



NZ TRANSPORT AGENCY  
WAKA KOTAHI

## **Peka Peka to Ōtaki (Southern Section) Noise Mitigation Plan**

**Waka Kotahi NZ Transport Agency  
Peka Peka to Ōtaki (Southern Section)  
Noise Mitigation Plan**

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	Project Manager:
	Prepared by: B Shanks
	Reviewed by: S Wilkening
	Approved for issue by: S Wilkening

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# Waka Kotahi NZ Transport Agency

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## Publishing Note

### Background to the development and release of these noise plans.

On award of the design and build contract for the PP2O expressway in 2016, Fletcher Construction Limited (Fletchers) undertook noise modelling and developed a draft noise plan based on their expressway designs, which included the following changes to that presented to the Board of Inquiry (BOI) in 2013:

- alignment changes to the far north end of the alignment, and (Northern Section)
- low flood bunds to the expressway edges along the southern section between the Ōtaki River and Mary Crest and (Southern Section)
- the use of finer grade 3/5 two coat chip seals than the specimen design (Full design)

Fletchers modelled noise levels were based on a 100 kph design speed and the traffic volumes used were those presented to the BOI in 2013. Normally this would be reviewed by Waka Kotahi, submitted to Kāpiti Coast District Council (KCDC) for statutory compliance purposes and then published.

However, as a result of changed traffic conditions after the M2PP expressway opening in 2017, Waka Kotahi reassessed the level of likely traffic on the PP2O expressway. This assessment confirmed that the traffic volumes would be greater than that presented to the BOI back in 2013. In addition, a law change allowing a higher speed limit on expressways were being contemplated by Waka Kotahi, and so modelling the effects of an increase to 110 Km/hr was desirable.

Consequently in 2018, Waka Kotahi instructed Fletchers to address the new understanding of traffic conditions by undertaking additional modelling. Throughout 2018 and into 2019, Fletchers undertook additional noise modelling to consider the effects of increased traffic volumes and an increased operational speed limit of 110 km/hr. Additional noise modelling tasks were run on the Fletcher design including and all Open Graded Porous Asphalt (OGPA) surface option and three alternatives options with chip seal and noise barriers in selected locations where noise impacts to were known to be greatest.

Noise levels were assessed with the new traffic volumes as well as with an additional 15 % and 30% of traffic over and above the new increased volumes. No modifications to buildings were identified as being required from this additional modelling work as either noise barriers and/or quiet road surfaces would deliver the required benefits in accordance with NZS6806.

Further work by Fletchers followed in 2019 to undertake an assessment of the acoustic benefits and costs of various noise barrier options for selected properties in the northern section of the expressway (where a quiet road surface was already required as part of the BOI consent conditions). The constraints of the existing urban environment in this northern section made noise barriers on property boundaries the only practical option in these locations.

Waka Kotahi wrote to and met with affected landowners in the northern section in late in 2019 to canvas their views on possible noise barriers on their property boundaries. At about the same time Waka Kotahi concluded a review of expressway pavements and decided to upgrade the entire expressway pavement using deep lift asphalt and an all OGPA surface for engineering reasons.

After obtaining affected northern landowner feedback, Waka Kotahi assessed noise barriers as very likely to represent the best practical option (BPO) for acoustic mitigation purposes at these selected locations and Fletchers were instructed to complete the detailed designs in consultation with landowners.

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As at September 2020, these details have progressed sufficiently to enable a public release of this report. This is still a “living document”, meaning that further updates and releases will be made as the detailed work is completed, submissions are made to KCDC for statutory compliance purposes and post project reviews are completed. In some locations in this report, place holding text has been used to indicate where details will be added in future.

Waka Kotahi

September 2020

# 1 Introduction

The Peka Peka to Ōtaki Expressway (southern section) is an 8.8 km length of state highway which is being constructed by Fletcher Ltd under Transport Agency contract 730N.

The Peka Peka to Ōtaki Expressway extends from the Mackays to Peka Peka Expressway in the south to the existing SH1 at Taylors Road in the north. The project is split into two zones – north and south, with the boundary being the northern bank of the Ōtaki river.

A Noise Assessment for the full Peka Peka to Ōtaki section (Northern and Southern) was performed using the processes documented in NZS 6806 by URS prior to the lodgement of Notices of Requirement (NoR) and is detailed in report '*Peka Peka to Ōtaki Expressway – Operational noise and vibration assessment*' ref. 42176987/002/H, dated 12 February 2013. Designation conditions for road-traffic noise were set on the basis of that assessment.

## 1.1 Purpose of this document

This Noise Mitigation Plan (NMP) documents the detailed noise mitigation design for the Peka Peka to Ōtaki (northern section) necessary to satisfy the designation conditions, as well as the Principal's / Minimum requirements for the project.

This is intended to be a "living document", meaning that revisions will be made as additional information is available. In some locations, place holding text has been used to indicate where details will be added.

This document also demonstrates compliance with the Transport Agency's specification for noise mitigation (P40)<sup>1</sup>.

This NMP has been prepared to document:

- a) Criteria;
- b) Noise modelling;
- c) Noise barriers;
- d) Low-noise road surfaces;
- e) Building-modification mitigation; and
- f) Post-construction review.

## 1.2 Revised assessment

Some changes that have an effect on noise have been made to the project since the NoR assessment. The three most significant changes are:

1. The projected traffic flow data has significantly increased, based on the number of vehicles using the now operational Mackays to Peka Peka section of the expressway.
2. The modelled speed limit was increased from 100 km/h to 110 km/h, as instructed by the Waka Kotahi NZ Transport Agency. This increased speed limit has not yet been confirmed as the proposed speed limit for PP20.
3. The full expressway is to use a low noise road surface (EMOGPA) for engineering reasons.

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<sup>1</sup> NZ Transport Agency (2014), SP/SP40: 2014 1409016, Specification for noise mitigation.

The assessment of Detailed Design noise levels was revised on this basis. As a result of these changes there were no negative changes in noise criteria categories at PPFs in the Southern Section. Therefore, no additional mitigation measures were considered in the Southern Section.

In some instances, PPFs have changed Categories for the better e.g. from Category B to Category A.

