M2PP-121-D-PLNM-0001

Appendix 3: BRIDGE SUMMARY- POPLAR AVE BRIDGE

Site Specific Management Plan 001 - [sector 320]
MacKays to Peka Peka Expressway

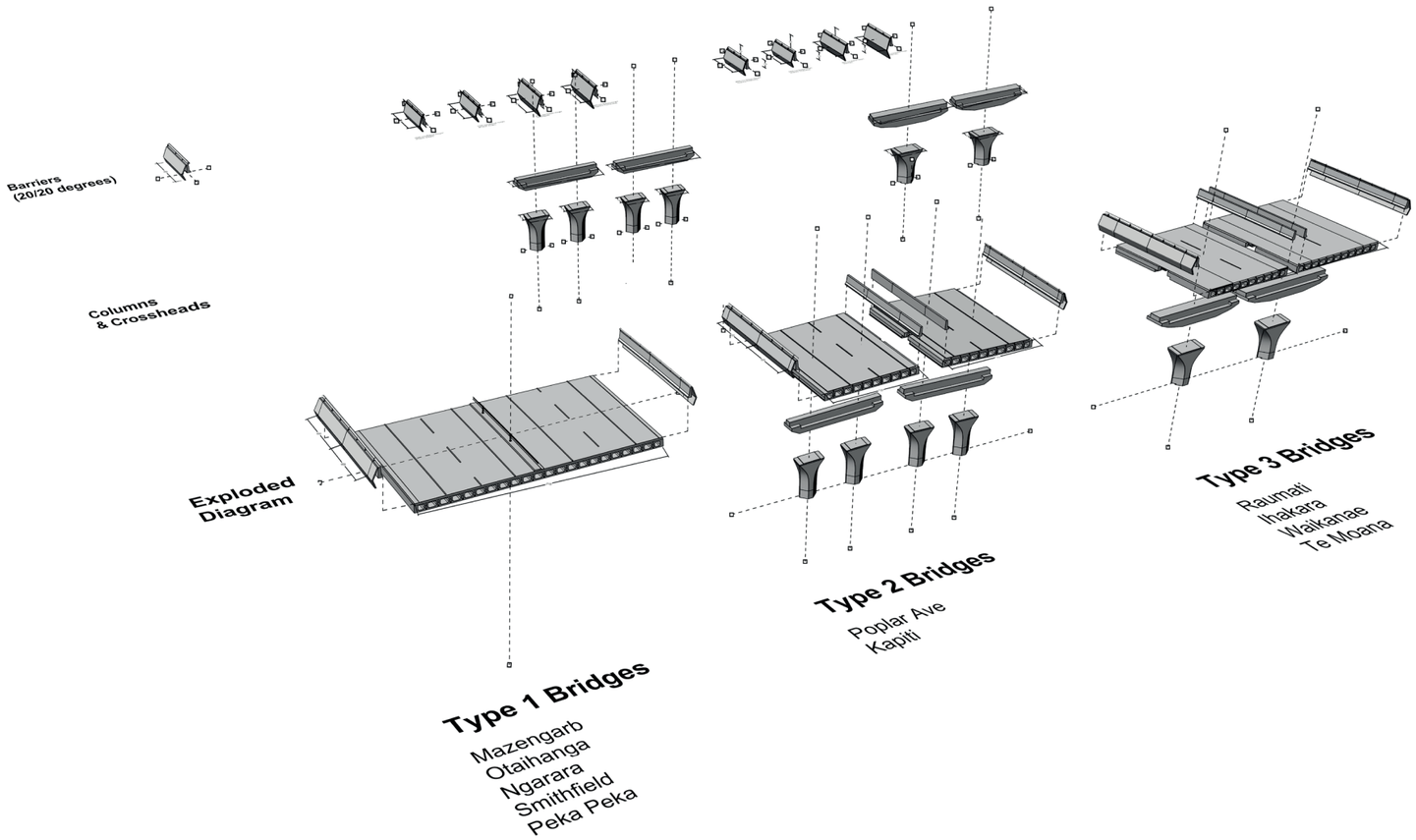
18TH SEPTEMBER 2014 - REV B

NZ TRANSPORT AGENCY
WAKA KOTAHI

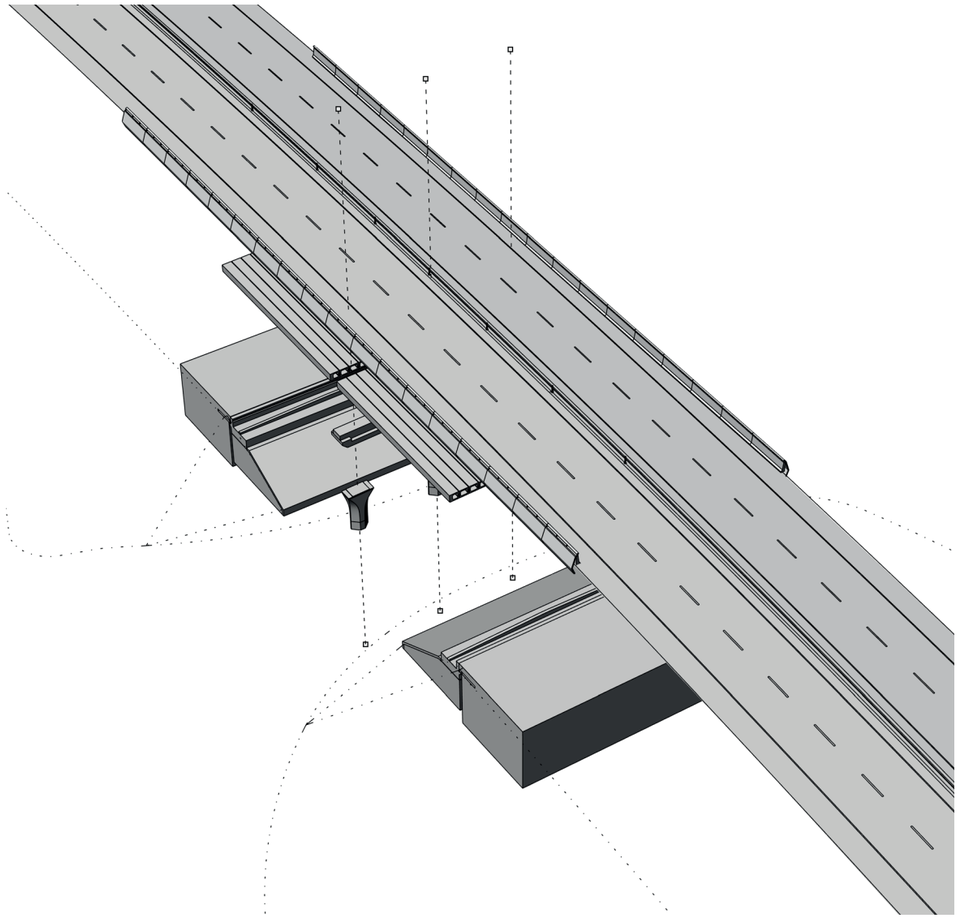
MacKays to Peka Peka
Wellington Northern Corridor

M2PP Bridge Design Objectives

Bridges as a series of components



