

PREPARED FOR: Commute
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DATE: 03-Oct-17

PROJECT: Peka Peka Connectivity SSBC
PROJECT NO: 17016
TN NO: 001

SUBJECT: Concept Options Assessment

1.0 Overview

RoadLab are pleased to be working with Commute on the Peka Peka Connectivity Single Stage Business Case, investigating ways to improve the connectivity to and from the expressway at and near Peka Peka. Specifically, in our role to develop Concept Options we have considered where additional on- and off-ramps could be included, with due consideration to geometric design parameters and site constraints.

Following the workshop held with stakeholders in Paraparaumu on Friday 15th September 2017 where numerous possible options were identified by the wider group, RoadLab has been investigating and developing concepts for options as narrowed down by Commute and NZTA, and as illustrated by the following diagrams.

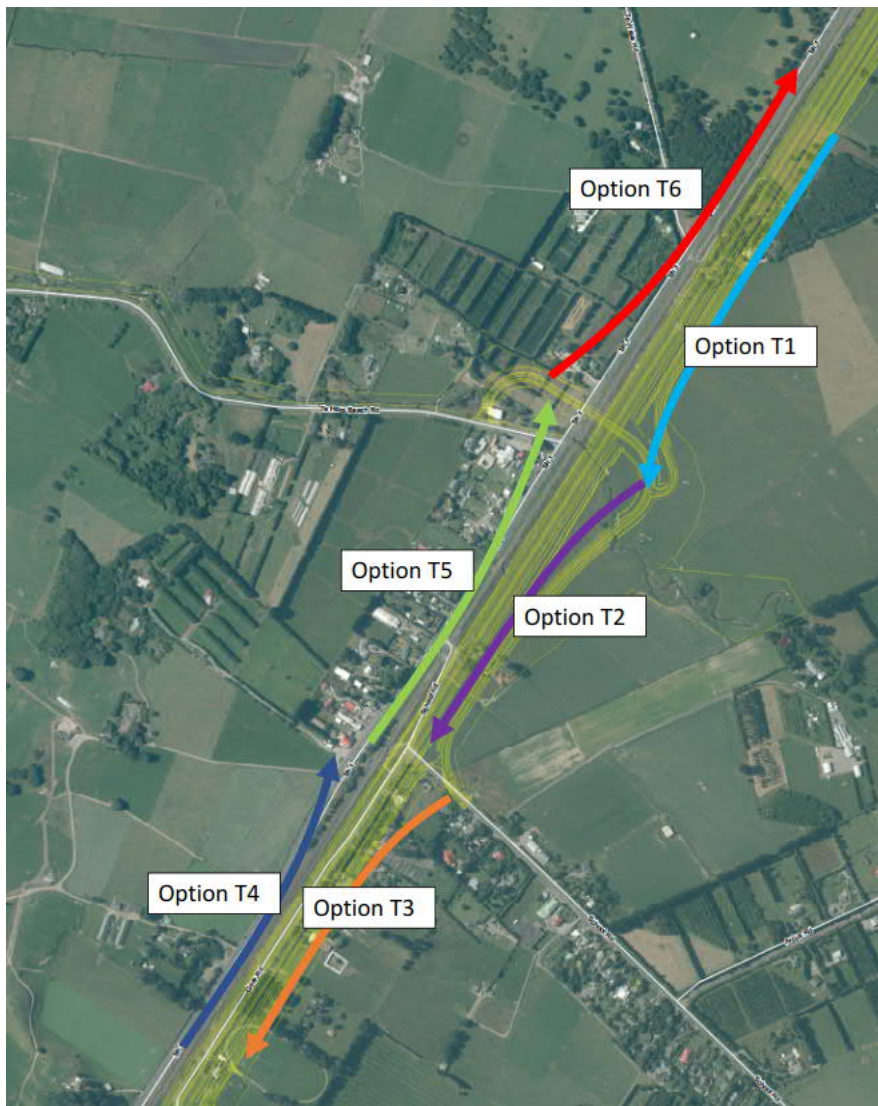


Figure 1: Options at Te Horo (2 separate locations, 6 possible ramps)

