided that the stopbank are located outside a site of ecological significance, outstanding or significant landscape or feature, and area of outstanding or high natural character. The proposed stopbank is not located in any of these areas and is therefore also a **permitted activity** within the Specific Purpose Flat Land Recovery Zone.

There are also two locations where stopbank works (repairs/replace/or new) are located on land that is not zoned Specific Purpose Flat Land recovery. These are:

(a) The land on which the proposed new stopbank around Pump Station 205 stopbank is located is zoned **Open Space Natural Zone** (Horseshoe Lake Reserve).

(b) The land between Owles Terrace and Evans Avenue is zoned **Open Space Water and Margins.**

With regard to the proposed new stopbank that is to be constructed to protect pump station 205, that is located on land zoned **Open Space Natural Zone** (Chapter 18), the activity is considered to be a **controlled activity** under **Rule 18.5.2.2 (C1).** The rule states:

> *New Buildings and structures (including stopbanks) for the purpose of flood and /or bank erosion mitigation and or protection, where undertaken by the Council, Canterbury Regional Council or the Crown.*

Comment: The proposal is considered to comply with these requirements as the works are to be undertaken by the Council and are required for flood mitigation.

The proposed repairs to the stopbank within the **Open Space Water & Margins Zone**, that is located between Owles Terrance and Evens Avenue, is also considered to be permitted under Rule 18.6.2.1 (P22) with no activity specific standards. Rule 18.6.2.1 P22 states:

Maintenance and upgrade of existing flood and/or bank erosion mitigation and protection works, where undertaken by the Council, Canterbury Regional Council or the Crown.

Comment: The proposal is considered to comply with these requirements as the works are to be undertaken by the Council and are required for flood mitigation.

In addition to the three zones **Open Space Water & Margins Zone, Open Space Natural Zone & Specific Purpose Flat Land Recovery Zone** that the stopbanks footprint is located in, much of the stopbank footprint is also subject to the following overlays:

- Avon River **Significant Landscape Area Overlay** (SL 8.1).
- Avon River **Site of Ecological Significance** (SES/LP/24).
- **Fixed Minimum Floor Level Overlay within Flood Management Area** (FMA).
- **High Flood Hazard Management Area.**

The proposal has therefore been assessed against these overlays of the Christchurch District Plan and does not comply with the following:

- **Chapter 5-Natural Hazards- Flood Hazard- Activities and earthworks in the Flood Management Area (as shown on the Planning Maps) : Restricted Discretionary**
  Rule 5.5.1.5 (RD2):
  Filling or excavation which is not a permitted activity under P10, P11, P12, or P17 set out in Rule 5.5.1.1 or filling or excavation that exceeds the standards in P13-P15 set out in Rule 5.5.1.1 exceeds the standards in P13-P15 set out in Rule 5.5.1.1.

- **Comment:** The proposed filling or excavation required for the new stopbanks is not a permitted activity under the list of permitted activities (P10, P11, P12, P14, P15, P16 & P 17) and also will exceed the maximum height and the maximum volume of fill as set out under the activity specific standards for P13 (filling or excavation in other zones- Table 5.5.1.1b) rule 5.5.1.1.(max height of fill 0.3m and excavation 0.6m and max volume 10m3 per site or 25m3 per site in a continuous 10 year period).

  (a) Council's discretion is limited to the following matters:
  (i) Timing, location, scale and nature of earthworks,
  (ii) earthworks method and,
  (iii) mitigation of effects as they impact flooding and surface drainage.

  (b) These restricted discretionary activities will be assessed against the following criteria:

  (i)Whether any effects arise from filling or excavation on land stability, flooding, waterways, groundwater and natural ground levels on and/or off site, including:

  A. any likelihood of exacerbation of flooding, erosion, or siltation either upstream or downstream of the site.

B. any likelihood of affecting the stability of adjoining land, including its susceptibility to subsidence or erosion.
C. any adverse effects on other properties from disturbances to surface drainage patterns.
D. effects on flood storage capacity and function in the immediate area, and any wider effects on the flood storage in the catchment including any compensatory storage proposed; and any effects on existing stormwater and flood protection works.
E. any implications for groundwater and the water table, on or off site.
F. any benefits associated with flood management.

(ii) Whether there are any benefits arising that enable the reasonable use of the site.

(iii) Whether any mitigation measures are proposed, their effectiveness and whether, and to what extent there is a transfer of adverse effects to other properties.

- **Chapter 5-Natural Hazards- Flood Hazard- Activities in the High Flood Hazard Management Areas (as shown on the Planning maps) : Non Complying:**
  Rule 5.5.6.3 (NC2): *New buildings within a High Flood Hazard Management Area shown on the Planning Maps, unless specified in P1, P6 or P8 in Rule 5.5.6.1, or RD2 in Rule 5.5.6.2.*

  Comment: The proposed "new buildings" (stopbanks) that are to be constructed within the high flood hazard management areas are not a permitted activity or a restricted discretionary activity and are therefore considered to be a non-complying activity.

  Note: the Christchurch District Plan does not provide a definition of a "stopbank" or "structure" therefore the stopbank has been defined as a **building** in this application which is defined in the Christchurch District Plan to include :*any structure or part of a structure whether permanent, movable or immovable.*

- **Chapter 9- Natural and Cultural Heritage- Landscapes and Natural Character-9.2.5- Landscape overlays- significant features and rural amenity landscapes: Significant feature 8.1 and 8.3 Otakaro/Avon River, rule 9.2.5.1(a)** *: any building, except as listed below or specified as "Z" below with the noted significant feature is a* ***discretionary activity.***

- **Comment:** The proposed stopbanks are not listed nor are they specified as "Z" and are therefore considered to be a discretionary activity under this rule.

  Overall, the proposal is considered a **non-complying activity**.

Earthworks rules

The proposal has also been considered against the earthworks requirements of the Christchurch District Plan (CDP). Specifically, Chapter 8 – Subdivision, Development and Earthworks contains the rules concerning earthworks (8.5A).

The proposed earthworks are considered to be hazard mitigation and protection works, and are exempt under the exemptions listed in Rule 8.5A.3 (v.) Exemptions. No resource consent is therefore required for the proposed earthworks.

It is also acknowledged that the Christchurch City Council also holds a global resource consent which is considered applicable to these works. This global consent (RMA92020520) provides for earthworks within waterway setbacks and the disturbance of potentially contaminated soils.

Avon River- Site of Ecological Significance

As noted the Avon River also fall within the Site of Ecological Significance (SES/LP/24) overlay. While there is no description for this site, (refer Appendix 9.1.6.1 Schedule A), this site closely matches the Significant Landscape Overlay on the planning maps, and is therefore assumed to also include both the water and the margins of the Avon River.

The stopbank repair works are therefore located within these overlays, while the new stopbanks at Porritt Park and Pump Station 205 are outside these overlays.

The Avon River Site of Ecological Significance contains rules relating to vegetation clearance only i.e. there are no rules relating to stopbank/building construction and repair.

Indigenous vegetation clearance in a site of ecological significance listed in Schedule A of Appendix 9.1.6.1 that is not permitted under Rule 9.1.4.1(P1) is a non-complying activity under Rule 9.1.4.4(NC1).

However, there is an exemption for flood protection and drainage works (Rule 9.1.3(h)). Consequently, indigenous vegetation removal proposed for the specific purpose of erecting a stop bank for flood protection will be a **permitted activity in a site of ecological significance listed in Schedule A.**

National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES)

The NES controls soil disturbance on land where an activity on the Hazardous Activities and Industries List (HAIL) is being carried out, has been carried out, or is more likely than not to have been carried out. The land on which the stopbanks are located (both sides of the Avon River) have not been identified on the Canterbury Regional Council's Listed Land Use Register (LLUR) and are therefore not considered to be HAIL land therefore the provisions of the NES do not apply.

The existing environment

The surrounding environment predominantly comprises red zone land that was vacated following the Canterbury Earthquake Sequence. There are pockets of residential activity around Porritt Park and on New Brighton Road which are not red zoned, and a small number of occupied residential properties within the red zone. The majority of the Avon River margins comprise grassed banks interspersed with established trees. The area has not been maintained since the Canterbury Earthquake Sequence and the grass and vegetation is largely scrappy and overgrown.

There are few public amenities remaining along the river, with the exception of the Avon Rowing Club at Kerrs Reach and Avon River boat ramp on Hardy Street which are both still operational. Aside from these activities the red-zone margins are used for informal recreation activities such as dog walking.

Written approvals [Sections 95D, 95E(3)(a) and 104(3)(a)(ii)]

No written approvals have been provided with the application.

Effects on the environment and adversely affected persons [Sections 95A, 95B, 95E(3) and 104(1)(a)]

As a non-complying activity the Council's assessment of the effects of this proposal is unrestricted however some guidance on what the effects could be are contained in the matters of discretion provided in the Plan for each of the listed non compliances.

For example, when residential units are proposed to be located within the High Flood Hazard Management Area, Council discretion is limited to matters including: the mitigation of the effects of flooding and reducing the risk to people's safety, well-being and property.

For proposed buildings that are not listed – (residential unit, farm building, recreation facility, tramping hut, or a public amenity) under Rule 9.2.5 Landscape overlays- significant features and rural amenity landscapes, Council's discretion is limited to maintaining the qualities of the significant feature and ensuring that the proposal recognises the context and values of historic and cultural significance of the feature, visual significance and acknowledging the connectivity between the proposal and the Flat Land Recovery Zone while maintaining the significant natural features of the Avon River and its margins.

Therefore, having regard to the planning framework, I consider that the potential adverse effects of this proposal on the environment relate to amenity, noise, dust, traffic, water quality and ecological, flooding and Tangata Whenua values. I also consider that there will be positive effects generated by this proposal.

Amenity effects

This proposal involves the undertaking of earthworks, which if not managed appropriately can cause a range of effects on the amenity of the surrounding area. While the overall amenity does include nuisance effects associated with excessive noise and dust are discussed briefly here, these matters are discussed in more depth later in the following sections.

The applicant has indicated that to ensure that the overall effects of the proposal on the environment are limited in scope and in scale, the contractors will only be undertaking the site works in 10 metre sections. This should ensure that the environment effects are minimised. I support this initiative and agree that it will ensure that any effects are minimised.

Using this technique will also reduce any visual effects associated with the earthworks, especially where the earthworks are being undertaken on sections of the stopbanks that are in directly opposite occupied residential property.

In assessing the potential effects on the amenity of the river corridor during the proposed works on the environment I have determined that there are two distinct environments for consideration.

Firstly, there is the red zoned land which adjoins the majority of the stopbank on which works are programmed. In these areas there is no longer any residential activities nor public road access to the river margins. In these areas the potential effect of the proposed earthworks on the amenity of the area is considered to be less than minor.

The second environment identified are the residences that live within the six pockets of residentially occupied land that is located directly opposite the proposed working areas on the stopbanks. Each pocket is separated by a minimum distance of a formed operational legal roadway of 20 metres.

In these areas residences will have a clear view of the earthworks and associated activities and be subjected to an increase in noise and traffic, changes to the visual amenity and to a potentially dust nuisance. The minimum 20m width of the road way may provide some mitigation to these effects, especially to the increase in noise associated with the proposed works.

The applicant has not confirmed that noise levels associated with the site works will comply with the noise standards contained in the Christchurch District Plan, nor have they identified a breaches of the relevant noise level rules of the Christchurch District Plan. To ensure compliance a condition of consent will require compliance with the relevant noise level for the land zone.

If Council does receive substantiated noise complaints associated with the earthworks, Council's Compliance officers can require that the contractors cease operations until noise levels are reduced to a complying level or additional resource consents are granted to exceed the noise levels outlined in the Christchurch District Plan.

It is acknowledged that these residents may have a reduction in their overall amenity as a result of the proposed earthworks, however the reduction will be short term and once completed the amenity associated with the river corridor should be returned to a level consistent with pre earthquake amenity levels. The overall timeframe for the completion of the project is 6 months, which given the scale of the project appears a short timeframe.

The potential amenity effects will be mitigated by the adoption by the contractors only opening up 10 metre of working area at one time, the imposition of specific daily timetable for day to day operations, appropriate erosion and sediment control measures and a site specific transport management plan for each area associated with residential occupation. The specific daily timetable is discussed in the following section.

The proposed erosion and sediment control plan will be required to provide details of how dust production will be managed during dry weather periods. These management techniques, which were noted in the introduction above, will ensure that any effects associated with nuisance dust production will be minimised.

Likewise, traffic associated with the earthworks will be managed as part of a detailed site specific transport management plan that will be required to be prepared for each of the residential areas identified as being located directly opposite the stopbank working areas. Once in place the traffic management plan will ensure that any traffic effects are minimised.

It is also noted that the majority of the proposed works is to be undertaken on the stopbanks that have been in place for many years. The stopbanks are therefore existing and forms part of the existing environment. It is therefore not unreasonable to expect the stopbanks to require some form of maintenance from time to time.

Overall in my opinion the effect on the amenity of the surrounding environment will be less than minor on the adjoining residential zoned land, the operational public roads and the red zoned land.

Noise effects

The potential noise effects on the adjoin environment are also directly influenced by the proximity of the areas of current residential use and the location of the river corridor where the works are to occur.

The Christchurch District Plan does have permitted noise levels for each planning zone of the district as well as various exemptions. In addition there are activity specific noise rules.

Under the permitted activity specific noise requirements (P2) Chapter 6 6.6.1.1 construction activities are permitted provided the construction activities meet the relevant noise limits in table 2 and 3 of NZS 6803:1999 Acoustics- Construction Noise, when measured and assessed in accordance with that standard.

I consider this proposal to be a construction activity, even though the Christchurch District Plan does not provide a definition of what a construction activity is. However the Oxford Dictionary defines "construction" as the action of building something, typically a large structure. The Oxford dictionary defines an "activity" as the condition in which things are happening or being done.

In my opinion the proposal does constitute a "construction activity" and therefore is required to comply with the table 2 & 3 of NZS 6803: 1999 Acoustics- Construction Noise.
Table 2 provides the upper limits for construction noise received in residential zones and dwellings in rural areas.

Time of week	Time period	Duration of work					
		Typical duration (dBA)		Short-term duration (dBA)		Long-term duration (dBA)	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
Sundays and public holidays	0630-0730	45	75	45	75	45	75
	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

The applicant has not indicated if the proposed works can comply with the noise limits listed in Table 2 when operations commence, however in order for the works to be considered a permitted activity, it is anticipated that all site works will comply with these noise limits.

It is therefore consider appropriate that a condition of consent requires that all construction noise meet the above table. In addition to ensure that all residences that occupy the residential land directly opposite the work areas are given some respite by not allowing any site works (other than works approved by Council) to occur on any Sundays or public holidays.

All site works are not to start earlier than 6:30 am and cease no later than 20:00 pm on any weekday and no earlier than 6:30 am and cease no later than 18:00 pm on any Saturday.

Provided that all onsite earthworks are undertaken in strict accordance these restrictions any effects on the existing noise environment will be less than minor.

Dust effects

Typically the minimisation of dust being generated and causing a nuisance effect for adjoining residential neighbours is included in the erosion and sediment control plans that are prepared for all earthworks.

This proposal has not included a prepared erosion and sediment control for consideration, however the applicant has indicated that appropriate mitigation measures to control erosion and sediment runoff will be installed in accordance with Environment Canterbury's guidelines. This matter is discussed in more detail later in this report.

In addition the applicant has indicated to control nuisance dust being generated, sprinklers will be on hand to dampen down any exposed land during the construction phase and during periods of dry weather. The use of sprinklers for this task is a recognised practice used for dust control. It is therefore accepted that provided sufficient numbers of sprinklers are available at all times, any dust effects will be less than minor. In reaching this conclusion, I note that much of the earthworks are to be undertaken outside the summer months and that only 10 metre sections of stopbanks are to be exposed and worked at any one time. This proposed management of the site is supported and it is therefore anticipated that nuisance dust will not be generation during the undertaking of this proposal.

Traffic effects

As noted, much of the works on the stopbanks are to be undertaken where the surrounding land has been red zoned and where roads have been closed to the general public. Any traffic affects where the site works are located on land within red zoned land are considered to be less than minor.

Where the stopbank works immediately adjoin roads that are in public use there is the potential for traffic management effects to occur which could also compromise public use and safety. While the applicant has indicated that a temporary traffic management plan will be implemented by the contractors no details have been provided with the application.

It is recognised that any project that can have an impact on the transport network and the safety of road users requires a traffic management plan to minimise the potential effects. It is also a requirement when considering how these traffic effects might be managed to require the applicant prepare the traffic management plan prior to the on-site works commencing. While this is not the case here, provided the traffic management plan is prepared prior to any onsite works commence, reviewed and accepted by appropriate Council staff, and fully implemented, any effects on the transport network and road user safety will be less than minor. A condition of this consent will require that a traffic management plan be prepared and submitted for peer review and acceptance prior to any on site works commence.

This traffic management plan only needs to consider those sections of the site works that immediately adjoins roads that are in public use. Sections of the stopbanks that adjoin the roading network that is now located within the red zone is not required to have a traffic management plan prepared. With the implementation of a traffic management plan I consider any traffic effects associated with this proposal are considered to be less than minor.

Water quality and ecological effects

Appropriate erosion and sediment control for any project that involves significant earthworks that are to be undertaken in close proximity to a significant waterway is not only expected but also vital to ensure that water quality is maintained. This proposal will involve earthworks in some locations less than 5 metres from the Avon River. The applicant has noted the presence of several fish species including brown trout, eels (long and short finned) and Inanga (whitebait) which are all likely to be sensitive to chemical pollutants and sediment runoff entering the Avon River.

The applicant has not provided an erosion and sediment control plan for consideration, however have confirmed that erosion and sediment controls in accordance with the Canterbury Regional Council Guidelines will be installed. In addition the contractors are to have spill kits available at all times and to monitor all site vehicles to minimise the risk of accidental spills that could enter the river.

While this is commendable, it is considered essential that a comprehensive erosion and sediment control plan be prepared and the mitigation measures installed **before** any earthworks on site are undertaken. It has become Council practise to require that the erosion and sediment control plan be prepared by a suitably experienced and qualified professional and submitted for acceptance by the Manager of Council's Resource Consents Team (or assignee) prior to any earthworks commencing on site. Undertaking the erosion and sediment control plan preparation, acceptance and the installation of mitigation measures before any earthworks commence will ensure that any potential effects on the river environment will be minimised.

The plan must be appropriate for the activities proposed and acknowledge the close proximity of the Avon River and margins to the proposed earthworks. It is not limited to, but must also detail how erosion and sediment controls are to be managed, how accidental spills of contaminants will be avoided, remedied and mitigated, what ongoing monitoring will be used and how nuisance dust will be mitigated.

The applicant has identified the location of several significant Inanga spawning areas along the margins of the Avon River that will be subjected to the proposed earthworks on the existing stopbanks. These areas are highlighted in Appendix B of the applicants' application report.

The identified spawning areas begin on the margins of both sides of the Avon River at the location where Breezes Road forms a junction with Avonside Drive and continues unbroken to the point where Barkers Lane Burwood intersects with New Brighton Road further to the east.

The applicant has volunteered not to undertake any of the proposed site works on the land that adjoins these identified Inanga spawning during the months of January to May and undertaking the construction works in these areas during the period of June to October. In addition Inanga spawning habitat will be enhanced by allowing the rank grass that grows adjacent to the Avon River and on the river bank within these areas to remain and will not be cut, however it is unclear if this enhancement will continue after all of the works proposed under this consent have been completed or just for the six month duration that the applicant has indicated the works will take to complete. The voluntary restriction on working adjacent to the identified spawning areas and the change to the grass management in these areas is supported.

However a review of technical paper 2015/17 titled "Freshwater Fish Spawning and Migration Periods" prepared for the Ministry of Primary Industries (dated June 2015) suggests that the "peak spawning period" for Inanga is between the months of March to June (inclusive). In addition, this publication also suggest that the spawning range is between Jan-July and then between September-December any calendar year, which leaves August as the only month each calendar year where there is no Inanga spawning. In addition the report identifies the retention of the vegetation (grasses- exotic & native) for several months prior to the peak spawning period as an important measure to encourage and support the spawning of Inanga.

Obviously it would not be reasonable for the applicant to only be permitted to undertake the stopbank works that adjoin these spawning areas for one month only (August) therefore it is considered appropriate to allow the proposed works to be undertaken during the period August –December (inclusive) provided adequate erosion and sediment control is in place at all times, in accordance with the approved erosion and sediment control plan. In this way the peak spawning period for Inanga identified in Technical paper 2015/17 (March to July) will occur without any possibility of an accidental sediment or contaminant spill into the river and the consent holder will still have five months to complete the works on the stopbanks adjacent to these areas. In addition it would appear very helpful to the success of the Inanga that the vegetation adjacent to the Avon River is not cut for some time before the peak spawning period and the proposed work period (August-December) for this consent, however it is considered that it is outside the scope of this report to consider long term management of these grasses for the betterment of the Inanga in the Avon River.

It also needs to be acknowledged that while noting the spawning season for the Inanga and reducing the duration and nominating a set time that works are to occur in these locations, provided appropriate erosion and sediment control is always in place and adequately managed, there should not be any sediment or other contamination entering the Avon River during the undertaking of the proposed works anyway. Therefore the accepted erosion and sediment control plan is to also consider the presence of the Inanga spawning areas and include any additional techniques that may need to be included to avoid, remedied or mitigate and potential effects on Inanga during the peak spawning period between March to June Inclusive.

Effects on flood flows and drainage

The purpose of this proposal is to repair and upgrade the stopbanks located on both sides of the Avon River. The finished stopbank has been designed to provide 20 years of flood protection from a 1 in 50 year (2% AEP) flood event combined with a high tide event.

The repaired stopbanks will not significantly alter flood flows and drainage patterns in comparison to the existing situation, but they will provide a greater level of flood protection by taking into account the effect of a high tide event "backing up" against floodwaters. The new stopbanks will protect Pump Station 205 and the occupied residential properties adjacent to Porritt Park.

The proposal will therefore have a positive effect (from a s.104 perspective) by containing flood flows and preventing spill over into surrounding land during a 1 in 50 year event.

Effects on natural and cultural heritage including Tangata Whenua values

The Avon River is a recognised food source for Tangata Whenua and the condition of the water resource is considered a reflection on the state of the land and in turn is a reflection on the health of Tangata Whenua. The potential adverse effects on water quality and the river ecology has been discussed earlier with the conclusion being that the effects are considered to be less than minor.

The use of land for the construction of stopbanks within the Avon River margins is therefore within the ambit of consideration of effects on Tangata Whenua.

The proposed area of works are not located within a Statutory Acknowledgement Area and there are no silent file areas or Treaty of Waitangi settlement areas in the vicinity of the works according to Environment Canterbury's geographic information system (GIS).

However, to ensure that if unrecorded archaeological material is accidentally uncovered during site operations, the applicant has prepared an archaeological appraisal (prepared by Underground Overground Archaeological Ltd) and applied for an emergency archaeological authority with Heritage New Zealand. The authority has not been issued at the time the consent application was lodged. In addition a Cultural Values Statement has been prepared in consultation with Ngai Tahu. The applicant has agreed to have a suitably qualified archaeologist and a member of Ngai Tuahuriri on site to monitor all earthworks.

If any archaeological material is discovered work will cease and the contractor will notify Christchurch City Council, Canterbury Regional Council, Heritage New Zealand Pouhere Taonga and Te Ngāi Tuahuriri Runanga.

Any uplifting or re-interment of koiwi (human remains) will be carried out in consultation with Te Ngāi Tuahuriri Runanga. Any adverse effects on natural and cultural heritage will therefore be minimised and appropriately managed under the Emergency Archaeological Authority. However as noted, as the emergency archaeological authority was not issued at the time of consent lodgement, no site works are to commence until the applicant has received acknowledgement from the Christchurch City Council's Resource Consents Manager that the emergency archaeological authority has been granted.

Overall the stopbank repairs will have less than a minor effect on the cultural heritage values of Tangata Whenua.

Positive effects

In terms of s.104 the Act requires Council to consider any positive effects that may result from a proposal. In this instance I consider there are positive effects and note them below.
This proposal seeks consent to not only undertake repairs and upgrades to the existing stopbank system but also to install two new sections of stopbank. These works will ensure that significant areas of Christchurch City will remain appropriately protected for at least the next 20 years from a 1 in 50 year (2% AEP) flood event combined with a high tide. By ensuring that these areas, some of which are located within the red zone, are protected from flooding, more robust and better supported decision can be made for the future use of this land. These proposed works when completed will provide a positive effect (benefit) for both the present and future residents of Christchurch.

In addition, much of the land on which the stopbanks are located has not been maintained regularly since the earthquakes began. The land has becoming overgrown with grass and weeds which has resulted in the river margins appearing un-kepted and rundown. In addition to the general lack of regular maintenance, and contributing to the un-kepted appearance, approximately 50 trees located within the river margins have died and have not been removed and replaced. The result is a significant reduction in the overall amenity of the area.

This proposal once fully completed will ensure that the stopbanks are returned to their pre earthquake appearance with all of the stopbanks having a uniform design and appearance. In addition the dead trees will have been removed and new trees planted. While no details have been provided with the application, it is assumed that once the works have been completed, regular maintenance of the area will be resumed which will ensure that the overall amenity of the river margins will return to at least a pre earthquake level. This will have a positive overall effect on the citizens of Christchurch and the Canterbury region.

Conclusion

In my opinion overall, the proposed works (repair, upgrade and construction of 2 new sections of stopbanks) will have a less than minor effect on the environment and will not compromise the amenity of the adjoining residential land owners.

Pursuant to Section 95E(1) of the Act a person is not deemed affected by an activity where the adverse effects are less than minor, hence written approval is not required from this person.

In summary, based on my previous assessment recorded in this report, it is my opinion any adverse effects associated with the identified breaches of the Christchurch District Plan rules will be less than minor.

Relevant objectives, policies, rules and other provisions of the Plan and proposed Plan [Section 104(1)(b)(vi)]

Under Section 104(1)(b) of the RMA, when considering this application the consent authority must, subject to Part 2, have regard to any relevant provisions of national policy statements, national environmental standards, regional policy statements and plans or proposed plans.

The provisions considered relevant from the National Policy Statement for Freshwater Management (NPS), Canterbury Regional Policy Statement (RPS), Canterbury Land and Water Regional Plan (LWRP), Christchurch Replacement District Plan and Mahaanui Iwi Management Plan are outlined and discussed below.

National Policy Statement for Freshwater Management 2011 (NPS)

The NPS for Freshwater Management sets out the objectives and policies for the management of freshwater on a national basis. The following objectives are considered relevant to this application:

- Objective A1 (To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water).
- Objective A2 (The overall quality of fresh water within a region is maintained or improved).
- Objective C1 (Integrated management of fresh water resources).

Adverse effects of this proposal on the water quality of the Avon River and the associated ecosystems will be less than minor. The temporary nature of the construction works programme (6 months duration), the voluntarily imposed of only undertaking works in a 10 metre section at one time, the implementation of an erosion and sediment control plan, the proposed five month window for the construction works alongside the identified Inanga spawning areas and the cessation of vegetation cutting and removal alongside the Inanga spawning areas during the duration of the proposed works will ensure the above objectives are achieved. The proposal is therefore considered to be consistent with the NPS.

Canterbury Regional Policy Statement 2013 (RPS)

The following objectives and policies are considered relevant for this application:

Chapter 5: Land use and infrastructure

- Policy 5.2.1 (Location, design and function of development).

Chapter 9: Ecosystems and indigenous biodiversity

- Objective 9.2.3 (Protection of significant indigenous vegetation and habitats).
- Policy 9.3.1 (Protecting significant natural areas).

Chapter 11: Natural hazards

- Objective 11.2.2 (Adverse effects on people, property, infrastructure and the environment resulting from hazard mitigation methods are avoided or mitigated).
- Policy 11.3.7 (Physical mitigation works).

Chapter 12: Landscapes

- Objective 12.2.1 (Identification and protection of outstanding natural features and landscapes).

Chapter 15: Soils

- Objective 15.2.1 (Maintenance of soil qualities).

The construction and ongoing maintenance of stopbanks is an anticipated activity within the margins of the Avon River and as the majority of the stopbanks already exists, forms part of the existing environment. The overall quality of the natural environment will therefore be maintained consistent with Policy 5.2.1. The stopbanks are relatively low in height (maximum of 0.7m for the new Terramesh units) and the repaired stopbanks will be given a grass finish with additional tree planting.

No works are proposed in the bed of the river which will ensure that ecosystems and biodiversity are protected. The significant natural features and characteristics of the Avon River will therefore be protected in accordance with Objective 9.2.3, Objective 12.2.1 and Policy 9.3.1. Likewise, the stopbank has been designed to provide protection to people and infrastructure, and construction phase controls (erosion and sediment control plan) will be implemented to minimise adverse effects on the environment in accordance with Objective 11.2.2.

Policy 11.3.7 outlines that new physical mitigation works will only be acceptable where the natural hazard risk cannot reasonably be avoided, and adverse effects on the natural and built environment and on cultural values of Ngai Tahu are avoided, remedied or mitigated. Policy 11.3.7 also outlines that alternatives to physical works, such as the relocation, removal or abandonment of existing structures should be considered.

The natural hazard risk (i.e. flooding combined with a high tide event) cannot reasonably be avoided in this location as the river is tidally influenced. There are no viable alternatives which will continue to provide this level of flood protection for properties outside the red zone over the next 20 years (temporary stopbank lifetime). The proposal is consistent with Objective 15.2.1 relating to the maintenance of soil quality as only clean fill will be used to construct the stopbanks and there is no known contaminated soil within the stopbank footprint. The proposal is therefore consistent with the relevant objectives and policies of the RPS.

The Canterbury Land & Water Regional Plan (LWRP).

The LWRP became operative in part on 1st September 2015. Decisions have also been released on Plan Change 4 (PC4) which have made minor amendments to the majority of provisions in the LWRP. The relevant provisions of the LWRP (PC4 Decisions Version) are discussed below:

Objectives

- Objective 3.6 (Water is recognised as essential to all life and is respected for its intrinsic values).
- Objective 3.19 (Natural character values of freshwater bodies, including braided rivers and their margins, wetlands, hapua and coastal lagoons, are protected).
- Objective 3.23 (Soils are healthy and productive, and human-induced erosion and contamination are minimised).
- Objective 3.24 (All activities operated at “good environmental practice” or better to optimise efficient resource use and protect the region’s fresh water resources from quality and quantity degradation).