Proposed Poplar 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:

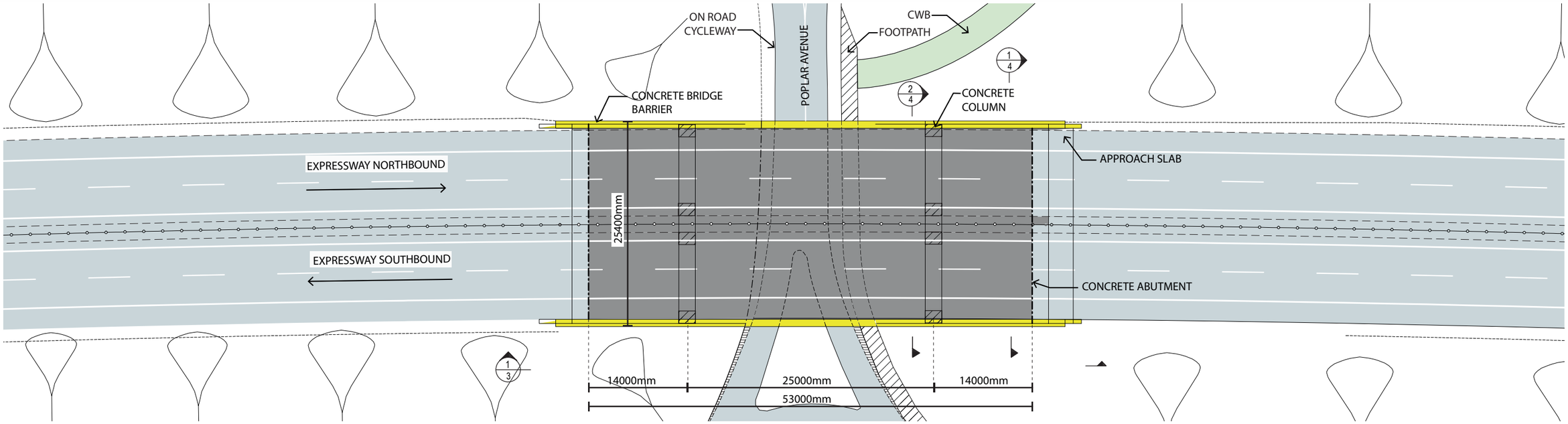
1. The public spaces of the roads and streets take primacy over the experience of the Expressway users. Local people will be making slower movements and as a consequence the bridges will be more visually apparent to them than to people travelling along the Expressway.