The changes and subsequent assessment detailed above occurred after construction began on this section of the expressway. Therefore, it was not possible to provide details of the assessment or its outcomes prior to construction commencing.

### **1.3 Personnel**

The P40 specification requires that noise mitigation design is conducted by a suitably qualified professional. Mitigation design and preparation of this NMP has been prepared by Brendon Shanks and reviewed by Siiri Wilkening.

Brendon Shanks holds the degrees of Bachelor of Science (physics) and Bachelor of Music, and has ten years' experience as an acoustic consultant in New Zealand and the United Kingdom. He is a member of the Acoustical Society of New Zealand and the Institute of Acoustics (UK). He meets all the requirements set out in the P40 specification.

Siiri Wilkening holds a Master's degree in Engineering (Landscaping and Environmental Protection). She has more than 20 years' experience as an acoustic consultant. She is a member of the Acoustical Society of New Zealand. She meets all the requirements set out in the P40 specification.



## 2 Criteria

### 2.1 Designation conditions

The following designation conditions have been imposed on this project.

**Table 2-1 Designation conditions – Operational noise**

Condition	Subject	Addressed in this NMP
DC60	Operational rail noise	Yes
DC61	Definition of terms	Yes
DC62	Specification of mitigation measures	Yes
DC63	Detailed design requirements	Yes
DC64	BPO Process	Yes
DC65	Timing of mitigation options	Yes
DC66	Identification of Category C PPFs	Yes
DC67-71	Processing of Category C PPFs	N/A
DC72	Maintenance of Structural Mitigation	Yes
DC73	Noise Mitigation Plan	Yes

### 2.2 Selected options

The revised Noise Assessment includes no specific noise mitigation options in the Southern Section. Details of the changes to previous options are summarised below.

#### ***Noise barriers***

Noise barriers were not required in the NoR design and are not required in the current design. A series of noise barriers were considered in the Southern Section in an attempt to reduce the noise level at some PPFs below the Categories defined in the NoR assessment. This additional mitigation was not a requirement of the designation conditions.

Waka Kotahi NZ Transport Agency instructed that the road surface of the expressway was to be changed in the Southern Section (see below). An additional assessment was conducted for any PPFs that had negatively changed Categories from the BoI assessment. There were no such instances in the Southern Section, so noise barriers were not required by the designation conditions or considered necessary by Waka Kotahi NZ Transport Agency.

#### ***Road surfaces***

Low-noise road surfaces have been selected for the Expressway, as summarised in Table 2-2. Waka Kotahi NZ Transport Agency has instructed that this option is to be used for engineering reasons, rather than specifically as a noise mitigation measure. Therefore, it is no longer considered to be a “noise mitigation measure” and a BPO assessment relating to noise is not necessary.

**Table 2–2 Selected options – road surfaces**

Location	Surface
Expressway - PP2O Southern section (excluding bridges)	PA-10
Expressway bridge decks (Bridge 5 - Ōtaki River, Mary Crest Rail overpass)	SMA 10-14
Ōtaki Gorge on-ramp SB	SMA 10-14
Ōtaki Gorge off-ramp NB	SMA 10-14

### ***Building modification***

The dwelling at 14 Old Hautere Road, which is owned by NZTA, has been identified as being in Category C in the NoR Assessment, and therefore required building modification. As a result of the additional shielding provided a landscape bund, the predicted noise level at this PPF has reduced to Category B in the Detailed Design assessment and no longer requires building modification.

There is a bund along the eastern side of the expressway between CH 4250m (Ōtaki Gorge Road) and CH 8600m (Gear Road). Between CH 6500m and CH 7850m it is a flood bund. For the remainder of the extents it is a landscape bund. The height of the bund is determined to be at least 1m above the nearest lane edge of the adjacent local road. It was noted in the NoR assessment that the landscaping bunds did not provide any reduction in noise level.

The noise predictions, based on the earthworks terrain contours provided to MDA, indicated that the landscaping bunds will block line of sight to some PPFs and result in a reduction of 2-3 dB when compared with the NoR Assessment predicted levels.

The shielding provided by the bunds is such that a small reduction in bund height would remove this predicted benefit. Therefore, this location shall be included in the post-construction validation measurements to confirm which category it falls within.

Details of this change will be provided to Kāpiti Coast District Council for certification.

### ***PPF Categories***

With the structural mitigation detailed above, the total number of PPFs in the Southern Section in each of the NZS 6806 categories are shown in Table 2-1.

**Table 2–3 Number of PPFs in NZS 6806 categories**

Category A	Category B	Category C
79 PPFs	10 PPFs	0 PPFs

## **2.3 Transport Agency P40 specification**

The relevant sections of the P40 specification are listed in Table 2-4 along with the section of this NMP where they are addressed.

**Table 2–4 P40 Specification**

P40 Section	Subject	Addressed in this NMP
2.1	Suitably qualified professionals	Section 1.3
3.3	Construction design	Section 2.2
5	Low-noise road surfacing	Section 4
6	Building modification	Section 5
7	Noise mitigation plan	This document
8	Post-construction review	Section 6

## 2.4 Principal's Requirements

The Principal's Requirements relating to operational noise are summarised in Table 2-5. The full text is attached in Appendix B.

**Table 2–5 Principal's Requirements**

Condition	Subject	Addressed in this NMP
A15.1.1	General – Prepare noise mitigation plan and satisfy designation conditions	Yes
A15.1.2	Quiet road surfacing	Yes
A15.1.3	Building modification	N/A
A15.1.4	Rail noise and vibration	No
A15.1.5	Post construction review	Yes

## 3 Modelling

Noise modelling has been performed to demonstrate that development of the road alignment and noise mitigation since the Noise Assessment undertaken for the Notice of Requirement is consistent with the designation conditions. The model includes the structural noise mitigation detailed in Sections 4 and 5 of this report.

### 3.1 Procedures

Table 3-1 lists the key model settings.

**Table 3-1 Model settings**

Parameter	Setting/source
Software	SoundPLAN 8.1
Algorithm	CRTN <sup>2</sup>
Reflection model	CRTN <sup>3</sup>
Parameter	$L_{Aeq(24h)}$
Earthworks topographic vertical resolution	0.5m
Ground absorption	1.0
Receiver height	1.5 m (4.5 m upper floors) – most exposed façade
Noise contour grid	1.5 m height, 5 m resolution
Receiver positions	Free-field

The CRTN algorithm gives results in terms of the  $L_{A10(18h)}$ . To convert this to  $L_{Aeq(24h)}$  a -3 dB adjustment has been made. This adjustment has been implemented in the software in conjunction with the road surface adjustment detailed below.

