Appendix 4: BRIDGE SUMMARY- KAPITI

Site Specific Management Plan 003 - [SectorS 360-370-380] MacKays to Peka Peka Expressway

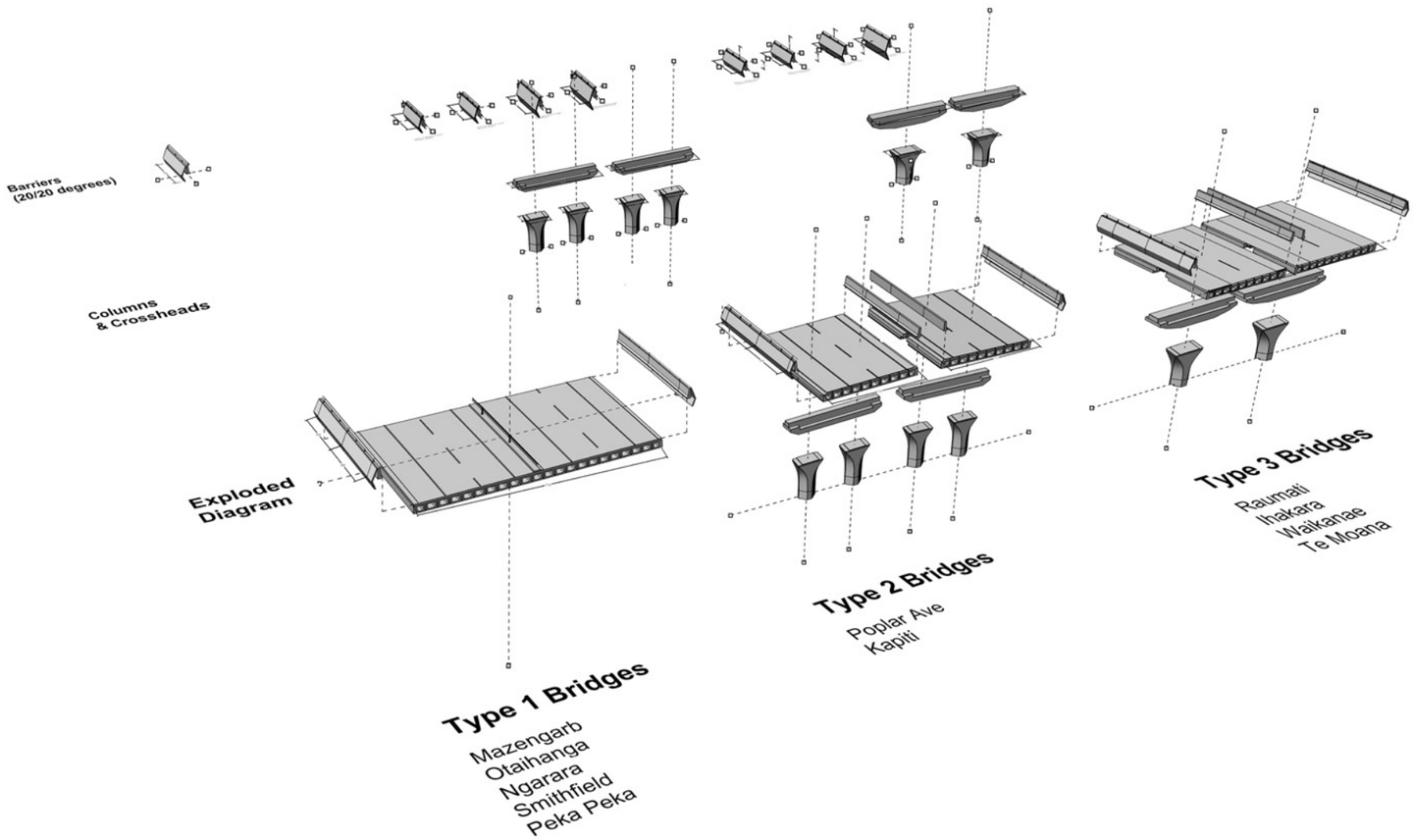
01 SEPTEMBER 2014 - CERTIFIED ISSUE - REV C