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.

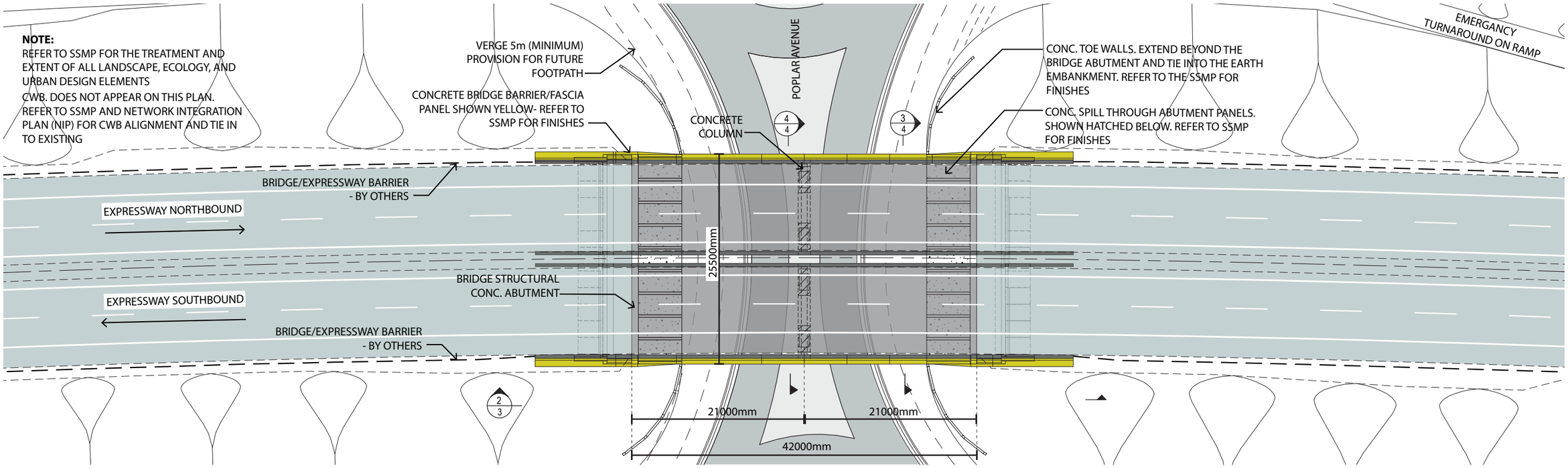
3. Bridges are formed as a whole from a single kit of parts, which allows the components to be repeated and a similar approach used at the multiple crossings to register as a ‘family’ of bridges because people will have multiple interactions day to day with the Expressway and this approach promotes simplicity 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- POPLAR AVENUE CROSSING - 1:500@A3