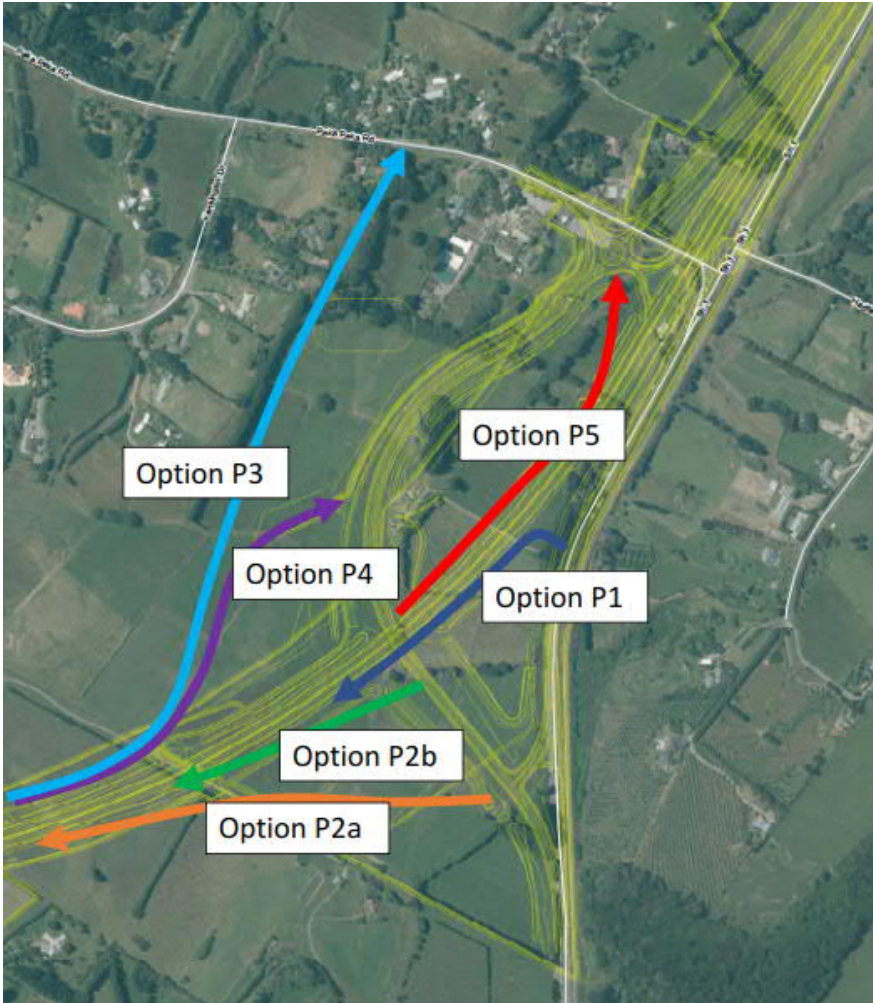


Figure 2. Options at Peka Peka (6 possible ramps)

A key factor in our geometric design assessments, and also further development of options, has been to establish options that can fit within the existing NZTA designation(s), and/or within land currently owned by NZTA. Some of the options identified could be achieved with lesser capital cost, but the alternative(s) would have planning / consenting implications and more impact on land requirement, which ultimately is likely to create greater project costs.

This Technical Note provides summaries of these options, following detailed geometric design assessments. Our assessments have considered the geometric requirements and constraints, and has enabled us to develop the most feasible options at each location to a level required to facilitate high level pricing. We have been working closely with CM Bond to provide high quality and relevant information to assist with the accuracy of the pricing. The quantity information, as has been provided to CM Bond is attached (as attachment 1).

2.0 Te Horo Options

The Te Horo options are located north of the current Peka Peka partial interchange, in the vicinity of the small township of Te Horo. This stage of the Wellington Expressway has not yet been built, but the current design has been consented. Detailed design of this section, shown as Peka Peka to Otaki (or PP2O), is currently underway and quite advanced.

Refer to Figure One for diagrams showing location and intent of each ramp option described following.

Our assessment has identified four ramps for further design development, with two on-ramps and two off-ramps, providing connectivity for all northbound and southbound movements. The layout (as illustrated in DRG-005) is a fairly conventional diamond interchange, albeit requiring significant extents of retaining walls to keep the proposal with the existing NZTA designation.

Option T1 – developed further (refer GA-00-004)

- Southbound off-ramp
- Located between expressway and local road (Winiata Link) on embankment supported by retaining walls
- Additional intersection required on School Road
 - The vertical crest curve over the bridge requires flattening for Approach Sight distance
 - Safe intersection sight distance requires widening of the bridge
 - Vehicle tracking may require widening a corner of the bridge
- The flood bund & treatment swale would need to be relocated
- Rooding layout is within the existing designation but unsure if relocated drainage infrastructure would be
- Refer drawing PP-DRG-GA-00-004 Rev A

Option T2 – developed further (refer GA-00-004)

- Southbound on-ramp
- Located between expressway and local road (School Road) on embankment supported by a retaining wall
- Additional intersection required on School Road
 - The vertical crest curve over the bridge requires flattening for Approach Sight Distance
 - A right turn bay or wider shoulders are likely to be required to cater for turning vehicles
 - Vehicle tracking may require widening a corner of the bridge
- Rooding layout is within the existing designation
- The flood bund & treatment swale would need to be relocated
- Refer drawing PP-DRG-GA-00-004 Rev A

Option T3

- Southbound on-ramp
- Gear Road would need to be relocated, and likely that Gear Road would need to be terminated as a cul'd'sac, as an intersection between School Road/Gear Road and a southbound on-ramp is challenging
- The Gear Road intersection would need to be upgraded as the on-ramp intersection
- The designation would need to be widened to accommodate the realigned Gear Road
- Property access would need to be reconstructed
- Less feasible than T1 so not developed further

Option T4

- Northbound off-ramp
- This ramp would rise between the motorway and railway, most likely on walls/bridge
- An additional bridge would be required across the existing highway and motorway connecting School Road with Te Horo Beach Road or the existing highway.
- The PP2O design of School Road extension and Gear Road require modifying / relocating as these road would be unable to tie-in with the raised motorway crossing needed to connect the ramp.
- Several dwellings would be affected
- The rooding layout is outside the NZTA designation within the KiwiRail designation
- Less feasible than T6 so not developed further

Option T5 – developed further

- Northbound off-ramp (refer GA-00-004)
- This ramp would rise between the motorway and railway, most likely on walls/bridge
- Additional intersection required on School Road
 - The vertical crest curve over the bridge requires flattening for Approach Sight distance
 - Safe intersection sight distance requires widening of the bridge
 - Vehicle tracking may require widening a corner of the bridge
- Rooding layout is outside the NZTA designation within the KiwiRail designation

Option T6 – developed further

- Northbound on-ramp (refer GA-00-004)
- This ramp would rise between the motorway and railway, most likely on walls/bridge
- Roding layout is outside the NZTA designation within the KiwiRail designation
- Additional intersection required on School Road
 - The vertical crest curve over the bridge requires flattening for Approach Sight distance
 - A right turn bay or wider shoulders are likely to be required to cater for turning vehicles
 - Vehicle tracking may require widening a corner of the bridge

In order to develop these options (T1, T2, T5 and T6) the current PP2O design of School Road, including the the vertical alignment of School Road; and, the design of the School Road Bridge (including bridge width), would need to be revised. In addition, we have identified two main streams that cross through the existing transport corridor, as illustrate in Figure 3, would need to be accommodated in all the options developed at Te Horo.