Strategic Policies

- Policy 4.1 (Water bodies meet regional freshwater outcomes).

Activity or Resource Policies

- Policy 4.13 (The effects of any discharge of contaminants into or onto land or surface water bodies are avoided or minimised).
- Policy 4.14B (Have regard to Ngāi Tahu values, and in particular those expressed within an iwi management plan, when considering applications for discharges to surface waterbodies).
- Policy 4.15 (Cumulative effects of stormwater discharges are avoided).
- Policy 4.17 (Stormwater run-off does not cause or exacerbate inundation, erosion or damage to property or risks to human safety downstream).
- Policy 4.18 (Discharges from earthworks and construction are avoided or minimised).
- Policy 4.22 (Sedimentation of water bodies as a result of land clearance, earthworks and cultivation is avoided or minimised).
- Policy 4.85 (Water quality, indigenous biodiversity and ecosystem health are enhanced through riparian planting).
- Policy 4.86B (Damage to inanga spawning habitat is minimised by scheduling works in the beds and margins to occur outside of the 1 March to 1 June inanga spawning season where practicable).

The proposal involves earthworks in close proximity to the margins of the Avon River. A comprehensive approved erosion and sediment control plan will be implemented at all times to prevent uncontrolled sediment discharges into the Avon River, and no earthworks will occur in the bed of the river.

Consultation with Ngai Tahu has occurred (refer to Cultural Values Statement in **Appendix D**) and the activity does not conflict with the provisions of the Mahaanui Iwi Management Plan as outlined in following section of this report.
All works within spawning areas will be undertaken outside of the peak inanga spawning season. In addition (as noted) comprehensive council accepted erosion and sediment plan controls will be implemented at all times during the works programme. Once complete the repaired stopbanks will provide additional stomwater runoff treatment by replacing the gravel bunds with grassed topsoil. The overall water quality and ecosystems of the Avon River will therefore be maintained in accordance with the relevant objectives and policies of the LWRP.

Christchurch District Plan

The Replacement District Plan was notified in three stages with decisions released on the Strategic Directions, Natural Hazards, Transport, Natural and Cultural Heritage and Open Space Natural provisions. The appeal period has closed on all of these chapters with the exception of the Natural and Cultural Heritage chapter and the Stage Three Natural Hazards Chapter. These objectives and policies therefore have significant weight and are considered to supersede the Christchurch City Plan objectives and policies for the purposes of this application.

The relevant objectives and policies are:

Chapter 3: Strategic directions

- Objective 3.3.1 (Enabling recovery and facilitating the future enhancement of the district).
- Objective 3.3.3 (Ngāi Tahu Manuwhenua's connections and values are recognised and provided for).
- Objective 3.3.6 (Natural hazards).
- Objective 3.3.9 (Natural and cultural environments are appropriately managed and people have access to high quality public open space).

The proposal is consistent with the strategic directions of the Replacement District Plan as it will provide a temporary (20 year) solution to flooding which will enable decisions to be made on the future of land surrounding the Avon River which is largely red zoned (Objective 3.3.1 and Objective 3.3.6). Ngai Tahu's connections with the Avon River have been recognised and provided for through consultation and the management of all earthworks under an Emergency Archaeological Authority, and public open space will be maintained once the project has been completed (objectives 3.3.3 & 3.3.9)

Chapter 5: Natural hazards

- Policy 5.2.1.2 (Manage activities to address natural hazards risk).
- Policy 5.2.1.4 (No transferring of natural hazard risk as a result of hazard mitigation works).
- Policy 5.2.2.1 (b. Avoid use and development in high flood hazard areas where it will increase the potential risk to people's safety, well-being and property) and (e. Ensure that filling in urban areas does not transfer flooding risk to other people, property or infrastructure).

Most of the proposed works relate to the existing stopbanks which will be repaired to a consistent design profile. This will provide flood protection for a 2% AEP flood event combined with a high tide event. Flooding risk will not be transferred to any other property as there will be no substantial change in drainage patterns and the purpose of the work is to provide flood protection.
The proposal is therefore considered to be consistent with the objectives and policies relating to natural hazards in the Christchurch District Plan.

Chapter 9: Natural and cultural heritage

- Objective 9.2.2.3 (The significant features of the district are maintained).
- Objective 9.2.2.4 (The natural character of the district's rivers and margins is preserved).
- Policy 9.2.2.8 (Recognise qualities of significant features by restricting visually prominent uses and development, limiting urban encroachment, recognising Ngai Tahu values, promoting ecological enhancement initiatives, ensuring activities are carried out in a way that maintains or enhances water quality).
- Policy 9.2.2.12 (Recognise and preserve the natural character of rivers and their margins by ensuring scale of development is appropriate, minimising indigenous vegetation clearance and structures, encouraging consolidation of activities, requiring appropriate setbacks, ensuring development is not readily visible from public places).

- Policy 9.2.2.13 (Assess cumulative effects on natural character of rivers and margins including allowing more of the same activity and more of a particular effect).

The Avon River is listed as a significant landscape area (SL 8.1) under the Christchurch District Plan. Stopbanks form part of the existing environment in the margins of this significant landscape area. The proposed repairs will have positive visual amenity effects by finishing earlier rudimentary repairs following the 2010-2012 earthquakes which left numerous sections of the stopbank in gravel, with appropriate contouring and grassed banks. The limited sections of new stopbank in Porritt Park and around Pump Station 205 are outside the significant landscape overlay and will be grassed to maintain a consistent appearance. The overall natural character and landscape qualities associated with the Avon River will therefore considered to be maintained in accordance with the natural and cultural heritage objectives and policies.

Chapter 18: Open space

- Objective 18.1.2 (Conservation and enhancement of the inherent qualities of natural open spaces and water bodies and their margins).
- Objective 18.1.3 (Activities, buildings and structures within open spaces are of an appropriate scale, form and design).
- Policy 18.1.4 (Provide, restore and enhance Open Space Natural Zone spaces to ensure biodiversity, landscape, accessibility and cultural and heritage values are protected and enhanced).
- Policy 18.1.8 (Ensure activities are appropriate to the locality and context and adverse effects on amenity values are mitigated).

- Policy 18.1.9 (Recognise and provide for flood protection works having regard to potential adverse effects).

Stopbanks form part of the existing riparian environment and the proposed repairs will improve the existing stopbank appearance by adding a grass surface. The new stopbanks at Porritt Park and around Pump Station 205 will also be hydroseeded with grass. The overall natural open space characteristics of the Avon River (including its margins) will therefore not be compromised by the proposal in accordance with the Open Space objectives and policies.

Mahaanui Iwi Management Plan

The Mahaanui Iwi Management Plan has been prepared by the six Papatipu Runanga from the Hurunui River in the north, to the Hakatere/Ashburton River in the south. The relevant policies of the Mahaanui Iwi Management Plan are as follows:

Part 5.3: Wai/Water

- Objective 3 (Water and land are managed as interrelated resources embracing the practice of Ki Uta Ki Tai, which recognises the connection between land, groundwater, surface water and coastal waters).
- Policy 2.2 (Water is recognised as essential to all life and is respected for its taonga values).
- Policy 6.8 (Oppose the discharge of contaminants to water and to land where contaminants may enter water).

Part 5.4: Papatūānuku/Land

- Objective 1 (The mauri of land and soil resources is protected).
- Policy 6.2 (Oppose the use of existing natural waterways for the treatment and discharge of stormwater).
- Policy 11.9 (To require stringent and enforceable controls on land use and earthworks activities to protect waterways and waterbodies from sedimentation).

Part 6.5: Ihutai Catchment

- Policy 6.5.3 (Ngāi Tahu sense of place and identity is enhanced through the restoration of the cultural health of the Ihutai catchment).
- Policy 6.5.6 (The restoration and enhancement of indigenous biodiversity is an essential part of the image and brand of Ōtautahi, and an improved balance between exotic and indigenous plant species is achieved).
- Policy 6.5.6.2 (To require that any physical works on waterways in the urban environment occurs in a manner that does not reduce the width of margins or riparian plantings, and is consistent with the re-naturalisation of the waterway).

Land and water quality will be protected during the undertaking of the proposed works through the implementation of an approved erosion and sediment control plan. This will include not only having in place at all times appropriate erosion and sediment control measures but also methods to avoid, remedied or mitigate any adverse effects associated with uncontrolled discharges of contaminants from all machinery utilised during the project. The erosion and sediment control plan will also include monitoring requirements to ensure that all measures are fully operational at all times.

The proposal is therefore is considered to be consistent with the objectives and policies of the Mahaanui Iwi Management Plan relating to Wai/Water and Papatūānuku/Land.
An Emergency Archaeological Authority application has been made to Heritage New Zealand and a Cultural Values Statement has been prepared in consultation with Ngai Tahu which includes appropriate protocols in the event of any accidental archeological discoveries during the project. In addition the applicant has confirmed that no works will occur that will reduce the width of the river margins or the riparian plantings which is consistent with achieving Policy 6.5.6.2 of the Mahaanui Iwi Management Plan.

The proposal is therefore considered to be consistent with the relevant policies of the Mahaanui Iwi Management Plan in regard to Ihutai catchment.

Further, in addition to the above discussion, Chapter 3 of the Operative Christchurch District Plan contains a number of high level strategic objectives to guide the recovery and future development of the City.

In this particular proposal it is recognised that for the purpose of non-notification of this application I have been consistent with strategic Objective 3.3.2 of the Christchurch District Plan which states that requirements for notification and written approval are to be minimised when implementing the Plan.

Conclusion regarding Objectives and Policies

In my opinion the application is consistent with the relevant objectives and policies found in the Replacement District Plan and discussed previously. Further, the application is consistent with the noted Objectives and Policies contained in the Mahaanui Iwi Management Plan.

Recovery Plans and Regeneration Plans

Section 60(2) of the Greater Christchurch Regeneration Act 2016 requires that decisions and recommendations on resource consent applications are not inconsistent with Recovery Plans and Regeneration Plans.

None of the current Recovery Plans are relevant to this application, and there are no Regeneration Plans in place at this time.

Relevant provisions of a National Environmental Standard, National Policy Statement, Regional Plan, Regional Policy Statement or Coastal Policy Statement [Section 104(1)(b)]

Environment Canterbury and Council records indicate that the application site has not been used for an activity on the Hazardous Activities and Industries List (Ministry for the Environment) therefore the National Environmental Standard for managing contaminants in soil to protect human health does not apply.

The proposal has been assessed against all relevant National Environmental Standards **The Canterbury Land & Water Regional Plan (LWRP). Canterbury Regional Policy Statement 2013 (RPS)**

The proposal has been considered against the National Policy Statement for Freshwater Management (NPS), the Canterbury Regional Policy Statement (RPS), and the Canterbury Land and Water Regional Plan (LWRP).

In addition the proposal has been considered against the Mahaanui Iwi Management Plan.

Any other matters which are relevant and reasonably necessary to determine the application [Section 104(1)(c)]

Precedent / Plan Integrity

Given the non-complying status of this application it is appropriate to have regard to the issue of precedent, as well as the effect of granting consent upon the integrity of the City Plan and public confidence in its consistent administration. Case Law has established however, through the High Court in *Rodney District Council v Gould,*

that concerns relating to plan integrity and precedent effect are not mandatory considerations. The Court held that they are matters that decision makers *may have regard to*, depending on the facts of a particular case including:

1. Whether a proposal is contrary to the objectives and policies of the plan; and if so
2. Whether in the circumstances of a particular case a proposal can be seen as having some unusual quality.

In this case the proposal is not contrary to the objectives and policies, therefore I am satisfied that issues of precedent or plan integrity do not arise.

Part II of the Resource Management Act 1991 [Section 104(1)]

The above considerations are subject to Part II of the Act which outlines its purpose and principles.

The proposal is considered to be consistent with Part II matters as it will maintain the amenity of the surrounding environment, in accordance with Section 7(c) and 7(f) of the Resource Management Act 1991.

Non complying activity threshold tests [Section 104D(1)]

The application satisfies both tests as the adverse effects on the environment will be no more than minor and the application is not contrary to the objectives and policies of the Christchurch District Plan.

General notification provisions [Sections 95A(1), 95A(4) and Section 104(3)(d)]

There are no special circumstances or other aspects of the application that warrant public notification of this application.

Recommendations

That, for the above reasons:

A. The application be processed on a **non-notified** basis in accordance with Sections 95A - 95F of the Resource Management Act 1991.

B. The application **be granted** pursuant to Sections 104, 104C, and 108 of the Resource Management Act 1991, subject to the following condition:

1. The development shall proceed in accordance with the information and plans submitted with the application. The Approved Consent Documentation has been entered into Council records as RMA/2016/3454 (14 pages).
2. A Traffic Management Plan (TMP) shall be prepared and submitted to the Head of Resource Consents (or nominee) for accepted prior to any works being undertaken on site.
3. The content of the Traffic Management Plan shall be communicated to all Transportation contractors and a copy given to them to utilise for the duration of the consent.
4. All site works are to be undertaken at all times in accordance with the approved traffic management plan
5. The applicant is to adhere to the construction noise standards stated in the following table below during the construction/earthworks period.

Time of week	Time period	Duration of work					
		Typical duration (dBA)		Short-term duration (dBA)		Long-term duration (dBA)	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85

	1800-2000	70	85	75	90	65	80
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85

6. No work, with the exception of dust and sediment control, shall be undertaken on Public Holidays, or outside the hours of 06.30 to 20.00 pm Monday to Friday and 06.30 to - 18:00 Saturday without the Council's prior consent. There shall be no construction during public holidays.
7. The consent holder is to provide an erosion and sediment control plan (ESCP) to the Head of Resource Consents (or nominee) for review and acceptance prior to any earthworks occurring on site. The ESCP is to contain among other things dust suppression measures and procedures setting out how contractors should manage unforeseen contamination and protect themselves against exposure to contaminated materials.
8. ~~Prior to earthworks commencing the consent holder shall submit to the Head of Resource Consents (or nominee) for review an acceptance Certificate signed by an appropriately qualified and experienced engineer, to certify that the Erosion and Sediment Control measures have been put in place / constructed in accordance with ESC Guidelines (Ecan).~~ (condition revised under section 133a May 2017)

8 The erosion and sediment control measures contained in the ESCP required by Condition 7 shall be put in place/constructed prior to commencement of each area of works.

9 This consent shall not be given affect to unless and until all other necessary authorisations have been obtained from appropriate agencies. Copies of all other necessary authorizations must be provided to the Head of Resource Consents (or nominee) at the Christchurch City Council upon request.

10 Unless authorised, the consent holder shall not discharge any water (storm or ground) from the site into the Avon River during the site works.

11 The consent holder shall be responsible for all contracted operations relating to the exercise of this consent and shall ensure that all personnel working on the site are made aware of the conditions of this consent, have access to the contents of this consent document and all associated erosion and sediment control plans and methodology, and shall ensure compliance with consent conditions.

12 A copy of the consent condition list (earthwork related) shall be available on site to contractor(s) undertaking the earthworks at all time the physical works (authorised by consent) are being undertaken.

13 Prior to the commencement of the earthworks pursuant to this consent the consent holder shall appoint a site supervisor who has the responsibility to ensure that compliance with conditions of this consent are observed at all times. Contact details of that person shall be sent to all properties that immediately adjoin the application site prior to the commencement of earthworks.

14 At least 2 working days prior to the commencement of any earthworks or construction activity, the consent holder shall notify the Head of Resource Consents (or nominee) of the commencement day of earthworks, and the name and contact details of the site supervisor.

15 Should the Consent Holder cease, abandon work on site, stop the works for a period longer than 6 weeks, or be required to allow time gaps along the earthworks proposed timeline, it shall first take adequate preventive and remedial measures to control sediment discharge / run-off and dust emission, and shall thereafter maintain these measures for so long as necessary to prevent sediment discharge or dust emission from the site. All such measures shall be of a type and to a standard which are to the satisfaction of the Council's the Head of Resource Consents (or nominee).

16 The earthworks and construction work is to be under the control of a nominated and suitably qualified engineer.

~~17 The working area shall be limited to a single section of stopbank of no more than 10 metres at any one time.~~(condition 17 deleted under section 133a May 2017)=There is no condition 17,

18 Adequate dust control measures must be in place at all times so as to minimise any nuisance to neighbouring property. Appropriate equipment including water carts and sprinklers is to be available on site at all times. The roads to and from the site are to remain tidy at all times. These will need to be regularly monitored and swept or vacuumed if necessary at the end of each day.

19 All loading and unloading of trucks with excavation or fill material is to be carried out within the subject site.

20 All bared surfaces shall be adequately top-soiled and vegetated as soon as possible to limit sediment mobilisation.

21 ~~No works are to undertaken within the banks of the Avon River.~~(condition 21 deleted under section 133a May 2017)~~-~~There is no condition 21

22 All site works (other than erosion and sediment control) located adjacent to the identified Inanga spawning areas shall be undertaken between the months of August – December (inclusive) only. The identified Inanga areas of the of the Avon River are the junction of Breezes Road and Avonside Drive and continues unbroken to the point where Barkers Lane Burwood intersects with New Brighton Road further to the east.

23 During the months (January- July (inclusive) while implementing this consent the grass adjoining the Avon River in the identified Inanga spawning areas shall not be cut unless authorised by the Head of Resource Consents (or there nominee).

24 The final landscape treatment for all of the stopbanks shall consist of uniform grass appearance and new trees where appropriate.

25 All required landscaping shall be provided on site within 12 months of the date of the taking up of this consent.

26 All of the proposed landscaping shall be maintained and retained. Any dead, diseased, or damaged trees are to be replaced immediately with plants of a similar species.

27 No on site work is to be undertaken until the emergency archaeological authority has been issued by Heritage New Zealand and a copy of the approved authority provided to the Head of Resource Consents (or their nominee).

28 ~~A suitably qualified and approved (by Heritage New Zealand) archaeologist and a member of Ngai Tuahuriri is to be on site at all times during the undertaking any excavations to monitor all earthworks.~~(condition 28 revised under section 133a, May 2017)

28. A suitably qualified and approved archaeologist and a member of Ngai Tuahuriri be onsite at all times during the undertaking of any excavation in undisturbed ground. (condition 28 revised under section 133a, May 2017)

29 If any archaeological material is discovered work will cease and the contractor will notify Christchurch City Council, Canterbury Regional Council, Heritage New Zealand Pouhere Taonga and Te Ngāi Tuahuriri Runanga.

Advice Notes:

- The Council will require payment of its administrative charges in relation to monitoring, as authorised by the provisions of section 36 of the Resource Management Act 1991. The current monitoring charges are:

  (i) One inspection: A monitoring fee of $241.50 (residential) to cover the cost of setting up a monitoring programme and carrying out a site inspection to ensure compliance with the conditions of this consent; and

  (ii) Time charged at an hourly rate of $118.50 incl. GST if additional monitoring is required, including non-compliance with conditions.

Reported and recommended by: Alistair Sharp-Senior Planner **Date:** 4 May 2017

Reviewed by: Nathan O'Connell

Decision

That the above recommendations be adopted for the reasons outlined in the report.

Commissioner:

Name: David Mountfort

Signature: D. L Mountfort

Date: 31 May 2017

14 September 2017

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Christchurch City Council
PO Box 73014
Orchard Road
Christchurch 8154

Dear Sir/Madam

Notice of Resource Consent Decision

Record Number(s): CRC176134
Applicant Name: Christchurch City Council
Activity Description: To reconstruct, repair or place structures and to occupy the coastal marine area.
Decision: Granted

Decision

The decision of Environment Canterbury is to grant your application on the terms and conditions specified in the attached resource consent document. The reasons for the decision are:

1. The activity is consistent with the policies of the regional plan or national policy statement.
2. The activity will achieve the purpose of the Resource Management Act 1991.

Commencement of consent

Your resource consent commences from the date of this letter advising you of the decision.
If you object to or appeal this decision, the commencement date will then be the date on which the decision on the appeal is determined.

Lapsing of consent

This resource consent will lapse if the activity is not established or used before the lapse date specified on your consent document. Application may be made under Section 125 of the Resource Management Act 1991 to extend this period.

Your rights of objection and appeal

- **Objection to Decision**
  If you do not agree with the decision of the consent authority, you may object to the whole or any part in accordance with Section 357A(1)(g) of the Resource Management Act 1991 (RMA). Notice of any objection must be in writing and lodged with Environment Canterbury **within 15 working days** of receipt of this decision in accordance with Section 357C(1) of the RMA.

- **Right to Appeal**
  You may appeal the decision of the consent authority to the Environment Court in accordance with section 120 of the RMA. The notice of appeal must be lodged with the Court within 15 working days of receipt of this decision, at PO Box 2069, Christchurch. A copy of the appeal should also be forwarded to Environment Canterbury within the same timeframe.

If you are in any doubt about the correct procedures, you should seek legal advice.

- **Objection to Costs**
  Section 357B of the RMA allows you to object to costs. Your objection must be received **within 15 working days** of the date on which you receive your invoice. Your objection must be in writing and should clearly explain the reasons for your objection as detailed in section 357C of the RMA.

Monitoring of conditions

It is important that all conditions of consent are complied with, and that the consent holder continues to comply with all conditions, to ensure that the activity remains lawfully established.
You can find online Information regarding the monitoring of your consent at www.ecan.govt.nz/monitoringconsent.pdf.

Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.

Further information about your consent

For some activities a report is prepared, with officer recommendations, to provide information to the decision makers. If you require a copy of the report please contact our Customer Services section. You can find online information about your consent document at www.ecan.govt.nz/yourconsent.pdf.

Queries

For all queries please contact Customer Services Section quoting your CRC number noted above.

Thank you for helping us make Canterbury a great place to live

Yours sincerely

Consents Planning Section

cc:
GHD Limited, Christchurch
Attn To: Bill Harrington
138 Victoria Street
Christchurch 8141

RESOURCE CONSENT CRC176134

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO:	Christchurch City Council
A COASTAL PERMIT (S12):	To reconstruct, repair or place structures and to occupy the coastal marine area.
COMMENCEMENT DATE:	14 Sep 2017
EXPIRY DATE:	14 Sep 2052
LOCATION:	Avon River and estuary margins between Evans Avenue and Bridge Street, Christchurch

SUBJECT TO THE FOLLOWING CONDITIONS:

LIMITS

1 The activity shall be limited to:

a. the reconstruction, repair, and/or placement of a structure in, on or over the foreshore and seabed; and

b. the permanent occupation of the Coastal Marine Area by the structures.

associated with the temporary stopbanks located within the Coastal Marine Area adjacent to Avon Heathcote Estuary as shown on Plan CRC176134A which forms part of this consent.

2 The temporary stopbanks shall be designed and constructed in general accordance with the attached design Plan CRC176134B, Plan CRC176134C, Plan CRC176134D, Plan CRC176134E, Plan CRC176134F and Plan CRC176134G which form part of this consent.

3 The activities carried out in accordance with condition (1)(a) shall cease five years from the issue of this consent.

PRIOR TO COMMENCEMENT

4 The consent holder shall provide to the Canterbury Regional Council, Attention: Regional Leader – Monitoring and Compliance, written notification at least five working days prior to

the commencement of works under this consent.

5 The consent holder shall ensure that all personnel undertaking activities authorised by this consent are made aware of, and have access to, the contents of this consent document prior to the commencement of the works.

6 At least 10 days prior to the start of construction, the consent holder shall erect a sign at the site explaining the nature of the work, time frames expected for the completion of the works and a contact name and telephone number.

DURING WORKS

7 The consent holder shall ensure that erosion and sediment control measures are constructed and maintained in accordance with the Environment Canterbury Erosion and Sediment Control Guidelines (Report R06/23, February 2007).

8 There shall be no machines or plant operating from or stored on the seabed of the Avon Heathcote Estuary / Ihutai.

9 All material excavated from the Avon Heathcote Estuary / Ihutai shall be reused on site, or removed from the site and disposed of off-site at a facility authorised to receive such material.

10 All practicable measures shall be undertaken to prevent oil and fuel leaks from vehicles and machinery or spills of any other contaminant within the site, including not storing fuel or refuelling machinery within 20 metres of the coastal marine area unless:

a. A drip tray is positioned underneath the filling point; or

b. Fuelling is carried out within a bunded area created for all refuelling operations.

11 The consent holder shall ensure that spill management measures and equipment, as necessary to contain, manage, and remove spilled hazardous substances and contaminated material, are retained on site at all times. These measures shall include but not be limited to:

a. Retaining a spill kit on-site that is capable of absorbing the quantity of oil and petroleum products that may be spilled on site at any one time; and

b. Preparing and providing a written spill response plan to all persons undertaking activities authorised by this consent. A copy of this response plan shall be kept on site at all times.

12 In the event of a spill of fuel or any other hazardous substance with the potential to enter

the coastal marine area, the consent holder shall:

a. Clean up the spill as soon as practicable, inspect and clean the spill area, and take measures to prevent a recurrence.

b. Inform the Canterbury Regional Council, Attention: Regional Leader – Monitoring and Compliance, within 24 hours of a spill event and provide the following information:

i. the date, time, location and estimated volume of the spill;

ii. the cause of the spill;

iii. the type of hazardous substance(s) spilled;

iv. clean up procedures undertaken;

v. details of the steps taken to control and remediate the effects of the spill on the receiving environment;

vi. an assessment of any potential effects of the spill; and

vii. measures to be undertaken to prevent a recurrence.

13 The works shall not prevent the passage of fish, or cause the stranding of fish in pools or channels.

14 Machinery shall be free of plants and plant seeds prior to use in the coastal marine area.

15 In the event of an archaeological discovery of interest to Tangata Whenua, all archaeological excavation and recovery work shall be conducted by representatives from the relevant Runanga under the supervision of the archaeologist, if requested by the relevant Runanga.

16 The consent holder shall remove all spoil and other waste material from the site on completion of works.

POST CONSTRUCTION

17 All structures erected, extended, or placed in or on the foreshore or seabed during the exercise of the consent shall be positioned to ensure that they do not cause erosion or exacerbate flooding.

18 All structures erected, extended, or placed in or on the foreshore or seabed during the exercise of the consent shall be maintained to a standard where they will continue to function as designed for the duration of the consent.

ADMINISTRATION

19 The Canterbury Regional Council may annually on the last five working days of May each year, serve notice of its intention to review the conditions of this consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of this consent; or

b. Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

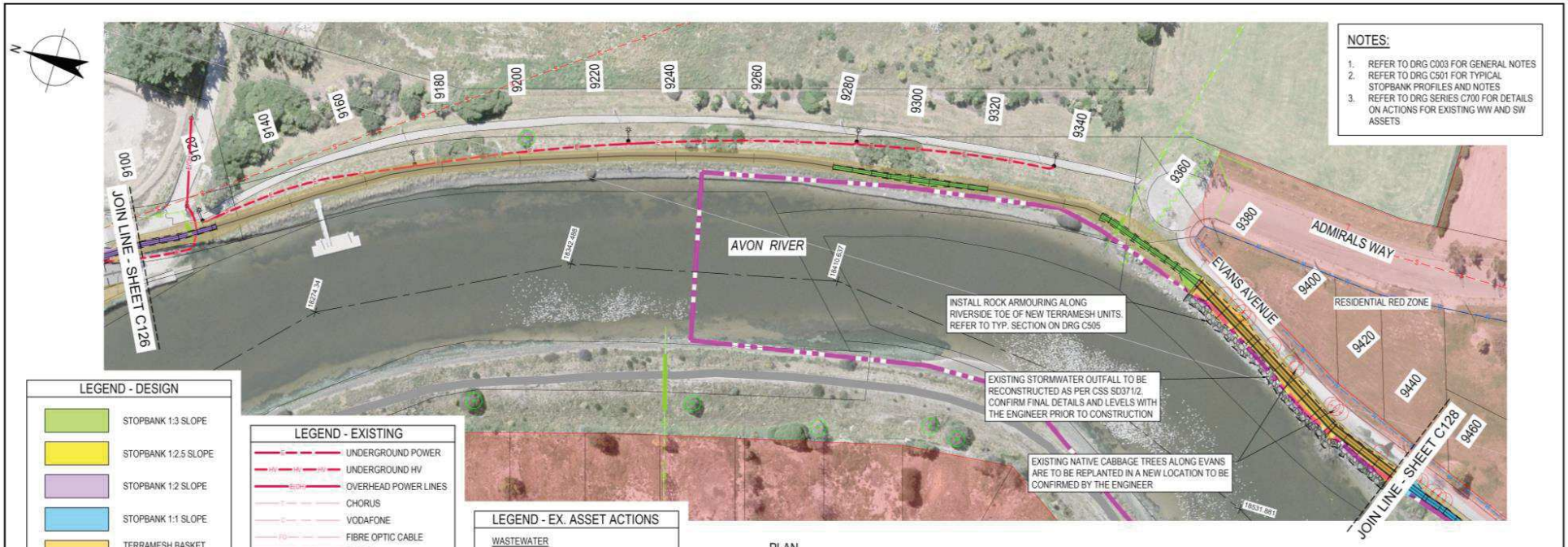
20 The lapsing date for the purposes of section 125 of the Resource Management Act shall be 30 September 2022.