Most data used in the noise model has been obtained directly from the project GIS system. However, in some instances additional data such as traffic flow and barriers have required manual entry direct into the noise model.

#### *Contours*

Earthwork contours have been imported from 'Contours\_des south 80dd.dxf' dataset dated 12/09/2017 of the earthworks model as 3D polylines. Natural terrain contours outside of the earthworks boundary have been sourced from a combination of LiDAR and terrestrial mapping sources which have been combined to form the '3D Tri Ground Contours 20170721.dxf' dataset dated 21/07/2017.

Road gradients and terrain screening have been determined by SoundPLAN from the terrain contours.

<sup>2</sup> Calculation of Road Traffic Noise (CRTN). UK Department of Transport and the Welsh Office. ISBN 0115508473. 1988.

<sup>3</sup> Calculation of Road Traffic Noise (CRTN). UK Department of Transport and the Welsh Office. ISBN 0115508473. 1988.

## ***Buildings***

The footprints for all buildings and all other structures within 200 metres of the roads have been imported into the noise model from the project GIS. All buildings have been modelled as 5 metres uniform height for single storey buildings and 7.5 metres uniform height for known two storey buildings. Predictions were made at all façades of individual buildings, with the noise levels stated being the highest of any facade.

## ***Road alignments***

Road alignments have been imported from 'Corridors all south.dxf' dataset dated 12/09/2017 of the geometrics model, as centrelines and road widths. Each two-lane carriageway has been modelled as a separate road. Where there is a third lane (e.g. crawler lane, or exit lane) this has been modelled as a separate road. Local roads with one lane in each direction have typically each been modelled as a single road source.

## ***Road surfaces***

The procedure used to incorporate different road surfaces in the model is as follows:

- In accordance with Transit Research Report 28<sup>4</sup>, a -2 dB adjustment has been made for a reference asphaltic concrete road surface, compared to CRTN,
- Surface corrections relative to asphaltic concrete have been in accordance with LTNZ Research Report 326<sup>5</sup>. The combination of surface corrections for cars and heavy vehicles have been made using the equation in the road surfaces noise guide<sup>6</sup>, and
- The combined correction has been entered in the modelling software as a road surface correction. This has also included the adjustment from  $L_{A10(18h)}$  to  $L_{Aeq(24h)}$ .

## ***Safety barriers***

Solid (e.g. concrete) safety barriers have been manually entered in the noise model as 0.81 m high barriers.

## ***Calculation safety margin***

A safety margin of 1.5 dB is included in the predicted noise levels to account for calculation uncertainty and reduce the risk of exceedance post-installation. It should be noted that this was not included in the NoR design. The introduction of the safety margin has not materially affected the predicted noise categories.

To allow direct comparison, the change in noise level presented in Table 3-3 assumes the 1.5 dB safety margin is applied to the NoR values and the Predicted Detailed Design values.

## ***Bridges***

All bridges have been configured to be 'self-screening' roads, which blocks the noise of that road passing through them. Where there are not solid safety barriers on bridges, a 150 millimetre high vertical barrier has been modelled along the edges of the bridges to represent the kerb and channel.

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<sup>4</sup> Research Report 28. Traffic noise from uninterrupted traffic flows, Transit, 1994.

<sup>5</sup> Research Report 326: Road surface effects on traffic noise: Stage 3 – Selected bituminous mixes. Land Transport New Zealand, 2007.

<sup>6</sup> Guide to state highway road surface noise, NZ Transport Agency, 2014.

### **Traffic data**

Traffic data has been provided for all roads as the Annual Average Daily Traffic (AADT), percentage of heavy vehicles and speed. This has been provided separately for each carriageway and separately for crawler lanes. All traffic data has been provided for the design year of 2031, which is 11 years after the assumed opening year of 2020.

The CRTN model has been developed based on 18-hour traffic. However, this has been entered as the 24-hour daily traffic (AADT), which results in modelling in the order of +0.2 dB conservative. A safety margin of 1.5 dB is included in the predicted noise levels to account for calculation uncertainty and reduce the risk of exceedance post-installation.

**Table 3–2 Road details**

Road section	Detailed design for construction (2031)			
	Surface	Speed (km/h)	AADT (vpd)	HV (%)
<b>Expressway</b>				
Bridge 5 (Ōtaki River) NB	SMA 10-14	110	6,341	16
Bridge 5 (Ōtaki River) SB	SMA 10-14	110	5,709	14
North of Ōtaki Gorge Road NB	PA-10	110	6,341	16
North of Ōtaki Gorge Road SB	PA-10	110	5,709	14
Ōtaki Gorge on-ramp SB	PA-10	70	4,446	32
Ōtaki Gorge off-ramp NB	PA-10	70	4,716	33
Mary Crest Rail overpass NB	SMA 10-14	110	10,708	23
Mary Crest Rail overpass SB	SMA 10-14	110	9,840	22
North of Peka Peka Road NB	PA-10	110	10,708	23
North of Peka Peka Road SB	PA-10	110	9,840	22
<b>Existing SH1 / new local arterial (two way)</b>				
Mary Crest	Grade 3/5	80	4,586	20
North of Peka Peka Road	Grade 3/5	100	5,099	19
<b>Local roads (two way)</b>				
Overbridge at Ōtaki Gorge Road	SMA 10-14	50	4,807	6
Gear Road	Grade 3/5	50	2,995	19
Overbridge at School Road	SMA 10-14	50	4,613	17

## **3.2 Results**

Predicted road-traffic noise levels for the construction design of the Southern Section are shown in Table 3-3, compared with the predictions from the Noise Assessment for the NoR design/Selected options. The cells are colour coded according to the NZS 6806 category: category A – green, category B – orange, and category C – red.

Noise contour plots of the model are attached in Appendix C.

A table including the existing noise levels as modelled for 2010 is included in Appendix D.