This stage of the expressway (PP2O) has not yet been built, but has been consented. Detailed design is currently underway.

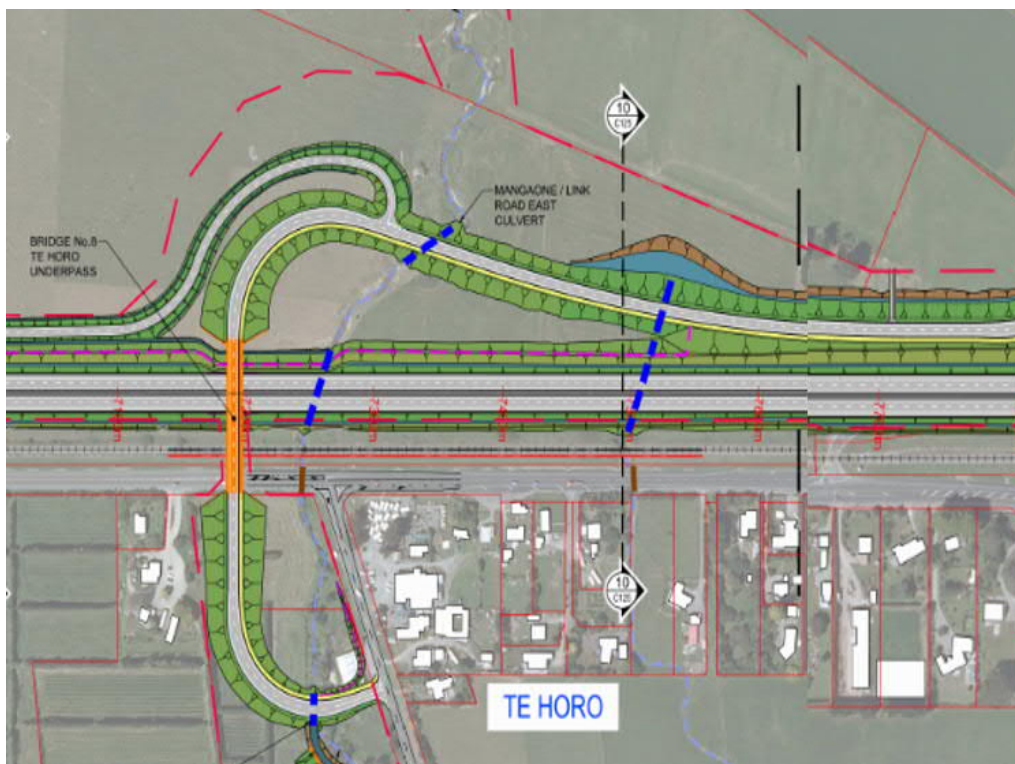


Figure 3. Specimen Design of expressway at Te Horo, showing location of two main streams in the area

Peka Peka Options

The Peka Peka options are located at the current Peka Peka partial interchange, which has recently been completed as part of the MacKays to Peka Peka (M2PP) section of the Wellington Expressway.

Refer to Figure Two for diagrams showing location and intent of each ramp option described following.

Our assessment has identified five ramps for further design development, four options for a southbound on-ramp, and one option for a northbound off-ramp. These could provide connectivity for the currently "missing" south-facing ramps not provided for in the current partial interchange.

Option P1 – developed further (refer GA-00-002)

- Southbound On-ramp
- Need a departure to have a reduced shoulder width under the existing underpass; or would require widening of the SH1 underpass (probably require reconstruction of bridge/southern abutment)
- Within the existing designation
- Refer drawing PP-DRG-PP-DRG-GA-00-002 Rev B (also shows P5)

Option P2a – developed further (refer GA-00-001)

- Southbound On-ramp
- The existing designation would require widening in two locations, near the new local road intersection (NZTA land) and near Paetawa Stream (private land)
- A structure is required across the Paetawa Stream
- Embankment is located in the stormwater storage area, needs to be accommodated elsewhere
- Refer drawing PP-DRG-GA-00-001 Rev B (drawing also shows P5)

Option P2b

- Southbound On-ramp
- The existing designation would require widening
- A structure is required across the Paetawa Stream
- The intersection with SH1 wouldn't meet sight distance requirements as it is on a crest
 - A change in speed zone is the likely solution although a hard one to get
- Less feasible than P2a (or others) so not developed further

Option P3

- Northbound Off-ramp
- The existing designation would require widening significantly
- Multiple property purchases required
- A structure is required across the Paetawa Stream
- A new intersection is required with Peka Peka Road
- Less feasible than P5 so not developed further

Option P4

- Northbound Off-ramp
- The existing designation would require widening
- A structure is required across the Paetawa Stream
- A new intersection is required with main road
 - To meet sight distance and adverse crossfall turning requirements the intersection would need to be approx. 200m from the bridge.
- Less feasible than P5 so not developed further

Option P5 – developed further (refer GA-00-001)

- Northbound Off-ramp
- Within the existing designation
- Deceleration length meets requirements however is at absolute minimum
- Ties into existing roundabout
- Drainage devices to be relocated (design shows equivalent in location immediately adjacent)
- Refer drawing PP-DRG-GA-00-001 Rev B (also shown on 002, 003 and 005)