Issued at Christchurch on 14 September 2017

Canterbury Regional Council

Plan CRC176134A

Plan CRC176134B



PLAN
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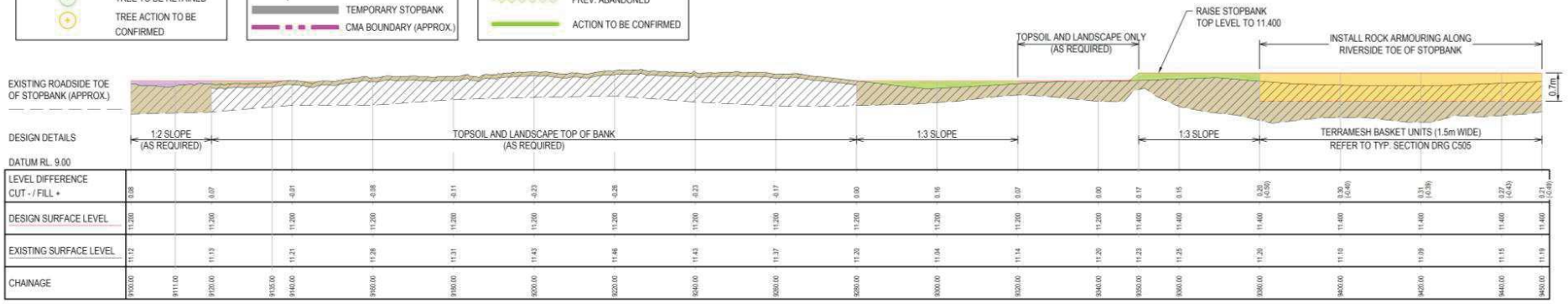


LONGITUDINAL SECTION - STOPBANK TRUE LEFT

HORZ 1:500 VERT 1:50

SCALE 1:50 AT ORIGINAL SIZE

SCALE 1:500 AT ORIGINAL SIZE

ISSUE	AMENDMENTS	SIGNED	DATE
B	DRAFT		
A	PRELIMINARY		

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.O.D.	DESIGNED	G. LIDGETT		
BENCH MK.	-	DES. REVIEW	-	-	-
RL	-	DRAWN	N. MACKIE	-	-
SURVEY	-	DRW. CHECK	-	-	-
SURVEY LB	-				
DRAIN. REF.	-				
SAP WBS	-				

APPROVED

FOR TENDER		
DATE	SIGNED	
-	-	

FOR CONSTRUCTION	
DATE	SIGNED
-	-

CONSULTANT: GHD CLIENTS | PEOPLE | PERFORMANCE
Level 3, 138 Victoria Street, Christchurch 8013 New Zealand
T 64 3 379 0900 F 64 3 377 8575 E chcmail@ghd.co.nz W www.ghd.co.nz

CONSULTANT DRAWING SHEET REF	CONSULTANT FILE REF
51-34150	C127

PROJECT TITLE: TEMPORARY STOPBANK MANAGEMENT (LDRP507)

DRAWING TITLE: TRUE LEFT STOPBANK PLAN & LONG SECTION

CONTRACT NUMBER	ORIGINAL SHEET SIZE	SCALES
	A1	1:50 1:500 DO NOT SCALE
CAD DRAWING FILE REF		
CPG PROJECT FILE NUMBER		SHEET 27 OF 33

Plan CRC176134C

INSTALL ROCK ARMOURING ALONG RIVER-SIDE TOE OF NEW TERRAMESH UNITS. REFER TO TYP. SECTION ON DRG C505

PLAN
SCALE 1:500

NOTES:

1. REFER TO DRG C003 FOR GENERAL NOTES
2. REFER TO DRG C501 FOR TYPICAL STOPBANK PROFILES AND NOTES
3. REFER TO DRG SERIES C700 FOR DETAILS ON ACTIONS FOR EXISTING WW AND SW ASSETS

LEGEND - EXISTING

- UNDERGROUND POWER
- UNDERGROUND HV
- ELECTRICAL DUCT
- OVERHEAD POWER LINES
- POWER POLE
- LIGHT POLE
- CHORUS
- VODAFONE
- FIBRE OPTIC CABLE
- SEWER
- WATER
- STORMWATER
- 9314.115 AVON RIVER CHAINAGE
- TEMPORARY STOPBANK
- CMA BOUNDARY (APPROX.)

LEGEND - DESIGN

- STOPBANK 1:3 SLOPE
- STOPBANK 1:2.5 SLOPE
- STOPBANK 1:2 SLOPE
- STOPBANK 1:1 SLOPE
- TERRAMESH BASKET UNITS
- TOPSOIL AND LANDSCAPE ONLY
- GRAVEL PATHWAY

TREE ACTIONS

- TO BE REMOVED
- TO BE RETAINED

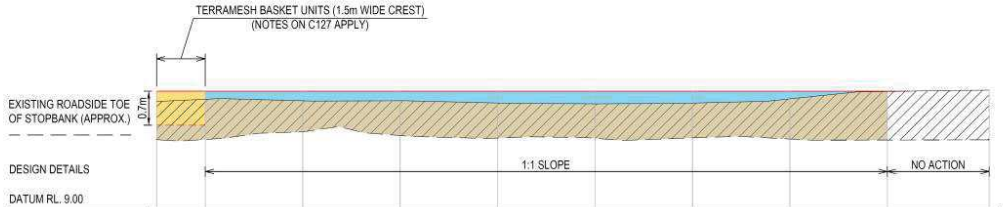
LEGEND - EX. ASSET ACTIONS

WASTEWATER

- PREV. ABANDONED
- TO BE ABANDONED
- ACTION TO BE CONFIRMED

STORMWATER

- PREV. ABANDONED
- REFER TO DRG C702 FOR ACTION



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SCALE 1:50 AT ORIGINAL SIZE

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SCALE 1:500 AT ORIGINAL SIZE

ISSUE	AMENDMENTS	SIGNED	DATE
1	FOR TENDER		
A	FOR TENDER	MD	30-11-2016

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

	DATUM	C.O.G.
	BENCH MK.	-
	RL	-
	SURVEY	-
	SURVEY LIB	-
	DRAIN. REF	
	SAP/WBS	-

	NAME	SIGNED	DATE
DESIGNED	G. LIDGETT	GL	30-11-2016
DES. REVIEW	A. INGLES	AI	30-11-2016
DRAWN	N. MACKIE	NM	30-11-2016
DRW. CHECK	G. LIDGETT	GL	30-11-2016

APPROVED

FOR TENDER		
DATE	SIGNED	
30-11-2016		M. DASLER

FOR CONSTRUCTION	
DATE	SIGNED
-	-

Note: * indicates signatures on original issue of drawing or last revision of drawing

CONSULTANT
GHD CLIENTS | PEOPLE | PERFORMANCE
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CONSULTANT DRAWING SHEET REF.	CONSULTANT FILE REF
51-34150	C128

PROJECT TITLE
TEMPORARY STOPBANK MANAGEMENT (LDRP507)

DRAWING TITLE
TRUE LEFT STOPBANK PLAN & LONG SECTION

CONTRACT NUMBER	ORIGINAL SHEET SIZE	SCALES
CAD DRAWING FILE REF.	A1	1:50 1:500 DO NOT SCALE
CPO PROJECT FILE NUMBER	SHEET	28 OF 28

PLOT DATE: 30 December, 2016 - 11:49 AM BY: Joshua Bird

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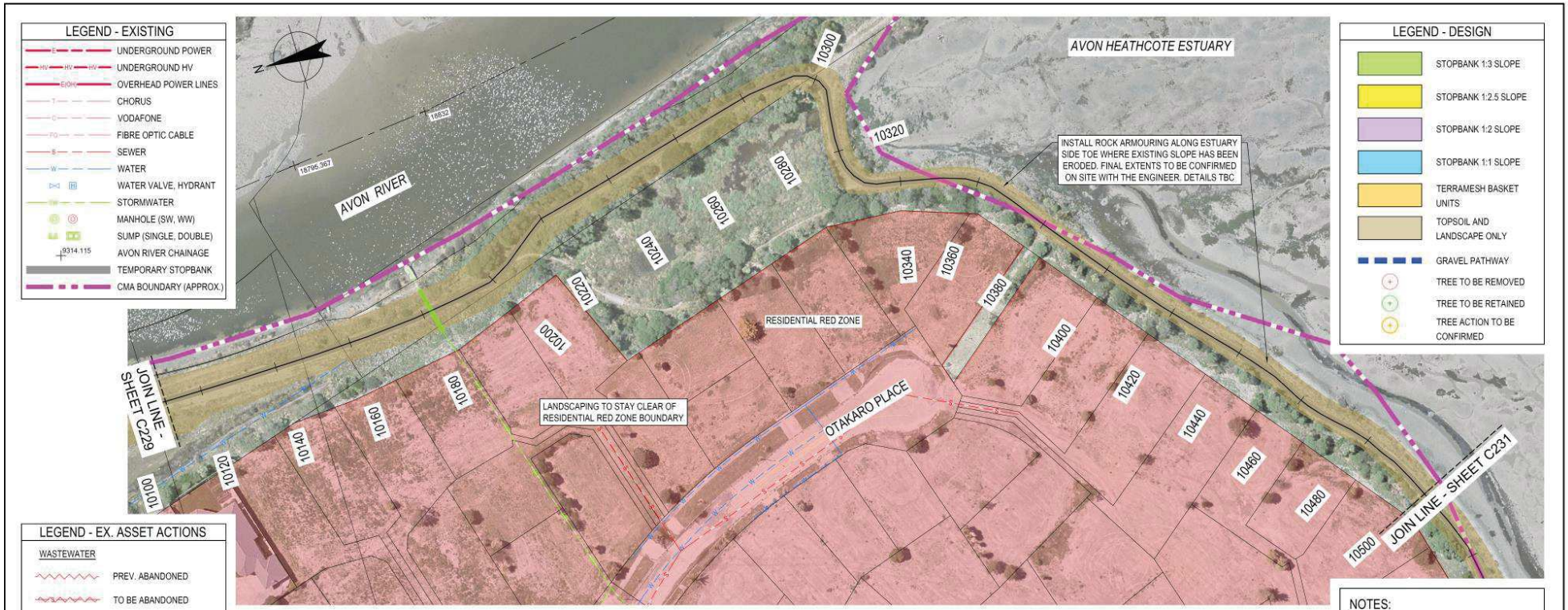
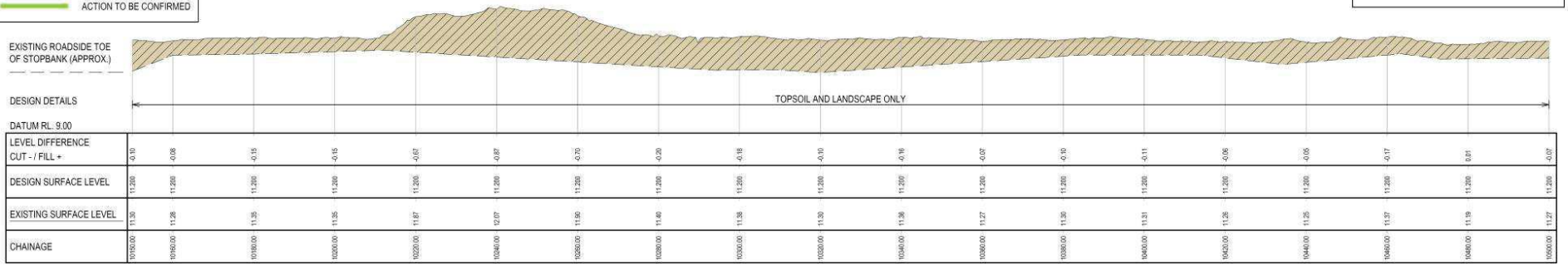
Plan CRC176134D



PLAN
SCALE 1:500

NOTES:

1. REFER TO DRG C003 FOR GENERAL NOTES
2. REFER TO DRG C501 FOR TYPICAL STOPBANK PROFILES AND NOTES
3. REFER TO DRG SERIES C700 FOR DETAILS ON ACTIONS FOR EXISTING WW AND SW ASSETS



LONGITUDINAL SECTION - STOPBANK TRUE LEFT

HORZ 1:500 VERT:1:50

SCALE 1:50 AT ORIGINAL SIZE

SCALE 1:500 AT ORIGINAL SIZE

ISSUE	AMENDMENTS	SIGNED	DATE
A	PRELIMINARY		

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.D.D.		NAME	SIGNED	DATE	APPROVED
BENCH MK	-	DESIGNED	G. LIDGETT	-	-	FOR TENDER
RL	-	DES. REVIEW	-	-	-	DATE / SIGNED
SURVEY	-	DRAWN	G. LIDGETT	-	-	- / -
SURVEY LIB	-	DRW. CHECK	-	-	-	FOR CONSTRUCTION
DRAIN. REF.	-					DATE / SIGNED
SAP WBS	-					- / -

Note: * indicates signatures on original issue of drawing or last revision of drawing

CONSULTANT: GHD CLIENTS | PEOPLE | PERFORMANCE
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CONSULTANT DRAWING SHEET REF	CONSULTANT FILE REF
51-34150	C230

PROJECT TITLE: TEMPORARY STOPBANK MANAGEMENT (LDRP507)

This Drawing must not be used for Construction unless signed as Approved

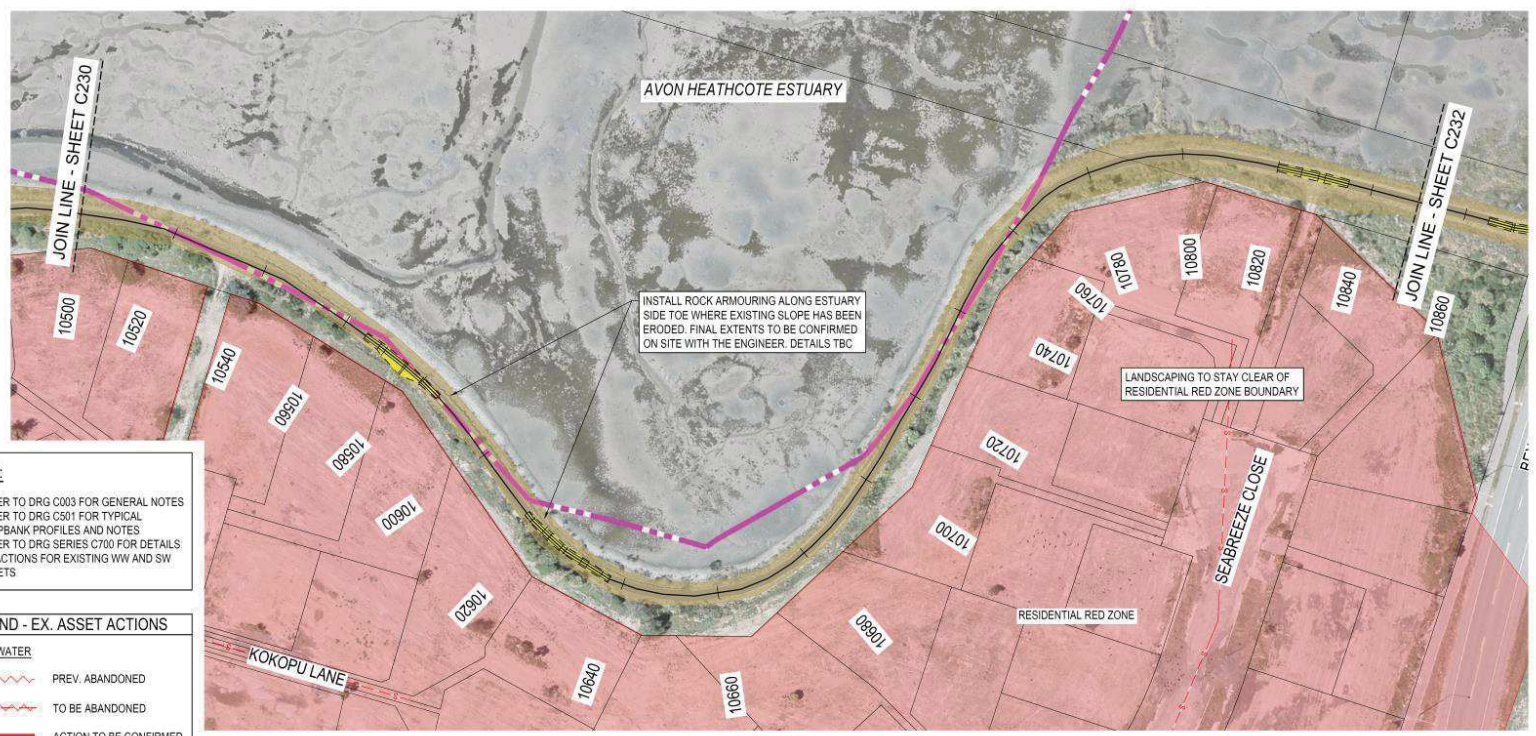
DRAWING TITLE: TRUE RIGHT STOPBANK PLAN & LONG SECTION

CONTRACT NUMBER	ORIGINAL SHEET SIZE	SCALES
CAD DRAWING FILE REF	A1	1:50 1:500 DO NOT SCALE
CPG PROJECT FILE NUMBER	SHEET	30 OF 33

PLOT DATE: 28 November, 2016 - 1:12 PM BY: George Lidgett

CAD FILE NO: G:\51\34150\CADD\Drawings\51-34150-C201_C230.dwg

Plan CRC176134E



PLAN
SCALE 1:500

NOTES:

1. REFER TO DRG C003 FOR GENERAL NOTES
2. REFER TO DRG C501 FOR TYPICAL STOPBANK PROFILES AND NOTES
3. REFER TO DRG SERIES C700 FOR DETAILS ON ACTIONS FOR EXISTING WW AND SW ASSETS

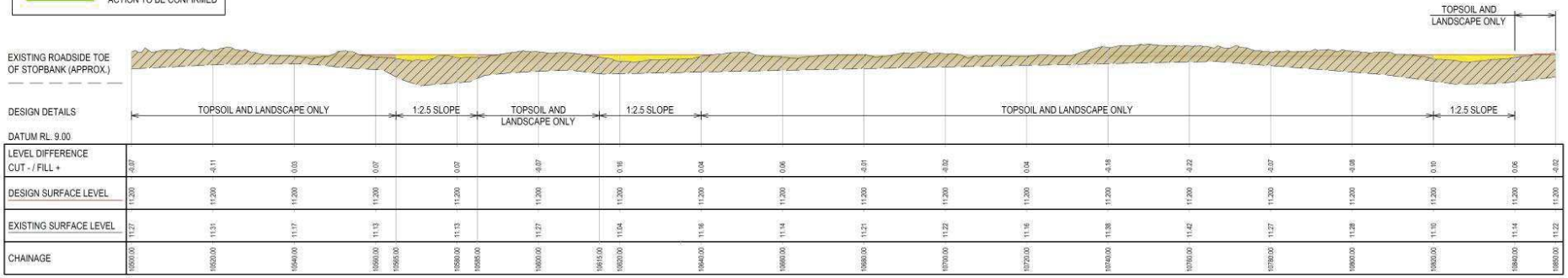
LEGEND - EX. ASSET ACTIONS

WASTEWATER
- PREV. ABANDONED
- TO BE ABANDONED
- ACTION TO BE CONFIRMED

STORMWATER
- PREV. ABANDONED
- ACTION TO BE CONFIRMED

LEGEND - EXISTING
- UNDERGROUND POWER
- UNDERGROUND HV
- OVERHEAD POWER LINES
- CHORUS
- VODAFONE
- FIBRE OPTIC CABLE
- SEWER
- WATER
- WATER VALVE, HYDRANT
- STORMWATER
- MANHOLE (SW, WW)
- SUMP (SINGLE, DOUBLE)
- 9314.115 AVON RIVER CHAINAGE
- TEMPORARY STOPBANK
- CMA BOUNDARY (APPROX.)

LEGEND - DESIGN
- STOPBANK 1:3 SLOPE
- STOPBANK 1:2.5 SLOPE
- STOPBANK 1:2 SLOPE
- STOPBANK 1:1 SLOPE
- TERRAMESH BASKET UNITS
- TOPSOIL AND LANDSCAPE ONLY
- GRAVEL PATHWAY
- TREE TO BE REMOVED
- TREE TO BE RETAINED
- TREE ACTION TO BE CONFIRMED



LONGITUDINAL SECTION - STOPBANK TRUE LEFT

HORZ 1:500 VERT 1:50

SCALE 1:50 AT ORIGINAL SIZE

SCALE 1:500 AT ORIGINAL SIZE

ISSUE	AMENDMENTS	SIGNED	DATE
A	PRELIMINARY		

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.D.D.		NAME	SIGNED	DATE	APPROVED
BENCH MK	-	DESIGNED	G. LIDGETT	-	-	FOR TENDER
RL	-	DES. REVIEW	-	-	-	DATE / SIGNED
SURVEY	-	DRAWN	G. LIDGETT	-	-	- / -
SURVEY LIB	-	DRW. CHECK	-	-	-	FOR CONSTRUCTION
DRAIN. REF.	-					DATE / SIGNED
SAP WBS	-					- / -

Note: * indicates signatures on original issue of drawing or last revision of drawing

CONSULTANT: GHD — CLIENTS | PEOPLE | PERFORMANCE
Level 3, 139 Victoria Street, Christchurch 8013 New Zealand
T 64 3 378 0900 F 64 3 377 8575 E chtmail@ghd.co.nz W www.ghd.co.nz

CONSULTANT DRAWING SHEET REF	CONSULTANT FILE REF
51-34150	C231

PROJECT TITLE: TEMPORARY STOPBANK MANAGEMENT (LDRP507)

This Drawing must not be used for Construction unless signed as Approved

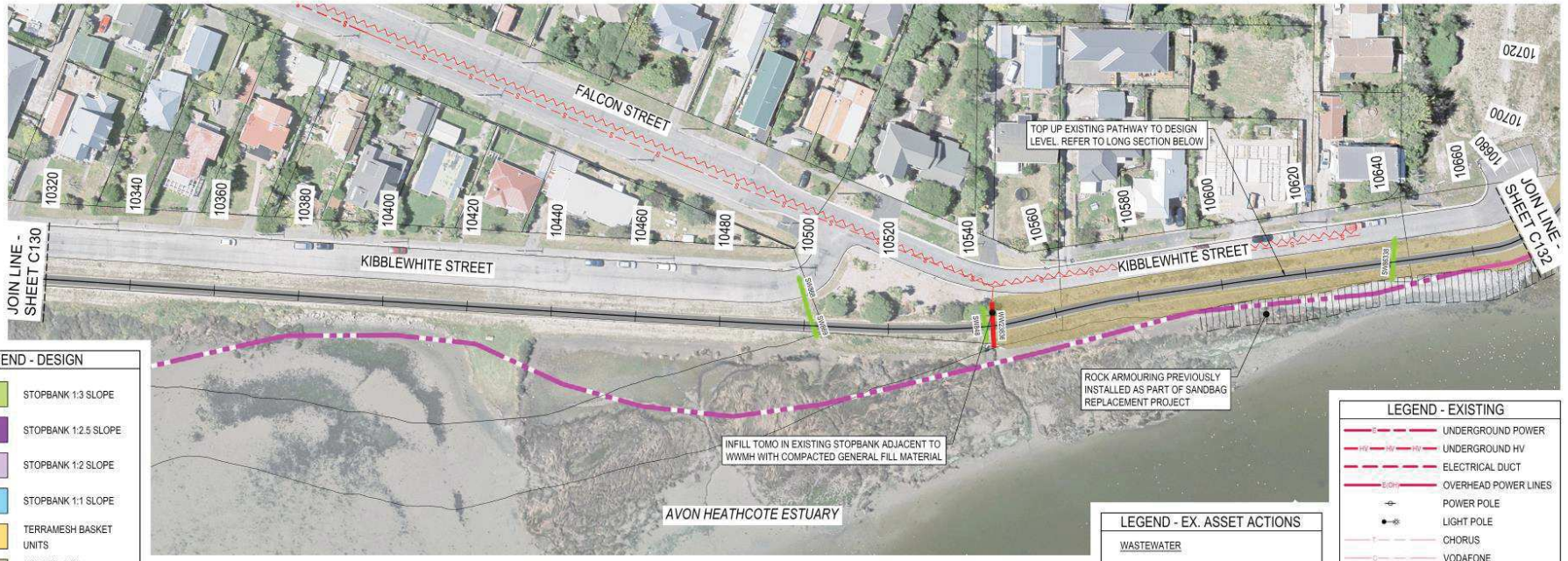
DRAWING TITLE: TRUE RIGHT STOPBANK PLAN & LONG SECTION

CONTRACT NUMBER	ORIGINAL SHEET SIZE	SCALES
CAD DRAWING FILE REF	A1	1:50 1:500 DO NOT SCALE
GPG PROJECT FILE NUMBER		SHEET 31 OF 33

PLOT DATE: 28 November, 2016 - 1:12 PM BY: George Lidgett

CAD FILE NO: G:\51\34150\CAD\Drawings\51-34150-C201_C230.dwg

Plan CRC176134F



PLAN
SCALE 1:500

LEGEND - DESIGN

- STOPBANK 1:3 SLOPE
- STOPBANK 1:2.5 SLOPE
- STOPBANK 1:2 SLOPE
- STOPBANK 1:1 SLOPE
- TERRAMESH BASKET UNITS
- TOPSOIL AND LANDSCAPE ONLY
- GRAVEL PATHWAY

TREE ACTIONS - CONFIRM WITH ENGINEER

- TO BE REMOVED
- TO BE RETAINED
- PARK TREE TO BE REMOVED BY CCC

NOTES:

1. REFER TO DRG C003 FOR GENERAL NOTES
2. REFER TO DRG C501 FOR TYPICAL STOPBANK PROFILES AND NOTES

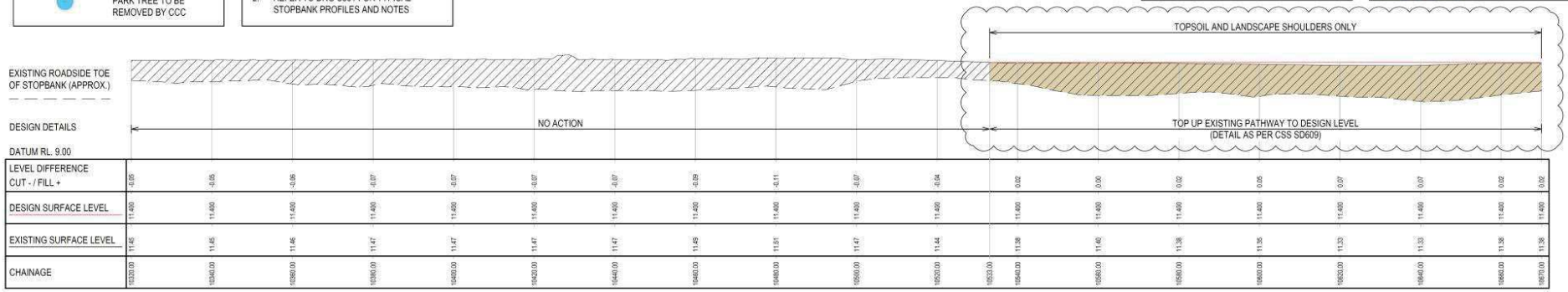
LEGEND - EX. ASSET ACTIONS

WASTEWATER
- PREV. ABANDONED
- ACTION - REFER TO DRG C701 FOR DETAILS

STORMWATER
- PREV. ABANDONED
- ACTION - REFER TO DRG C702 FOR DETAILS

LEGEND - EXISTING

- UNDERGROUND POWER
- UNDERGROUND HV
- ELECTRICAL DUCT
- OVERHEAD POWER LINES
- POWER POLE
- LIGHT POLE
- CHORUS
- VODAFONE
- FIBRE OPTIC CABLE
- SEWER
- WATER
- STORMWATER
- AVON RIVER CHAINAGE
- TEMPORARY STOPBANK
- CMA BOUNDARY (APPROX.)



LONGITUDINAL SECTION - STOPBANK TRUE LEFT
HORZ 1:500 VERT 1:50

SCALE 1:50 AT ORIGINAL SIZE
SCALE 1:500 AT ORIGINAL SIZE

ISSUE	AMENDMENTS	SIGNED	DATE
1	REISSUED FOR CONSTRUCTION		
0	FOR CONSTRUCTION	AB	28.04.2017

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.D.D.	DESIGNED	G. LIDGETT	GL	30.11.2016
BENCH MK.	-	DES. REVIEW	A. INGLES	AI	30.11.2016
RL	-	DRAWN	G. LIDGETT	GL	30.11.2016
SURVEY	-	DRW. CHECK	A. INGLES	AI	30.11.2016
SURVEY LB	-				
DRAIN. REF.	-				
SAP WBS	-				

APPROVED

FOR TENDER		
DATE	SIGNED	
30.11.2016	M. DAELER	
FOR CONSTRUCTION		
DATE	SIGNED	
28.04.2017	A. BRESLER	

Note: * indicates signatures on original issue of drawing or last revision of drawing.