**Table 3-3 Predicted noise category**

PPF	Address	Criteria	Detailed design for construction			
			NoR design 6806 Category	Predicted change from NoR <sup>1</sup>	Predicted noise level (L <sub>Aeq(24h)</sub> )	6806 Category
R074	1277 SH1	Altered	Cat A	-2 dB	55 dB	Cat A
R075	69 Ōtaki Gorge Rd	New	Cat A	-3 dB	52 dB	Cat A
R076	53 Ōtaki Gorge Rd	New	Cat A	-2 dB	52 dB	Cat A
R077	34 Ōtaki Gorge Rd	New	Cat A	2 dB	56 dB	Cat A
R078	32 Ōtaki Gorge Rd	New	Cat A	-2 dB	55 dB	Cat A
R079	65 Ōtaki Gorge Rd	New	Cat A	-3 dB	49 dB	Cat A
R080	1217 SH1	Altered	Cat A	-4 dB	52 dB	Cat A
R081	1215 SH1	Altered	Cat A	-2 dB	57 dB	Cat A
R082	1209 SH1	Altered	Cat A	-2 dB	57 dB	Cat A
R083	44 Ōtaki Gorge Rd	New	Cat A	-3 dB	50 dB	Cat A
R084	1195 SH1	Altered	Cat A	-3 dB	58 dB	Cat A
R085	1191 SH1	Altered	Cat A	-3 dB	58 dB	Cat A
R086	1189 SH1	Altered	Cat A	-3 dB	58 dB	Cat A
R087	38 Ōtaki Gorge Rd	New	Cat A	-3 dB	52 dB	Cat A
R088	1173 SH1	Altered	Cat A	-2 dB	58 dB	Cat A
R089	1171 SH1	Altered	Cat A	-2 dB	59 dB	Cat A
R090	1169 SH1	Altered	Cat A	-3 dB	58 dB	Cat A
R091	1167 SH1	Altered	Cat A	-3 dB	58 dB	Cat A
R092	1155 SH1	Altered	Cat A	-4 dB	53 dB	Cat A
R093	1165 SH1	Altered	Cat A	-2 dB	59 dB	Cat A
R094	1153 SH1	Altered	Cat A	-3 dB	57 dB	Cat A
R095	1149 SH1	Altered	Cat A	-3 dB	59 dB	Cat A
R096	11 Old Hautere Rd	New	Cat A	-3 dB	53 dB	Cat A
R097	1149 SH1	Altered	Cat A	-3 dB	59 dB	Cat A
R098	1147 SH1	Altered	Cat A	-3 dB	59 dB	Cat A
R099	1127 SH1	Altered	Cat A	-3 dB	59 dB	Cat A
R100	9 Old Hautere Rd	New	Cat B	-5 dB	57 dB	Cat A
R101	15 Old Hautere Rd	New	Cat A	-4 dB	54 dB	Cat A
R102	19 Old Hautere Rd	New	Cat A	-4 dB	54 dB	Cat A
R103	14 Old Hautere Rd	New	Cat C	-7 dB	61 dB	Cat B
R104	23 Old Hautere Rd	New	Cat A	-3 dB	51 dB	Cat A
R105	26 Old Hautere Rd	New	Cat B	-5 dB	55 dB	Cat A
R106	33 Old Hautere Rd	New	Cat A	-4 dB	53 dB	Cat A
R107	22 Old Hautere Rd	New	Cat B	-4 dB	57 dB	Cat A
R108	1115 SH1	Altered	Cat A	-2 dB	61 dB	Cat A
R109	36 Old Hautere Rd	New	Cat A	-4 dB	55 dB	Cat A

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PPF	Address	Criteria	NoR design	Detailed design for construction		
			6806 Category	Predicted change from NoR <sup>1</sup>	Predicted noise level (L <sub>Aeq(24h)</sub> )	6806 Category
R110	46 Old Hautere Rd	New	Cat A	-3 dB	54 dB	Cat A
R111	1081 SH1	Altered	Cat A	-5 dB	53 dB	Cat A
R112	1081 SH1	Altered	Cat A	-3 dB	59 dB	Cat A
R113	56 Old Hautere Rd	New	Cat A	-6 dB	53 dB	Cat A
R114	1070 SH1	New	Cat B	-4 dB	60 dB	Cat B
R115	1039 SH1	Altered	Cat A	-4 dB	57 dB	Cat A
R116	12 Te Weka Rd	Altered	Cat A	-4 dB	57 dB	Cat A
R117	990B SH1	New	Cat B	-5 dB	55 dB	Cat A
R118	12 Te Horo Beach Rd	Altered	Cat A	-6 dB	55 dB	Cat A
R119	40 Te Horo Beach Rd	Altered	Cat A	-4 dB	52 dB	Cat A
R120	961 SH1	Altered	Cat A	-3 dB	62 dB	Cat A
R121	13 Te Horo Beach Rd	Altered	Cat A	-1 dB	58 dB	Cat A
R122	11 Te Horo Beach Rd	Altered	Cat A	1 dB	59 dB	Cat A
R123	3 Te Horo Beach Rd (Bld 2)	Altered	Cat A	-4 dB	54 dB	Cat A
R124	3 Te Horo Beach Rd (Bld 1)	Altered	Cat A	-3 dB	61 dB	Cat A
R125	941 SH1	Altered	Cat A	-3 dB	60 dB	Cat A
R126	939 SH1	Altered	Cat A	-3 dB	59 dB	Cat A
R127	931 SH1	Altered	Cat A	-2 dB	62 dB	Cat A
R128	921 SH1	Altered	Cat A	-3 dB	58 dB	Cat A
R129	915A SH1	Altered	Cat A	-4 dB	55 dB	Cat A
R130	915 SH1	Altered	Cat A	-2 dB	63 dB	Cat A
R131	913 SH1	Altered	Cat A	-2 dB	62 dB	Cat A
R132	909 SH1	Altered	Cat A	-4 dB	62 dB	Cat A
R133	907 SH1	Altered	Cat A	-2 dB	62 dB	Cat A
R134	901A SH1	Altered	Cat A	-3 dB	55 dB	Cat A
R135	903 SH1	Altered	Cat A	-2 dB	61 dB	Cat A
R136	901 SH1	Altered	Cat A	-1 dB	62 dB	Cat A
R137	895 SH1	Altered	Cat A	-3 dB	57 dB	Cat A
R138	893 SH1	Altered	Cat A	-2 dB	58 dB	Cat A
R139	32 School Rd	New	Cat B	-4 dB	61 dB	Cat B
R140	34 School Rd	New	Cat B	-4 dB	58 dB	Cat B
R141	42A School Rd	New	Cat A	-4 dB	54 dB	Cat A
R142	40 School Rd	New	Cat B	-1 dB	59 dB	Cat B
R143	42B School Rd	New	Cat A	-3 dB	55 dB	Cat A
R144	45 Gear Rd	New	Cat A	-3 dB	62 dB	Cat A
R145	91 Gear Rd	New	Cat A	-3 dB	59 dB	Cat A
R146	97 Gear Rd	New	Cat A	-3 dB	55 dB	Cat A