Option P6 – new option identified and developed further (refer GA-00-003)

- Southbound On-ramp
- Would require a new underpass through embankment (misses existing MSE abutment).
- Provides a new “matching” roundabout
- Last 90m of on-ramp merge has reduced sight distance as it is on an existing crest K=102
- Existing Paetawa Stream bridge requires widening
- Within the existing designation
- Refer drawing PP-DRG-GA-00-003 (also shows P5)

Option P7 – variation on P2A, developed further (refer GA-00-005)

- Southbound On-ramp
- The existing designation would require widening in one location, near the new local road intersection (NZTA land)
- Motorway drainage infrastructure around Paetawa Stream would require redesign and may not stay within the designation
- A structure is required across the Paetawa Stream
- Refer drawing PP-DRG-GA-00-001 (also shows P5)

We are aware that stormwater management is very critical in the area adjacent to the Peka Peka Interchange, and that all of the options developed will affect the drainage and required offset storage areas illustrated in figure 4, and will these will need modification / relocation.

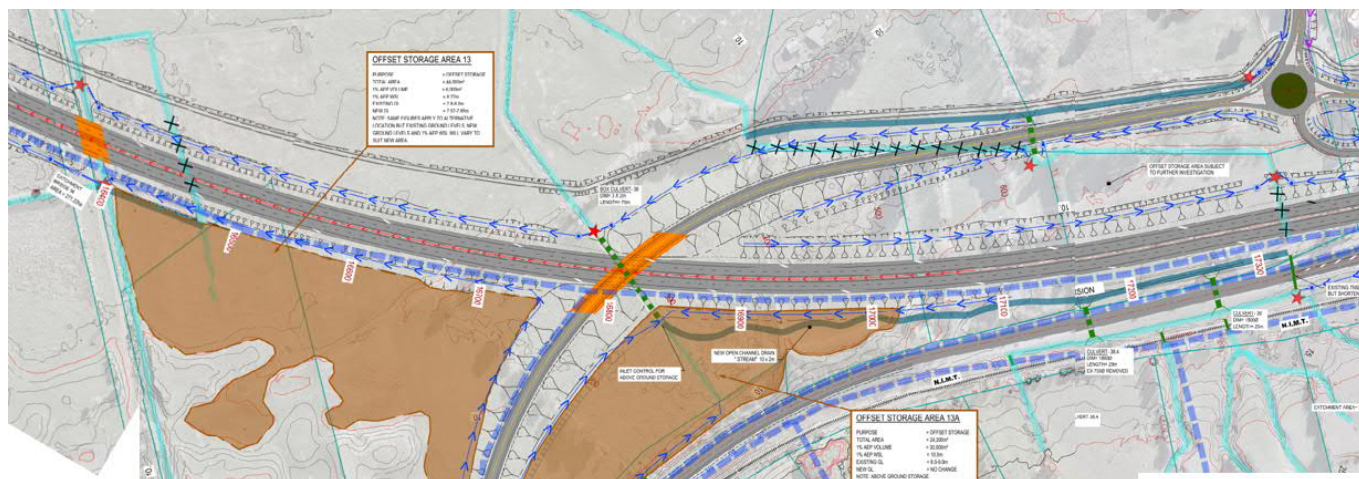


Figure 4. Drainage Layout in the Peka Peka Interchange area as proposed in the M2PP AEE documentation showing proposed conveyance and offset storage areas

3.0 ATTACHMENTS:

- Attachment 1 - High Level Quantities for pricing (1x A3 sheet, also provided in MS Excel format)
- Attachment 2 - Concept Design Drawings
 - PP-DRG-GA-00-001 Rev B
 - PP-DRG-GA-00-002 Rev B
 - PP-DRG-GA-00-003 Rev B
 - PP-DRG-GA-00-004 Rev A
 - PP-DRG-GA-00-005 Rev A

Peka Peka Connectivity SSBC - Option Quantities

| Option | Earthworks * | | Pavement | | Bridge | | | Walls face area (m2) | Barrier | | | | Drainage ** | | Land req'd (m2) | Comments |
|---------------|--------------|-------|----------------|--------------|----------------|-----------------|----------------|-------------------------------|---------|-----|-----------|-------------|-------------|------|-----------------------|---|
| | cut | fill | seal area (m2) | islands (m2) | deck area (m2) | span length (m) | widenin g (m2) | | TL4 | TL5 | terminals | transitions | K&C | kerb | | |
| P1 | 832 | 11654 | 3252 | - | - | - | - | - | 646 | 60 | 3 | 1 | 57 | - | - | Departure required for 1m shoulder adjacent to ramp merge |
| P2a | 1085 | 19909 | 4778 | - | 138 | 17 | - | - | 1309 | 120 | 3 | 3 | 20 | - | 7396 | Alteration to designation required, may require intersection upgrade |
| P5 | 2886 | 9641 | 4150 | 45 | - | - | - | - | 711 | - | 3 | - | 107 | - | - | - |
| P6*** | 3142 | 11148 | 8374 | 2470 | 173 | 10 | 21 | - | 689 | 128 | 3 | 6 | 826 | 576 | - | Departure required for final 90m of ramp merge having reduced sight distance |
| P7 | 462 | 21574 | 5035 | - | 126 | 16 | - | - | 1350 | 120 | 3 | 3 | 20 | - | 6354 | Alteration to designation required, may require intersection upgrade, departure for gore area |
| School Rd**** | - | 25021 | 1017 | 60 | ? | ? | 3.5m | - | - | - | - | - | - | - | - | Regraded and widened to receive ramp intersections (including bridge which becomes 2) |
| Winiata**** | - | 3158 | - | - | - | - | - | - | - | - | - | - | - | - | - | Regraded due to School Rd regrade |
| T1 | - | 14418 | 2727 | - | - | - | - | 1348 | 450 | - | 1 | 2 | ? | - | - | Significant drainage and flood bund impact |
| T2 | - | 19693 | 2965 | - | - | - | - | 982 | 480 | - | 1 | 2 | ? | - | - | drainage and flood bund need to be relocated |
| T5 | - | 13996 | 2861 | - | - | - | - | 2236 | 480 | - | 1 | 2 | ? | - | 5000 | Alteration to designation required for railway land, significant drainage impact |
| T6 | - | 12488 | 2833 | - | - | - | - | 2051 | 450 | - | 1 | 2 | ? | - | 3610 | Alteration to designation required for railway land, significant drainage impact |