CONSULTANT: GHD CLIENTS | PEOPLE | PERFORMANCE
Level 3, 138 Victoria Street, Christchurch 8013 New Zealand
T 64 3 378 0900 F 64 3 377 8575 E chcmail@ghd.co.nz W www.ghd.co.nz

CONSULTANT DRAWING SHEET REF: C131
CONSULTANT FILE REF: 51-34150

PROJECT TITLE: TEMPORARY STOPBANK MANAGEMENT (LDRP507)

This Drawing must not be used for Construction unless signed as Approved

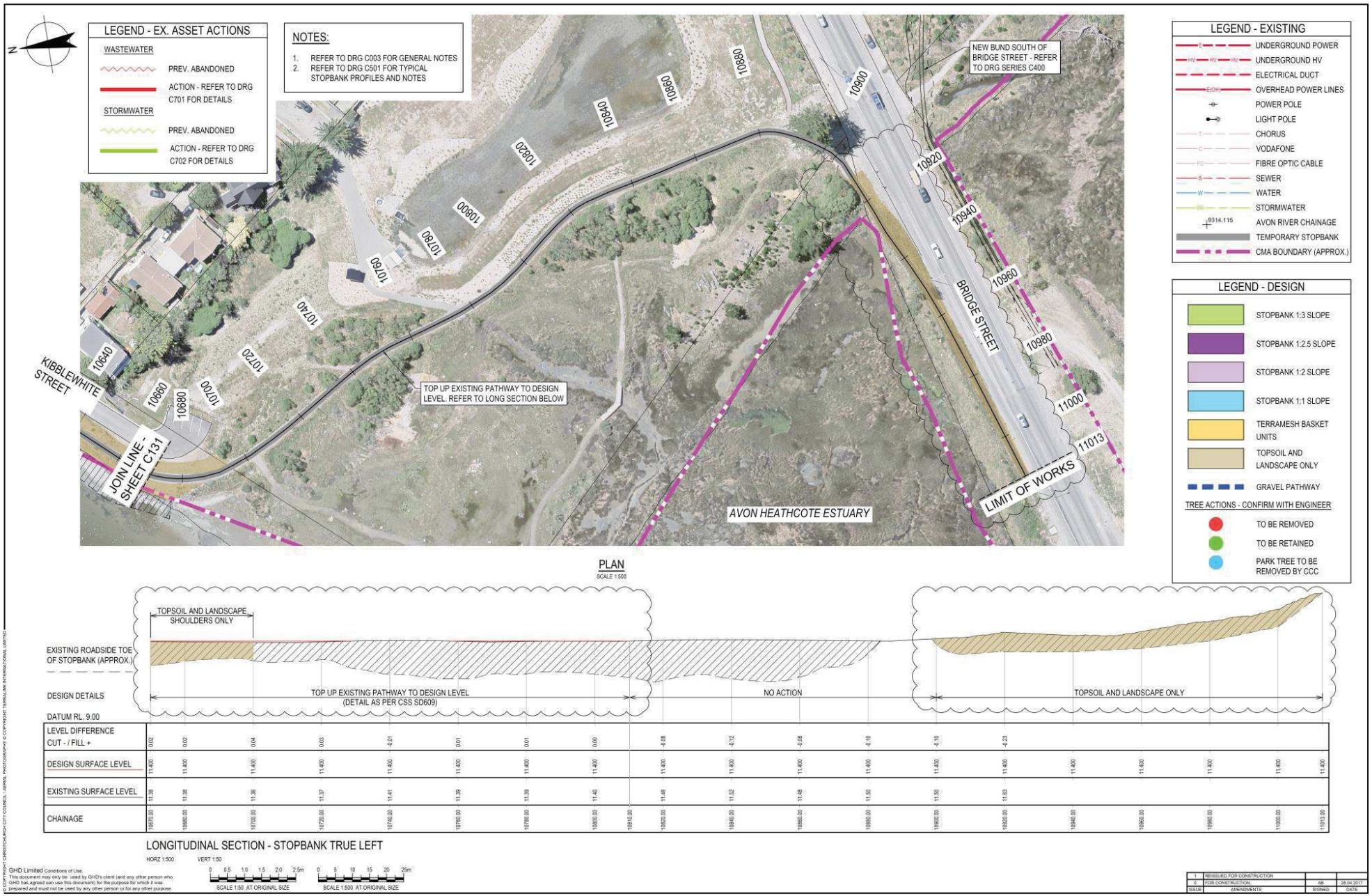
DRAWING TITLE: TRUE LEFT STOPBANK PLAN & LONG SECTION

CONTRACT NUMBER:
CAD DRAWING FILE REF:
CPO PROJECT FILE NUMBER:
ORIGINAL SHEET SIZE: A1
SCALED: AS SHOWN
DO NOT SCALE
SHEET: C131

CAD FILE NO: G:\51\34150\CADD\Drawings\51-34150-C131_C133.dwg

PLOT DATE: 12 July 2017 - 10:01 AM BY: George Lidgett

Plan CRC176134G



ISSUE	AMENDMENTS	SIGNED	DATE
1	REISSUED FOR CONSTRUCTION		
0	FOR CONSTRUCTION	AB	28.04.2017

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.D.O.		NAME	SIGNED	DATE
BENCH MK.	-	DESIGNED	G. LIDGETT	GL	30.11.2016
PL	-	DES. REVIEW	A. INGLES	AI	30.11.2016
SURVEY	-	DRAWN	G. LIDGETT	GL	30.11.2016
SURVEY LS	-	DRW. CHECK	A. INGLES	AI	30.11.2016
DRAIN. REF.	-				
SAP WBS	-				

APPROVED

FOR TENDER		
DATE	SIGNED	
30.11.2016	M. DAISLER	
FOR CONSTRUCTION		
DATE	SIGNED	
28.04.2017	A. BRESLER	

Note: * indicates signatures on original issue of drawing or last revision of drawing

CONSULTANT: GHD — CLIENTS | PEOPLE | PERFORMANCE
Level 3, 136 Victoria Street, Christchurch 8013 New Zealand
T 64 3 378 0900 F 64 3 377 8575 E chcmail@ghd.co.nz W www.ghd.co.nz

CONSULTANT DRAWING SHEET REF: C132
CONSULTANT FILE REF: 51-34150

PROJECT TITLE: TEMPORARY STOPBANK MANAGEMENT (LDRP507)

This Drawing must not be used for Construction unless signed as Approved

DRAWING TITLE: TRUE LEFT STOPBANK PLAN & LONG SECTION

CONTRACT NUMBER:
ORIGINAL SHEET SIZE: A1
CAD DRAWING FILE REF:
CPG PROJECT FILE NUMBER:
SCALES: AS SHOWN — DO NOT SCALE
SHEET: C132

PLOT DATE: 12 July, 2017 - 10:01 AM BY: George Lidgett

CAD FILE NO: G:\ST\34150\CADD\Drawings\51-34150-C101_C133.dwg

Exercising of resource consent CRC176134

It is important that you notify Environment Canterbury when you first start using your consent.

GRANTED TO:	Christchurch City Council
A COASTAL PERMIT (S12):	To reconstruct, repair or place structures and to occupy the coastal marine area.
LOCATION:	Avon River and estuary margins between Evans Avenue and Bridge Street, Christchurch

---

Even if the consent is replacing a previous consent for the same activity, you need to complete and return this page.

Providing this information will:

- Validate your consent through to its expiry date
- Minimise compliance monitoring charges
- Help provide an accurate picture of the state of the environment.

If consent CRC176134 is not used before 30 Sep 2022 this consent will lapse and no longer be valid.

Declaration:

I have started using this resource consent.

Action taken: (e.g. pasture irrigated, discharge from septic tank/boiler/spray booth etc).

_____

Approximate start date (***Note: this may be different to the date the consent was granted)***: _____

Signed: _____ **Date:** _____

Full name of person signing (please print)**:** _____

Please return to:

Environmental Protection - Administration
Environment Canterbury
PO Box 345
Christchurch 8140

File: CRC176134

14 September 2017

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Christchurch City Council
PO Box 73014
Orchard Road
Christchurch 8154

Dear Sir/Madam

Notice of Resource Consent Decision

Record Number(s): CRC176135
Applicant Name: Christchurch City Council
Activity Description: To undertake earthworks.
Decision: Granted

Decision

The decision of Environment Canterbury is to grant your application on the terms and conditions specified in the attached resource consent document. The reasons for the decision are:

1. The activity is consistent with the policies of the regional plan or national policy statement.
2. The activity will achieve the purpose of the Resource Management Act 1991.

Commencement of consent

Your resource consent commences from the date of this letter advising you of the decision.
If you object to or appeal this decision, the commencement date will then be the date on which the decision on the appeal is determined.

Lapsing of consent

This resource consent will lapse if the activity is not established or used before the lapse date specified on your consent document. Application may be made under Section 125 of the Resource Management Act 1991 to extend this period.

Your rights of objection and appeal

- **Objection to Decision**
  If you do not agree with the decision of the consent authority, you may object to the whole or any part in accordance with Section 357A(1)(g) of the Resource Management Act 1991 (RMA). Notice of any objection must be in writing and lodged with Environment Canterbury **within 15 working days** of receipt of this decision in accordance with Section 357C(1) of the RMA.

- **Right to Appeal**
  You may appeal the decision of the consent authority to the Environment Court in accordance with section 120 of the RMA. The notice of appeal must be lodged with the Court within 15 working days of receipt of this decision, at PO Box 2069, Christchurch. A copy of the appeal should also be forwarded to Environment Canterbury within the same timeframe.

If you are in any doubt about the correct procedures, you should seek legal advice.

- **Objection to Costs**
  Section 357B of the RMA allows you to object to costs. Your objection must be received **within 15 working days** of the date on which you receive your invoice. Your objection must be in writing and should clearly explain the reasons for your objection as detailed in section 357C of the RMA.

Monitoring of conditions

It is important that all conditions of consent are complied with, and that the consent holder continues to comply with all conditions, to ensure that the activity remains lawfully established.
You can find online Information regarding the monitoring of your consent at www.ecan.govt.nz/monitoringconsent.pdf.

Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.

Further information about your consent

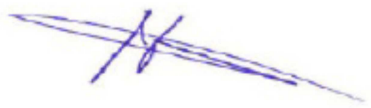
For some activities a report is prepared, with officer recommendations, to provide information to the decision makers. If you require a copy of the report please contact our Customer Services section. You can find online information about your consent document at www.ecan.govt.nz/yourconsent.pdf.

Queries

For all queries please contact Customer Services Section quoting your CRC number noted above.

Thank you for helping us make Canterbury a great place to live

Yours sincerely



Consents Planning Section

cc:
GHD Limited, Christchurch
Attn To: Bill Harrington
138 Victoria Street
Christchurch 8141

RESOURCE CONSENT CRC176135

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO:	Christchurch City Council
A LAND USE CONSENT (S9):	To undertake earthworks.
COMMENCEMENT DATE:	14 Sep 2017
EXPIRY DATE:	14 Sep 2022
LOCATION:	Avon River and estuary margins between Evans Avenue and Bridge Street, Christchurch

SUBJECT TO THE FOLLOWING CONDITIONS:

LIMITS

1 The land use shall be limited to the excavation of land within 50 metres of the Avon River and the Estuary Drain associated with the temporary stopbank repair and upgrade works required between Evans Avenue and Bridge Street, and for the stopbanks at Bexley Road and south of Bridge Street, as shown on Plan CRC176135, attached to and forming part of this resource consent.

Advice Note: This resource consent does not authorise the take of groundwater for the purpose of dewatering.

2 Excavation and disturbance of land authorised by this consent shall not exceed a maximum depth of 0.5 metres below ground level.

3 If groundwater is encountered during excavation, all excavations at the site shall cease until such time as groundwater recedes. If groundwater does not recede naturally after 48 hours, the excavation shall be backfilled with clean gravels.

4 The consent holder shall adopt the best practicable options to minimise soil disturbance, the discharge of dust and sediment transport offsite.

5 All waste material shall be removed from the site on completion of works.

6 Any excavated material removed off-site shall be disposed of at a facility authorised to receive such material.

PRIOR TO COMMENCING LAND USE

7 The Consent Holder shall inform the Canterbury Regional Council, Attention: Regional Leader – Monitoring and Compliance, at least ten working days prior to the commencement of works under this consent.

8 Prior to commencing works, a copy of this resource consent shall be given to all persons undertaking activities authorised by this consent.

a. Details of the steps taken to control and remediate the effects of the spill on the receiving environment.

b. An assessment of any potential effects of the spill; and

c. Measures to be undertaken to prevent a recurrence.

9 Where works may result in the reduced integrity of a stopbank, or part of a stopbank, a Flood Mitigation Management Plan (FMMP) shall be prepared and shall include, but not be limited to:

a. The sequence and staging of the works; and

b. Flood contingency measures.

The FMMP shall be provided to the Canterbury Regional Council on request.

ACCIDENTAL DISCOVERY OF CONTAMINATED SOIL

10 In the event that contaminated soil is detected (by sight or odour) during site works, all works within 10 metres of the potentially contaminated soil or material shall cease immediately. Work must not recommence until a Suitably Qualified and Experienced Practitioner (SQEP) has assessed the contamination and advised of the appropriate remediation and/or disposal options for these soils.

11 The Canterbury Regional Council, Attention: Contaminated Sites Manager, shall be notified within 24 hours of the discovery of any potentially contaminated soil. All records and documentation associated with the discovery, remediation, and any material disposal shall be kept and copies shall be provided to the Canterbury Regional Council on request.

SPILLS

12 All practicable measures shall be undertaken to prevent oil and fuel leaks from vehicles and machinery, including but not limited to:

a. Not storing fuel or refuelling of vehicles within 20 metres of the bed of the Avon

River and excavated areas;

b. Vehicles and machinery shall not enter flowing water; and

c. Storing fuel securely or removing it from sites overnight.

13 All practicable measures shall be taken to avoid spills of fuel or any other hazardous substances within the site. In the event of a spill of fuel or any other hazardous substance, the consent holder shall:

a. Clean up the spill as soon as practicable, inspect and clean the spill area, and take measures to prevent a recurrence;

b. Inform the Canterbury Regional Council's Regional Leader - Monitoring and Compliance 24 hours of a spill event and provide the following information:

i. The date, time, location and estimated volume of the spill.

ii. Details of the steps taken to control and remediate the effects of the spill on the receiving environment.

iii. The cause of the spill;

iv. The type of hazardous substance(s) spilled;

v. Clean up procedure undertaken including evidence of appropriate disposal;

vi. An assessment of any potential effects of the spill; and

vii. Measures to be undertaken to prevent a recurrence.

ADMINISTRATION

14 The Canterbury Regional Council may annually on the last five working days of May or November each year, serve notice of its intention to review the conditions of this resource consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of this onset and which it is appropriate to deal with at a later stage; or

b. Requiring the consent holder to carry out monitoring and reporting instead of, or in addition to, that required by the consent.

Issued at Christchurch on 14 September 2017

Canterbury Regional Council

Plan CRC176135

Exercising of resource consent CRC176135

It is important that you notify Environment Canterbury when you first start using your consent.

GRANTED TO: Christchurch City Council
A LAND USE CONSENT (S9): To undertake earthworks.
LOCATION: Avon River and estuary margins between Evans Avenue and Bridge Street, Christchurch

---

Even if the consent is replacing a previous consent for the same activity, you need to complete and return this page.

Providing this information will:

- Validate your consent through to its expiry date
- Minimise compliance monitoring charges
- Help provide an accurate picture of the state of the environment.

If consent CRC176135 is not used before 14 Sep 2022 this consent will lapse and no longer be valid.

Declaration:

I have started using this resource consent.

Action taken: (e.g. pasture irrigated, discharge from septic tank/boiler/spray booth etc).

_____

Approximate start date (***Note: this may be different to the date the consent was granted):***: _____

Signed: _____ **Date:** _____

Full name of person signing (please print)**:** _____

Please return to:

Environmental Protection - Administration
Environment Canterbury
PO Box 345
Christchurch 8140

File: CRC176135

14 September 2017

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Christchurch City Council
PO Box 73014
Orchard Road
Christchurch 8154

Dear Sir/Madam

Notice of Resource Consent Decision

Record Number(s): CRC176137
Applicant Name: Christchurch City Council
Activity Description: To discharge construction phase stormwater to land and surface water.
Decision: Granted

Decision

The decision of Environment Canterbury is to grant your application on the terms and conditions specified in the attached resource consent document. The reasons for the decision are:

1. The activity is consistent with the policies of the regional plan or national policy statement.
2. The activity will achieve the purpose of the Resource Management Act 1991.

Commencement of consent

Your resource consent commences from the date of this letter advising you of the decision.
If you object to or appeal this decision, the commencement date will then be the date on which the decision on the appeal is determined.

Lapsing of consent

This resource consent will lapse if the activity is not established or used before the lapse date specified on your consent document. Application may be made under Section 125 of the Resource Management Act 1991 to extend this period.

Your rights of objection and appeal

- **Objection to Decision**
  If you do not agree with the decision of the consent authority, you may object to the whole or any part in accordance with Section 357A(1)(g) of the Resource Management Act 1991 (RMA). Notice of any objection must be in writing and lodged with Environment Canterbury **within 15 working days** of receipt of this decision in accordance with Section 357C(1) of the RMA.

- **Right to Appeal**
  You may appeal the decision of the consent authority to the Environment Court in accordance with section 120 of the RMA. The notice of appeal must be lodged with the Court within 15 working days of receipt of this decision, at PO Box 2069, Christchurch. A copy of the appeal should also be forwarded to Environment Canterbury within the same timeframe.

If you are in any doubt about the correct procedures, you should seek legal advice.

- **Objection to Costs**
  Section 357B of the RMA allows you to object to costs. Your objection must be received **within 15 working days** of the date on which you receive your invoice. Your objection must be in writing and should clearly explain the reasons for your objection as detailed in section 357C of the RMA.

Monitoring of conditions

It is important that all conditions of consent are complied with, and that the consent holder continues to comply with all conditions, to ensure that the activity remains lawfully established.
You can find online Information regarding the monitoring of your consent at www.ecan.govt.nz/monitoringconsent.pdf.

Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.

Further information about your consent

For some activities a report is prepared, with officer recommendations, to provide information to the decision makers. If you require a copy of the report please contact our Customer Services section. You can find online information about your consent document at www.ecan.govt.nz/yourconsent.pdf.

Queries

For all queries please contact Customer Services Section quoting your CRC number noted above.

Thank you for helping us make Canterbury a great place to live

Yours sincerely

Consents Planning Section

cc:
GHD Limited, Christchurch
Attn To: Bill Harrington
138 Victoria Street
Christchurch 8141

RESOURCE CONSENT CRC176137

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO:	Christchurch City Council
A DISCHARGE PERMIT (S15):	To discharge construction phase stormwater to land and surface water.
COMMENCEMENT DATE:	14 Sep 2017
EXPIRY DATE:	14 Sep 2022
LOCATION:	Avon River and estuary margins between Evans Avenue and Bridge Street, Christchurch

SUBJECT TO THE FOLLOWING CONDITIONS:

LIMITS

1 The discharge shall be only construction phase stormwater generated from exposed areas to land and surface water associated with the temporary stop bank repair and upgrade works required on the banks adjacent to the Avon River between Evans Avenue and Bridge Street, and construction of a new temporary stopbank south of Bridge Street – South New Brighton and adjacent to Bexley Road, as shown on Plan CRC176137, attached to and forming part of this resource consent.

2 During construction all practicable measures shall be undertaken to minimise discharge of sediment-laden stormwater in to the Avon River and beyond the boundaries of the site.

3 The discharge into the Avon River shall not at any time result in:

a. The production of floatable or suspended materials; or

b. A change in visual clarity (as measured by a clarity tube) of more than 20 percent in the Avon River.

PRIOR TO COMMENCING DISCHARGES

4 Prior to the commencement of works the consent holder shall ensure that all personnel working on the site are made aware of and have access to the contents of this consent document and all associated erosion and sediment control plans and methodology.

5 The Canterbury Regional Council shall be notified no less than 48 hours prior to the commencement of works.

EROSION AND SEDIMENT CONTROL

6 The discharges during the construction phase of the development shall occur in accordance with the Erosion and Sediment Control Plan (ESCP):

a. The ESCP shall detail the sediment control measures that will be taken to ensure compliance with this consent; and

b. The ESCP shall be prepared in accordance with Environment Canterbury's "Erosion and Sediment Control Guidelines for the Canterbury Region" Report No. CRC R06/23, February 2007 (ESGC).

7 The ESCP shall include, but not be limited to

a. A map showing the location of all works;

b. Detailed plans showing the location of sediment control measures, on-site catchment boundaries, and sources of runoff;

c. Drawings and specifications of designated sediment control measures including a silt fence and floating boom in the Avon River adjacent to the work site;

d. A programme of works, which includes but is not limited to, a proposed timeframe for the works;

e. Inspection and maintenance of the sediment control measures;

f. Sampling procedures and protocols;

g. Defined discharge points where stormwater leaves the site;

h. The description of dust mitigation to be used and details of best practicable options to be applied to mitigate dust and sediment discharge beyond the site boundary;

i. The methodology for stabilising the site if works are abandoned; and

j. The methodology for stabilising the site and decommissioning erosion and sediment control measures after works have been completed.

8 The ESCP shall be submitted to the Canterbury Regional Council, Attention: Regional Leader Monitoring and Compliance, at least ten working days prior to construction commencing, for certification that it complies with Environment Canterbury's Erosion and Sediment Control Guidelines for the Canterbury Region and the conditions of this consent.

a. The discharge shall not commence until the consent holder has received the certification from the Canterbury Regional Council that it consistent with the ESCG and the conditions of this consent.

b. Notwithstanding Condition (8)(a) if the consent holder has not received the certification within ten working days of the Regional Leader - Monitoring and Compliance receiving the ESCP, the discharge may commence.

9 The ESCP may be amended at any time. Any amendments shall be:

a. Only for the purpose of improving the efficacy of the erosion and sediment control measures and shall not result in reduced discharge quality; and

b. Consistent with the conditions of this resource consent; and

c. Submitted in writing to the Canterbury Regional Council, Attention: Regional Leader - Monitoring and Compliance, prior to any amendment being implemented.

d. The applicant shall apply best practice and all practicable measures to mitigate dust and sediment transport off-site.

SPILLS

10 All practicable measures shall be undertaken to prevent oil and fuel leaks from vehicles and machinery, including but not limited to:

a. Not storing fuel or refuelling of vehicles within 20 metres of the bed of the Avon River and excavated areas;

b. Vehicles and machinery shall not enter flowing water; and

c. Storing fuel securely or removed them from sites overnight.

11 All practicable measures shall be taken to avoid spills of fuel or any other hazardous substances within the site. In the event of a spill of fuel or any other hazardous substance, the consent holder shall:

a. Clean up the spill as soon as practicable, inspect and clean the spill area, and take measures to prevent a recurrence;

b. Inform the Canterbury Regional Council's Regional Leader - Monitoring and Compliance 24 hours of a spill event and provide the following information:

i. The date, time, location and estimated volume of the spill.

ii. The cause of the spill;

iii. The type of hazardous substance(s) spilled;

iv. Clean up procedure undertaken including evidence of appropriate disposal;

v. Details of the steps taken to control and remediate the effects of the spill on the receiving environment.

vi. An assessment of any potential effects of the spill; and

vii. Measures to be undertaken to prevent a recurrence.

ADMINISTRATION

12 The Canterbury Regional Council may annually, on the last five working days of May or November, serve notice of its intention to review the conditions of this consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of this consent; or

b. Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

Issued at Christchurch on 14 September 2017

Canterbury Regional Council

Plan CRC176137

Exercising of resource consent CRC176137

It is important that you notify Environment Canterbury when you first start using your consent.

GRANTED TO: Christchurch City Council
A DISCHARGE PERMIT (S15): To discharge construction phase stormwater to land and surface water.
LOCATION: Avon River and estuary margins between Evans Avenue and Bridge Street, Christchurch

---

Even if the consent is replacing a previous consent for the same activity, you need to complete and return this page.

Providing this information will:

- Validate your consent through to its expiry date
- Minimise compliance monitoring charges
- Help provide an accurate picture of the state of the environment.

If consent CRC176137 is not used before 14 Sep 2022 this consent will lapse and no longer be valid.

Declaration:

I have started using this resource consent.

Action taken: (e.g. pasture irrigated, discharge from septic tank/boiler/spray booth etc).

_____

Approximate start date (***Note: this may be different to the date the consent was granted)***: _____

Signed: _____ **Date:** _____

Full name of person signing (please print)**:** _____

Please return to:

Environmental Protection - Administration
Environment Canterbury
PO Box 345
Christchurch 8140

File: CRC176137

14 September 2017

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Christchurch City Council
PO Box 73014
Orchard Road
Christchurch 8154

Dear Sir/Madam

Notice of Resource Consent Decision

Record Number(s): CRC176138
Applicant Name: Christchurch City Council
Activity Description: To discharge operational phase stormwater to land and surface water.
Decision: Granted

Decision

The decision of Environment Canterbury is to grant your application on the terms and conditions specified in the attached resource consent document. The reasons for the decision are:

1. The activity is consistent with the policies of the regional plan or national policy statement.
2. The activity will achieve the purpose of the Resource Management Act 1991.

Commencement of consent

Your resource consent commences from the date of this letter advising you of the decision.
If you object to or appeal this decision, the commencement date will then be the date on which the decision on the appeal is determined.

Lapsing of consent

This resource consent will lapse if the activity is not established or used before the lapse date specified on your consent document. Application may be made under Section 125 of the Resource Management Act 1991 to extend this period.

Your rights of objection and appeal

- **Objection to Decision**
  If you do not agree with the decision of the consent authority, you may object to the whole or any part in accordance with Section 357A(1)(g) of the Resource Management Act 1991 (RMA). Notice of any objection must be in writing and lodged with Environment Canterbury **within 15 working days** of receipt of this decision in accordance with Section 357C(1) of the RMA.

- **Right to Appeal**
  You may appeal the decision of the consent authority to the Environment Court in accordance with section 120 of the RMA. The notice of appeal must be lodged with the Court within 15 working days of receipt of this decision, at PO Box 2069, Christchurch. A copy of the appeal should also be forwarded to Environment Canterbury within the same timeframe.

If you are in any doubt about the correct procedures, you should seek legal advice.

- **Objection to Costs**
  Section 357B of the RMA allows you to object to costs. Your objection must be received **within 15 working days** of the date on which you receive your invoice. Your objection must be in writing and should clearly explain the reasons for your objection as detailed in section 357C of the RMA.

Monitoring of conditions

It is important that all conditions of consent are complied with, and that the consent holder continues to comply with all conditions, to ensure that the activity remains lawfully established.
You can find online Information regarding the monitoring of your consent at www.ecan.govt.nz/monitoringconsent.pdf.

Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.

Further information about your consent

For some activities a report is prepared, with officer recommendations, to provide information to the decision makers. If you require a copy of the report please contact our Customer Services section. You can find online information about your consent document at www.ecan.govt.nz/yourconsent.pdf.

Queries

For all queries please contact Customer Services Section quoting your CRC number noted above.

Thank you for helping us make Canterbury a great place to live

Yours sincerely

Consents Planning Section

cc:
GHD Limited, Christchurch
Attn To: Bill Harrington
138 Victoria Street
Christchurch 8141

RESOURCE CONSENT CRC176138

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO:	Christchurch City Council
A DISCHARGE PERMIT (S15):	To discharge operational phase stormwater to land and surface water.
COMMENCEMENT DATE:	14 Sep 2017
EXPIRY DATE:	14 Sep 2052
LOCATION:	Bexley Road/Anzac Drive, Christchurch

SUBJECT TO THE FOLLOWING CONDITIONS:

1 The discharge shall be only operational phase stormwater flows from the:

a. Bexley Road/Anzac Drive and its margin; and

b. 10 metre section of Terramesh adjacent to Bexley Road/Anzac Drive

Associated with the temporary stopbanks located at or about map reference NZ Topo50 BX24:7746-8115 and NZ Topo50 BX24:7735-8124, as shown on Plan CRC176138A and Plan CRC176138B, attached to and forming part of this consent.

2 Stormwater shall be discharged as follows.

a. Stormwater from Bexley Road/Anzac Drive and its margins shall be diverted and discharged via a new sump and outfall structure underneath the stopbank on the eastern side of Bexley Road/Anzac Drive as shown on Plan CRC176138A; and

b. Stormwater generated from the 10 metre section of Terramesh adjacent to Bexley Road/Anzac Drive shall be discharged directly within the site boundary as shown on Plan CRC176138B.

3 The stormwater system shall be designed and constructed to dispose of stormwater from storm events up to and including 10% Annual Exceedance Probability of any duration.

4 The stormwater discharge system shall be inspected once every year. The inspection shall ensure that any scour or erosion shall be repaired within 10 working days of the inspection.

5 Any material removed in accordance with Condition (4) shall be disposed of at a facility

authorised to receive that material.

6 Records of any inspections and maintenance carried out on the stormwater discharge systems shall be retained and made available to the Canterbury Regional Council on request.

7 All best practicable options shall be used to contain spills or leaks of any hazardous substance from being discharged via the stormwater system. These shall include, but not be limited to the following:

a. Using a tank filling procedure to minimise spills during any fuel delivery;

b. Making spill kits available to contain or absorb any hazardous substances used or stored on the site;

c. Maintaining signs to identify the location of the spill kits; and

d. Maintaining written procedures in clearly visible locations that are to be undertaken to contain, remove and dispose of any spilled hazardous substance.

8 The Canterbury Regional Council may annually on the last five working days of May each year, serve notice of its intention to review the conditions of this consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of this consent; or

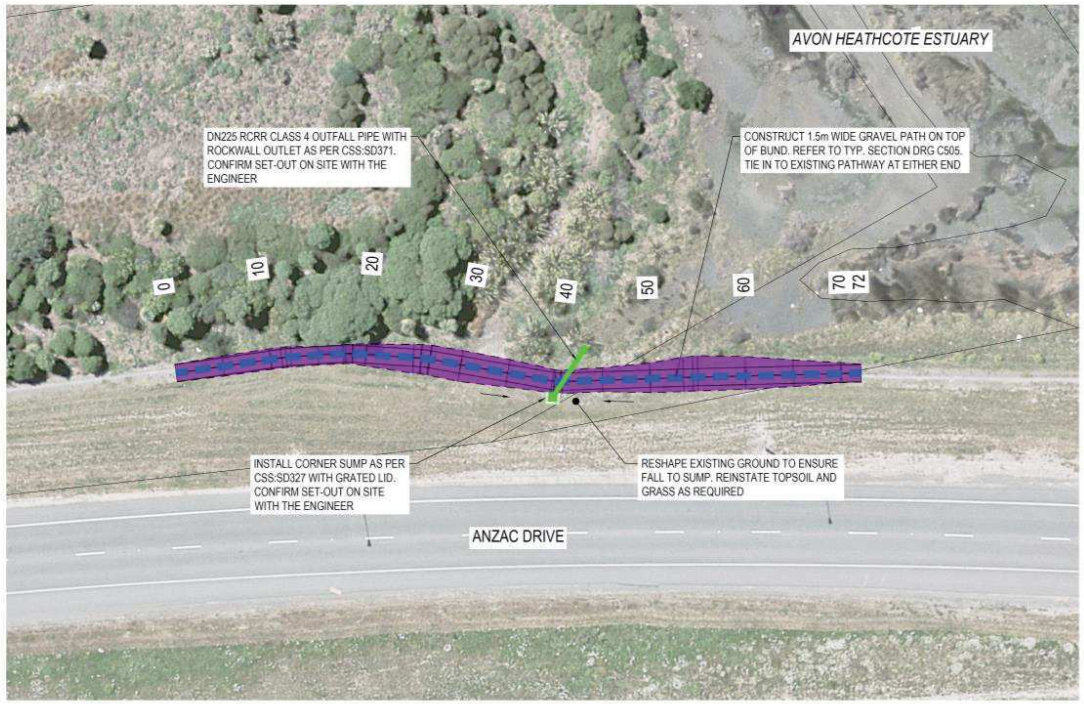
b. Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment

9 The lapsing date for the purposes of Section 125 of the Resource Management Act 1991 shall be 30 September 2022.

Issued at Christchurch on 14 September 2017

Canterbury Regional Council

Plan CRC176138A



PLAN
SCALE 1:250

NOTES:

1. REFER TO DRG C003 FOR GENERAL NOTES
2. REFER TO DRG C501 FOR TYPICAL STOPBANK PROFILES AND NOTES

LEGEND - EXISTING

- UNDERGROUND POWER
- UNDERGROUND HV
- ELECTRICAL DUCT
- OVERHEAD POWER LINES
- POWER POLE
- LIGHT POLE
- CHORUS
- VODAFONE
- FIBRE OPTIC CABLE
- SEWER
- WATER
- STORMWATER
- 9314.115 AVON RIVER CHAINAGE
- TEMPORARY STOPBANK
- CMA BOUNDARY (APPROX.)