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PPF	Address	Criteria	NoR design	Detailed design for construction		
			6806 Category	Predicted change from NoR <sup>1</sup>	Predicted noise level (L <sub>Aeq(24h)</sub> )	6806 Category
R147	82 Gear Rd	New	Cat B	-3 dB	60 dB	Cat B
R148	737 SH1	Altered	Cat A	-4 dB	58 dB	Cat A
R149	36 Sutton Rd	New	Cat B	-2 dB	58 dB	Cat B
R150	38 Sutton Rd	New	Cat B	-2 dB	58 dB	Cat B
R151	17 Sutton Rd	New	Cat A	-5 dB	53 dB	Cat A
R152	31 Sutton Rd	New	Cat A	-2 dB	54 dB	Cat A
R153	35 Sutton Rd	New	Cat B	-2 dB	59 dB	Cat B
R154	31A Sutton Rd	New	Cat A	-2 dB	57 dB	Cat A
R155	34 Sutton Rd	New	Cat A	-2 dB	55 dB	Cat A
R156	635 SH1	New	Cat A	-1 dB	53 dB	Cat A
R157	633 SH1	New	Cat A	1 dB	52 dB	Cat A
R158	33 Sutton Rd	New	Cat A	-3 dB	56 dB	Cat A
R159	12 Derham Rd	New	Cat B	-3 dB	60 dB	Cat B
R160	670 SH1	New	Cat A	-4 dB	55 dB	Cat A
R161	664 SH1	New	Cat A	-2 dB	55 dB	Cat A
R162	36 Te Hapua Rd	New	Cat A	-2 dB	57 dB	Cat A

<sup>1</sup> With a 1.5 dB safety margin applied to both sets of values

### Only positive changes of noise category have occurred

Four PPFs have reduced from Category B to Category A and one from Category C to Category B, because of the low-noise road surface and additional shielding provided by bunds on the eastern side of the Expressway.

None of the PPFs have changed up a category (i.e. A to B, or B to C) as a result of design development and therefore no approvals are required under designation condition DC62.

## 4 Road surfaces

### 4.1 Location

Low-noise road surfaces will be used along the alignment as detailed in Table 5-1. The extents of low-noise road surfaces are also shown graphically in Appendix E.

**Table 5-1 Road surfaces**

Location	Start chainage	End chainage	Surface	Chip size, thickness and design void content (where applicable)
Expressway - PP2O Southern section	3830	12260	EMOGPA (PA-10)	Minimum depth of 25mm, 10mm nominal size aggregate, design air voids 20% min
Ōtaki Bridge	3600	3830	SMA 10-14	45mm SMA on tack coat on dense graded asphalt levelling course
Mary Crest Rail overpass Southbound	9740	9870	SMA 10-14	45mm SMA on tack coat on dense graded asphalt levelling course
Northbound	9630	9795		
Ōtaki Gorge on-ramp SB	000	380	SMA 10-14	45mm SMA11, 12.5mm nominal size aggregate, design air voids 4%
Ōtaki Gorge off-ramp NB	000	460	SMA 10-14	45mm SMA11, 12.5mm nominal size aggregate, design air voids 4%

### 4.2 NAASRA counts

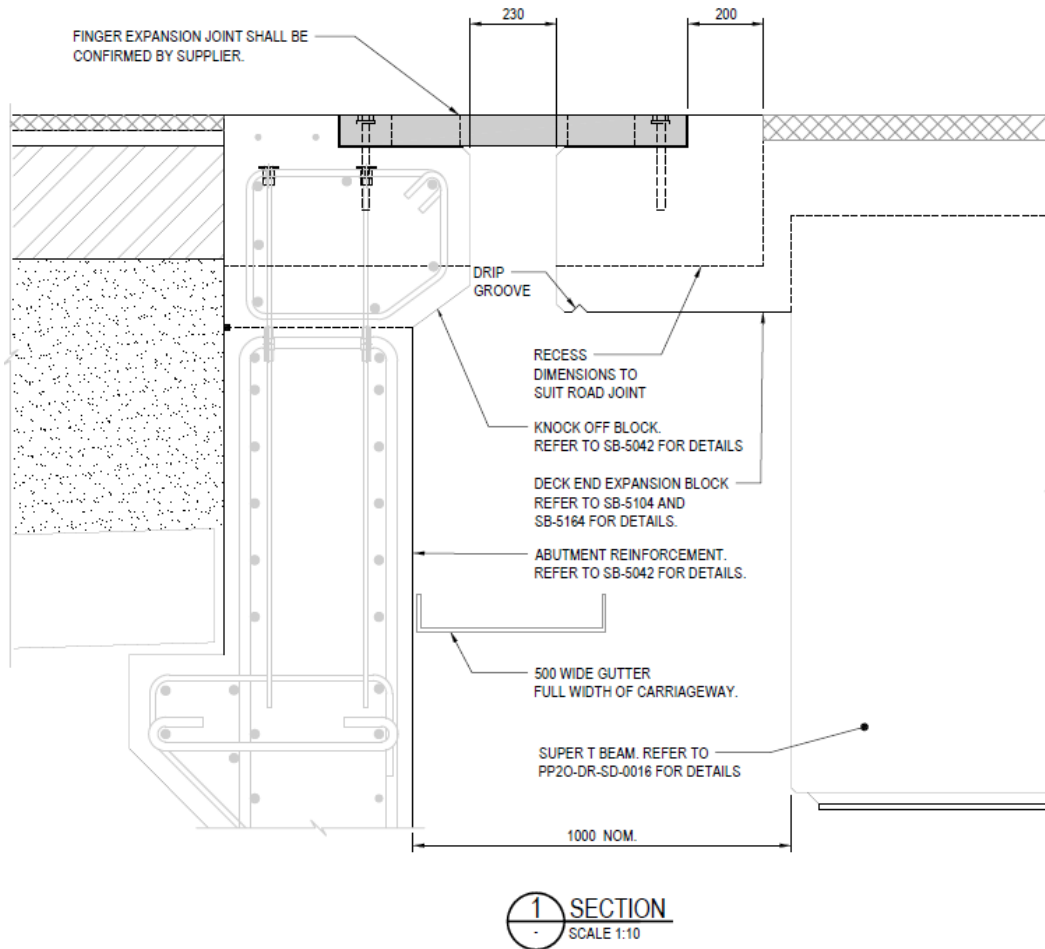
Principal's Requirement A15.1.2.1 requires the NAASRA count for the OGPA road surfaces to be an average value of less than 30 and a maximum value less than 50. This will be assessed during the post construction review.