PROPOSED PLAN- POPLAR AVENUE CROSSING - 1:500@A3

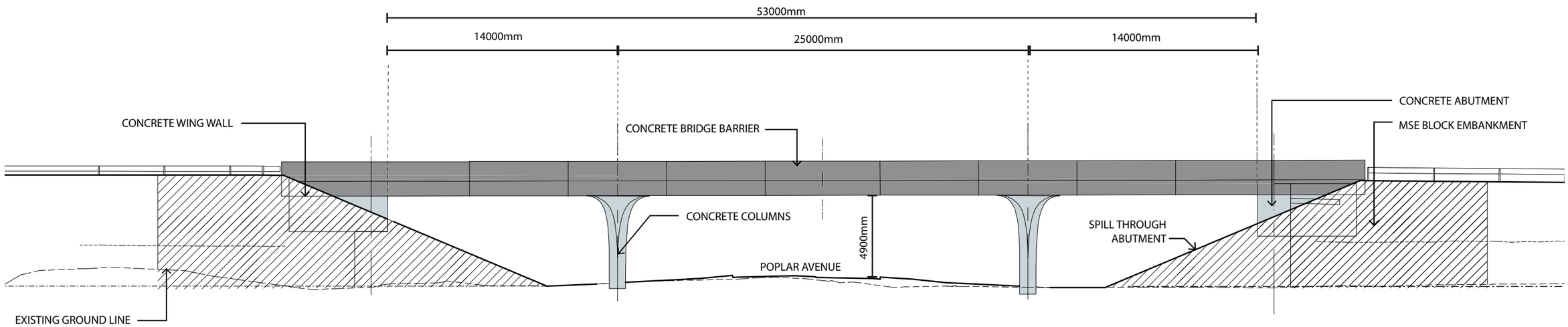
Design development

1. Reduced bridge Length. Reduced number of spans from 3 to 2
2. Column locations and number adjusted
3. Column profile developed
4. Local road design developed
5. Removed footpath from under Poplar Ave bridge
6. Change to split deck

Rationale

1. More efficient bridge design. Columns no longer sit between the verge and spill through abutments.
2. Reduced number of spans, reduce columns - 4 columns vs 8
3. Increased structural core based on geotech investigations carried out post AEE, while still providing the sculptural outer.
4. Local road design refined since AEE. Roundabouts are closer, increased central median
5. CWB Connects to old SH1 via Leinster Ave pedestrian bridge. Provision for future pedestrian/cycle link as part of KCDC SH1 revocation work. Refer to SSMP for more detail.
6. Allows light penetration, bridge performs better seismically

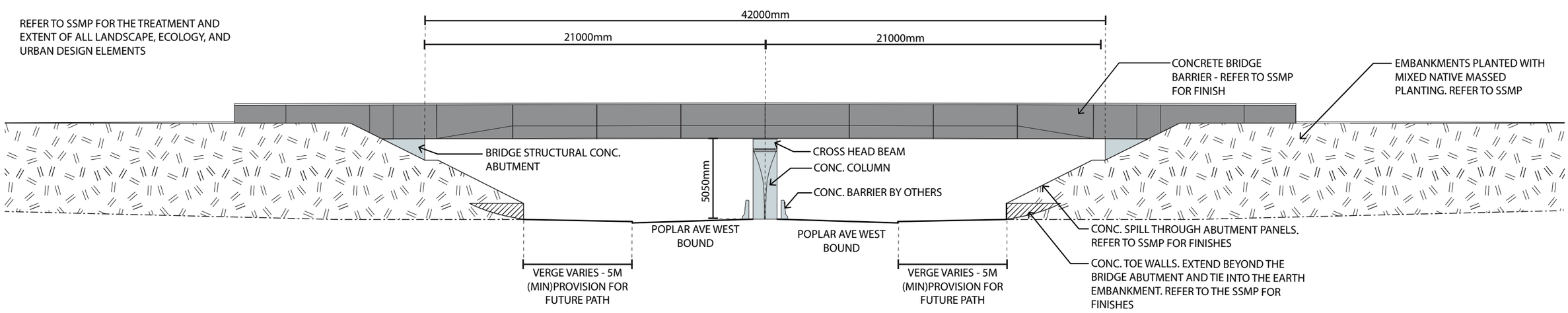
AEE Consented to DET Proposed Graphic Comparison



1. AEE ELEVATION - POPLAR AVENUE CROSSING ELEVATION - 1:250@A3

NOTE:

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



2. PROPOSED ELEVATION - POPLAR AVENUE CROSSING EAST ELEVATION - 1:250@A3

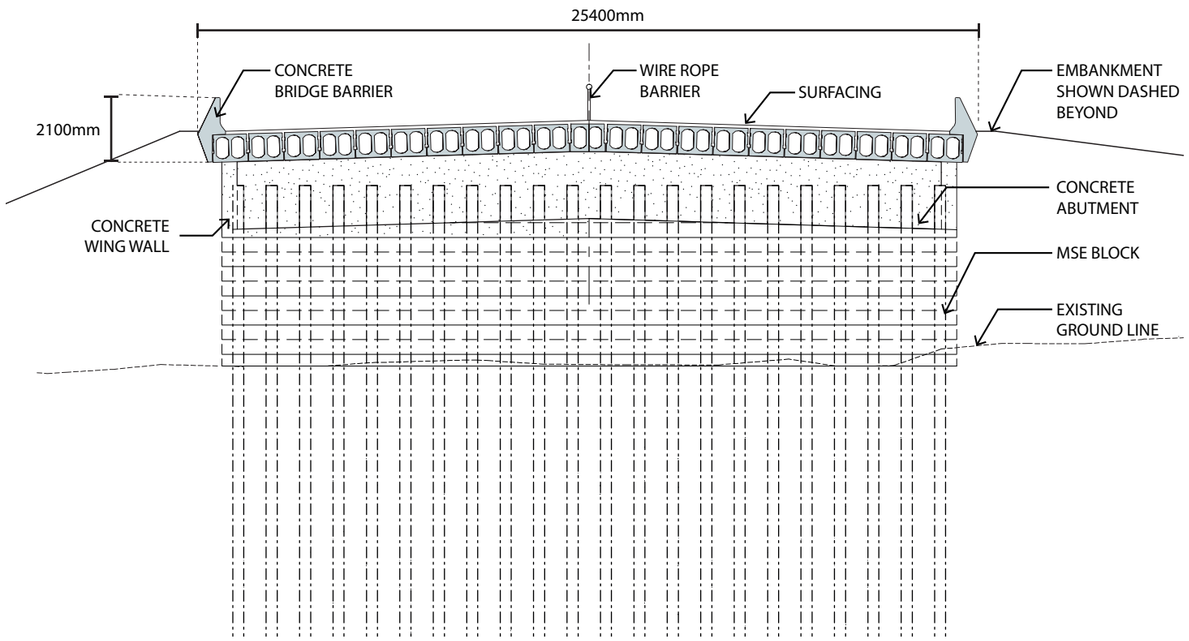
Design development

1. Reduced overall length of bridge, Reduced number of spans from 3 to 2
2. Column locations adjusted
3. Column profile developed
4. Local road design developed
5. Removal of footpath under Poplar Ave bridge

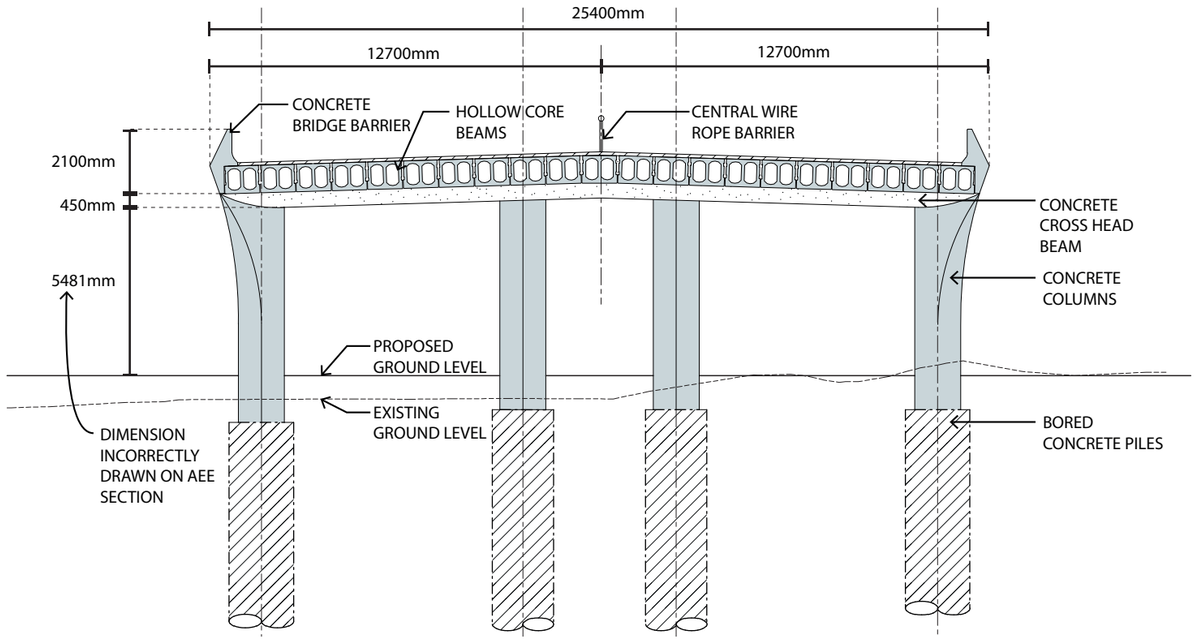
Rationale

1. More efficient bridge design. Columns no longer sit between the verge and spill through abutments.
2. Reduced number of spans, reduce columns - 4 columns vs 8. Columns moved away from pedestrians.
3. Increased structural core based on geotech investigations carried out post AEE, while still providing the sculptural outer.
4. Local road design refined since AEE. Roundabouts are closer increased central median to allow for centrally placed columns
5. CWB Connects to old SH1 via Leinster Ave pedestrian bridge. Provision for future pedestrian/cycle link as part of KCDC SH1 revocation work. Refer to SSMP for more detail.