LEGEND - DESIGN

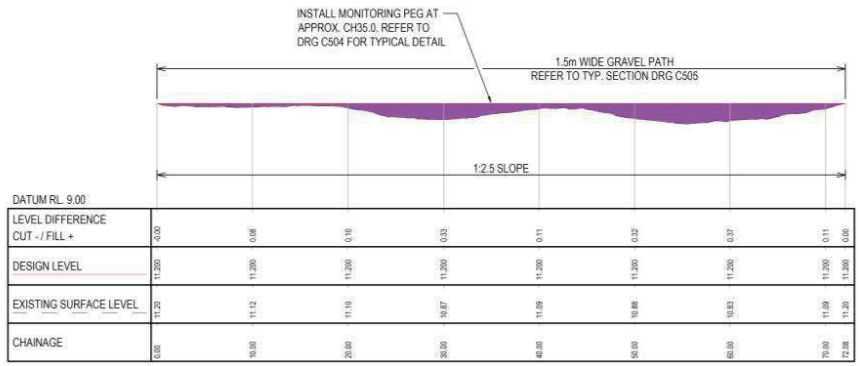
- STOPBANK 1:3 SLOPE
- STOPBANK 1:2.5 SLOPE
- STOPBANK 1:2 SLOPE
- STOPBANK 1:1 SLOPE
- TERRAMESH BASKET UNITS
- TOPSOIL AND LANDSCAPE ONLY
- GRAVEL PATHWAY

TREE ACTIONS - CONFIRM WITH ENGINEER

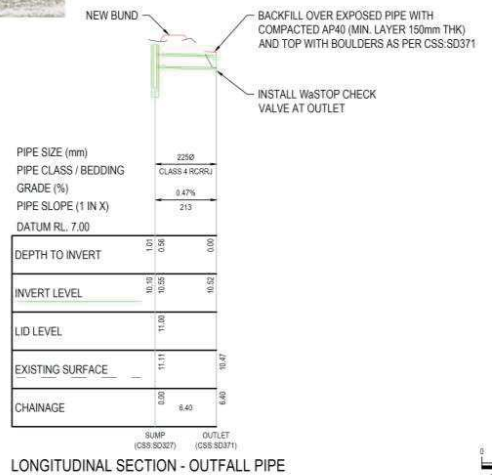
- TO BE REMOVED
- TO BE RETAINED
- PARK TREE TO BE REMOVED BY CCC

STORMWATER

- DN225 PIPE
- CORNER SUMP



LONGITUDINAL SECTION - BEXLEY ROAD BUND
HORZ 1:250 VERT 1:50



LONGITUDINAL SECTION - OUTFALL PIPE
HORZ 1:250 VERT 1:50

SCALE 1:50 AT ORIGINAL SIZE
SCALE 1:250 AT ORIGINAL SIZE

ISSUE	AMENDMENTS	SIGNED	DATE
A	FOR INFORMATION		

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.O.D.		NAME	SIGNED	DATE
BENCH MK.	-	DESIGNED	G. LIDGETT		
RL	-	DES. REVIEW	A. INGLES		
SURVEY	-	DRAWN	G. LIDGETT		
SURVEY LB	-	DRW. CHECK	A. INGLES		
DRAIN. REF	-	© COPYRIGHT CHRISTCHURCH CITY COUNCIL AERIAL PHOTOGRAPHY © COPYRIGHT TERRALINK INTERNATIONAL LIMITED			
SAP WBS	-				

APPROVED

FOR TENDER	
DATE	SIGNED
-	-
FOR CONSTRUCTION	
DATE	SIGNED
-	-

CONSULTANT
GHD CLIENTS | PEOPLE | PERFORMANCE
Level 3, 139 Victoria Street, Christchurch 8013 New Zealand
T 64 3 378 0900 F 64 3 377 8575 E chomail@ghd.co.nz W www.ghd.co.nz
CONSULTANT DRAWING SHEET REF | CONSULTANT FILE REF

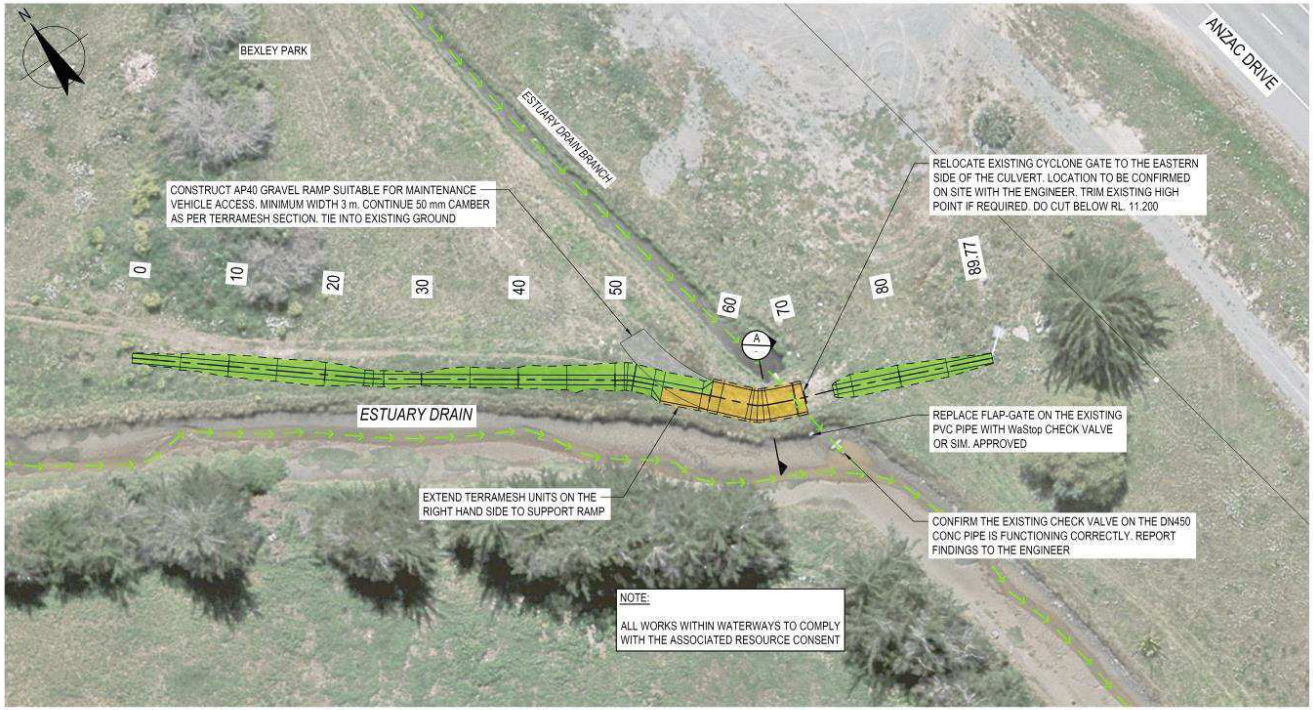
PROJECT TITLE
TEMPORARY STOPBANK MANAGEMENT (LDRP507)
This Drawing must not be used for Construction unless signed as Approved

DRAWING TITLE
BEXLEY PROTECTION
ANZAC DRIVE BUND
PLAN & LONG SECTION

CONTRACT NUMBER	ORIGINAL SHEET SIZE	SCALES
CAD DRAWING FILE REF	A1	AS SHOWN
CPG PROJECT FILE NUMBER		DO NOT SCALE
	SHEET	C304

PLOT DATE: 11 July, 2017 - 5:17 PM BY: George Lidgett
Note: * indicates signatures on original issue of drawing or last revision of drawing
CAD FILE NO: G:\51\34150\CADD\Drawings\51-34150-C301_C305.dwg

Plan CRC176138B



PLAN
SCALE 1:250

NOTES:

1. REFER TO DRG C003 FOR GENERAL NOTES
2. REFER TO DRG C501 FOR TYPICAL STOPBANK PROFILES AND NOTES

LEGEND - EXISTING

- UNDERGROUND POWER
- UNDERGROUND HV
- ELECTRICAL DUCT
- OVERHEAD POWER LINES
- POWER POLE
- LIGHT POLE
- CHORUS
- VODAFONE
- FIBRE OPTIC CABLE
- SEWER
- WATER
- STORMWATER
- 8314.115 AVON RIVER CHAINAGE
- TEMPORARY STOPBANK
- CMA BOUNDARY (APPROX.)

LEGEND - DESIGN

- STOPBANK 1:3 SLOPE
- STOPBANK 1:2.5 SLOPE
- STOPBANK 1:2 SLOPE
- STOPBANK 1:1 SLOPE
- TERRAMESH BASKET UNITS
- TOPSOIL AND LANDSCAPE ONLY
- GRAVEL PATHWAY

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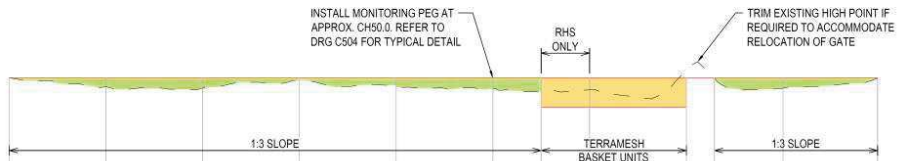
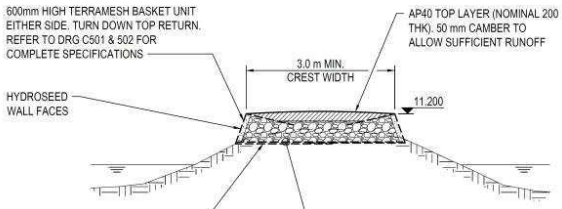
- TO BE REMOVED
- TO BE RETAINED
- PARK TREE TO BE REMOVED BY CCC



DATUM RL. 9.00												
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.18	0.21	0.04	0.16	0.21	0.27 (-0.33)	0.25 (-0.55)	-0.79	0.21	-0.00	
DESIGN SURFACE LEVEL	11.200	11.200	11.200	11.200	11.200	11.200	11.200	11.200	11.200	11.200	11.200	
EXISTING SURFACE LEVEL	11.20	11.02	10.99	11.16	11.04	10.99	10.93	10.95	11.39	10.99	11.20	
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	55.00	60.00	70.00	73.00	80.00	89.77

LONGITUDINAL SECTION - ESTUARY DRAIN BUND
HORZ 1:250 VERT 1:50



A SECTION
SCALE 1 : 50
TYP. TERRAMESH SECTION

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

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

ISSUE	AMENDMENTS	SIGNED	DATE
A	FOR INFORMATION		

Christchurch City Council
TECHNICAL SERVICES AND DESIGN

DATUM	C.D.D.		NAME	SIGNED	DATE	APPROVED
BENCH MK.	-	DESIGNED	G. LIDGETT			FOR TENDER
RL	-	DES. REVIEW	A. INGLES			DATE SIGNED
SURVEY	-	DRAWN	G. LIDGETT			- -
SURVEY LB	-	DRW. CHECK	A. INGLES			FOR CONSTRUCTION
DRAIN. REF.	-	© COPYRIGHT CHRISTCHURCH CITY COUNCIL AERIAL PHOTOGRAPHY © COPYRIGHT TERRALINK INTERNATIONAL LIMITED				DATE SIGNED
SAP WBS	-					- -

PLOT DATE: 11 July, 2017 - 6:17 PM BY: George Lidgett

Note: * indicates signatures on original issue of drawing or last revision of drawing

CONSULTANT
GHD CLIENTS | PEOPLE | PERFORMANCE
Level 3, 138 Victoria Street, Christchurch 8013 New Zealand
T 64 3 378 0900 F 64 3 377 8575 E chcmail@ghd.co.nz W www.ghd.co.nz

CONSULTANT DRAWING SHEET REF.: C302
CONSULTANT FILE REF.: 51-34150

PROJECT TITLE
TEMPORARY STOPBANK MANAGEMENT (LDRP507)

This Drawing must not be used for Construction unless signed as Approved

DRAWING TITLE
BEXLEY PROTECTION ESTUARY DRAIN BUND PLAN & LONG SECTION

CONTRACT NUMBER:
CAD DRAWING FILE REF.:
ORIGINAL SHEET SIZE: A1
CPC PROJECT FILE NUMBER:
SCALES: AS SHOWN — DO NOT SCALE
SHEET: C302

CAD FILE NO: G:\51\34150\CADD\Drawings\51-34150-C301_C305.dwg

Exercising of resource consent CRC176138

It is important that you notify Environment Canterbury when you first start using your consent.

GRANTED TO: Christchurch City Council
A DISCHARGE PERMIT (S15): To discharge operational phase stormwater to land and surface water.
LOCATION: Bexley Road/Anzac Drive, Christchurch

Even if the consent is replacing a previous consent for the same activity, you need to complete and return this page.

Providing this information will:

- Validate your consent through to its expiry date
- Minimise compliance monitoring charges
- Help provide an accurate picture of the state of the environment.

If consent CRC176138 is not used before 30 Sep 2022 this consent will lapse and no longer be valid.

Declaration:

I have started using this resource consent.

Action taken: (e.g. pasture irrigated, discharge from septic tank/boiler/spray booth etc).

_____

Approximate start date (***Note: this may be different to the date the consent was granted)***: _____

Signed: _____ **Date:** _____

Full name of person signing (please print)**:** _____

Please return to:

Environmental Protection - Administration
Environment Canterbury
PO Box 345
Christchurch 8140

File: CRC176138

Resource Management Act 1991

Christchurch City Council

Report / Decision on a Non-notified Resource Consent Application

(Sections 95A, 95B and 104 / 104B)

Application Number:	**RMA/2017/1216**
Applicant:	Christchurch City Council
Site address:	Banks of Avon-Heathcote Estuary from Evans Avenue to Bridge Street Reserve comprising 29 Wairoa Street; 29F Wairoa Street; 295 Bexley Road; 289 Bexley Road; 196 Bexley Road; 194 Bexley Road; 143 Bridge Street; 59 Kibblewhite Street; 75 Tovey Street; 24 Admirals Way
Legal Description:	Pt RS 41458 Canterbury Dist; Pt Lots 223 DP 807; Lot 141 DP 313340, Lot 145 DP 327093, Lots 1,2 DP 72537; Secs 1,2,3,4,5,6 SO 300779; RSs 42403,42404,42405,42410 Canterbury Dist, Lot 3 DP 61910, Lot 1 DP 77676; Pt Lot 7 DP 15300; Ress 1579,1579 Canterbury Dist, Sec 1 SO 16502; Sec 2 SO 16502; Pt Res 1579 Canterbury Dist; RSs 42406,42407,42408 Canterbury Dist
Zoning:	**Operative Replacement District Plan:** Open Space Community Park (OCP); Open Space Natural (ON); Open Space Water and Margins (OWM); Specific Purpose Flat Land Recovery (SPLR); Open Space Coastal (OC); Transport
Overlays and map notations:	Downstream Waterway (Avon River); Environmental Asset Waterways (Estuary Drain and Jervois Street Outlet); Network Waterways (Bridge Street Outfall; Blighs Drain; Tovey Street Drain; Admirals Way Outfall); Liquefaction Management Area (LMA); Fixed Minimum Floor Level Overlay within Flood Management Area (FMA); High Flood Hazard Management Area (HFHMA); Nga Turanga Tupuna; Site of Ecological Significance; Significant Feature; Area of Natural Character in the Coastal Environment; Coastal Environment Overlay
Activity Status:	**Operative Christchurch District Plan:** Non-complying
Description of Application:	Repair, upgrade and replacement of stopbanks around the Avon Heathcote Estuary between Evans Avenue and Bridge Street Reserve and construction of three new temporary stopbanks

Introduction

The applicant seeks consent to repair, upgrade and replace temporary stopbanks constructed after the earthquakes along the margins of the Avon Heathcote Estuary between Evans Avenue and Bridge Street in South New Brighton and to construct three new temporary stopbanks, two on either side of Bexley Road and one to the south of Bridge Street in the Bridge Street Reserve.

The purpose of the works is to provide a consistent level of flood protection for a 1 in 50 year (2% AEP) flood event combined with a high tide event on the lower Avon River.

The anticipated lifespan of the stopbanks is 20 years.

Figure 1 Location of stopbanks to be repaired and upgraded (green) and location of new proposed stopbanks (yellow).

The proposed works will primarily involve levelling off and repair of existing stopbanks with fill and topsoil, hydroseeding with grass along the length of the stopbanks and constructing rock riprap toes where existing stopbank has been eroded. The methodology for the works is set out in section 2.7 of the application. It includes installation of erosion and sediment controls and stripping of the foundation or existing surface (as required) to a maximum depth of 0.3m below ground level along the length of the stopbank, and placement of cleanfill to bring the bank up to the design height. Some sections of the stopbanks will be constructed with Terramesh basket units.

The works include:

	Location	**Summary of works proposed**	**Zones and overlays applying**
1.	True left bank at Evans Avenue (point 9240-9380 on Plan C127)	a. Approximately 140m of stopbank repaired to a 1:3 slope with new topsoil and landscaping	Open Space Community Park Coastal Environment Overlay Area of Natural Character in the Coastal Environment Overlay FMA HFHMA
2.	True left bank at Evans Avenue (point 9380 on Plan C127 to point 9460 on Plan C128)	a. Approximately 80m of stopbank replaced with Terramesh units and a rock rip rap toe b. 12 trees to be	Specific Purpose Flat Land Recovery Zone Coastal Environment Overlay Site of Ecological Significance FMA

		removed and replanted c. Reconstruction of existing stormwater outfall	HFHMA
3.	True left bank at Evans Avenue (point 9460-9580 on Plan C128)	a. Approximately 120m of stopbank repaired to a 1:1 slope with new topsoil and landscaping b. Rock rip rap installed for partial length c. 18 trees to be removed	Specific Purpose Flat Land Recovery Open Space Coastal Network Waterway (Admirals Way Outfall) Coastal Environment Overlay Area of Natural Character in the Coastal Environment Site of Ecological Significance FMA HFHMA
4.	True left bank between Evans Avenue and Bridge Street (point 9580 on Plan C128 to point 11013 on Plan C132)	a. Topsoiling and landscaping the shoulder of the stopbank between points 9600 and 9700. b. Infill tomo at point 10540 with compacted clean fill material c. Top up existing pathway as required d. Topsoiling and landscaping of stopbank between points 10920 and 11013 on the west side of Bridge Street e. Lining of existing piped section of Jervois Street Drain	Open Space Coastal Open Space Natural Network Waterway (Tovey Street Drain) Environmental Asset Waterway (Jervois Street Drain) Network Waterway (Blighs Drain) Transport Zone Coastal Environment Overlay Area of Natural Character in the Coastal Environment Significant Feature Site of Ecological Significance Nga Turanga Tupuna FMA HFHMA
5.	True left bank south of Bridge Street in road reserve (point 0-80 on Plan C401)	a. Approximately 20m of new earth bund stopbank with a 1:2.5 slope b. Approximately 60m of new 0.7m high Terramesh stopbank c. New planting of low (up to 0.5m high) native plants on north side of Terramesh stopbank	Transport Zone Coastal Environment Overlay Area of Natural Character in the Coastal Environment Site of Ecological Significance Nga Turanga Tupuna FMA HFHMA
6.	True left bank south of Bridge Street in Bridge Reserve (point 80-185 on Plan C401)	a. Approximately 105m of new earth bund stopbank with a varied slope of between 1:2.5 and 1:4 including a bund over the existing gravel pathway b. Construction of new 1.5m wide gritted pedestrian pathway around the bund c. Topsoil and landscape existing path	Open Space Natural Coastal Environment Overlay Network Waterway (Bridge Street Outfall) Area of Natural Character in the Coastal Environment Site of Ecological Significance Nga Turanga Tupuna FMA HFHMA
7.	True right bank opposite Evans Avenue to Otakaro Place (point 9740 on Plan	a. Approximately 610m of repairs to existing stopbank including	Open Space Water and Margins Open Space Natural Coastal Environment Overlay

	C228 to point 10350 on Plan C230)	topsoiling and landscaping	Area of Natural Character in the Coastal Environment Significant Landscape Feature Site of Ecological Significance FMA
8.	True right bank from Otakaro Place to Seabreeze Close (point 10350 on Plan 230 to point 10700 on Plan C231)	a. Approximately 350m op repairs to existing stopbanks comprised of topsoiling and landscaping b. Installation of rock rip rap protection as required	Open Space Natural Coastal Environment Overlay Area of Natural Character in the Coastal Environment Significant Landscape Feature Site of Ecological Significance FMA HFHMA
9.	True right bank from Seabreeze Close to Bexley Road (point 10700 on Plan C231 to point 10980 on Plan C232)	a. Approximately 280m of repairs to existing stopbanks comprising topsoiling and landscaping with repairs to achieve a 1:2.5 slope b. Infilling of the depression between the existing stopbank and the high ground at point 10980	Open Space Natural Coastal Environment Overlay Area of Natural Character in the Coastal Environment Site of Ecological Significance FMA HFHMA
10	True right bank west of Bexley Road (Plan C301)	a. Approximately 90m long new temporary stopbank topping up existing earth mound on west side of Bexley Road and installing a new 10m section of Terramesh up to 0.6m high b. Repairs to culverts in Estuary Drain including new flapgate and valve	Open Space Community Parks Environmental Asset Waterway (Estuary Drain) FMA HFHMA
11	True right bank east of Bexley Road (Plan C303)	a. Approximately 70m of new stopbank comprised of filling of low points to 0.4m high. b. A new pipe and outfall structure to channel stormwater from the road reserve underneath the stopbank c. Construction of a 3m wide gravel ramp for maintenance vehicle access	Open Space Natural Transport Zone Coastal Environment Overlay Area of Natural Character in the Coastal Environment Site of Ecological Significance

An estimated total volume of 1752m^3 of earthworks is anticipated.

The proposal will involve removal of vegetation within the footprint of the existing temporary stopbanks over a corridor width of approximately 15m. This includes the removal of thirty trees adjacent to the stopbank at Evans Avenue as indicated by red dots on the application plans.

Site and Surroundings

The site and surroundings are described in sections 2.1 to 2.5 of the application. I adopt the applicant's description. I also adopt the description of the significant cultural values of the application site set out in Appendix D of the application (the archaeological assessment and authority).

In addition, I note that:

a) some of the sites in the Specific Purpose Flat Land Recovery Zone are still occupied, including a residential dwelling at 9 Velsheda Street; and
b) the paths on top of the stopbanks are popular for recreational users including dog walkers.

Figure 2 Zones relevant to the application

Previous Resource Consents

Christchurch City Council holds a global resource consent (RMA92019127) for removal and works within 10m of the base or within the dripline of vegetation protected under the City Plan and Banks Peninsula District Plan. This includes the trees along Evans Avenue, which were scheduled in Volume 3, Part 8/4.5.4 of the City Plan.

SCIRT (which includes the applicant as a member organisation) holds a global resource consent for earthworks in contaminated soil (RMA92020520). The consent authorises earthworks, including stopbanks, in HAIL sites.

The applicant also holds a global consent with Canterbury Regional Council (CRC146620) for earthworks in the bed and margins of a river. This consent does not apply to stopbanks and flood protection works but does authorise activities with comparable effects including earthworks in riparian margins and installation of utilities.

Existing Environment

Lower stopbanks have been located around this section of the estuary for some time. Appendix B shows the 2009 survey levels of these stopbanks and Appendix A includes photos provided from the Council's parks and stormwater team showing the levels of the stopbanks at Evans Avenue and Kibblewhite Street prior to the earthquakes.

Following the Canterbury Earthquake sequence emergency works were carried out to repair damage to the stopbanks and fill in a number of gaps. This work was requested by the National Director of Civil Defence. Section 84 of the CDEM Act 2002 provides the power of direction and section 85 power to undertake certain works in a state of emergency which includes carrying out works, clearing roads, making safe dangerous

structures. Section 111 relates to the restricted application of the Resource Management Act 1991 to emergency works and refers to the ability to carry out emergency works under Section 330B of the RMA.

Section 330B (3) states that if the adverse effects of the activity continue, the necessary consents must be obtained within 20 working days of giving notice to the consent authority in respect to the works.

In my view, global consent RMA92020520 applies to earthworks in contaminated soil, but does not apply to earthworks in waterway setbacks. The proposal would have triggered a resource consent requirement under the then operative City Plan for earthworks and buildings in the setback of a downstream waterway (Volume 3 Part 9/5.2.4). While the City Plan exempts works with regional consent and the Council has a global consent from the regional council for earthworks in waterway setbacks (CRC146620), the global consent does not apply to stopbanks.

Therefore, I consider that the existing environment against which the effects of the proposal should be assessed would be the environment as it existed prior to the emergency works (as documented in Appendices A and B).

Previous Consultation

Consultation was undertaken by the applicant with Ngai Tahu (Te Ngai Tuahuriri Runanga) as part of the application for an Archaeological Authority.

Planning Framework

The operative Christchurch district plans are under review. The Independent Hearings Panel has made all decisions on the Proposed Replacement District Plan. With the exception of specific provisions in the Commercial Chapter and Central City provisions, all rules are now fully operative or treated as operative pursuant to section 86F of the Act. The rules applicable to this proposal have been assessed and the breaches are identified below. Relevant objectives and policies are discussed in a later section of this report.

Christchurch District Plan

The proposed stopbanks are located in a number of Christchurch District Plan zones including Open Space Community Park, Open Space Natural, Open Space Water and Margins, Open Space Coastal, Specific Purpose Flat Land Recovery and Transport.

The purpose of the Open Space Community Park Zone is to enable formal and informal recreation activities and ensure provision of accessible neighbourhood parks with a predominance of open space capable of accommodating amenity tree planting, landscaping, small-scale public amenities, etc.

The purpose of the Open Space Natural Zone is to recognise extensive natural, ecological, scenic and outdoor recreation areas and ensure protection and enhancement of biodiversity, landscape, cultural and historic heritage values. The Open Space Natural environment is intended to be accessible and to provide for recreation activities.

The purpose of the Open Space Water and Margins Zone is to ensure the protection of the natural qualities and habitats of surface water bodies and their margins and provisions for sports and recreational use of water bodies where this does not compromise other values.

The purpose of the Open Space Coastal Zone is to protect the natural environment of the sandy beaches and rocky shorelines of the Christchurch City coast while providing for restoration and enhancement of indigenous flora and fauna and compatible coastal recreation activities.

The Specific Purpose Flat Land Recovery Zone is a zone to provide for the interim management of red-zoned land. The zone anticipates a largely open environment that recognises the natural hazard risks affecting the properties in the area and maintains the longer-term potential of the area to contribute to the recovery and future enhancement of Christchurch.

The purpose of the Transport Zone is to provide for a safe and efficient transport network and to enable non-transport related activities that contribute to public amenity values and/or provide a public place for community activities.

In addition to the zone rules, a number of overlays apply to proposal. These include the Fixed Minimum Floor Level Overlay within Flood Management Area (FMA); High Flood Hazard Management Area (HFHMA); Nga Turanga Tupuna; Site of Ecological Significance; Significant Feature; Area of Natural Character in the Coastal Environment; and Coastal Environment overlays. Parts of the stopbanks also fall within the setbacks of several waterways.

The stopbanks are consistent with the definition of "buildings". This definition includes *"any structure or part of a structure, whether permanent, moveable or immoveable". The RMA defines a structure as "any building, equipment, device or other facility made by people and which is fixed to land*". The Oxford English Dictionary defines a "facility" as *"a place, amenity or piece of equipment provided for a particular purpose"*. I consider that the stopbanks are a manmade facility provided for the purpose of flood protection and are therefore a structure as defined by the RMA and a building as defined by the District Plan.

Rule 6.6.3(h)(viii) exempts earthworks (but not buildings) associated with the maintenance, upgrade or construction of hazard mitigation and protection works where undertaken by the Council in a water body setback.

Rule 8.9.3(a)(v) exempts earthworks associated with the maintenance, upgrade or construction of hazard mitigation and protection works were undertaken by the Crown from the requirement for a resource consent under the general earthworks rules in Chapter 9.

Rule 9.1.3(h)(iii) exempts flood protection and drainage works undertaken by the Council from the restrictions on clearance of indigenous vegetation in a site of ecological significance.

The proposal is a Non-complying activity under the Christchurch District Plan under the following rules:

- *Pursuant to Rule 5.4.1.5 RD2, in a Flood Management Area resource consent is required for filling and excavation that is not a permitted activity under P11 (which permits filling and excavation associated with the maintenance of flood protection works)*

  The proposal included filling and excavation for the upgrade of flood protection works which is not provided for under P11 and exceeds the maximum volume of filling of $10m^3$ per site provided for under P13. The applicant is proposing $1752m^3$ of earthworks which includes earthworks both for maintenance and upgrade and for the establishment of the new stopbanks.

- *Pursuant to Rule 5.4.6.1 NC2, in a High Flood Hazard Management Area resource consent is required for any new building where the ground floor area of the replaced or repaired building is greater than the ground floor area of the existing building or is located on a part of the site that is lower than the existing building.*

  The proposal includes construction of new stopbanks and repairs to existing stopbanks which increase the area covered by the stopbanks in the High Flood Hazard Management Area.

- *Pursuant to Rule 6.6.4.3 RD2, a resource consent is required for new buildings within a water body setback.*

  The new temporary stopbank on the west side of Bexley Road is within the 7 metre setback of an Environmental Asset Waterway (Estuary Drain).