### 4.3 Bridge joints

Bridge joints are required on the Ōtaki River bridge. There are no PPFs within 200m of the bridge.

Nevertheless, finger type joints are proposed for the Ōtaki River bridge, as shown in Figure 4-1. These must be installed within standard tolerances. There the step between road surface and joint is larger than designed, the resultant impact of vehicle tyres can cause clearly definable sounds, as well as generating body rattle in trucks and trailers.

Figure 4-1: Proposed bridge joint cross section



#### 4.4 Timeframes for installation

The Selected Options, including low noise surfacing, will be in place at the time of opening the expressway.

#### 4.5 Changes to selected options

The change to the selected options is the use of a low-noise road surface throughout expressway and in critical areas of the on/off ramps. A low-noise surface was previously only included in the Ōtaki township section of the expressway.

## 5 Building-modification

Based on the predicted noise levels from the Detailed Design, there are no PPFs requiring building modification. A post-construction assessment of noise levels at 14 Old Hautere Rd (R105) will be undertaken to determine if building modification is required.

### 5.1 Design details

If necessary, building-modification mitigation will be investigated and designed in accordance with the designation conditions and the *State highway guide to acoustics treatment of buildings*<sup>7</sup>.

### 5.2 Mitigation agreements

Legal agreements will be entered into with all property owners as detailed in the *State highway guide to acoustics treatment of buildings*, and using the templates from [www.acoustics.nzta.govt.nz](http://www.acoustics.nzta.govt.nz).

### 5.3 Timeframes for installation

If required, an investigation of building modification options and discussion with relevant land owner will occur after the post-construction assessment. The timeframe for building modification works shall be agreed with the land owner.

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<sup>7</sup> State highway guide to acoustic treatment of buildings, NZ Transport Agency, 2015

## **6 Post-construction review**

A post-construction review of the modelling assumptions will be made to confirm the basis of this mitigation design, and to specifically confirm that the barriers and road surfaces have been constructed as specified. The review will be completed and reported within 12 months of the expressway opening to traffic.

The post-construction review report shall be submitted to the Transport Agency, and where necessary the Kāpiti Coast District Council.

### **6.1 Road surface inspection**

The road surface shall be visually inspected by a road surfacing specialist within three months of completion of all surfacing to confirm it is of the type detailed in in Table 5-1 of the final NMP. If twin layer or high void porous asphalt has been used, the specialist shall confirm the final surface has been laid as documented in the final NMP.

### **6.2 Noise modelling**

Noise modelling of the as built alignment, surfaces, barriers and traffic data shall be conducted within 12 months of the expressway opening to traffic to confirm if there are significant changes from those detailed in the NMP.

Traffic monitoring shall be conducted to establish traffic volumes, including mix and speed. A traffic modelling specialist shall confirm whether these data measured shortly after opening correspond to the future design year conditions used in the noise model.

### **6.3 Verification measurements**

PR A15.1.7-8 requires that noise measurements are conducted at three locations to verify predicted noise levels. Noise measurements would be conducted at locations on:

- Sutton Road
- Old Hautere Road, and
- County Road

Measurements would be conducted by Marshall Day Acoustics a period of 7 days at each location, during the period between 6 and 9 months after the expressway opens, as required by A15.1.7.

## 7 Ongoing maintenance

Management and maintenance of Structural Mitigation, including road surfacing and noise barriers (unless otherwise stated) shall be the responsibility of the Requiring Authority, as detailed in DC72.

### 7.1 Road surfaces

Road surface degradation – review timeframe and responsibility - TBC

## Glossary

### Abbreviations

Abbreviation	Meaning	Abbreviation	Meaning
AADT	Annual average daily traffic	NZS	New Zealand Standard
AC	Asphaltic concrete	NZTA	Waka Kotahi NZ Transport Agency
AEE	Assessment of effects on the environment	OGPA	Open graded porous asphalt
BPO	Best practicable option	PPF	Protected premises and facilities
CRTN	Calculation of road traffic noise	RoNS	Road of national significance
dB	Decibels	RP	Route position
GIS	Geographic information system	RMA	Resource Management Act 1991
HV	Heavy vehicle	SAR	Scheme assessment report
Hz	Hertz	SH1	State Highway 1
km	Kilometre	SMA	Stone mastic asphalt
km/h	Kilometres per hour	vpd	Vehicles per day
NoR	Notice of requirement		

### Terminology

Term	Definition
Alignment	The horizontal or vertical geometric form of the centre line of the carriageway.
Annual average daily traffic	The total volume of traffic passing a roadside observation point over the period of a calendar year, divided by the number of days in that year (365 or 366 days). Measured in vehicles per day.
Bridge	A structure designed to carry a road or path over an obstacle by spanning it. This includes culverts with a cross-sectional area greater than or equal to 3.4 square metres.
Carriageway	That portion of the road devoted particularly to the use of travelling vehicles, including shoulders.
Centreline	The basic line, at or near the centre or axis of a road or other work, from which measurements for setting out or constructing the work can conveniently be made.
Chip seal	A wearing course consisting of a layer or layers of chips originally spread onto the pavement over a film of freshly sprayed binder and subsequently rolled into place.
Clear zone	An area adjacent to a road carriageway that is clear of fixed objects and other hazards, providing a recovery zone for vehicles that have left the carriageway.
Conditions	Conditions placed on a resource consent (pursuant to section 108 of the RMA) or conditions of a designation (pursuant to subsection 171(2)(c) of the RMA).
Cross-section	A vertical section, generally at right-angles to the centreline showing the ground. On drawings it commonly shows the road to be constructed, or as constructed.