NZ TRANSPORT AGENCY WAKA KOTAHI

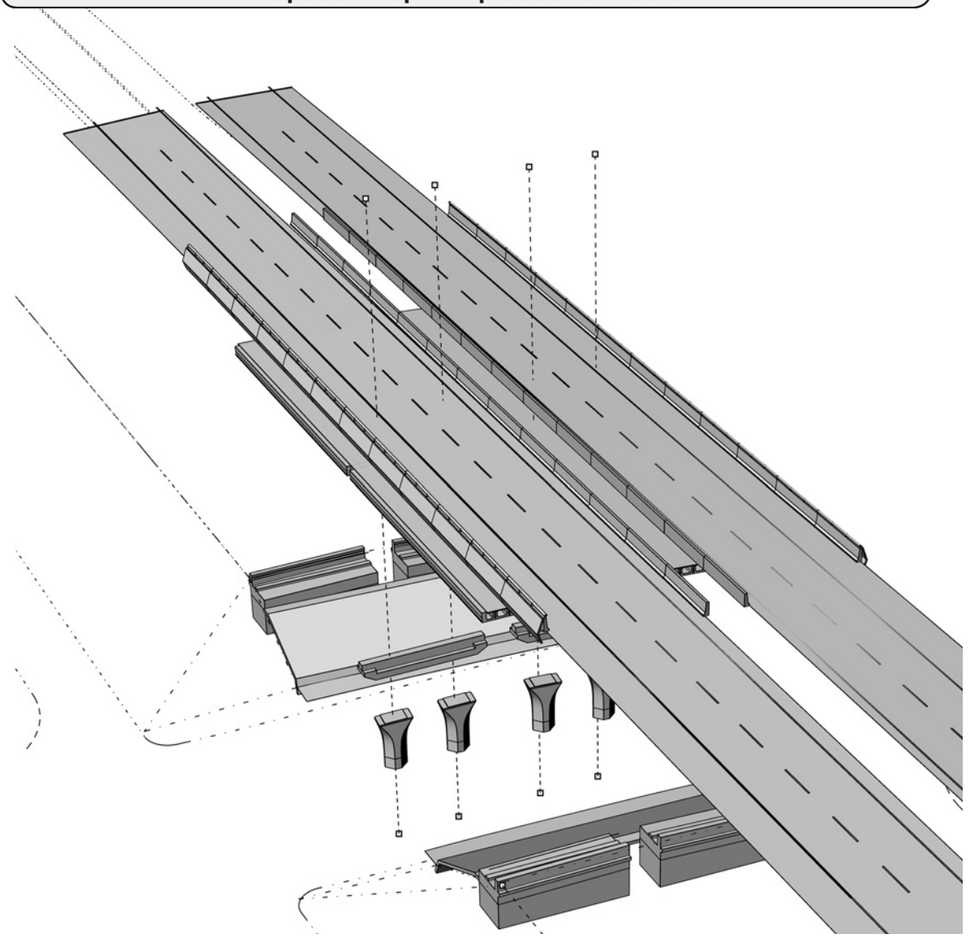
MacKays to Peka Peka
Wellington Northern Corridor

M2PP Bridge Design Objectives

Bridges as a series of components



Proposed Kapiti exploded isometric



Design Objectives

With reference to the Urban and Landscape Design Framework (Technical Report 5) (ULDF) there are four design objectives for the bridges and their respective contexts. These four objectives are overarching aims for the project and have been extracted from the Design Concept statements in two sections of the ULDF: Local Road Interface Design (section 5.7) and Bridge Design (section 5.8).

The purpose of extracting these objectives is to enable any changes to bridge structures and their context made through the concept and detailed design process to be considered at the highest level of the design intent. There are design principles in each of the sections as noted above and these too form a basis for considering the development of the designs for the bridges and their context.

As is typical in a design evaluation process, any aspects of design that do not align with the design principles would be elevated to consideration against the design objectives.

Design Objectives:

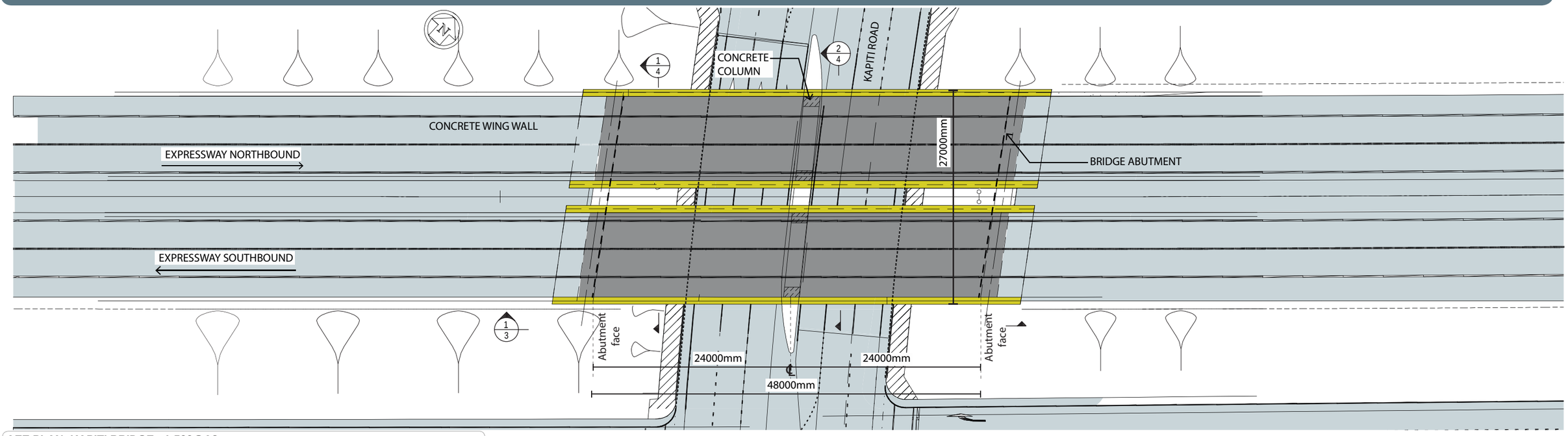
1. The public spaces of the roads and streets take primacy over the experience of the Expressway users. Local people will be making slower movements and as a consequence the bridges will be more visually apparent to them than to people travelling along the Expressway.