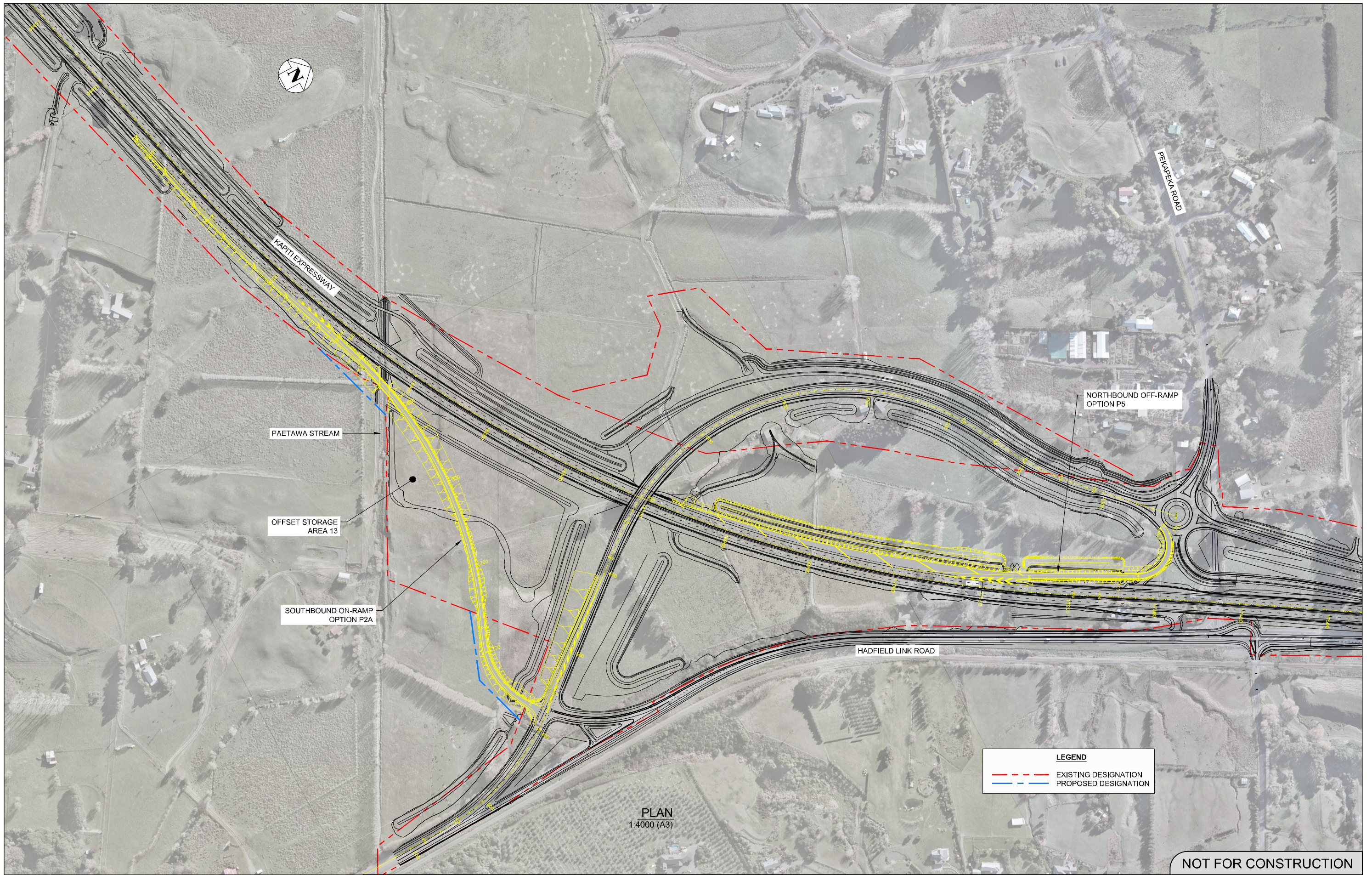
Notes:

* Design surface to existing surface, no allowances for pavement/topsoil/settlement/undercut/bulking/etc.