<b>Term</b>	<b>Definition</b>
Deceleration lane	A speed-change lane provided to allow vehicles to decrease speed.
Designation	Defined in section 166 of the RMA as: “a provision made in a district plan to give effect to a requirement made by a requiring authority under section 168 or section 168A or clause 4 of schedule 1.”
Design life	The period during which the performance of a pavement is expected to remain acceptable.
Design speed	A speed fixed for the design of minimum geometric features of a road.
Design year	The predicted year in which the design traffic volume would be reached.
Detailed design for construction	The final design that forms the basis for noise mitigation built on site.
Embankment	A construction work (usually of earth or stone) that raises the ground (or formation) level above the natural surface.
Expressway	A road mainly for through traffic, usually dual carriageway, with full or partial control of access. Intersections are generally grade separated.
Footpath	That portion of the road reserve set aside for the use of pedestrians only.
Free-field (Noise)	Description of a location which is at least 3.5 metres from any significant sound reflecting surface other than the ground.
Guard rail	A rail erected to restrain vehicles from physically leaving the road, including wire-rope barriers.
Interchange ramp	A carriageway within an interchange providing for travel between two arms (legs) of the intersecting roads.
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways.
Intersection	A place at which two or more roads cross at grade or with grade separation.
$L_{Aeq(24h)}$	Time-average sound level over a twenty-four hour period, measured in dB.
Local road	A road (other than a State highway) in the district, and under the control, of a territorial authority, as defined in Section 5 of the Land Transport Management Act 2003.
Median barrier	A device used on multi-lane roads to keep opposing traffic within their prescribed carriageways.
Minimum requirements	Specifications in the contract documentation detailing the minimum requirements for the project construction, including noise mitigation measures/outcomes.
Noise	Noise may be considered as sound that serves little or no purpose for the exposed persons and is commonly described as ‘unwanted sound’.
Notice of requirement	A notice given to a territorial authority (under section 168 of the RMA) or by a territorial authority (under section 168A of the RMA) of a requirement for land, water, subsoil or airspace to be designated.
Outline plan	A plan of the public work, project, or work to be constructed on designated land provided to a territorial authority, pursuant to section 176A of the RMA, prior to the work being undertaken.



Term	Definition
Principal's requirements	The Transport Agency's requirements for the contractor's design and construction.
Ramp	Carriageway within an interchange providing for travel between two arms (legs) of the intersecting roads.
Retaining wall	A wall constructed to resist lateral pressure from the adjoining ground or to maintain in position a mass of earth.
Road	An area formed for vehicular traffic to travel on. The term 'road' describes the area between kerbs or surface water channels and includes medians, shoulders and parking areas.
Road reserve	A legally described area within which facilities such as roads, footpaths and associated features may be constructed and maintained for public travel.
Roundabout	An intersection where all traffic travels in one direction around a central island.
Sound	Sound (pressure) levels are an objective measure of changes in pressure levels that may be heard by humans. Unwanted sound can be considered as noise.
Traffic flow	The number of vehicles passing a given point during a specified period of time.
Traffic lane	A portion of the carriageway allotted for the use of a single line of vehicles.
Traffic volume	The number of vehicles flowing in both directions past a particular point in a given time (e.g. vehicles per hour, vehicles per day).
Vehicles per day	The number of vehicles observed passing a point on a road in both directions for 24 hours.

## Road surface types

Term	Definition
SMA 10-14	Stone Mastic Asphalt with 10 to 14mm nominal size aggregate
EMOGPA (PA-10)	Epoxy Modified Porous Asphalt (Low noise surfacing) using 10-12.5mm nominal size aggregate

## Appendix A Designation conditions

DC60A	The Requiring Authority shall enter into negotiations with the relevant property owner and / or occupier prior to construction of the realigned North Island Main Trunk Railway and implement any agreed noise mitigation measures in relation to the Ōtaki Motel and 230 Main Highway, in order to, where practicable, achieve indoor noise levels from rail operations not exceeding 35dB LAeq(1h) in bedrooms and 40 dB LAeq(1h) in other habitable spaces assuming outdoor rail noise levels as per Table 3.5 of TR 14, while maintaining adequate ventilation within these spaces, (subject to the landowner allowing reasonable access to implement the measures).
DC61	For the purposes of Conditions 61 to 73, the following terms mean: <ul style="list-style-type: none"> <li>a) BPO – means Best Practicable Option;</li> <li>b) Building-Modification Mitigation – has the same meaning as in NZS6806:2010;</li> <li>c) Habitable Space – has the same meaning as in NZS6806:2010;</li> <li>d) Noise Assessment – means the Operational Noise and Vibration Assessment submitted with the NoR;</li> <li>e) Noise Criteria Categories – means groups of preference for time-averaged sound levels established in accordance with NZS6806:2010 when determining the selected mitigation option considered to be the BPO; i.e. Category A – primary noise criterion, Category B – secondary noise criterion, Category C – internal noise criterion;</li> <li>f) NZS6806:2010 – means NZS 6806:2010 Acoustics – Road-traffic noise – New and altered roads;</li> <li>g) PPFs – has the same meaning as in NZS6806:2010, and are generally identified in green, yellow or red on drawings NS-01 to NS-08; and</li> <li>h) Structural Mitigation – has the same meaning as in NZS6806:2010.</li> </ul>
DC62	The Requiring Authority shall implement noise mitigation measures with reference to the “Selected Options” as set out within Section 7 Tables 7-1 and 7-2 of TR14, including the surfacing of 1050m of the Expressway with OGPA (PA10) through Ōtaki township from chainage 1300 to 2350 and Building-Modification Mitigation of the dwelling at 14 Old Hautere Road. The mitigation noted in this condition shall achieve the Noise Criteria categories indicated in drawings NS-01 to NS-08, where practicable and shall be subject to Conditions 63 to 73.
DC63	The detailed design of the selected mitigation options (the “Selected Options”) required to be implemented by Condition 62 shall be undertaken by a suitably qualified acoustics specialist prior to the Commencement of Construction of the Project.
DC64	Where the design of the Selected Options identifies that it is not practicable to implement a particular Structural Mitigation measure in the location or of the length included in the Selected Options required by Condition 62 either: <ul style="list-style-type: none"> <li>a) If the design of the Structural Mitigation measure could be changed and would still achieve the same Identified Category or Category B at all relevant PPFs, and an independent and suitably qualified person certifies to KCDC that the changed Structural Mitigation would be consistent with adopting the BPO in accordance with NZS6806:2010, the Selected Options may include the changed mitigation measure, or</li> <li>b) If the changed design of the Structural Mitigation would change the Noise Criteria Category at any PPF from Category A or B to Category C, and the Manager confirms that the changed Structural Mitigation would be consistent with adopting the BPO in accordance with NZS6806:2010, the Selected Options may include the changed mitigation measure.</li> <li>c) The Requiring Authority shall consult with affected property owners prior to amending the Selected Options.</li> </ul>