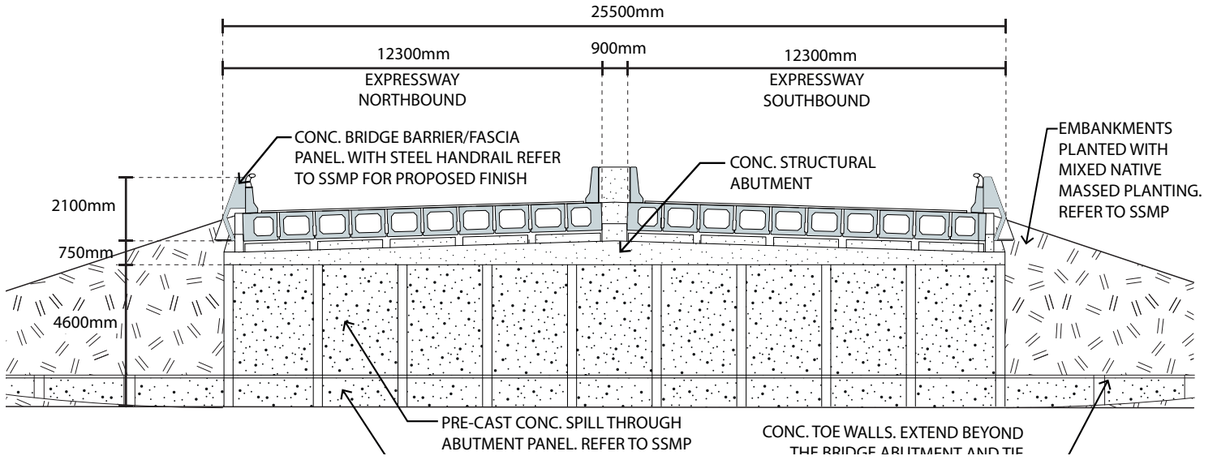
AEE Consented to DET Proposed Graphic Comparison



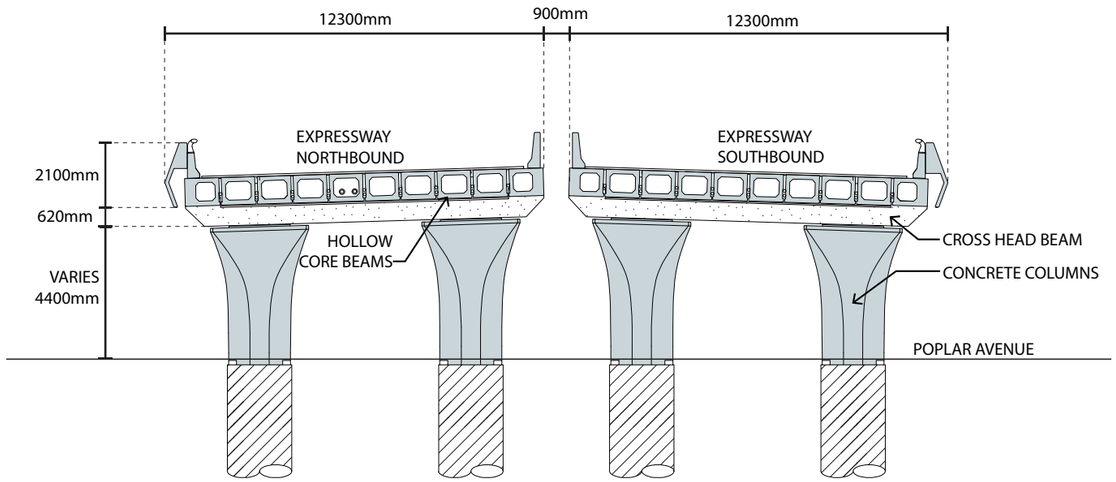
1. AEE SECTIONAL ELEVATION - POPLAR AVENUE CROSSING (NORTH ABUTMENT) - 1:200@A3



2. AEE SECTIONAL ELEVATION - POPLAR AVENUE BRIDGE CROSSING (LOOKING NORTH) - 1:200@A3



3. PROPOSED SECTIONAL ELEVATION - POPLAR AVENUE CROSSING (NORTH ABUTMENT) - 1:200@A3



4. PROPOSED SECTIONAL ELEVATION - POPLAR AVENUE CROSSING (LOOKING NORTH) - 1:200@A3

Design development

1. More detail provided for abutment treatment
2. Cross head depth has increased
3. Column profile developed
4. Simply supported structure
5. Change to split deck
6. Handrail shown on top of barrier