** Roadside features only, no allowances for pit/pipe/treatment devies

*** No allowance for roundabout earthworks

**** Delta (amount over and above the PP2O current design)



PLAN
1:4000 (A3)

LEGEND
 --- EXISTING DESIGNATION
 --- PROPOSED DESIGNATION

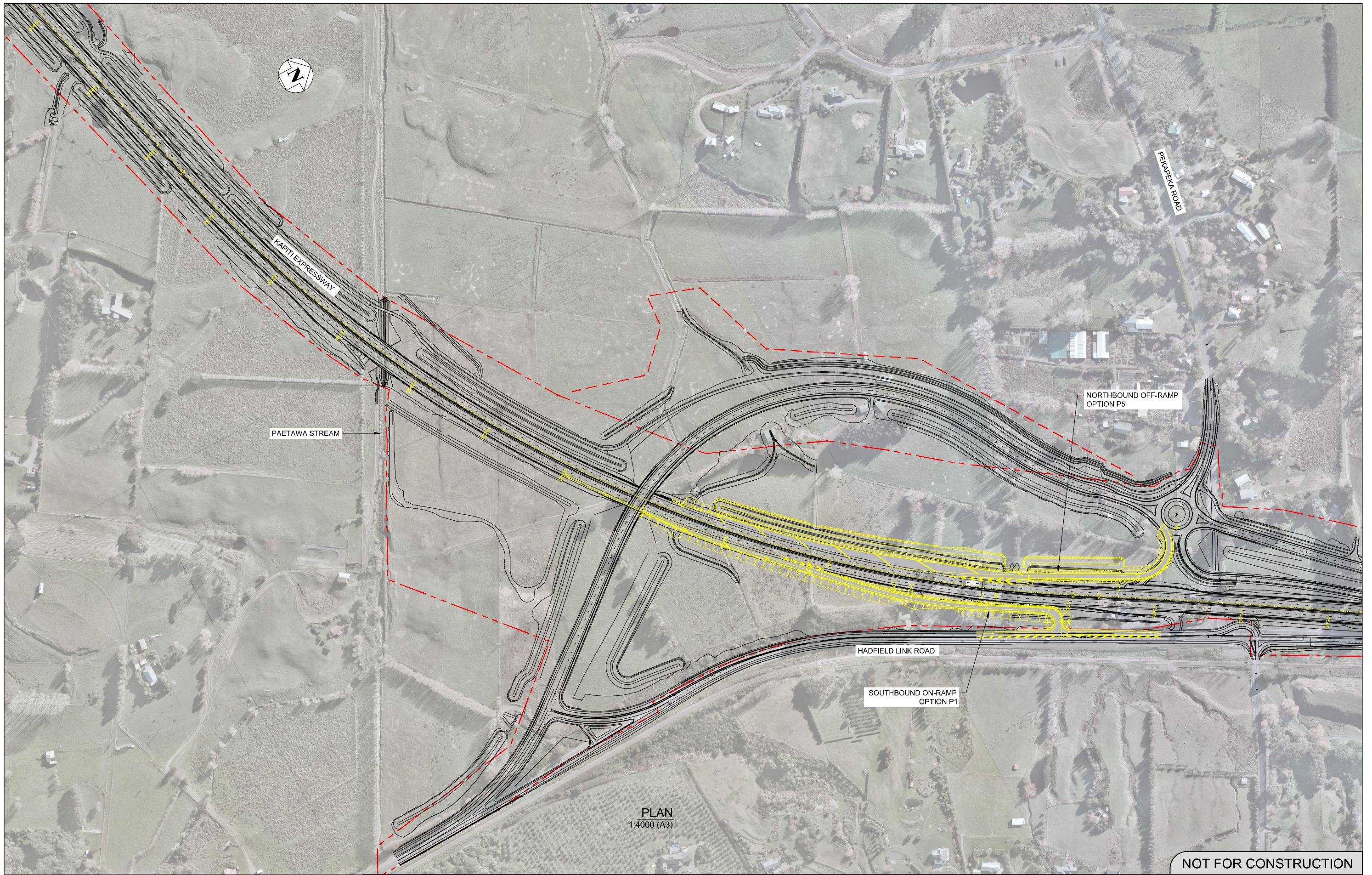


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| PROJECT | PEKA PEKA CONNECTIVITY SSBC |
| TITLE | PEKA PEKA OPTIONS SOUTHBOUND ON-RAMP OPTION P2A AND NORTHBOUND OFF-RAMP OPTION P5 |