2. As a new element in the landscape, the bridges respect the surrounding landscape and are expressed in terms of their horizontality, fluidity and simplicity because the landscape is relatively low key and low in scale; having several ‘feature’ bridges would become both visually complex and overwhelming in scale.

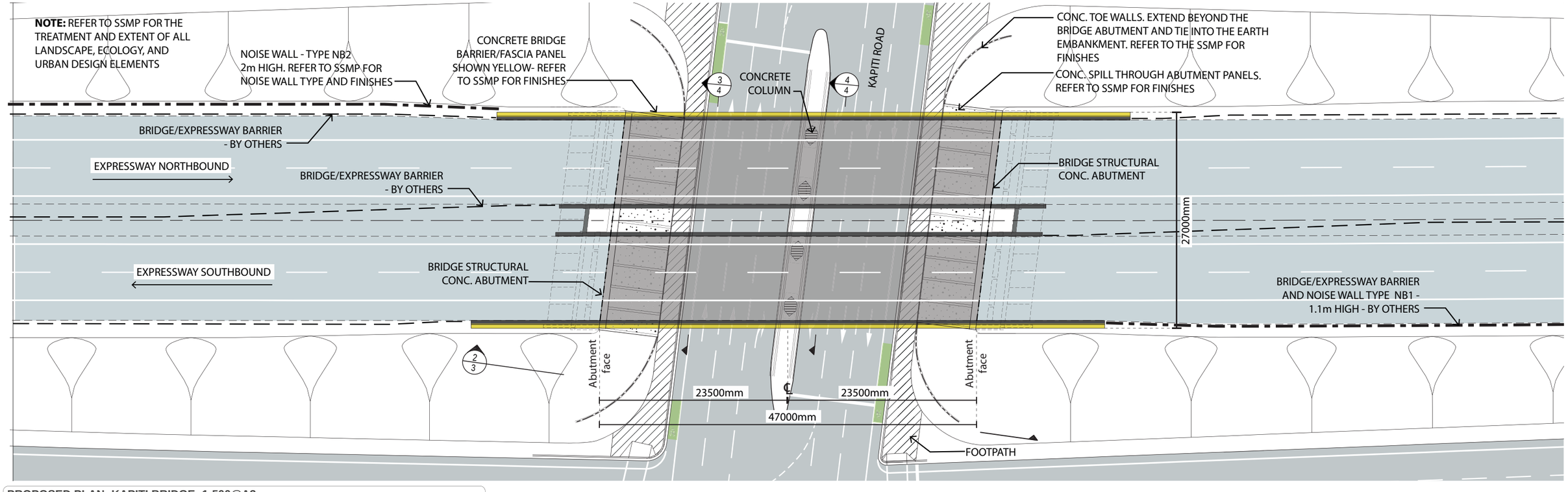
3. Bridges are formed as a whole from a single kit of parts, which allows the components to be repeated and a similar approach used at the multiple crossings to register as a ‘family’ of bridges because people will have multiple interactions day to day with the Expressway and this approach promotes simplicity and visual continuity

4. Utilise concrete prefabricated parts because this allows fine levels of quality control, cost benefits and significant improvements in construction time at the crossings and reduces disturbance to the area.

AEE Consented to DET Proposed Graphic Comparison



AEE PLAN- KAPITI BRIDGE - 1:500@A3



PROPOSED PLAN- KAPITI BRIDGE- 1:500@A3

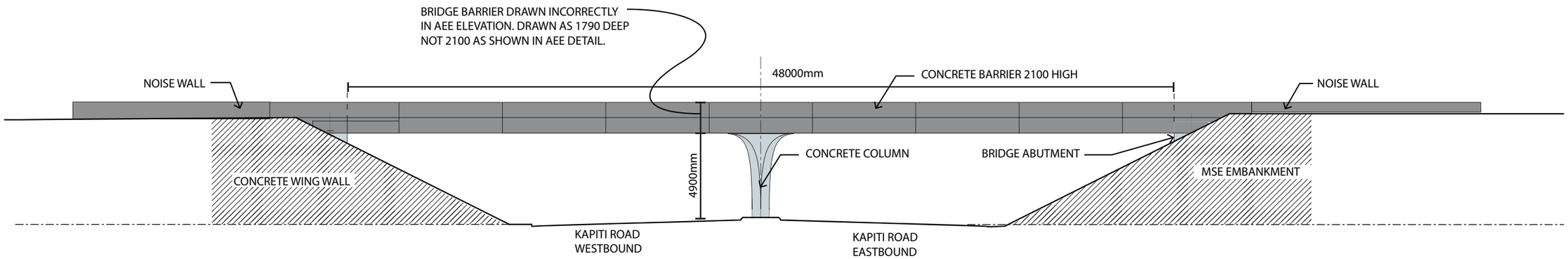
Design development

1. Further detail provided for abutment treatment
2. Further detail provided for pedestrian and cycle (treatment)
3. Columns moved in-board