- *Pursuant to Rule 6.6.4.4 D1, a resource consent is required for new buildings within a water body setback located within a site of ecological significance.*

  The new temporary stopbank south of Bridge Street is within the 5 metre setback for a network waterway (Bridge Street Outfall) and this stopbank is located within a site of ecological significance.

- *Pursuant to Rule 7.4.2.2 C2, in the Transport Zone a resource consent is required for any activity that would be a controlled activity in the adjoining zone.*

  The approximately 95m of the new stopbank on the south side of Bridge Street is in the Transport Zone. The adjoining zone is Open Space Natural. Therefore, as discussed below, pursuant to Rule 18.7.1.2 C1 a resource consent is required for new stopbanks undertaken by the Council in this zone.

  Likewise, the 70m long new stopbank on the east side of Bexley Road is in the Transport zone. The adjoining zone is Open Space Water and Margins. In that zone, pursuant to Rule 18.8.1.2 C1 a resource

consent for a controlled activity is required for new stopbanks undertaken by the Council. Therefore a controlled activity resource consent is also required in the adjoining Transport Zone.

- *Pursuant to Rule 7.4.2.4 D1, a resource consent as a discretionary activity is required for any activity in the Transport Zone that is not otherwise provided for as a permitted, controlled, restricted discretionary, non-complying or prohibited activity.*

  Part of the stopbank repairs will extend into the Kibblewhite Street Road Reserve. These works are not otherwise provided for in the Transport Zone.

- *Pursuant to Rule 9.2.5.1 D1, a resource consent is required for any building not otherwise specified in the Significant Feature 8.1 Otakaro/Avon River overlay.*

  The new stopbank on the south side of Bridge Street is in the significant feature overlay area.

  Part of the areas between Point 10180 on Plan 230 and Point 10760 on Plan 231 also fall within the significant feature overlay. The proposal indicates that rock armouring may be installed at the toes of these stopbanks as required and that the stopbanks will be covered in topsoil and grassed. I consider that these are additions to the existing stopbank which will exceed 40m^2 in GFA and therefore these upgrades also trigger a consent requirement pursuant to Rule 9.2.5.1 D1.

- *Pursuant to Rule 9.2.6.1 D1, in an Area of Natural Character in the Coastal Environment a resource consent is required for any building not otherwise described.*

  The proposal includes construction of new stopbanks (south of Bridge Street and east of Bexley Road) within an Area of Natural Character in the Coastal Environment. I consider that the upgrades to the existing stopbanks will increase the GFA by more than 40m^2 and therefore 9.2.6.1 D1 also applies to the proposed upgrades rather than 9.2.6.1 P4.

- *Pursuant to Rule 13.11.4.1.3 RD9 a resource consent is required for hazard management or mitigation works undertaken by the Council in the Specific Purpose Flat Land Recovery Zone that do not meet the activity specific standards for Rule 13.11.4.1.1 P9 including the requirement for those works not to be located within a site of ecological significance.*

  Part of the proposed replacement of 80m of stopbank with Terramesh units and rock rip rap toe between point 9380 on Plan C127 and point 9560 on Plan C128 will be located within a site of ecological significance. Rule 13.11.4.1.1 P10 permits *"maintenance, repair, relocation and removal or flood protection and bank erosion works… undertaken or authorised by the Christchurch City Council".* The Oxford English Dictionary defines "maintenance" as "*the process of preserving a condition or situation" or "the process of keeping something in good condition".* In my view, the proposed installation of rock armouring and the increase in height of the stopbank by 0.2-0.3m goes beyond the ordinary plan meaning of "maintenance" or "repair" to the extent that the works create a new and enduring physical structure rather than being a process of preserving an existing structure. The proposal introduces a new structural element into the stopbank and increases its size. While the purpose of the rock armouring is to reduce future erosion at the toe of the stopbank, I do not consider that this new structure is captured by the definition of maintenance as a process. Therefore, I consider that P10 does not apply to the proposed works in this part of the site.

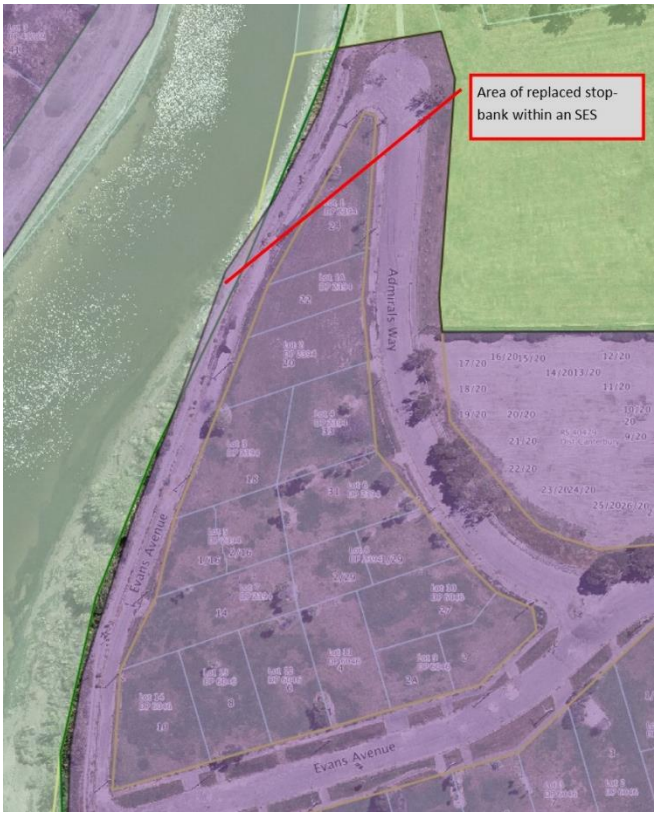


Figure 3 Area of stopbank replacement at Evans Avenue which is inside a site of ecological significance (SES) – shown with green shading above.

- *Pursuant to Rule 18.4.1.2 C1, in the Open Space Community Parks Zone resource consent is required for new buildings and structures (including stopbanks) for the purposes of flood protection where undertaken by the Council*

  The new 100m long temporary stopbank on the west side of Bexley Road is in the Open Space Community Parks Zone.

- *Pursuant to Rule 18.7.1.2 C1, in the Open Space Natural Zone resource consent is required for new buildings and structures (including stopbanks) for the purposes of flood protection where undertaken by the Council.*

  A new 105m long temporary stopbank is proposed in the Bridge Street Reserve which is zoned Open Space Natural.

  A new 70m long temporary stopbank is also proposed on the east side of Bexley Road within the Open Space Natural Zone.

  The proposal may also require installation of new rock armouring at the base of the stopbank between point 10350 on Plan C230 to point 10700 on Plan C231. This area is also in the Open Space Natural Zone.

- *Pursuant to Rule 18.9.1.5 NC1, a resource consent is required for any activity not otherwise provided for in the Open Space Coastal Zone.*

  The proposal includes repair and topping up of existing stopbanks in the Open Space Coastal Zone adjacent to Kibblewhite Street. This activity is not provided for as a permitted, controlled, restricted discretionary or discretionary activity in that zone.

While there are some differences between how I have assessed the stopbanks (as buildings across all of the chapters and overlays) and the applicant's assessment, I note that we both consider the application to be a non-complying activity on the basis of the stopbanks being in the High Flood Hazard Management Area and that the differences are not critical because we have both assessed the same environmental effects. The differences in our assessment of the rule non-compliances do not influence the overall evaluation of the application.

Christchurch City Plan

The Christchurch District Plan zone rules are operative and the City Plan zone rules have been replaced. Likewise the Christchurch District Plan natural and cultural heritage overlays, significant tree provisions, natural hazards rules, water body setbacks and noise provisions are all fully operative and have replaced the corresponding City Plan rules.

However, District Plan Review proposals on coastal hazards were withdrawn from the District Plan Review process on 16 October 2015. The withdrawal notice specified certain provisions of the City Plan and Banks Peninsula District Plan that would remain operative pending that review. This includes the provisions in Volume 3, Part 9/5.2 that require a Restricted Discretionary resource consent for filling, excavation or erection of buildings within 20m of Mean High Water Springs (MHWS).

The proposal involves filling, excavation and the erection of buildings. The majority of the project area is within 20m of MHWS as shown on the City Plan maps.

There are no other provisions in the City Plan that apply to this activity.

The proposal is a Restricted Discretionary activity with respect to the City Plan coastal hazards provisions that remain operative.

National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES)

The NES controls soil disturbance on land where an activity on the Hazardous Activities and Industries List (HAIL) is being carried out, has been carried out, or is more likely than not to have been carried out. The application site, specifically the reserve on the west side of Bexley Road, has been identified as HAIL land (former landfill) therefore the provisions of the NES apply.

The Council has already been granted a global resource consent (RMA92020520) for earthworks in contaminated soil, including earthworks for the construction and repair of stopbanks. I therefore consider that further resource consent is not required under the NES for this activity.

Written approvals [Sections 95D, 95E(3)(a) and 104(3)(a)(ii)]

No written approvals have been provided with the application.

Effects on the environment and adversely affected persons [Sections 95A, 95B, 95E(3) and 104(1)(a)]

As a non-complying activity the Council's assessment is unrestricted and all actual and potential effects of this proposal must be considered. Relevant guidance is contained in the relevant assessment matters as to the effects that require consideration.

I consider that the potential effects of the proposal relate to:

- Positive effects
- Natural hazard risk
- Ecological values
- Cultural values
- Landscape and amenity values
- Recreation values
- Transport network effects
- Temporary construction effects
- Cumulative effects

Positive effects

With respect to my assessment of the effects against section 104(1)(a), I concur with the applicant's assessment that the proposal will provide a more consistent level of flood protection from a 1 in 50 year (2%

AEP) flood event combined with a high tide event and that this will reduce the risk of damage to property and to the natural environment in the immediate area.

Topsoiling and grassing of the existing stopbanks will also improve their visual amenity, allowing them to better blend into the surrounding environment.

The 1.5m wide gravelled pathway on top of the stopbanks will enhance a popular recreational route around the estuary and will provide good public access to the coastal area.

Natural Hazard Risk

Strategic Directions Objective 3.3.6 is to avoid development in areas where the risks from natural hazards to people, property and infrastructure are assessed as being unacceptable and in all other areas to undertake development in a manner than ensures the risks of natural hazards to people, property and infrastructure are appropriately mitigated.

Policy 5.2.2.1(b) identifies the High Flood Hazard Management Area as an area where subdivision, use and development should be avoided *"where it will increase the potential risk to people's safety, well-being and property."*

Policy 18.2.2.6 is to recognise and provide for flood hazard mitigation and protection works in Open Space zones when undertaken by the Council having regard to potential adverse effects.

Ms Iris Brookland, a Planning Engineer with the Council's Stormwater and Land Drainage Team, provided advice on this application, attached as Appendix E. Ms Brookland's view is that the proposal will not increase the potential risk to people's safety, well-being and property. On the contrary, Ms Brookland considers that the proposal will *"increase the level of protection of flooding originating from the Avon River and decrease the risk of stopbank failure."*

Ms Brookland expressed some initial concerns that the degree of the flood protection provided by the stopbanks might be temporarily lessened during the process of repair and upgrade. The applicant included in their s92 response a copy of the project specifications which require contractors undertaking the work to either work in short sections that can be reinstated in the same working day or to construct alternate temporary works that will perform the same flood defence function. The contractor will also be required to keep resources available at all times to carry out emergency works and flood contingency works in accordance with clause 6.8 of NZS 3910.

Ms Brookland indicated that subject to these measures, she supports the application.

I agree with the applicant and with Ms Brookland that the proposal will provide a more consistent level of overall flood protection, reduce the risk of erosion of the stopbanks with the installation of additional rock armouring and will decreasing the overall potential risk to people's safety, well-being and property. I consider that any increased risk of natural hazards have been appropriately mitigated.

Policy 5.4.4.1.4 is to ensure that subdivision, use and development (including proposals for hazard mitigation works) do not transfer or create unacceptable natural hazard risk to other people, property, infrastructure or the natural environment.

The applicant notes in section 5.8 of the application that minor works to the existing stopbanks will not affect the land drainage in those areas. Ms Brookland agrees.

The new stopbank south of Bridge Street will cut off a potential flowpath through the low lying area adjacent to Bridge Street, however the applicant considers that any ponding of stormwater will drain into the reticulated stormwater system before reaching the base of the embankment. Likewise a new sump and outfall will provide for drainage under the new stopbank on the east side of Bexley Road. Ms Brookland agrees that the new stopbanks do not pose an increased risk of runoff accumulating behind them.

Relying on Ms Brookland's views, I consider that the proposal will not transfer or create unacceptable natural hazard risk to people, property, infrastructure or the environment.

Ecological Values

Effects on Water Quality and Estuarine Ecology

Strategic Directions Objective 3.3.17 is to recognise and provide for the critical importance of water to the District including by ensuring that the life supporting and intrinsic values and characteristics of water bodies are maintained or improved where degraded and ensuring that development and use safeguards water bodies, coastal waters and their margins.

Policy 9.2.2.2.7 is to ensure activities are carried out in a way that maintains or enhances water quality in the coastal environment.

Dr Greg Burrell, a waterways ecologist for the Council, provided comment on the proposal, attached as Appendix F. Dr Burrell's view is that, subject to the conditions proposed by the applicant including sediment and erosion controls, there would be no adverse effects of the proposal on water quality or estuarine ecological values.

I agree with Dr Burrell's assessment and with the assessment of the applicant's ecologist, Dr Hooson that, while the values of the estuary are high to very high, the impact of the proposed works on those values will be low to very low, generally located in parts of the estuary that have already been partially modified, and can be appropriately mitigated by the conditions proposed by the applicant.

Vegetation Removal

Strategic Direction Objective 3.3.9 is to appropriately manage indigenous ecosystems, particularly those supporting significant indigenous vegetation and significant habitats supporting indigenous fauna.

Objective 9.1.2.1.1 is to protect areas of significant vegetation and significant habitats of indigenous fauna to ensure there is no net loss of indigenous biodiversity. Objective 9.1.2.1.2 is to maintain and enhance Christchurch District's indigenous biodiversity.

Policy 9.1.2.2.6 is to ensure no net loss of indigenous biodiversity in areas identified as sites of ecological significance by avoiding the adverse effects of vegetation clearance and the disturbance of habitats as far as practicable.

"No net loss of biodiversity" is defined in the District Plan and in the Canterbury Regional Policy Statement as:

> *no reasonably measurable overall reduction in:*
> *a. the diversity of indigenous species or recognised taxonomic units; and*
> *b. indigenous species' population sizes (taking into account natural fluctuations) and long term viability; and*
> *c. the natural range inhabited by indigenous species; and*
> *d. the range and ecological health and functioning of assemblages of indigenous species, community types and ecosystems.*

Dr Trevor Partridge, a botanist for the Council, provided comment on the application, attached as Appendix D. Dr Partridge agrees with Dr Hooson's assessment of the values of the site, the relevant effects and their likely impacts. His view is that the parts of the estuary where works will be undertak*en "constitute an adjacent habitat to those of value and have no intrinsic value in themselves."*

Dr Partridge does not consider that significant vegetation will be removed. In his view, the effects of the proposed vegetation removal would *"constitute the kinds of losses that would occur naturally"*. He does not consider that the vegetation to be removed can be seen as a component of a functioning indigenous ecosystem.

I agree with Dr Partridge's assessment that the vegetation to be removed at Evans Avenue is in a modified environment (see Figures A1 and A2 in Appendix A). I note that the applicant is proposing planting of additional indigenous vegetation on the north side of the Bridge Street stopbank.

Ms. Jennifer Dray, a Senior Landscape Architect for the Council, also provided advice on this application attached as Appendix C. Ms. Dray's comment is that the vegetation at Evans Avenue is not thriving in the current environment and would not be suitable for transplanting.

I consider that Rule 9.1.3(h)(iii) generally permits vegetation clearance of this kind within an SES for the purposes of installing flood protection works.

Relying on Dr Hooson's and Dr Partridge's assessments, I consider any adverse effects would be less than minor.

Contaminated Land

While the Council's global consent for earthworks under the NES (RMA92020520) has assessed the effects of earthworks in potentially contaminated soil on human health, it does not address the potential wider ecological effects of soil disturbance in a HAIL site.

I agree with the applicant's assessment that subject to the installation of appropriate sediment and erosion controls that the risk of mobilisation of contaminants from the earthworks at the Bexley Road west site would have less than minor ecological effects on Estuary Drain and its margins. As the applicant notes, the addition of cleanfill to construct the stopbanks will improve the overall soil quality on site.

Summary

In summary, I consider that the adverse effects of the proposal on water quality and the ecological values of the estuary and its margins would be less than minor.

Cultural Values

Objective 9.5.2.1.2 is to maintain or enhance Ngai Tahu cultural values including the natural character of water bodies, wetlands and the coastal environment.

Objective 9.5.2.1.3 is to recognise the cultural significance of Te Tai o Mahaanui including Te Ihutai and enable Ngai Tahu to exercise kaitiakitangi and undertake customary uses in the accordance with tikanga within the coastal environment.

Policy 9.5.2.2.2 is to recognise the historic and contemporary relationship of Ngai Tahu with the areas and landscapes identified as Nga Turanga Tupuna and manage earthworks involving disturbance of soil below a depth not previously disturbed by cultivation or building foundations; facilitate opportunities to enhance mahinga kai and other customary uses of taonga species through planting and landscaping; enhance the natural character and cultural values of water bodies, wetlands and coastal waters including reinstating original water courses where practicable; and maintain or restore natural features with cultural values within these areas.

Policy 9.5.2.2.3 is to recognise the cultural significance of water bodies, wetlands and parts of the coastal environment identified as nga wai and manage effects of land uses to protect the natural character of the water bodies by maintaining natural character where it is high and enhancing it where it is degraded, recognising historic and contemporary Ngai Tahu customary uses, ensure any land uses adjoining these sites do not adversely affect taonga species.

Policy 9.5.2.2.4 is to avoid damage to or destruction of Ngai Tahu Manawhenua archaeological sites within identified sites of Ngai Tahu cultural significance or any unmarked or unrecorded archaeological site when undertaking earthworks or building activities.

The applicant undertook consultation with Ngai Tahu as part of a Cultural Values Statement provided with the application and as part of an application for an Archaeological Authority.

In addition, Ngai Tahu have provided the following comments on the proposal, also attached as Appendix G:

> "*The proposed application area (Te Ihutai) is of archaeological significance related to Māori occupation and activity dating back to early periods of ancestral Māori occupation. Archaeological sites of māori origin in the Ngāi Tahu takiwā are generally culturally significant and regarded as 'Ngā tapuae o ngā tupuna/footsteps of our ancestors' and are considered taonga under (Rangatiratanga) Article 2 of the Treaty of Waitangi (Treaty principles such as the Crown's duties of active protection and consultation, and the duty of both partners to act in good faith).*
>
> *Cultural Monitoring is seen as an appropriate measure to ensure site-workers are best advised about cultural significance, taonga and archaeological evidence (of Māori origin), evidence of the former environs and is an exercise that is a way the Rūnanga can continue their association with their ancestral lands.*
>
> *In terms of specific recommendations, the following is requested:*

- In terms of archaeological values and appropriate protection of Ngāi Tahu association with the area, the rūnanga have recommended an Accidental Discovery Protocol (consistent with appendix 3 of the Mahaanui Iwi Management Plan 2013) be followed during all earthworks activities.

- Additionally, an option to culturally monitor earthworks is recommended as the applicant is required to apply for an archaeological authority under the HNZPT Act 2014.

- A specific condition of consent which allows for cultural monitoring, could be worded as follows; "A member of Te Ngāi Tūāhuriri Rūnanga, trained in the recognition of archaeological deposits, is advised at least 10 working days prior to any earthworks being undertaken, to allow them the opportunity to be onsite to assist and offer cultural insights/ advice during all excavations."

I consider that the applicant has undertaken sufficient consultation with Ngai Tahu consistent with the objectives and policies of the Plan. Subject to conditions providing for cultural monitoring of earthworks and the use of an Accidental Discovery Protocol, I consider that any risk to archaeological remains will be appropriately managed.

As discussed below in the consideration of effects on landscape and amenity values, I consider that the impacts of the proposal on the natural character of the coastal environment and on the cultural landscape will be less than minor. The proposed increase in the height of the existing stopbanks will be barely perceptible once topsoiled and landscaped and the new stopbanks have been designed to blend into the existing landscape. New plantings proposed will be of indigenous species which will enhance the natural character of the estuary.

Landscape and Amenity Values

Effects on the natural character of the coastal environment

Objective 9.2.2.1.4 is to preserve the natural character of the coastal environment, wetlands and their margins.

Policy 9.2.2.2.7 is to recognise and preserve natural character qualities of areas in the coastal environment and to avoid significant adverse effects of use and development and ensure development is not readily visible from public places and frequently visited viewpoints

Policy 9.2.2.2.8 is to recognise and preserve natural character qualities of wetlands and their margins and their protection from inappropriate use and development by ensuring the location, intensity, scale and form of use and development is appropriate, minimising to the extent practicable indigenous vegetation clearance and modification (including earthworks, disturbance and structures), requiring appropriate setbacks from margins; and ensuring development is not readily visible from public places and frequently visited viewpoints.

Policy 18.2.2.5(a)(vi) is to minimise disturbance of natural landforms.

Ms Dray's view is that the works to top up and grass the stopbanks and to install Terramesh basket units would not create adverse effects on the natural character of the coastal environment and would not be readily visible from public places and frequently visited viewpoints.

Ms Dray's view is that the removal of the non-indigenous tree species at Evans Avenue will improve outlooks to the estuary. She considers that the non-indigenous vegetation to be removed has not done well in the coastal environment and that the removal of the trees will not have any adverse effects on the landscape values of the area.

Ms Dray considers that the new temporary stopbank at Bridge Street will "*be a very gentle interruption to the existing landform and will be barely perceptible once the new grass cover has established."*

With regard to the new temporary stopbank on the west side of Bexley Road, Ms Dray considers that the stopbank will be *"reasonably gently contoured and grass covered so will be barely perceptible to passing road users.*"

With regard to the new temporary stopbank on the east side of Bexley Road, it is Ms Dray's view that this stopbank *"will require some riparian planting to screen the movement of path users from the birdlife habitat in the estuary. These plants only need to be up to 1.0m in height at maturity for the length of the stopbank*

particularly on the estuary side. Flax and divarcating plant species would be appropriate. It would be useful for the applicant to submit a planting plan for CCC approval. These plants should also be planted within 3 months, or within the first planting season (April-October) following the completion of construction of the stopbank."

I agree with Ms Dray and with the applicant that the proposed works on the existing stopbanks would result in a tidier and more naturalised appearance that would be more consistent with the natural character of the coastal environment.

I agree that the design of the new temporary stopbanks in the Bridge Street Reserve will generally allow them to blend into the existing land contours and that the landscaping on the north side of the Bridge Street stopbank will screen the less naturalised sections of Terramesh basket units. The planting on the estuary side of the stopbank on the east side of Bexley Road will provide additional amenity in the more sensitive part of the estuary.

On the whole, I consider that the effects of the proposed works on the natural character of the estuary and the tidal wetlands would be less than minor.

Effects on the open space character of the reserves

Objective 18.2.1.3 is for buildings and structures in open spaces to be of a scale, form and design that maintains the predominance of open space, are compatible with the role and anticipated use of the open space, are integrated and consistent with the character of the surrounding area, minimise adverse effects on adjoining land uses and the surrounding environment's ecological, landscape and natural values, historic heritage values and amenity values.

Policy 18.2.2.5(b) is to ensure the scale, layout and design of building is consistent with the role and function of the open space and its anticipated level of spaciousness and character.

Because the stopbanks are relatively low lying and will be landscaped and contoured to blend into the existing environment, I do not consider that they would result in any adverse effects on the predominance of open space or the character in the reserves. The stopbanks will have pathways above and around them which will provide for recreational uses and this is consistent with the role and function of those spaces.

Amenity values

The location of the stopbanks at Kibblewhite Street, along Kibbelwhite Reserve and for the remaining occupied residence in the Specific Purpose Flat Land Recovery Zone (9 Velsheda Street) is between the residences and views of the estuary and wetlands.

Ms Dray considers that the stopbank repairs, topping up and reseeding of the stopbanks at Kibblewhite Reserve and Kibblewhite Street would improve the appearance of the stopbanks as viewed from those residences.

The works in those areas are increasing the height of the existing stopbanks by a minor extent (in Appendix A compare Figures A9, A12 and A13 (pre-earthquakes) with Figures A10, A14 and A15 (post-emergency works). Stopbanks levels recorded in 2009 (attached as Appendix B) show that the levels at Kibblewhite Street were between 10.94 and 11.26 metres above the Christchurch Drainage Datum. The levels in Kibblewhite Reserve were 10.43 to 11.37m. The proposed works will raise the level consistently to 11.4m. This is a difference of 0.46-0.14m along Kibblewhite Street and 0.97-0.03m in Kibblewhite Reserve.

I consider that the effects of this change as perceived from the neighbouring residences along Kibblewhite Street would be less than minor. This is when compared with the existing environment which includes a clearly perceptible rise along the edge of the estuary and riparian planting that partially screens views of the estuary to a greater height than the proposed increased height of the stopbank.

In Kibblewhite Reserve, the stopbanks are on lower ground than the level of the nearby residences with a large stormwater pond intervening and additional higher vegetation on the estuary side which screens views to a greater extent than the stopbanks.

At 9 Velsheda Street (see Figure A5 in Appendix A) the windows and outdoor living spaces of the residence are set back 20-25 metres from the stopbank with a fence and mature vegetation intervening. Proposed works on this section of the stopbank will reduce the level from the current 11.26m to 11.31m by approximately 0.06-

0.11m. I do not consider that these works would result in any adverse effects on the outlook or amenity from this residence after the initial construction phase.

In summary, I consider that the effects of the stopbanks on outlook and amenity for the occupied residential areas adjacent to the stopbanks would be less than minor when compared with the existing environment.

Recreation Values

Strategic Directions Objective 3.3.9 is "*a natural and cultural environment where people have access to a high quality network of public open space and recreation opportunities, including areas of natural character and natural landscape.*"

Ms Kelly Hansen, a Senior Recreation Planner with the Council's parks team, provided advice on this application, attached as Appendix H. Ms Hansen considers that the proposed new stopbank at the Bridge Reserve is consistent with the approved South New Brighton Reserves Management Plan 2014 and with South New Brighton Reserves Development Plan 2014. She considers that the proposed new shared use track will be realigned to go over the new stopbank at a gradient suitable for bicycles and pedestrians. She considers the effects on recreation and access to the coast will be less than minor.

With respect to the new stopbank in Bexley Reserve, she considers that the proposal is consistent with the Bexley Reserve Concept Plan approved by the Community Board in 2013. In her view, the only effects on recreation would be positive, improving current access to the site.

I agree with Ms Hansen and with the applicant that any adverse effects of the proposal on recreational access will be temporary and limited to the construction period. As the areas of construction will be relatively discreet and the period of time relatively short, I agree with the applicant that these effects would pose only a minor inconvenience to recreational users.

In the long term, the gravelled pathways on top of the stopbanks will protect and enhance appropriate public access to the coast (Policy 9.6.2.2.2; Policy 18.2.2.8). To the extent that this access may be incompatible with the ecological values of the estuary (as discussed above in the assessment of ecological effects), I consider that those effects would be mitigated by the proposed planting along the estuary edge of the new stopbank on the east side of Bexley Road.

On the whole, I consider any adverse effects on recreation values or access to the coastal environment would be less than minor.

Transport Network Effects

Policy 7.2.2.2 is to enable non-transport related activities where land in the Transport Zone is not immediately required for transport purposes as long as this will not give rise to reverse sensitivity effects, does not prevent land designated for transport purposes reverting to transport use when required, does not undermine the future transport use of the land designated for transport purposes and is consistent with the activities provided for in the adjoining zones.

Mr Andy Milne, a Senior Transport Planner for the Council, provided comment on the proposal. Mr Milne does not consider that any adverse effects from the proposal on the transport network will arise from the application that could not be managed with a traffic management plan in the construction phase.

The applicant has proposed that a temporary traffic management plan will be implemented. Subject to this condition, I consider that any adverse effects on the transport network would be less than minor.

Temporary Construction Effects

I agree with the applicant's assessment that the potential adverse effects from the construction stage of the proposal include noise, dust and traffic effects.

The majority of the stopbank construction will be in areas where there is limited sensitivity either because the works are adjacent to unoccupied land in the Specific Purpose Flat Land Recovery Zone or are along an arterial road or in a reserve.

Impacts on residential areas would be limited to the sections around Kibblewhite Street and Kibblewhite Reserve and for 9 Velsheda Street. Works in these areas primarily consist of topsoiling and landscaping and will have a limited duration.

The applicant notes that works will be carried out generally in 10m sections. A tanker or hose will be used for dust suppression. The construction works will comply with the District Plan noise standards for construction noise.

I agree with the applicant's assessment that the temporary construction effects, subject to the mitigation measures proposed by the applicant being secured by consent conditions, will be less than minor.

Cumulative Effects

Policy 9.2.2.2.9 is to consider the cumulative effects on the natural character of the coastal environment, wetlands, rivers and their margins including the effects of allowing more of the same activity; allowing more of a particular effect, whether from the same activities or from other activities causing the same or similar effect; and all activities in the coastal or freshwater environment at the site.

As discussed above, I do not consider that the effects on the natural character of the coastal environment would be at least minor and the topsoiling and landscaping of the stopbanks will increase the extent to which they blend into that environment. Therefore, I do not consider that they increase the extent to which the natural character of that environment will appear modified.

Because of the nature of the activity, I do not consider that implementation of this proposal would give rise to precedent effects. Raising the height of the stopbanks in the future would trigger another resource consent requirement and the effects of that increased height could be assessed at that time.

The stopbanks are a temporary measure while longer term options for the Specific Purpose Flat Land Recovery Zone and mitigation of coastal hazards are explored.

Summary

In summary, I consider that the adverse effects of the proposal would be less than minor and will be appropriately mitigated by the conditions proposed by the applicant. I do not consider that anyone would be adversely affected by the proposal or that there would be adverse effects on the wider environment.