Rationale

1. Lack of resolution in AEE. Abutment design developed
2. Simply supported structure requires platform to seat beams
3. Increased structural core based on geotech investigations carried out post AEE, while still providing the sculptural outer.
4. Constructibility issues because of seismic requirements. Integral connections difficult to build without increasing structural element sizes further.
5. Allows light penetration, bridge performs better seismically
6. Safety requirement for cyclists using the expressway

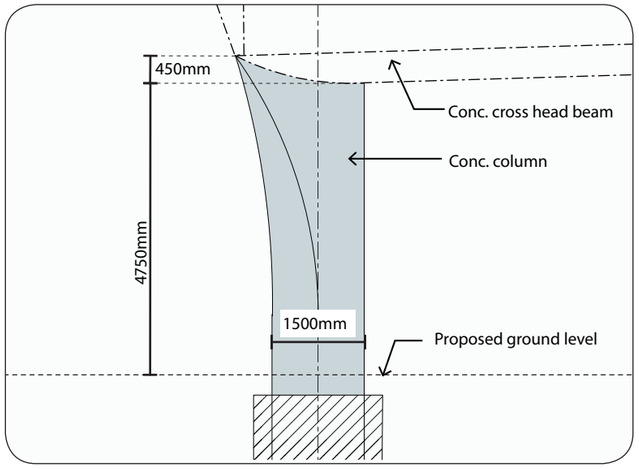
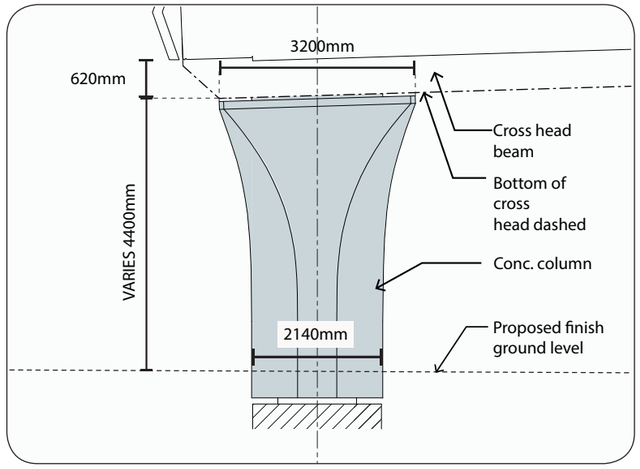
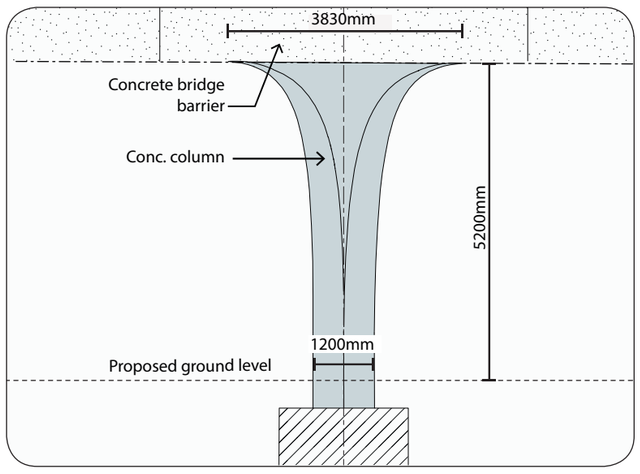
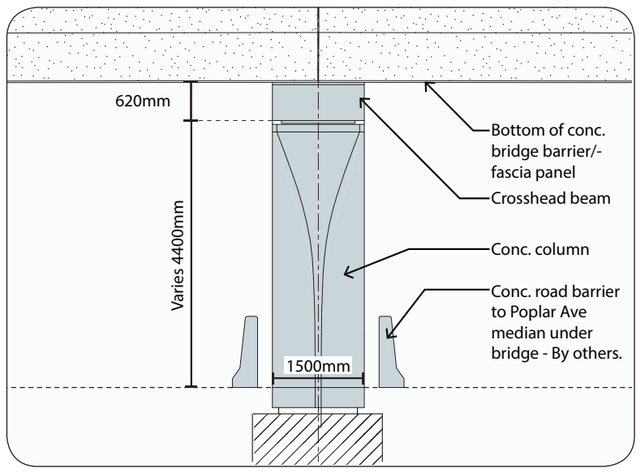
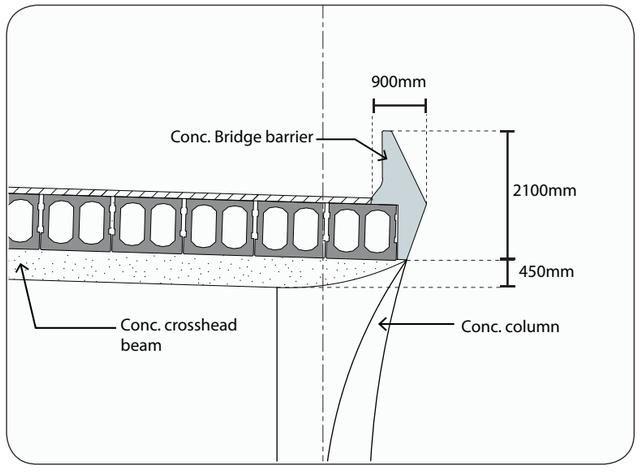
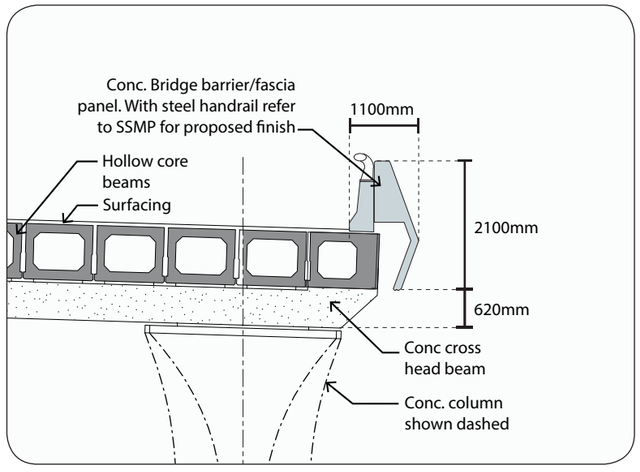
AEE Consented to DET Proposed Graphic Comparison