Rationale

1. Lack of info in AEE. Embankment developed to better integrate the level difference of the embankment and precast conc. spill through abutments.
2. Possible now that detail design of Kapiti Road has progressed
3. Simply supported structure requires platform to seat beam, and new arrangement helps resolve issues with bridge skew

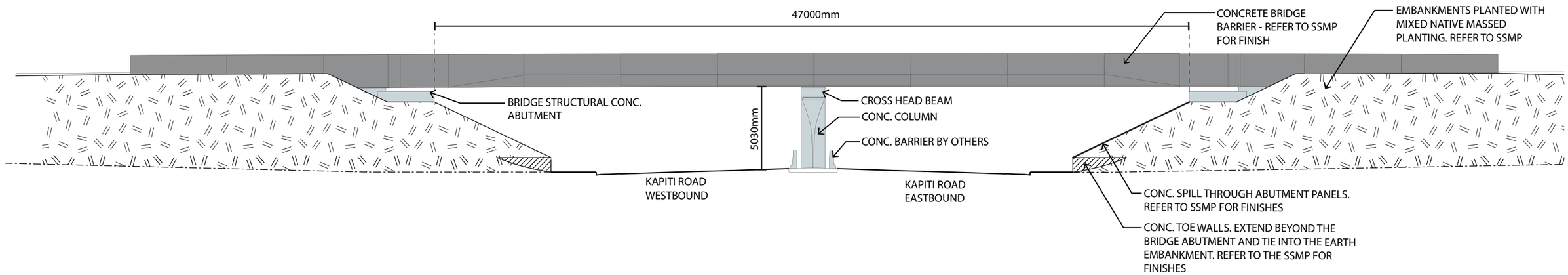
AEE Consented to DET Proposed Graphic Comparison



1. AEE ELEVATION - KAPITI BRIDGE EAST ELEVATION - 1:250@A3

NOTE:

REFER TO SSMP FOR THE TREATMENT AND EXTENT OF ALL LANDSCAPE, ECOLOGY, AND URBAN DESIGN ELEMENTS



2 PROPOSED ELEVATION - KAPITI BRIDGE EAST ELEVATION - 1:250@A3

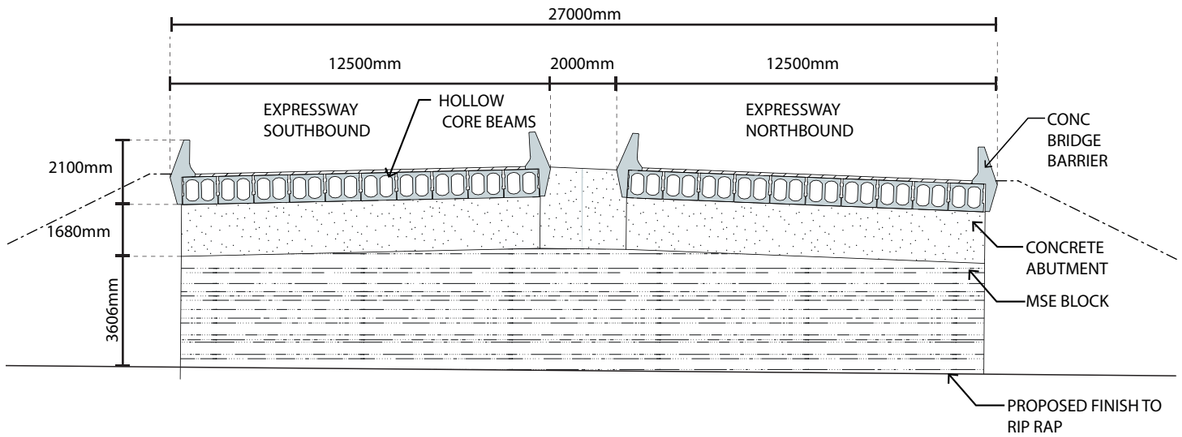
Design development

1. Column shape developed
2. Cross head lower by approx 200mm Change to simply supported system. Revised relationship between column, crosshead and barrier
3. Further detail provided for spill through abutment design and interface with embankments