NOT FOR CONSTRUCTION

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PAETAWA STREAM

KAPITI EXPRESSWAY

PEKEPEKE ROAD

NORTHBOUND OFF-RAMP
OPTION P5

HADFIELD LINK ROAD

SOUTHBOUND ON-RAMP
OPTION P1

PLAN
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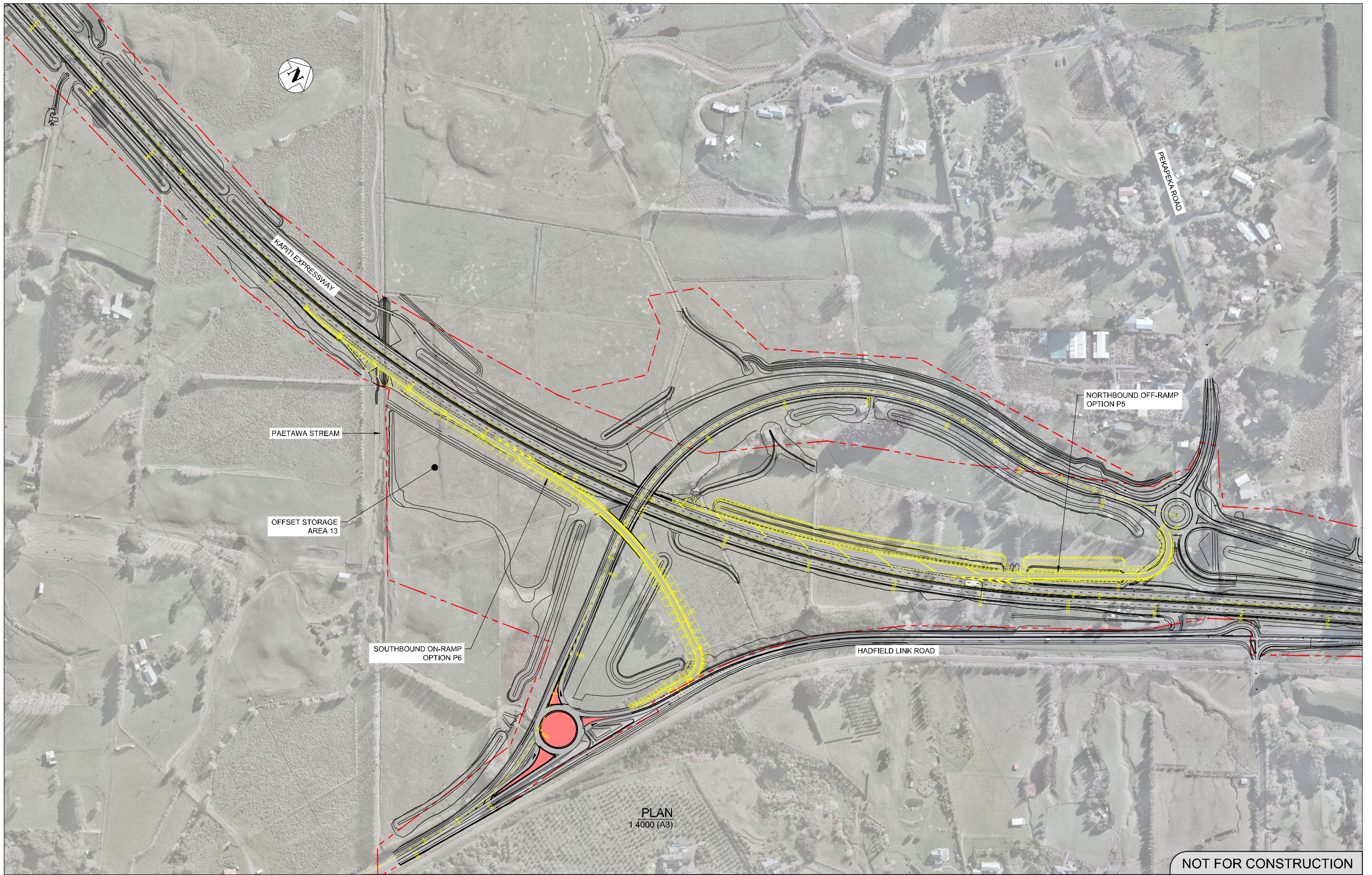
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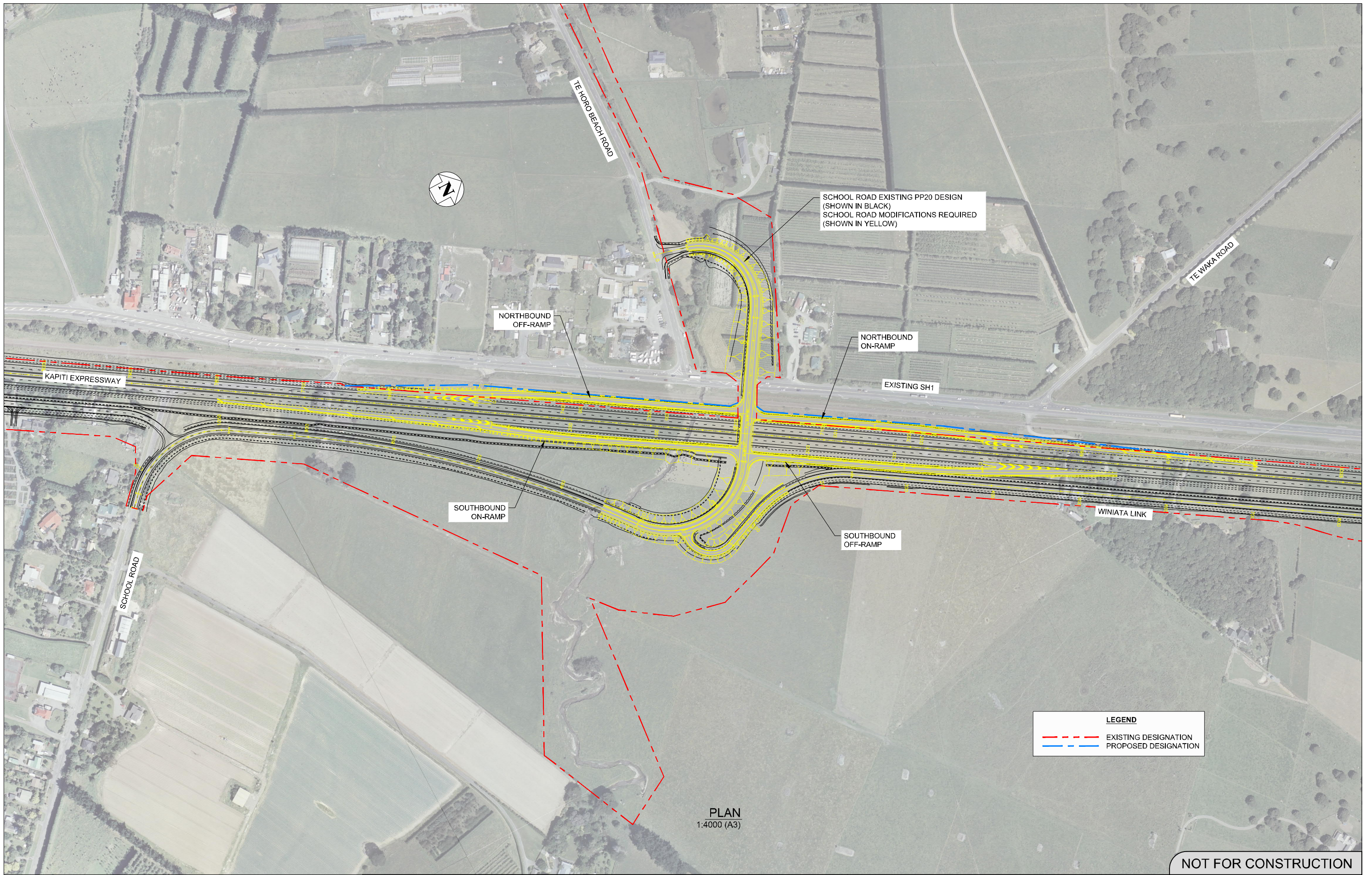
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| PROJECT | PEKA PEKA CONNECTIVITY SSBC |
| TITLE | PEKA PEKA OPTIONS SOUTHBOUND ON-RAMP OPTION P6 AND NORTHBOUND OFF-RAMP OPTION P5 |