Relevant objectives, policies, rules and other provisions of the Plan and proposed Plan [Section 104(1)(b)(vi)]

Regard must be had to the relevant objectives and policies in the Operative City and District Plans, and those in the Proposed Replacement District Plan. Of particular note, Chapter 3 of the Operative Replacement District Plan contains a number of high level strategic objectives to guide the recovery and future development of the City.

District Plan

The applicant sets out the relevant objectives and policies of the Christchurch District Plan in section 6.4 of the application and sections 14-16 of the s92 response.

I adopt the applicant's analysis of the relevant objectives and policies.

I have included reference to additional objectives and policies I consider relevant to the application in Appendix I.

In my view, the application is consistent with these and the other relevant objectives and policies in the operative District Plans, including the objectives and policies discussed above in the assessment of environmental effects.

City Plan

I also consider that the proposal is consistent with the operative objectives and policies of the Christchurch City Plan including:

Policy 2.5.2 to avoid any increased risk of adverse effects on property, wellbeing and safety from natural hazards by limiting the scale and density of development which is within an area subject to moderate to high risk of damage from natural hazards; or would result in an increased risk of damage from natural hazards elsewhere; or would adversely affect the functioning of existing flood protection works.

Policy 2.5.4 to avoid higher density forms of built development and adverse effects from inundation in areas that are projected to be subject to increased flood levels as a result of accelerated sea level rise.

Policy 2.5.9 to undertake works to avoid or mitigate the adverse effects of natural hazards as a supplementary measure to regulation of activities, and the provision of information.

Policy 2.6.3 to avoid or mitigate the adverse effects of erosion and flooding in the coastal environment.

Policy 6.3A.6 to ensure that development is avoided, or limited in scale or density, in areas subject to natural and other hazards, particularly flooding, erosion or potential sea level rise, unless these hazards can be adequately remedied or mitigated.

Weighting of the Christchurch City Plan and Christchurch Replacement District Plan

The relevant provisions in the Independent Hearings Panel's decisions on the Strategic Directions, Natural Hazards, General Rules, Transport, Earthworks, Natural and Cultural Heritage, Specific Purpose and Open Space chapters are fully operative and should be given significant weight. The corresponding provisions in the City Plan are no longer operative.

In the City Plan, objectives, policies and rules relating to coastal hazards remain operative and should also be given significant weight.

To the extent that the proposal relates to management of coastal hazards, I give more weight to the City Plan objectives and policies. These are generally consistent with the District Plan objectives and policies, except that I consider Policy 2.5.9 in the City Plan to undertake works to avoid or mitigate the adverse effect of natural hazards to be more directly supportive of the current proposal than corresponding policies in the District Plan such as Policy 5.2.2.2.1(b) to avoid development in the high flood hazard management area where it will increase the potential risk to people's safety, well-being and property.

Recovery Plans and Regeneration Plans

Section 60(2) of the Greater Christchurch Regeneration Act 2016 requires that no decision or recommendation on a resource consent application must be made that is inconsistent with Recovery Plans and Regeneration Plans.

The Land Use Recovery Plan (LURP) is relevant to this proposal to the extent that it directs the Council through its plan review to provide for the protection of people from risks in 'High Hazard Areas' as defined in the Regional Policy Statement. The Council has given effect to this direction through the identification of hazard areas, including the High Flood Hazard Management Area, in the District Plan. To the extent that the proposal is consistent with the District Plan objectives and policies for natural hazards, I consider it is consistent with the LURP.

There are no operative Regeneration Plans directly relevant to this application.

Relevant provisions of a National Environmental Standard, National Policy Statement, Regional Plan, Regional Policy Statement or Coastal Policy Statement [Section 104(1)(b)]

The applicant sets out the relevant provisions in the New Zealand Coastal Policy Statement 2010, the Canterbury Regional Policy Statement 2013 (RPS) and the Canterbury Land and Water Regional Plan (LWRP) in sections 6.1-6.3 of the application. I adopt the applicant's assessment of these objectives and policies.

In the New Zealand Coastal Policy Statement 2010, I also consider that Policy 15 to avoid significant adverse effects and avoid, remedy or mitigate other adverse effects on natural landscapes in the coastal environment applies and that the proposal is consistent with this policy.

In the Canterbury Regional Policy Statement 2013, I consider that the proposal also achieves:

- Policy 5.3.2 to ensure development avoids or mitigates natural or other hazards or land uses that would likely result in increases in the frequency and/or severity of hazards.
- Objective 6.2.1 to enable a land use framework that protects people from unacceptable risk from natural hazards and the effects of sea-level rise.

Part of the application site at Bexley Road has been identified as a HAIL site (former landfill) and therefore the provisions of the NES for Assessing and Managing Contaminants in Soil to Protect Human Health apply as discussed above.

The applicant sets out the relevant objectives and policies of the Mahaanui Iwi Management Plan in section 6.5 of the application. I adopt the applicant's assessment.

I agree with the applicant's assessment that the proposal is consistent with the South New Brighton Reserves Management Plan 2014 and the Avon-Heathcote Ihutai Management Plan 2013.

Part II of the Resource Management Act and any other relevant matters [Section 104(1) and 104(1)(c)]

I consider the proposal to be in keeping with Part II of the Act as it will:

- preserve the natural character of the coastal environment, wetlands and their margins and protect them from inappropriate use and development;
- protect areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- maintain and enhance public access to and along the coastal marine area;
- recognise and provide for the relationship of Maori with their ancestral lands, water, sites and other taonga; and
- manage significant risks from natural hazards.

Precedent / Plan Integrity

Given the non-complying status of this application it is appropriate to have regard to the issue of precedent, as well as the effect of granting consent upon the integrity of the City Plan and public confidence in its consistent administration. Case Law has established however, through the High Court in *Rodney District Council v Gould,* that concerns relating to plan integrity and precedent effect are not mandatory considerations. The Court held that they are matters that decision makers *may have regard to*, depending on the facts of a particular case including:

1. Whether a proposal is contrary to the objectives and policies of the plan; and if so
2. Whether in the circumstances of a particular case a proposal can be seen as having some unusual quality.

In this case the proposal is not contrary to the objectives and policies, therefore I am satisfied that issues of precedent or plan integrity do not arise.

Non complying activity threshold tests [Section 104D(1)]

The application satisfies both tests as the adverse effects on the environment will be no more than minor and the application is not contrary to the objectives and policies of the relevant Plans.

General notification provisions [Sections 95A(1), 95A(4) and Section 104(3)(d)]

There are no special circumstances or other aspects of the application that warrant public notification of this application.

Recommendations

That, for the above reasons:

A. The application be processed on a **non-notified** basis in accordance with Sections 95A - 95F of the Resource Management Act 1991.

B. The application **be granted** pursuant to Sections 104, 104B, 104D and 108 of the Resource Management Act 1991, subject to the following conditions:

1. The development shall proceed in accordance with the information and plans submitted with the application, including the further information submitted on 7 August 2017 and the amended plans provided on 13 September 2017 and 28 September 2017. The Approved Consent Documentation has been entered into Council records as RMA/2017/1216 (159 pages) and includes the stamped approved plans RMA/2017/1216 pages 64 to 83.

General

2. Prior to the commencement of works the consent holder shall appoint a site supervisor with responsibility to ensure compliance with the conditions of this consent. Contact details of the site supervisor shall be sent to all properties that immediately adjoin the section of proposed works (each section of proposed works being the area between the join lines of each drawing sheet on the stamped approved plans (RMA/2017/1216 pages 64 to 83).

3. Notice, including the contact details of the site supervisor, shall be provided to the Head of Resource Consents (or nominee) at least two working days prior to the commencement or recommencement (after a period of stoppage of more than six weeks) of works on a section of the stopbanks (each section of proposed works being the area between the join lines of each drawing sheet on the stamped approved plans (RMA/2017/1216 pages 64 to 83).

4. The consent holder shall be responsible for all contracted operations relating to the exercise of this consent; shall undertake an induction briefing for all personnel; and shall ensure that all personnel working on the site are made aware of the conditions of this consent and have access to the contents of the relevant consent documents and all associated erosion and sediment control plans.

Natural Hazards

5. Works shall be undertaken in accordance with a construction methodology reviewed by the consent holder's suitably qualified stormwater engineer that details how the effectiveness of the existing flood defences will be maintained during construction. A copy of this methodology shall be provided to and approved by the Council's Asset Planning – Stormwater and Land Drainage Team at least 5 working days before the commencement of works.

6. Earthworks and construction shall be supervised by a suitably qualified engineer.

Natural Values

7. Disturbance of indigenous vegetation shall be limited to the footprint necessary to construct the stopbanks. In particular, disturbance of tall fescue grassland and saltmarsh ribbon-wood shall be avoided.

8. The spread of weeds shall be minimised during the construction period by methods including; hosing down machinery upon completion of works to prevent tracking of seeds and continuing to control weeds through spraying or mechanical means as part of ongoing reserve maintenance.

9. Construction works shall not occur during the bird breeding season (1 September to 1 February) unless the proposed area of works is inspected by a suitably qualified ornithologist. Inspections will be conducted for each section of works no more than eight working days prior to their commencement. The person carrying out the inspection will prepare a written report that identifies located breeding or nesting

sites for any indigenous birds identified as “threatened” or “at risk” in Table 6 of the Ecology Assessment Report in the Approved Consent Documentation (RMA/2017/1216 page 99) and suggest appropriate mitigation measures. This report will be made available to the Head of Resource Consents (or nominee), the site supervisor and any persons carrying out works on site along with the name, qualifications and contact information of the person preparing the report. If indigenous birds are nesting or rearing their young, the contractors carrying out the works shall be informed and works shall not be carried out within 100m of the locations of any occupied nests. If work ceases in any section for more than eight days, the site will be re-inspected for bird breeding and nesting sites and an addendum to the report prepared in accordance with this condition.

10. The consent holder is to provide an erosion and sediment control plan (ESCP) prepared by an appropriately qualified expert to the Head of Resource Consents (or nominee) for certification prior to any earthworks occurring on site. The ESCP is to include dust suppression measures and procedures for managing unforeseen contamination.

11. Erosion and sediment control measures shall be installed prior to the commencement of works in each area in which works are being undertaken to prevent discharges of sediment into the Coastal Marine Area or into any waterways.

12. Should the consent holder stop works on a section of stopbank for a period longer than 6 weeks, it shall first take adequate preventative and remedial measures to control sediment discharge, run-off and dust from any areas of exposed earth and shall maintain these measures until work recommences. Any such measures shall be consistent either with the ESCP or shall be submitted for approval by the Head of Resource Consents (or nominee).

13. All bare soil will be hydroseeded or landscaped as soon as practicable after completion of works on that section.

Landscape and Amenity

14. The consent holder shall provide landscape planting on the north side of the Bridge Street stopbank between points 20 and 80 on Plan C401 that shall consist of locally sourced indigenous species capable of reaching at least 0.8m in height at maturity and providing continuous screening of the Terramesh basket units. The planting shall comprise at least 75 plants that are a mix of *Phormium cookianum* (Mountain Flax), *Coprosma propinqua* (Mingimingi), *Muehlenbeckia complexa* (Small-leaved Pohuehue), *Muehlenbeckia astonii* (Shrubby Tororaro) and *Austroderia richardii* (South Island Toetoe) that are planted at 0.8m spacings and are at least 300mm in height at the time of planting. The ground shall be appropriately prepared prior to planting with at least 300-400mm of cultivated topsoil.

15. Planting proposed in the planting plan shall be established within the first planting season (March to November) after the completion of the Bridge Street stopbank.

16. Landscaping shall be maintained and any plants or areas of grass that are dead or diseased shall be replaced with plants of a similar species.

Cultural Values

17. A member of Te Ngāi Tūāhuriri Rūnanga, trained in the recognition of archaeological deposits, shall be provided at least 10 working days prior to the commencement of physical works with a programme identifying the locations and approximate dates for proposed earthworks, to allow them the opportunity to be on site to assist and offer cultural insights/ advice during all excavations. This programme will be kept updated and the rūnanga notified of any significant changes that would affect their ability to observe earthworks in progress.

18. An Accidental Discovery Protocol consistent with Appendix 3 of the Mahaanui Iwi Management Plan 2013 shall be followed during all earthworks activities.

Temporary Construction Effects

19. A Traffic Management Plan (TMP) shall be prepared and shall be accepted prior to any transportation of fill to sites adjacent to live traffic lanes (including Kibblewhite Street, Bridge Street and Bexley Road). The TMP shall be submitted to the Christchurch Transport Operations Centre through www.tmpforchch.co.nz. Traffic movements shall be planned to cause minimum disruption to road users

without compromising safety. In particular the traffic plan shall include avoiding the morning and afternoon rush hours, between 08:00-09:00 and 15:00-16:00.

20. The content of the TMP shall be communicated to all transportation contractors and a copy of the plan shall be provided to them to utilise for the duration of the consent. This shall be the responsibility of the site supervisor.

21. All site works are to be undertaken in accordance with the approved TMP.

22. All works under this consent shall be limited to comply with the relevant noise limits in Tables 2 and 3 of NZS 6803:1999 "Acoustic – Construction Noise" when measured and assessed in accordance with that standard.

23. No work, with the exception of dust and sediment control, shall be undertaken on public holidays or outside the hours of 06:30 to 20:00 Monday to Friday and 06:30 to 18:00 on Saturday without the Council's prior consent.

24. The consent holder shall employ appropriate measures to ensure that any discharge of dust is not noxious, dangerous, or offensive at the boundary of any occupied residential property, within any site of ecological significance or within any live traffic lanes. These measures shall include but are not limited to:

    - Minimising areas of exposed earth to what is required for the immediate works and reinstating vegetation as soon as practicable once sections of works have been completed
    - Taking wind conditions into account in planning and carrying out works to minimise dust dispersion
    - Minimising drop heights for fill and excavated material
    - Keeping a water cart accessible 24 hours a day for the purpose of dust control

25. In the event of visible dust generated from site activities blowing into live traffic lanes, any occupied residential site or any site of ecological significance, activities shall cease until appropriate mitigation measures have been put in place (i.e. water applied to suppress dust) or conditions have improved.

26. Roads to and from the site (except for stopped roads in the Specific Purpose Flat Land Recovery Zone) shall be regularly monitored and swept or vacuumed where soil or debris has been tracked into the road by construction equipment.

27. Loading and unloading of trucks with excavation or fill material shall not be carried out on the estuary side of the footprints of any stopbanks that adjoin the estuary.

Advice Notes:

- The Council will require payment of its administrative charges in relation to monitoring, as authorised by the provisions of section 36 of the Resource Management Act 1991. The current monitoring charges are:

    (i) Two inspections: A monitoring fee of [redacted] to cover the cost of setting up a monitoring programme and carrying out two site inspections to ensure compliance with the conditions of this consent; and

    (ii) Time charged at an hourly rate of [redacted] incl. GST if additional monitoring is required, including non-compliance with conditions.

- You will need to obtain separate permission from the Council as owner of the land before you may carry out the proposed activity on this site. Please contact Joanne Walton, Policy Advisor Greenspace, Network Planning Team, on 941 8999.

- This site may be an archaeological site as declared by Heritage New Zealand Pouhere Taonga. Under Section 43 of the Heritage New Zealand Pouhere Taonga Act 2014, an archaeological site may be any place that was associated with human activity in or after 1900, and provides or may be able to provide, through investigation by archaeological methods, significant evidence relating to the historical and cultural heritage of New Zealand. **Please contact Heritage New Zealand Pouhere Taonga on infosouthern@heritage.org.nz or (03) 357 9629 before commencing work on the land.**

- Under the Council's Water Supply, Wastewater and Stormwater Bylaw 2014 no person may obstruct any overland flow path or floodplains with any material or structures such as fences and retaining walls. As the application site forms part of the flood plain, any proposed fencing will require authorisation from the Stormwater and Land Drainage Team. Please contact them by emailing Stormwater.Approvals@ccc.govt.nz.

- The conditions of global consent RMA92019127 require that written approval from the City Arborist be provided for the removal of any healthy or structurally sound protected trees. The City Arborist must be notified at least 5 working days prior to works being undertaken and will determine whether or not a supervising arborist should be in attendance. The consent also requires that wherever possible trees shall be replaced in an appropriate location and be of the same or complementary species.

- Conditions of global consent for RMA92020520 for disturbance of contaminated soil include notification at least five days prior to the commencement of works to the Team Leader Environmental Compliance. These conditions also require that records be kept of any contaminated material identified in the course of the works.

Reported and recommended by: Alison McLaughlin, Planner Level 3 **Date:** 6 October 2017

Reviewed by: Clare Dale – Senior Planner **Date:** 14/11/17

Decision

That the above recommendations be adopted for the reasons outlined in the report.

Commissioner:

Name: David Mountfort

Signature: 

Date: 22 November 2017

Appendix A: Site photos

Evans Avenue (true left bank)

Figure A1 - Photo supplied by Parks Team, circa 2004 showing height of stopbanks at approximately Point 9520 of Plan C128 prior to the emergency works in 2011.

Figure A2 - 13 June 2017 Looking north from the top of the existing stopbank at Evans Avenue approximately point 9480 on Plan C128.

Figure A3 April 2011 – Blighs Garden preparation for installation of stopbank (approx. between points 9760 and 9980 on Plan C129) showing level of pathway post-earthquakes but pre-emergency works.

Evans Avenue (true right bank)

Figure A4 – 11 July 2017 existing stopbanks on true right bank of estuary approximately point 9840 on C229 looking south. Proposed works including topsoiling and landscaping to raise the height of the stopbank by 0.06-0.54m.

Figure A5 – 11 July 2017 view looking south at approximately Point 10060 on C229. Note dwelling at right (9 Velsheda Street) which is still occupied.

Figure A6 – 11 July 2017 looking west from approximately point 10560 on Plan C231. White truck on Bexley Road visible in the far distance in the centre of the photo.

Figure A7 – 11 July 2017 looking west from approximately point 10800 on C231.Trucks are parked on Bexley Road.

Figure A8 – 11 July 2017 View from top of true right stopbanks looking east approximately point 9900 on C229 looking at Evans Avenue stopbank on far side of estuary. Existing Terramesh units at toe of stopbank.

Kibblewhite Street and Reserve

Figure A9 – 7 April 2011 – Kibblewhite Street looking north from approximately point 10420 on Plan C131 showing height of stopbanks post-earthquakes but before emergency works

Figure A10 – 13 June 2017 Kibblewhite Street looking south-west from approximately point 10340 on C131.

Figure A11 13 June 2017 Jervois Street Drain from top of outfall.

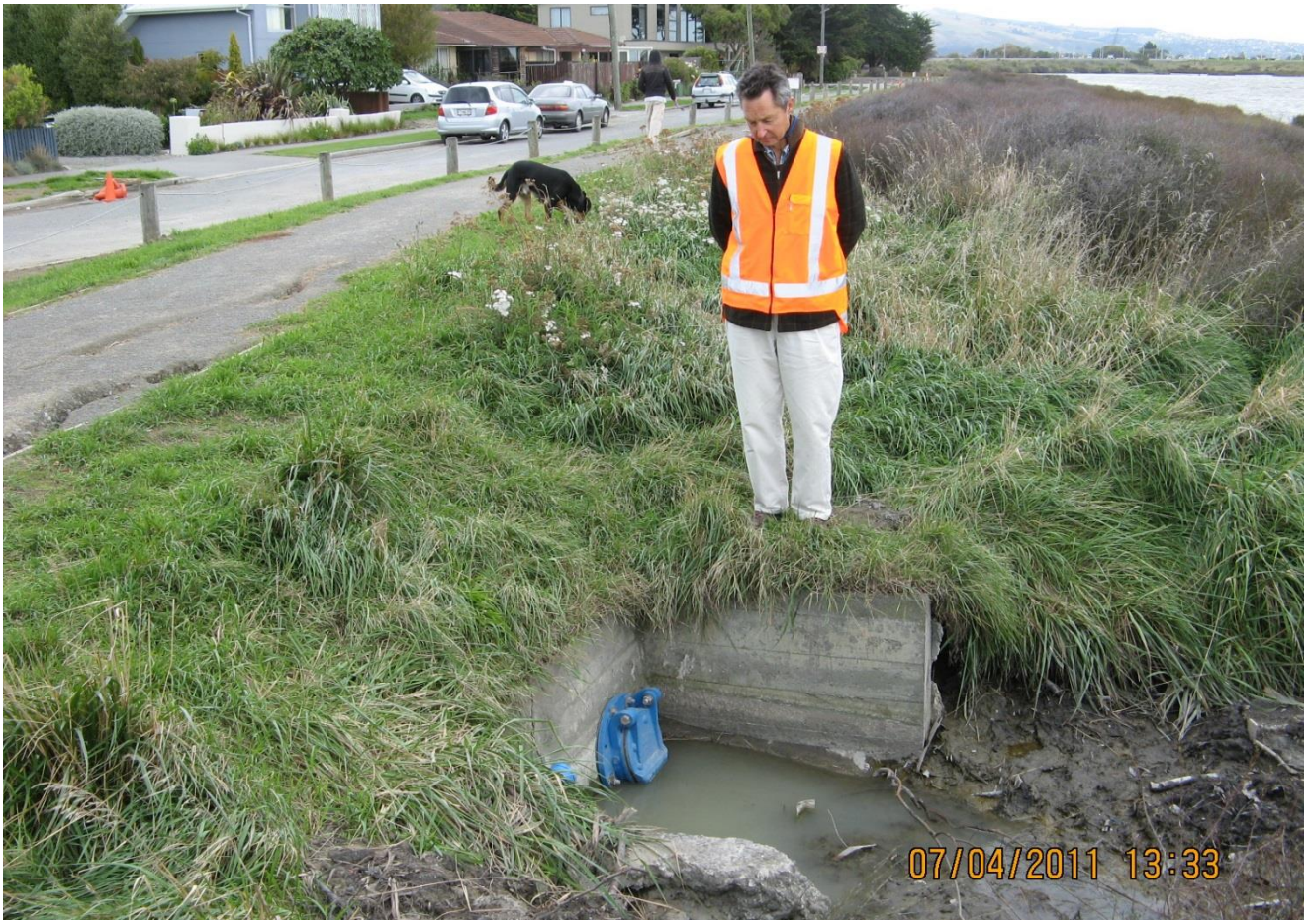


Figure A12 April 2011 - Kibblewhite Street looking south from approximately point 10430 on Plan C131 showing height of stopbanks after the February 2011 earthquake but before emergency works were undertaken

Figure A13 April 2011 – Kibblewhite Street looking north from approximately point 10500 on Plan C131 showing height of stopbanks post-earthquakes but before emergency works.

Figure A14 – 10 September 2017 Kibblewhite Street looking south-west from approximately point 10460 on C131.

Figure A15 – 10 September 2017 Kibblewhite Street looking north-east from approximately point 10700 on C132.

Bridge Street and Reserve

Figure A16 Location of new stopbank at Bridge Street looking west from approximately point 80 on C401.

Figure A17 Looking south from top of Bridge Street outfall

Figure A18 – 10 September 2017 looking north-west at Bridge Street outfall

Figure A19 Looking south-west from approximately point 165 on Plan C401 – high point of location of new stopbank.

Bexley Road (west side)

Figure A20 13 June 2017 Outfall of Estuary Drain looking west from approximately Point 70 on Plan C301. Location of proposed Terramesh units and ramp

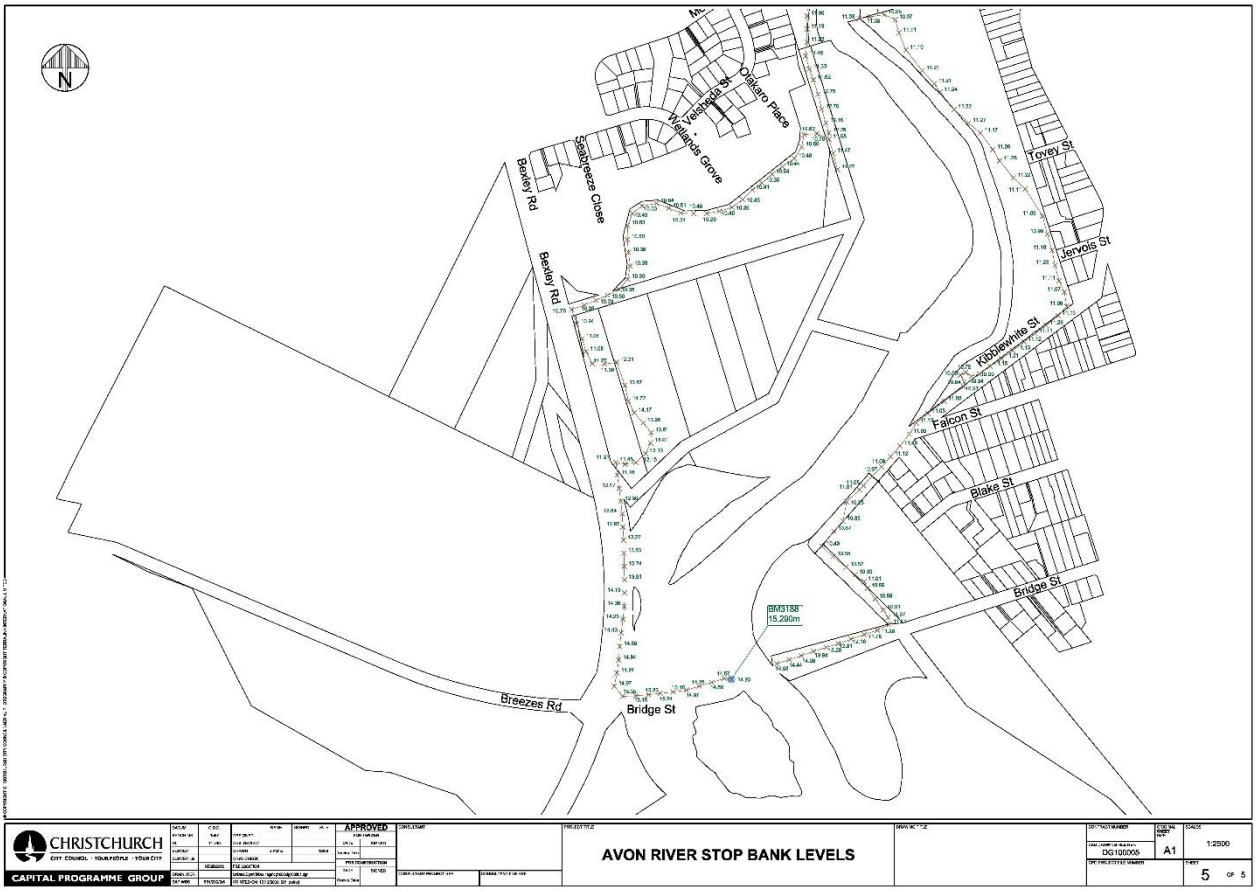
Figure A21 13 June 2017 Looking north from approximately Point 40 on Plan C301. Estuary Drain on left. New stopbank to be built slightly to the left of the track to the group of trees on the right – a height increase of between 0.04 and 0.2m.

Bexley Road (east side)

Figure A22 13 June 2017 Location of proposed temporary stopbank on east side of Bexley Road looking south. Bexley Road on right. Stopbank to be built over the existing gravel path increasing the height between 0.0 and 0.37m.

Figure A23 Interface with estuary at location of proposed stopbank on east side of Bexley Road looking south from approximately point 55 on Plan C304.

Appendix B: 2009 survey levels of part of site



Appendix C: Comments from landscape architect

Christchurch City Council
Assets and Network Unit

Memorandum

To: Alison McLaughlin, Planner, Resource Consents Unit, Christchurch City Council

From:: Jennifer Dray, Senior Landscape Architect, Technical Services and Design Team

Date:: 5 October 2017

Re: **RMA/2017/1216 AVON RIVER TEMPORARY STOPBANKS – LANDSCAPE COMMENTS**

Introduction

These comments are in relation to the application from the Christchurch City Council (CCC) for land use consent to repair and upgrade existing stop banks and for the construction of new temporary stop banks.

Documents referred to in the preparation of these comments include the following:

- Land Use Consent Application and associated drawings prepared for the CCC by GHD (May 2017)
- Lower Avon River Temporary Stop bank Management – Ecology Assessment Report prepared by Boffa Miskell (1 February 2017)
- Further information received (7 August 2017)

I have been asked to provide comments on the effects of the proposal particularly in relation to the potential visual and landscape effects upon the Coastal Environment, the Estuary as a significant landscape feature and on the Area of Natural Character in the Coastal Environment.

The Christchurch District Plan

The proposed stopbanks extend from Evans Avenue to south of Bridge Street, South New

Brighton. There are a number of relevant zonings:

- Stopbank repairs are proposed within the Open Space Natural Zone between Evans Avenue and Bridge Street. A new stopbank is proposed within the Open Space Natural Zone in Bridge Street Reserve and on the east side of Bexley Road.
- Stopbank repairs are proposed in the Open Space Community Parks (OCP) zone adjacent to Evans Avenue and a new stopbank is proposed in the OCP zone on the west side of Bexley Road beside Estuary Drain.
- Stopbank repairs are proposed within the Transport zone along Kibblewhite Street (adjacent to the Coastal zone), and a new stopbank is proposed within the Transport zone on Bridge Street Road Reserve adjacent to the Open Space Natural zone).
- The site is located within the Avon-Heathcote Estuary and Avon River Sites of Ecological Significance and Significant Landscape overlay.

The AEE submitted by the applicant provides a summary of the statutory context for this application, and an assessment of the proposal's compliance with the applicable built form standards in the District Plan. Landscape and visual amenity related non-compliances include the following:

- 18.4.1.2 (C1) New stopbank in Open Space Community Parks Zone.
- 18.7.1.2 (C1) New stopbank in the Open Space Natural Zone.

The proposal is to be assessed against pre-earthquake ground levels as the emergency works which increased the height of the stopbanks in some areas were temporary structures built as an emergency response immediately following the Canterbury Earthquakes. Overall, resource consent is required for a non-complying activity from Christchurch City Council.

Description of the Site and Surrounding Environment

A description of the site and surroundings is provided in the application which I summarise for the purposes of these comments.