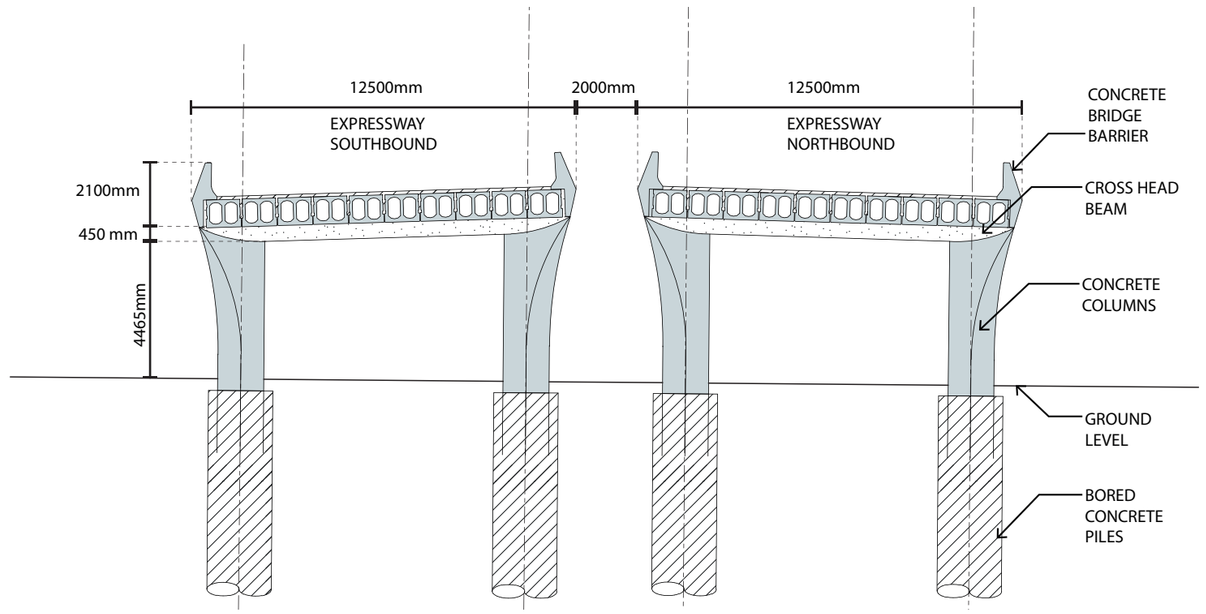
Rationale

1. Increased structural core based on geotech investigations carried out post AEE, while still providing the sculptural outer.
2. Simply supported structure requires platform to seat beam, and new arrangement helps resolve issues with bridge skew
3. Lack of info in AEE. Embankment developed to better integrate the level difference of the embankment and precast conc. spill through abutments.

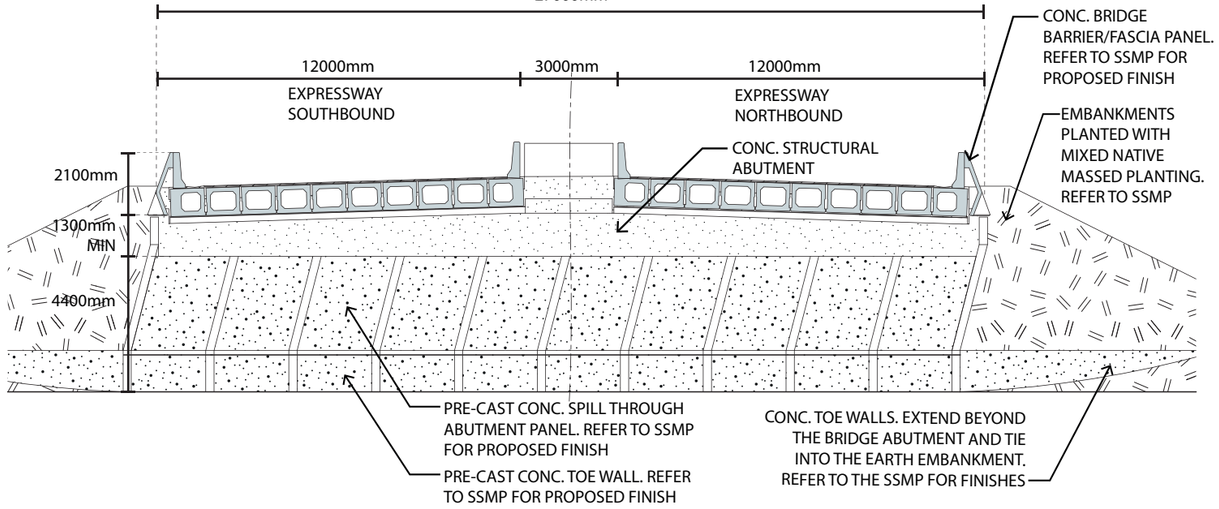
AEE Consented to DET Proposed Graphic Comparison