AEE VISUALISATION - POPLAR AVENUE CROSSING (NORTH SIDE OF POPLAR LOOKING EAST) SITUATION FOLLOWING CONSTRUCTION

PROPOSED VISUALISATION - POPLAR AVENUE CROSSING (NORTH SIDE OF POPLAR LOOKING EAST)

NOTE: TO BETTER REPRESENT THE BRIDGE, THE PROPOSED VISUALISATION HAS BEEN DRAWN FROM A VANTAGE POINT THAT IS CLOSER TO THE BRIDGE THAN THE ORIGINAL AEE RENDER

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.	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) 3. Column height reduced 4. Concrete road safety barrier added to Poplar Ave median	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. 3. To allow for the changes to the cross head. Development of local road levels 4. Safety. Poplar Ave road design developed, column location changed	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 changed 2. Column moved in-board. Cross head lower (approx 250mm) 3. Handrail shown on top of barrier	1. To improve shadow line 2. Simply supported structure requires platform to seat beam. 3. Safety requirement for cyclists using the expressway	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 Poplar Avenue bridge is different from the AEE bridge, but the form remains consistent with other proposed bridges. 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 and sits across the landscape as an horizontal element. The bridge is not seen as making a statement in its own right. The bridge appears 'heavier' in that the piers have doubled in width. However, there is a reduction in the number of piers from AEE.
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 and are centralised. 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	The space beneath the bridge will be no less visually appealing than the AEE bridge and maybe perceived as better given a simpler reduced number of piers (albeit that those being proposed are larger in size).
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 the centralised position leaves areas on the abutment side clear of piers and this space is accordingly more open. The abutments continue to be set at a slope that provides for light penetration. These will be treated in a consistent way with the other local road abutments.
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 differs from AEE in that the proposed split in the deck will allow some natural light penetration to the local road and space below. There is architectural lighting to be provided under the bridge to recognise the position of the Poplar Avenue Bridge as the gateway into the Raumati, Raumati South residential/urban area.
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. The objective will be to light the external barrier and pier/columns to enhance and accentuate their architectural forms.
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 Poplar Avenue Bridge barriers will be fair faced concrete with a white wash, applied concrete coating to ensure colour and tonal uniformity between panels. The other elements – columns, cross head and deck will be simple, 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. The material for the bridge abutments is to be developed. 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 Poplar Avenue 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. The proposed new structure is shorter in length with fewer piers whilst maintaining the 'spill through' abutments for the lightness of space beneath.
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 Poplar Avenue has seen the consideration of all the contributing factors of visual amenity, CPTED, structural design in a high seismic zone, and constructibility.

POPLAR AVE INTERCHANGE - VISUALISATION