Description and Assessment of the Proposal

The purpose of this proposal is to provide a consistent level of flood protection for a 1 in 50 year flood event combined with a high tide event on the lower Avon River. The expected lifespan of the temporary stopbanks is 20 years. The repair and upgrade works will comprise repairing existing stopbanks with fill and topsoil, and constructing rock riprap 'toes' where the existing stopbank has been eroded.

1. Evans Avenue. Along Evans Avenue the existing earth bund stopbank will be increased in height to approximately 700mm, with some sections replaced with a Terramesh reinforced embankment (battered gradients of 1:1). Some rock armouring is also to be installed. Some of the repair and upgrade works extend into the Coastal Marine Area (CMA). There are to be some removals of existing cabbage trees and some Chinese Poplar trees and Chinese Elm trees, however it is considered that these trees were scheduled under the previous operative City Plan and are therefore covered by the global consent RMA92019127. This includes a cabbage tree to be removed near Evans Avenue beside an outfall structure (Sheet C128) which has been confirmed by the applicant as falling within the Special Purpose Road Zone.

The works to be undertaken to the northern section, between Admirals Way and Owles Terrace is comprised of top soiling and grassing the existing stopbank. There are two sections where the proposed action is yet to be confirmed. In my opinion the earth stopbank does not detract from the visual or landscape amenity of the area, and the path which runs the top of the stopbank is well used, and adds to the recreational amenity of the area. It would be useful to provide a path from the stop bank down to the adjacent path at the Admirals Way cul de sac area.

The southern section between Admirals Way and Evans Ave comprises the construction of Terramesh units, and the addition of top soil and grass to existing stopbanks. I consider that this work will have very little adverse effect on the landscape or visual amenity of the surrounding environment. The adjacent area has now been Red Zoned, so will contain no residential dwellings which would be impacted by this work. This is with the exception of a residential dwelling at 9 Velsheda Street which sits on the opposite side of the waterway with views to the stopbank area from a distance of over 100m from the property boundary. I also consider that the visual amenity for these residents will not be adversely effected by the proposed works.

In terms of tree removals, the poplars, elms and cabbage trees that are marked for removal have no particular landscape amenity value. The Chinese Poplar and Chinese Elms are non-indigenous tree species often used as erosion control trees because of their vigorous, invasive root systems. The tree removals in this area will have little impact on the ecology of the area, and will improve out looks across the estuary, so will in fact have a positive effect. The existing cabbage trees mostly appear to be *Cordyline indivisa* or Mountain Cabbage tree, which have not thrived in this coastal environment. They are growing close to the road edge and will have compromised root systems, and would not be suitable for transplanting. The removal of these trees will not have any adverse landscape effect on the environment.

2. Bridge Street. The proposed new stopbank south of Bridge Street will extend approximately 185m in length. There will be an 85m long and 700mm high Terramesh bund in the Bridge Street Road Reserve (south-eastern edge), and a100m long and 700mm high landscaped earth bund

in the Bridge Street Reserve area adjacent to the Avon Heathcote Estuary. None of this section extends into the CMA.

The road reserve bund is to screened by road side planting which comprises of an approximately 1.0-1.5m wide bed planted with low native plants up to 500mm in height at maturity. The applicants have offered to submit a planting plan to be approved by the CCC. In my opinion, the proposed mitigation planting will not quite be adequate screening for the Terramesh units. Plants capable of reaching 800mm – 1.0m in height should be planted to screen the Terramesh units for their entire height and length. The Terramesh units will be screened from the opposite side (the estuary) by the existing well-established marsh ribbonwood shrubs. The re-aligned path within the Bridge Street Reserve area will also draw walkers away from the Terramesh units at the road's edge, reducing their visual impact.

Further information supplied by the applicant has indicated that extra planting is also to take place on the north-western edge of Bridge Street. This planting will add to the amenity of the general area, but will have no particular mitigation effect on the proposed Terramesh units to the east.

The earth bunding within the Reserve area is to extend 100m in a gentle curve to the east. The bunding is to have a gradient of approximately 1:3 to 1:4 on both sides and to vary in height to give a more naturalistic appearance. It is to be grass covered, and the removal of existing large Ngaio trees in the vicinity will be minimised. The pedestrian path is to be relocated eastwards, away from the estuary edge, and realigned over the top of the new earth bund.

In my opinion, the proposed earth bund will be a very gentle interruption to the existing landform and will be barely perceptible once the new grass cover has established. The surrounding area is reasonably hummocky, and the earth stopbanks will be seen as an extension of these land contours. The existing Ngaios will self-seed over time and aid in naturalising and integrating the bund further into the landscape. However, a condition of consent would be useful which requires the timely establishment of the grass cover within the first three months following the completion of the earth bund.

3. Bexley Road and Estuary Drain. The proposed new stopbank on the east (estuary) side of Bexley Road will be approximately 70m long and up to 400mm high with a footpath to be constructed along its top. The stopbank on the western side of Bexley Road (Estuary Drain) will be approximately 90m long and 600mm high. Two culverts will be repaired as part of these works and a new outfall structure will be installed. None of these works (including the outfall structure) extend into the CMA. These new lengths of stopbanks beside Bexley Road and Estuary Drain will be topsoiled to an even profile and hydroseeded with grass.

The stopbank/bund on the east (estuary) side of Bexley Road is to be topsoiled and hydroseeded. It will be separated from the road by a swale which is also grass covered. At 400mm in height, the stopbank is to be a low-lying structure and will be seen as an extension of the existing swale and road side berm. It will not impact on the landscape amenity of the immediate area.

The Estuary Drain stopbank is to be located approximately 35m from the Bexley Road edge at its nearest point, and curving away from the road to an approximately 80m offset from the road's edge. An unformed gravelled car park is situated between the drain and the road. The proposed stopbank is to be reasonably gently contoured, and grass covered, so will be barely perceptible to passing road users. There will be no adverse effects to the landscape or visual amenity of the surrounding environment.

4. Kibblewhite Reserve and Kibblewhite Street. There is no action to be taken around the existing 700mm high stopbanks through the reserve areas. These stop banks have reasonably gentle 1:3 to 1:4 batters on either side and a wide gravel footpath on the top which is popular with local walkers. In terms of visual and landscape amenity, I don't consider that the addition of these stop banks has had an adverse effect.

The southern portion of the stop bank along Kibblewhite Street is to have some of the existing pathway topped up and extra topsoil added to both sides and then is to be re-grassed (hydro seeded)or replanted with some low-growing natives. The change in ground level will be between 200mm and 700mm.

In terms of visual and landscape amenity, I don't consider that the addition of these stop banks has had an adverse effect. However, the top soiling and re-grassing of the southern portion will improve its appearance. In my opinion, no further landscape planting would be required. A grassed batter would be easier to maintain and allow for the stopbank to be traversable from an point.

Relevant District Plan Provisions

These comments are to particularly focus on the effects of the proposal in relation to the following District Plan provisions. (See also my assessment in the section above).

Strategic Directions Objective 3.3.9 is to identify and appropriately manage the specifically recognised values of important natural resources including the natural character of the coastal environment, wetlands and their margins.

Objective 9.2.2.1.4 is to preserve the natural character of the coastal environment, wetlands and their margins.

The contouring of the earth bunds will alleviate that engineered appearance of these structures, and the grass cover and riparian and coastal plantings, will aid in the mitigation of the proposed works. The Terramesh bunds will introduce an obviously manmade structure into the coastal environment, but will be mitigated at least in part by coastal plantings to a level where the adverse effects are acceptable.

Policy 9.2.2.2.6 is to recognise the following natural elements, patterns, processes and experiential qualities contribute to natural character: areas or waterbodies in their natural state or close to their natural state; coastal or freshwater landforms and landscapes; coastal or freshwater physical processes, including the movement of water and sediment; biodiversity; biological processes and patterns; water flows and levels and water quality; the experience of the above elements, patterns and processes.

Coastal landforms will be slightly modified by the stop bank structures, but to a level which I would find is acceptable.

Policy 9.2.2.2.7 is to recognise and preserve natural character qualities of areas in the coastal environment and to avoid significant adverse effects of use and development; avoid activities that damage the stability of coastal dune systems; require appropriate setbacks for use and development from riparian and coastal margins; ensure development is not readily visible from public places and frequently visited viewpoints.

The stopbanks will be visible from some areas, such as Bridge St and Kibblewhite Reserve. However, I consider that the naturalised contouring of the earth bunds, the proposed mitigation planting, and the viewing distances will all aid in the integration of the structures into the surrounding environment. These mitigation measures will ensure that the stopbank structures are not readily visible, and in some cases will be imperceptible.

Policy 9.2.2.2.8 is to recognise and preserve natural character qualities of wetlands and rivers and their margins and their protection from inappropriate use and development by ensuring the location, intensity, scale and form of use and development is appropriate, minimising to the extent practicable, indigenous vegetation clearance and modification (including earthworks, disturbance and structures), requiring appropriate setbacks from margins; ensuring development is not readily visible from public places and frequently visited viewpoints.

The location of the stopbanks are constrained by the functionality of the structure, however in terms of scale, the earth bund stopbanks are generally no higher than 1.0m with reasonably

gentle 1:3 gradients. This makes grassing and mowing of the bunds easily achievable, and allows them to visually integrate into the surrounding environment so that they are barely perceptible. The Terramesh units are more obviously a manmade element, but are to be visually mitigated by way of riparian coastal plantings. There is to be minimal indigenous vegetation clearance, with the trees to be removed mostly in a poor condition currently. These tree removals will be offset by new plantings. I am confident that the natural character of the river environment will be adversely affected by the proposal to a degree that is acceptable.

Objective 18.2.1.3 is for buildings and structures in open spaces to be of a scale, form and design that maintains the predominance of open space, are compatible with the role and anticipated use of the open space, are integrated and consistent with the character of the surrounding area, minimise adverse effects on adjoining land uses and the surrounding environment's ecological, landscape and natural values, historic heritage values and amenity values.

The stopbanks in the reserve areas are to be reasonably naturally contoured with gently graded batters and a grass cover and will integrate visually with the surrounding area. Recreational use of the area will not be compromised.

Policy 18.2.2.5(a)(vi) is to minimise disturbance of natural landforms.

Policy 18.2.2.5(b) is to ensure the scale, layout and design of building is consistent with the role and function of the open space and its anticipated level of spaciousness and character.

I am confident that the scale, layout and form of the stopbanks in the open space areas will not adversely affect the character of these areas to a degree that is not acceptable.

Recommendations

- Planting plans for all proposed planting to be submitted to the CCC for approval prior to planting taking place.
- The proposed mitigation planting for the Bridge Street Terramesh units, to be capable of reaching 800mm – 1.0m in height at maturity.
- All grass cover to be established within 3 months following the completion of construction.
- All riparian and landscape planting be planted within 3 months, or within the first planting season (April – October) following the completion of construction.

Conclusion

I consider that in all the relevant zones, the addition of the temporary stopbanks will a reasonably gentle interruption in the landform of the area. They are mostly to be low and gently battered with a grassed cover so will integrate well with the surrounding environment. They will be easy to maintain and easily traversable, so not compromising access. Where Terramesh units are required, they are to be mitigated by native riparian planting. Riparian planting is also to be added to mitigate any effects of pedestrian movement upon native birdlife.

I have concluded that if the proposal were to proceed in accordance with the recommendations above, any adverse effects of the stopbank construction and repair or upgrade on the surrounding environment will be to an acceptable degree, and will generally be consistent with the relevant objectives and policies within the District Plan.

I hope these comments have been helpful,

Regards

Jennifer Dray
Senior Landscape Architect
Technical Services and Design Team
VERTICAL CAPITAL DELIVERY & PROFESSIONAL SERVICES

Appendix D: Comments from botanist

The application is accompanied by an Ecologist Report prepared by Scott Hoosen of Boffa Miskell. The report identifies ecological values and the impacts the proposals to construct and modify the stopbanks will have at the sites on the Avon/Heathcote Estuary. I have read the report and carried out a site visit to assess the impacts.

I agree with the findings of the report. The ecological values of the estuary are high but provided the actions recommended to protect these habitats are followed, then the impacts will be low. They essentially occur around the margins of the estuary on land that has already been modified to such an extent that they have been colonised by mostly exotic species, and on landforms that are man-made. Their connection with the estuary is that they constitute an adjacent habitat to those of value and have no intrinsic value in themselves.

There will be no loss of significant vegetation because the work is being carried out on already modified areas. As the report states one of these areas is within an SES, but the small area being modified does not contain vegetation of value.

The effects of the losses of native plants from these sites would be less than minimal and would only constitute the kinds of losses that would occur naturally. Nor can they be seen as components of functioning ecosystems. They are human plantings that have not or never have functioned as part of an indigenous ecosystem and which will in time be replaced by natural colonisation.

At the Evans St site there are some cabbage trees that have been planted but which need to be removed. The reason these caught my attention was that amongst the common and excessively planted *Cordyline australis*, there were a couple of planted *Cordyline indivisa*, which is not indigenous to the Canterbury Plains Ecological District, but which reaches its southern limit on Banks Peninsula. A botanical curiosity, but not of any ecological note, especially in the context of where these trees are.

Therefore, provided the mitigations to the construction phase are carried out as recommended, the impacts on the ecology of these high value ecosystems will be less than minor.

Dr Trevor Partridge

Botanist

Christchurch City Council

Appendix E: Comments from stormwater engineer

The proposal is to repair or upgrade existing stopbanks. This will increase the level of protection of flooding originating from the Avon River and decrease the risk of stopbank failure. There will be no change to localised runoff patterns as the stopbanks were existing previously. I am satisfied that the currently existing level of flood protection will only be compromised during short time periods during works and measures will be put in place to re-instate the protection on a short notice if required I can support the application.

The new parts of the stopbank are proposed in locations where they provide additional protection from tidal and river flooding, but do not pose an increased risk to runoff accumulating behind them.

Regards

Iris Brookland
Planning Engineer
Asset Planning - Stormwater and Land Drainage
Three Waters and Waste

Appendix F: Correspondence with Waterways Ecologist

Thursday 7/9/2017

Hi Alison,

Yes, that's correct. I'm happy if Jennifer and Trevor are happy.

Best wishes,
Greg.

From: McLaughlin, Alison
Sent: Wednesday, 6 September 2017 1:22 p.m.
To: Burrell, Greg <Greg.Burrell@ccc.govt.nz>
Subject: RMA/2017/1216 Estuary stopbanks

Hi Greg,

Can I just confirm my understanding that, subject to the sediment and erosion controls proposed by the applicant, you don't have any additional concerns about the effects of the proposal on ecological values in the estuary that need to be brought to the attention of the applicant before your comments are finalised?

Cheers,
Alison

Appendix G: Comments from MKT

Mōrena Alison,

I can confirm that the following feedback and recommendations has been provided in regards to the proposed works:

The proposed application area (Te Ihutai) is of archaeological significance related to Māori occupation and activity dating back to early periods of ancestral Māori occupation. Archaeological sites of māori origin in the Ngāi Tahu takiwā are generally culturally significant and regarded as 'Ngā tapuae o ngā tupuna/footsteps of our ancestors' and are considered taonga under (Rangatiratanga) Article 2 of the Treaty of Waitangi (Treaty principles such as the Crown's duties of active protection and consultation, and the duty of both partners to act in good faith).

Cultural Monitoring is seen as an appropriate measure to ensure site-workers are best advised about cultural significance, taonga and archaeological evidence (of Māori origin), evidence of the former environs and is an exercise that is a way the Rūnanga can continue their association with their ancestral lands.

In terms of specific recommendations, the following is requested:

- In terms of archaeological values and appropriate protection of Ngāi Tahu association with the area, the rūnanga have recommended an Accidental Discovery Protocol (consistent with appendix 3 of the Mahaanui Iwi Management Plan 2013) be followed during all earthworks activities.

- Additionally, an option to culturally monitor earthworks is recommended as the applicant is required to apply for an archaeological authority under the HNZPT Act 2014.

- A specific condition of consent which allows for cultural monitoring, could be worded as follows; "A member of Te Ngāi Tūāhuriri Rūnanga, trained in the recognition of archaeological deposits, is advised at least 10 working days prior to any earthworks being undertaken, to allow them the opportunity to be on site to assist and offer cultural insights/ advice during all excavations".

Ngā mihi

Amy

Appendix H: Comments from Parks Unit

Bridge Reserve

The proposed stopbank in Bridge Reserve adjacent to Bridge St is consistent with the approved South New Brighton Reserves Management Plan 2014 and the South New Brighton Reserves Development plan 2014. The existing shared use track will be realigned to go over the new stopbank at a gradient suitable for bikes and pedestrians. Effect on recreation will be less than minor.

Bexley Reserve

If the proposed stopbank in Bexley Reserve adjacent to Bexley Rd allows for pedestrian and cycle access consistent with the Bexley Reserve Concept Plan which was approved by the Community Board in 2013, there will be no impact on recreation. In fact the proposed stopbank could potentially improve current recreational access. Locked vehicle access is also desirable and has been allowed for in the design. The location of the cyclone gate should be agreed with the Parks Unit to ensure suitable access.

Bexley Rd

The new stopbank on Bexley Rd will have a gravel pathway on top. There will be no impact on recreation.

Kelly

Kelly Hansen
Area Head Ranger
Coastal and Plains Ranger Team, Parks Unit

Appendix I: Additional Objectives and Policies Relevant to the Application

Christchurch District Plan

Strategic Directions Objective 3.3.17 to recognise and provide for the critical importance of wai (water) to life in the District including Te Tai o Mahaanui (water in the coastal environment). This includes ensuring that the life supporting and intrinsic natural and cultural values and characteristics associated with water bodies and coastal waters, their catchments and the connections between them are maintained, or improved where they have been degraded. It also includes ensuring use and development is managed to safeguard water bodies and coastal waters and their margins, particularly Otakaro (Avon River), Ihutai (Avon-Heathcote Estuary) and Te Tai o Mahaanui (coastal waters).

Policy 5.2.2.1.5 to protect natural features which assist in avoiding or reducing the risk of natural hazards, such as natural ponding areas, coastal dunes, wetlands, water body margins and riparian vegetation from inappropriate subdivision, use and development and where appropriate restore, maintain or enhance the functioning of these features.

Policy 5.2.2.1.8 to ensure that the level of assessment undertaken for development reflects the potential scale and significance of the hazard, and the nature and scale of the development and its susceptibility to those hazards.

Policy 5.2.2.2.1(d) to maintain the flood storage capacity and function of natural floodplains and wetlands.

Objective 6.6.2.1 to manage activities in the water body margins in a way that protects and/or enhances the flood management, water quality, riparian or aquatic ecosystems, the natural character and amenity of the water body, cultural values and access where appropriate for recreation activities, customary practices including mahinga kai, or maintenance.

Policy 6.6.2.1.1 to take a catchment-wide approach to protecting and/or enhancing the natural form, function and ecology of water bodies and their margins.

Policies 6.6.2.1.2 and 6.6.2.1.3 to manage activities in water body setbacks in a manner consistent with the functions of the water body.

Objective 8.2.4 for earthworks to facilitate hazard mitigation.

Policy 8.2.4.1 to ensure earthworks do not result in erosion, inundation or siltation or have an adverse effect on surface water or groundwater quality.

Policy 8.2.4.4 to ensure that earthworks, once completed do not result in any significant shading, visual impact, loss of privacy or other significant detraction from the amenity values enjoyed by those living or working in the locality.

Policy 9.1.2.2.8 to protect the indigenous biodiversity of sites of ecological significance in the coastal environment by avoiding adverse effects on indigenous taxa that are listed as threatened or which are naturally rare in the coastal environment.

Policy 9.2.2.2.6 which defines the natural elements, patterns, processes and experiential qualities that contribute to natural character.

Policy 9.2.2.2.10 to promote opportunities to restore and rehabilitate natural character, such as through the removal of plant and animal pests, and supporting initiative for regeneration of indigenous vegetation.

Policy 9.2.2.2.12 to recognise the effectiveness of other mechanisms such as covenants and conservation trusts in the preservation and restoration of the natural character of the coastal environment, wetlands and lakes and rivers and their margins.

Objective 9.4.2.1.1 is to maintain and enhance the contribution of trees in road corridors, parks, reserves and public open spaces to community amenity while providing for the reasonable use and enjoyment of property.

Policy 9.4.2.2.3 is to protect trees in road corridors, parks, reserve and public open space from inappropriate physical works to the extent consistent with maintaining the multiple functions of road corridors, parks, reserves and public open space.

Policy 9.4.2.2.6 is to plant trees in road corridors, parks, reserves and public open space to enhance environmental, landscape, cultural, social and economic values.

Policy 9.4.2.2.7 is to limit the felling of trees in road corridors, parks, public open space and reserves having regards to the size, location and species, except where there are no reasonable alternatives.

Objective 13.11.2.1 for the Specific Purpose (Flat Land Recovery) Zone to be a largely open environment with a very low density of residential and non-residential activities that recognises the natural hazard risks affecting many properties, acknowledges the interim nature of this Zone and maintains the longer-term potential of the area.

Policy 13.11.2.1.2 in the Specific Purpose (Flat Land Recovery) Zone, only provide for the following non-residential activities… water or hazard management or mitigation activities.

Policy 13.11.2.1.3 to manage activities in the Specific Purpose (Flat Land Recovery) Zone to reduce adverse amenity effects on occupied residential properties and effects at the interface with surrounding residential zones and sustain the qualities and values of the natural environment.

Policy 18.2.2.4 to maintain and enhance the natural character, biodiversity, health and life supporting capacity of water bodies and their margins by limiting development in the vicinity of water bodies to those activities which have a practical or functional need to be located within these areas and rehabilitation of water bodies and their margins and encouraging indigenous vegetation planting.

Appendix C – Geotechnical Information

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	P Johnston					
1	G. Lidgett	A.Ingles				

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Appendix F – Risk Register

Risk Register

Project: Temporary Stopbank Management (LDRP 507) - Detailed Design and Construction Management
Job Number : 51-34150
Job Manager: Salve Velasco
Project Director: Martin Dasler
Date: 10/11/16 Update

SAFE YOU ME GHD ENVIRONMENT & PEOPLE

	Threat	Opportunity
Extreme	351 to 100000	-351 to -100000
Very High	201 to 350	-201 to -350
High	71 to 200	-71 to -200
Moderate	31 to 70	-31 to -70
Low	4 to 30	-4 to -30
Negligible	1 to 3	1 to -3

Risk Register - Detailed Design Stage

No	Subject	Risk Description	Status	Owner of the Risk	Consequence of risk	Consequence	Rating (C)	Likelihood	Rating (L)	Score = C x L and colour rating		Controls or Mitigation		Current update
1	Land and private property	Land easements	Live	Client (CCC)	Delay of Construction /Redesign	Threat - Time - Months - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Early identifiction of requirements and commencement of negotitaions		Design profile to minimise encroachment into private properties; areas where stopbank encroached the road reserve has been forwarded to Council
2	Design	Project delays put construction back	Live	GHD - Design team	Delay of construction	Threat - Time - Months - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Monitor progress to maintain program	!	Risk presented every PCG meetings
3	Design	Land availability /constructability	Live	Contractor - Delivery team	Increased cost additional access negotiations	Threat - Cost - + $100k to $500k - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Early identification to Council of potential issue		None identified yet
4	Design	NZTA roading conflicts on or along Anzac Drive	Closed	GHD - Design team	Programme delay , redesign	Threat - Time - Months - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Early and ongoing communication with NZTA		No work on AZAC Drive
5	Construction	Dirty discharges to the river from construction activtiy	Emerging	Contractor - Delivery team	Environmental and ecological impacts, Council loss of reputation	Threat - Environment - Major but recoverable ecological damage - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Consent strategy, consider options in design, contractor diligence and monitoring		Included in consent application
6	Design	Council Roading and Parks consent for works in their land	Live	Client (CCC)	Delays and/or additional costs due to modification required to design	Threat - Time - Months - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Early consultation and no surprises approach		Communicated with Council (Roading and Parks) through emails and site meeting
7	Design	Remaining residents in RRZ suffer increased flood risk or otherwise obstruct construction	Live	Client (CCC)	Delays and/or additional costs due to modification required to design or protracted consultation	Threat - Time - Months - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Gain geographic understanding early to anticipate issues and address with time in hand		Red zone stayers + surface levels map produced
8	Operation	Earthquake movements or liquefaction	Live	Client (CCC)	Further land movement settlement requiring	Threat - Time - Months - Medium	40	Probability - 10 - 20% - Unlikely	3	120		Design to include earthquake resilience (ie designed for easy rebuild)		Compacted fill designed
9	Design	Unsuitable ground conditions	Emerging	Contractor - Delivery team	Increased costs	Threat - Cost - + $100k to $500k - Medium	40	Probability - 1 - 10% - Unusual	2	80		Early identficationof settelement from survey		Areas of instability identified in the design and included in the O & M manual for monitoring and maintenance
10	Environment	Land contamination identified	Closed	GHD	Delay, increased cost,redesign	Threat - Time - Months - Medium	40	Probability - 1 - 10% - Unusual	2	80		previous work has not identified risk		
11	Construction	Land contamination found	Emerging	Contractor - Delivery team	Delay, increased cost,redesign	Threat - Time - Months - Medium	40	Probability - 1 - 10% - Unusual	2	80		Early notifcation of any discovery		
12	Design	Difficulties with Crown in redzoned area for easements or purchase	Emerging	Client (CCC)	Programme delay , redesign	Threat - Time - Months - Medium	40	Probability - 1 - 10% - Unusual	2	80		Early and ongoing communication with LINZ		Design profile to minimise encroachment into private properties. Areas identified along the 1.5m crest and PS 205
13	Design	H & S risks to staff during design and investigation	Live	GHD	Injury, delay	Threat - Health & Safety - Serious Injuries - Medium	40	Probability - 1 - 10% - Unusual	2	80		Develop and follow appropriate H&S procedures including working adjacent to traffic and to water		Prepared and approved JSEA
14	Construction	H & S risks to staff during constrcution	Emerging	Contractor - Delivery team	Injury, delay	Threat - Health & Safety - Serious Injuries - Medium	40	Probability - 1 - 10% - Unusual	2	80		Develop and follow appropriate H&S procedures including working adjacent to traffic and to water		Prepared and approved JSEA
15	Construction	High river levels	Emerging	Contractor - Delivery team	Stopbank failure causing flooding and property damage	Threat - Cost - + $500k to $5M - Major	70	Probability - < 1% - Rare	1	70		Recognition and design to allow for high water levels during constrcution		Included in the specifications
16	Construction	Construction activities reduce flood protection	Emerging	Contractor - Delivery team	Increased flood risk during construction	Threat - Cost - + $500k to $5M - Major	70	Probability - < 1% - Rare	1	70		Contractor to have emergency management procedures in place and monitor tides and flood risk		To be part of construction methodology
17	Design	High river levels	Closed	GHD	Delay of Construction /Redesign	Threat - Cost - + $10k to $100k - Minor	10	Probability - > 50% - Likely	5	50		Recognition and design to allow for high water levels during constrcution		Included in the specifications
18	Construction	High river levels	Emerging	Contractor - Delivery team	Construction delays rework due to washout erosion	Threat - Time - Weeks - Minor	10	Probability - > 50% - Likely	5	50		programme works to account for very high extreme tides, monitor weather and develop appropraite work plan		To be part of construction methodology
19	Construction	Traffic management disruption during construction	Emerging	Contractor - Delivery team	Roads are closed or sufficiently reduced in level of service to cause major disruption to motorists or residents	Threat - Image / Reputation - Local Media Cover - Minor	10	Probability - 20 - 50% - Quite Common	4	40		Manage works and access to minimise distruption, mainatain clear communications with community		Included in the specifications
20	Operation	H & S risks to staff during operation	Emerging	Client (CCC)	Injury	Threat - Health & Safety - Serious Injuries - Medium	40	Probability - < 1% - Rare	1	40		Develop and follow appropriate H&S procedures		Included in the O & M Manual
21	Environment	Ecological values	Live	GHD	Delay, redesign	Threat - Environment - Limited but medium-term negative effects - Minor	10	Probability - 10 - 20% - Unlikely	3	30		Identification of ecologically sensitive ares early in design		Ecological Assessment to be undertaken
22	Archaeology / Heritage / iwi	Archaeological and Heritage requirements not identified until late in project.	Live	Client (CCC)	Delays in obtaining necessary approvals or engaging specialists	Threat - Image / Reputation - Local Media Cover - Minor	10	Probability - 10 - 20% - Unlikely	3	30		Identification of archaeological and heritage areas of interest early in design		Archaeological Authority currenlty undertaken by CCC
23	Archaeology / Heritage / iwi	Iwi interests not identified until late in project.	Live	GHD - Planning team	Delays in obtaining necessary approvals or completing necessary consultation	Threat - Image / Reputation - Local Media Cover - Minor	10	Probability - 10 - 20% - Unlikely	3	30		Planning team to identify iwi interests early		This will be in coordination with CCC and won't be identified until Item 74 is completed
24	Constructability	Additional services are encountered or services are discovered in different positions to those expected.	Live	GHD	Delays due to relocation of services or redesign to avoid clashes	Threat - Time - Weeks - Minor	10	Probability - 10 - 20% - Unlikely	3	30		Design team to identify potential services and with early investigation. Develop construction methods for addressing issues should they arise		Meeting with Orion completed and radar locating will commence once affected services are identified
25	Constructability	Construction noise and vibration	Emerging	Contractor - Delivery team	Community complaints from plant noise and/or location of temporary works plant	Threat - Time - Weeks - Minor	10	Probability - 10 - 20% - Unlikely	3	30		Appropriate plant to be used with due consideration to the location of temporary plant.		To be part of construction methodology
26	Input data	Base survey data tolerance and errors	Live	GHD - Design team	Redesign required to address actual conditions	Threat - Time - Weeks - Minor	10	Probability - 10 - 20% - Unlikely	3	30				Issues identified with using Drone survey during production of details - this will be included in the Lessons Learned
27	Consents	Additional consnet requirements during project	Live	GHD	project delays	Threat - Cost - + $10k to $100k - Minor	10	Probability - 1 - 10% - Unusual	2	20		Detailed review of required consnets and potential requirements early in project		Additional sections was added to the scope entailing a delay in the consent application

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Document Status

Revision	Author	Reviewer		Approved for Issue		
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0	S. Velasco	A Bresler		A Bresler		4/12/2018

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