1. AEE SECTIONAL ELEVATION - KAPITI BRIDGE ABUTMENT (LOOKING SOUTH) 1:200@A3



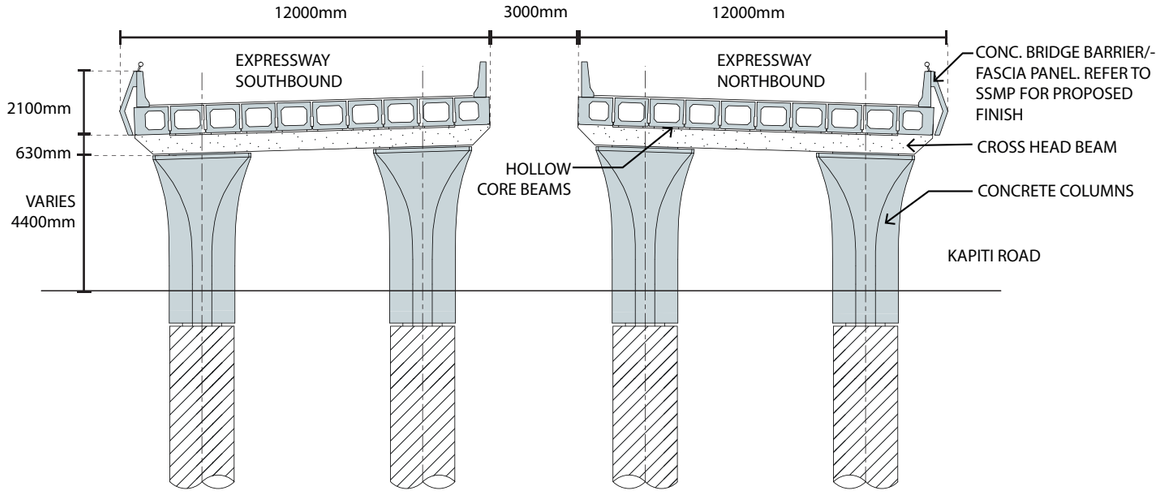
2. AEE SECTIONAL ELEVATION - KAPITI BRIDGE PIERS (LOOKING SOUTH) - 1:200@A3



NOTE:
THERE IS A SKEW BETWEEN THE EXPRESSWAY AND KAPITI ROAD. THE SPILL THROUGH ABUTMENTS ARE DESIGNED PERPENDICULAR TO THE LOCAL ROAD.

REFER TO SSMP FOR THE TREATMENT AND EXTENT OF ALL LANDSCAPE, ECOLOGY, AND URBAN DESIGN ELEMENTS

3. PROPOSED SECTIONAL ELEVATION - KAPITI BRIDGE ABUTMENT (LOOKING SOUTH) - 1:200@A3



4. PROPOSED SECTIONAL ELEVATION - KAPITI BRIDGE PIERS (LOOKING SOUTH) - 1:200@A3

Design development

1. Column shape developed
2. Cross head lower by approx 200mm Change to simply supported system. Revised relationship between column, crosshead and barrier
3. Inside barriers straight profile
4. Further detail provided for the spill through abutment design