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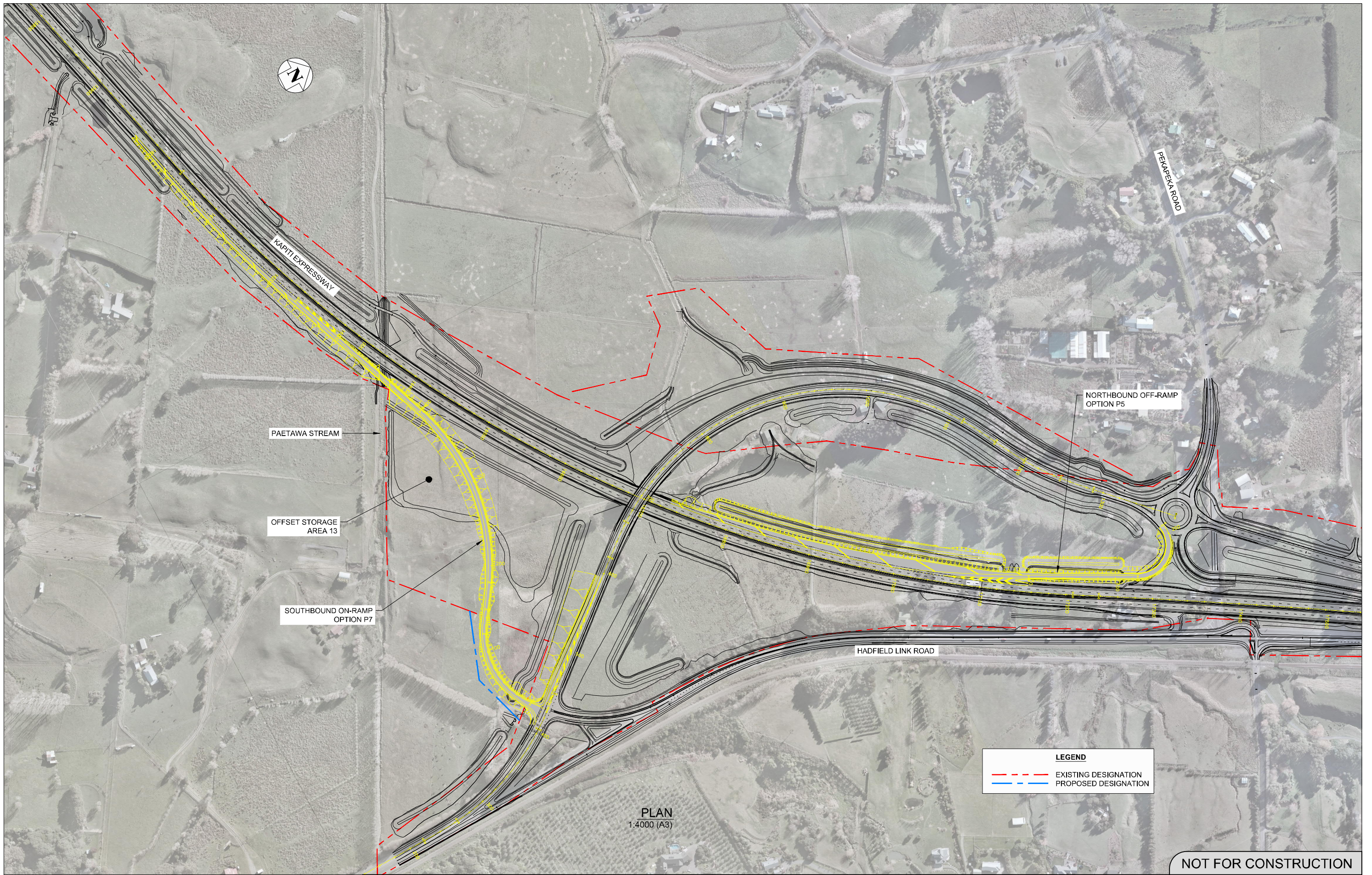
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| TITLE | TE HORO OPTIONS OPTIONS T1, T2, T5 & T6 |

NOT FOR CONSTRUCTION

NUMBER PP-DRG-GA-00-004

STATUS PRELIMINARY

SCALE AS SHOWN REVISION **A**



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| PROJECT | PEKA PEKA CONNECTIVITY SSBC |
| TITLE | PEKA PEKA OPTIONS SOUTHBOUND ON-RAMP OPTION P7 AND NORTHBOUND OFF-RAMP OPTION P5 |

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