Rationale

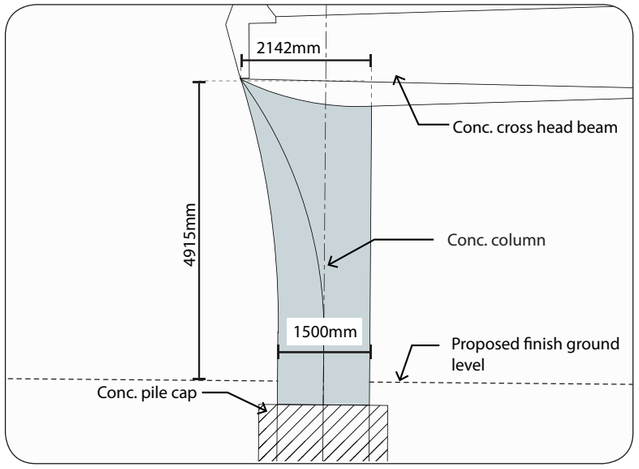
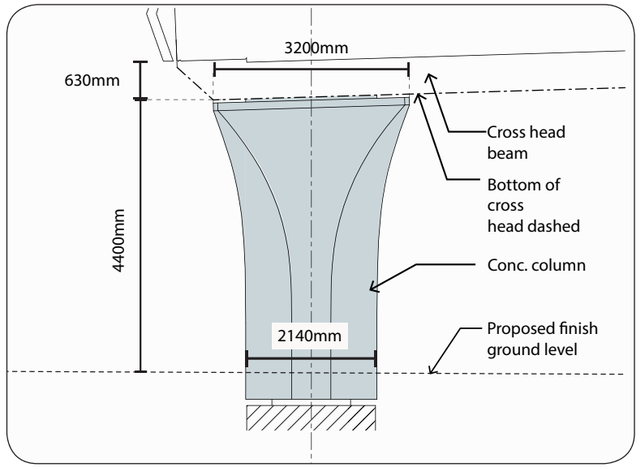
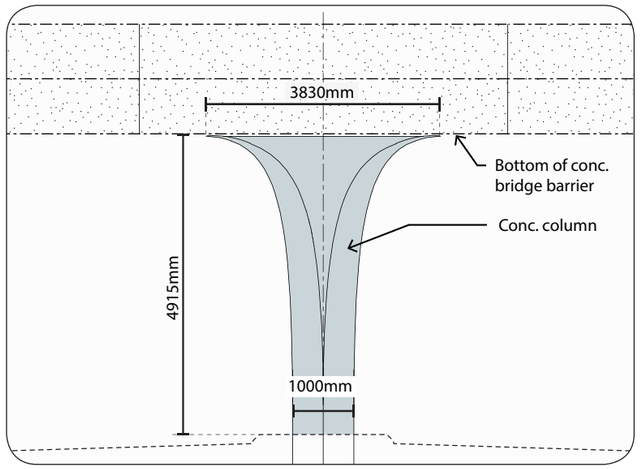
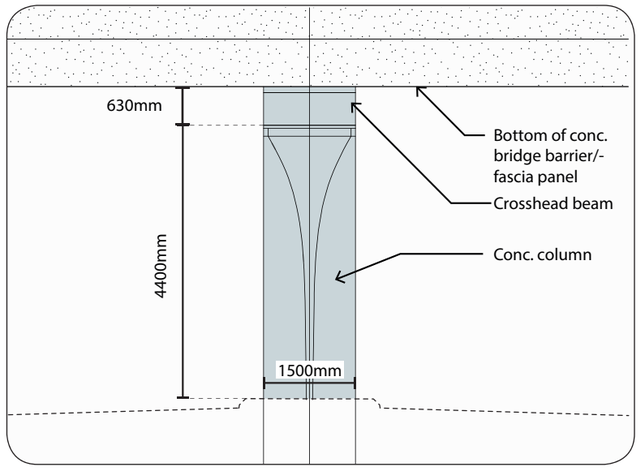
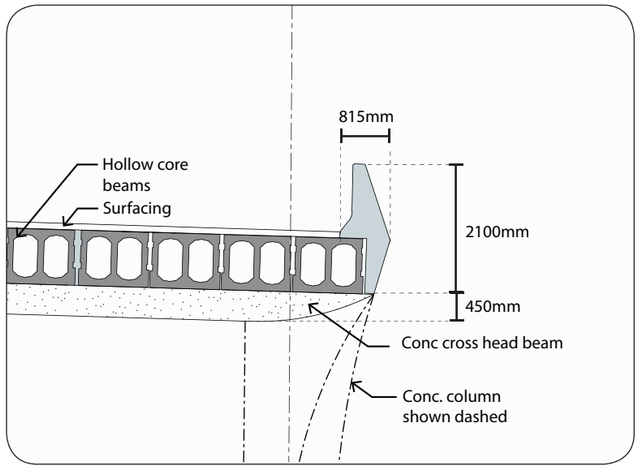
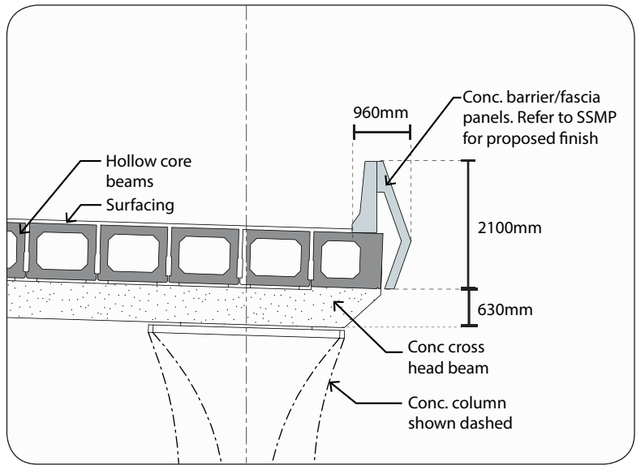
1. Increased structural core based on geotech investigations carried out post AEE, while still providing the sculptural outer.
2. Simply supported structure requires platform to seat beam, and new arrangement helps resolve issues with bridge skew
3. Increase width of light shaft.
4. Lack of information provided in AEE

AEE Consented to DET Proposed Graphic Comparison

AEE VISUALISATION - KAPITI ROAD BRIDGE CROSSING (LOOKING WEST)

PROPOSED VISUALISATION - KAPITI ROAD BRIDGE CROSSING (NORTH SIDE OF KAPITI LOOKING WEST)

Bridge Development Matrix

Elements	AEE Design	Current Design	Developments	Why?	ULDF Principles
Column Front elevation 1:100@A3			1. Column base width increase hexagonal column rather than flattened diamond at base of column 2. Column moved in-board. Cross head lower (approx 200mm)	1. To provide increased structural core to the column based on geotech investigations carried out post AEE, while still providing the sculptural outer. 2. Simply supported structure requires platform to seat beam, and new arrangement helps resolve issues with bridge skew	1. Please refer to ULDF principles summary on sheet; 7 of this document. With particular reference to principle number; 1, 2, 3, 5, 8, 11 and 13
Column Side elevation 1:100@A3			1. Column base width increase hexagonal column rather than flattened diamond at base of column 2. Column moved in-board. Cross head lower (approx 200mm)	1. To provide increased structural core to the column based on geotech investigations carried out post AEE, while still providing the sculptural outer. 2. Simply supported structure requires platform to seat beam, and new arrangement helps resolve issues with bridge skew	1. Please refer to ULDF principles summary on sheet; 7 of this document. With particular reference to principle number 1, 2, 3, 5, 8, 11 and 13
Cross Head & barrier junction 1:100@A3			1. Barrier shape developed 2. Column moved in-board. Cross head lower (approx 200mm)	1. To improve shadow line 2. Structure requires platform to seat beam, and new arrangement helps resolve issues with bridge skew	1. Please refer to ULDF principles summary on sheet; 7 of this document. With particular reference to principle number 1, 2, 3, 4, 8 and 13

ULDF PRINCIPLES SUMMARY

ULDF principle	Assessment of ULDF principles
1. Make the bridges generally consistent in their form so they register as a 'family' and provide some visual continuity within the local environment	Proposed Kapiti Road bridge is different from the AEE bridge, but the form remains consistent with other proposed bridges, including Poplar Road, Raumati Road. The consistency across the bridges overall has become even more consistent as there is less variation in types from that shown in AEE. Accordingly there is enhanced consistency in the local environment.
2. Express the bridges as simple forms that sit across the changes in landscape and are not seen as strong statement in their own right	Proposed bridge form remains a visually simple structure as far as it can be, given the on and off ramps and other structure such as retaining walls. The bridge is not seen as making a statement in its own right. The bridge appears 'heavier' in that the piers have become wider, but sit now (different than the AEE) just beneath the bridge.
3. Unite the bridge elements of pier, cross head, deck and barrier as one sculptural form and ensure services are concealed from view	Proposed bridge form is different than the AEE in that the piers have been repositioned to sit beneath the bridge deck. However, the principle of united piers, cross head, deck and barrier remains upheld, albeit in a new pier configuration. The profile from the crease of the barrier to the sloping cross head end to the shaped pier continues to show the bridge as a united single form.
4. Ensure the form of the bridges from the underside is visually appealing to recognise the primacy of the local roads user's experience in design consideration	Proposed Kapiti Road bridge interchange will be no less visually appealing than the AEE bridge. The spill through abutments continue to provide an open space and centralising the piers (consistent with the AEE) enables the space at either side of Kapiti Road to be maximised for the public benefit of walking and cycling movements.
5. Design the intersection of the piers with the ground in concert with the local road interface design of abutment forms and materials (refer to local road interface design principles)	Proposed bridge piers are located to provide good clearance for local road movements and enables the space at either side of Kapiti Road to be maximised for the public benefit of walking and cycling movements.
6. Light the spaces beneath local road over bridges to enhance the quality of the space including the use of natural light penetration where the local road has a higher frequency of pedestrian cycling and other non-vehicular users	Proposed bridge is continues with the split as in the AEE to allow some natural light penetration to the local road and space below. There is lighting to be provided under the bridge to recognise the relatively high level of usage by cyclists, walkers and others. This lighting can be used to enhance the architectural forms.
7. Use architectural lighting to emphasise the sculptural forms of the bridges and light units that are readily serviceable from the ground	Proposed bridge will be lit from beneath and objective will be to light the external barrier and pier shapes architecturally.
8. Utilise the opportunity provided by multiple bridges to make a system of parts that can be repeated at each location and improve efficiency of construction	Proposed bridge, as in the AEE, remains of the same systematised approach to allow repetition of parts at other locations and improves the efficiency of construction.
9. Use textured finishes within the bridge elements surfaces' to provide a crafted finish – avoid printed forms	The proposed finish on the Kapiti Road Bridge barriers will be fair faced concrete with a white wash, applied concrete coating to ensure colour and tonal uniformity between panels. The bridge abutment will be constructed with precast concrete panels with a formed concrete pattern finish. The underside of the deck will be fair faced concrete without the applied white wash coating to help make these elements visually recessive relative to the barrier. Matt graffiti protection to be applied to all bridge elements surfaces. Refer to the SSMP for further detail on the proposed finishes.
10. Repeat the bridge design concepts within the design of pedestrians bridges recognising that these may be able to utilise lighter weight materials	Not relevant
11. Develop each bridge crossing design considering the piers types best suited to the location	Proposed Kapiti Road bridge piers are different than those in AEE design. The AEE design did have bridge types where piers were located beneath the bridge and others where the piers were co-planar to the barrier and on the outside edge. Piers under the bridges were a response to the location. At Kapiti Road the piers proposed are on the outward edge of the bridge but are no long co-planar with the barrier. The piers now proposed provide more consistency with other bridge types which satisfies principle 1 above and assists with expediency of construction on this busy road.
12. Locate bridge piers associated with bridge watercourse crossings away from riparian edges to prevent need to armour stream edges	Not relevant
13. Ensure that the integrity and significance of the bridge forms as important to the amenity of the community is not accorded any less priority than the other design requirements of the project	Proposed bridge form at Kapiti Road has seen the consideration of all the contributing factors of visual amenity, safe CWB crossing, structural design in high seismic zone, and constructibility. At this location the bridge is one element in a complex context that must accommodate on and off ramps, multiple local road traffic lanes, safe crossing points for pedestrians and cyclists and noise mitigation structures.

KAPITI ROAD CROSSING - SIMULATION

NZ TRANSPORT AGENCY
WAKA KOTAHI

MacKays to Peka Peka
Wellington Northern Corridor