DC65	The Selected Options shall be implemented prior to completion of the Works, with the exception of any low-noise road surfaces, which shall be implemented within 12 months of the laying of the initial pavement surface.
DC66	Prior to construction of the Project, a suitably qualified acoustic specialist shall identify those PPFs which, following implementation of all the Structural Mitigation measures included in the Selected Options, are not in Noise Criteria Categories A or B and where Building Modification Mitigation in accordance with NZS 6806:2010 may be required to achieve 40 dB LAeq(24h) inside Habitable Spaces (“Category C Buildings”).
DC67	<p>a) Prior to Commencement of Construction of the Project in the vicinity of a Category C Building, the Requiring Authority shall write to the owner and occupier of each Category C Building seeking access to such building for the purpose of measuring internal noise levels and assessing the existing building envelope in relation to noise reduction performance.</p> <p>b) If the owner(s) and occupier(s) of the Category C Building approve the Requiring Authority’s access to the property within 12 months of the date of the Requiring Authority’s letter (sent pursuant to a), then no more than 12 months prior to Commencement of Construction of the Project Stage, the Requiring Authority shall instruct a suitably qualified acoustic specialist to visit the building to measure internal noise levels and assess the existing building envelope in relation to noise reduction performance.</p>
DC68	<p>Where a Category C Building is identified, the Requiring Authority shall be deemed to have complied with Condition 67 above where:</p> <p>a) The Requiring Authority (through its acoustics specialist) has visited and assessed the building; or</p> <p>b) The owner of the Category C Building approved the Requiring Authority’s request for access, but the Requiring Authority could not gain entry for some reason (such as entry being denied by a tenant); or</p> <p>c) The owner of the Category C Building did not approve the Requiring Authority’s access to the property within the time period set out in Condition 67b) (including where the owner(s) did not respond to the Requiring Authority’s letter within that period); or</p> <p>d) The owner of the Category C Building cannot, after reasonable enquiry, be contacted prior to completion of construction of the Project. If any of (a) to (d) above apply to a particular Category C Building, the Requiring Authority shall not be required to implement any Building-Modification Mitigation at that Category C Building.</p>
DC69	<p>Subject to Condition 70, within 6 months of the assessment required under Condition 67b), the Requiring Authority shall give notice to the owner of each Category C Building:</p> <p>a) Advising of the options available for Building-Modification Mitigation to the building; and</p> <p>b) Advising that the owner has three months within which to decide and advise the Requiring Authority whether to accept one or any option for Building-Modification Mitigation for the building</p>
DC70	Once an agreement on Building-Modification Mitigation is reached between the Requiring Authority and the owner of an affected building, the mitigation shall be implemented in a reasonable and practical timeframe agreed between the Requiring Authority and the owner.
DC71	<p>Subject to Condition 68, where Building-Modification Mitigation is required, the Requiring Authority shall be deemed to have complied with Condition 70 above where:</p> <p>a) The Requiring Authority has completed Building-Modification Mitigation to the Category C Building; or</p> <p>b) The owner(s) of the Category C Building did not accept the Requiring Authority’s offer to implement Building-Modification Mitigation prior to the expiry of the timeframe stated in Condition 69b) above (including where the owner(s) did not respond to the Requiring Authority within that period); or</p>

	c) The owner of the Category C Building cannot, after reasonable enquiry, be contacted prior to completion of construction of the Project.
DC72	The Requiring Authority shall manage, and maintain the Structural Mitigation to ensure that, to the extent practicable, those mitigation measures retain their noise reduction performance.
DC73	<p>A Noise Mitigation Plan shall be prepared by an independent and suitably qualified acoustics specialist 15 Working Days prior to the Commencement of Construction, and shall include details of:</p> <ul style="list-style-type: none"> <li>a) The Selected Options;</li> <li>b) Predicted noise levels, including identification of any PPFs which have changed NZS 6806:2010 noise categories; and</li> <li>c) Methods for post-construction validation of the Noise Assessment and to ensure the Selected Options retain their noise reduction performance.</li> </ul>

## Appendix B Principal's Requirements

As contained in page 216 of the 'Appendices to Principal's Requirements' SM031 App B3B Issue 9: September 2014.

### A15.1 Road and Rail Traffic (Operational) Noise

#### A15.1.1 General

A.15.1.1.1 The Contractor shall assess, implement, verify and document noise mitigation in accordance with the NZ Transport Agency specification NZTA P40:2014. This shall include mitigation for both road-traffic and railway noise.

A.15.1.1.2 The Contractor shall satisfy the requirements of all designation conditions relating to operational noise:

- a) Condition 60A – rail noise, and
- b) Conditions 61-73 – road-traffic noise

#### A15.1.2 Quiet Road Surface

A.15.1.2.1 The quiet road surfacing (see Appendix A8) in Ōtaki shall be an epoxy modified open graded porous asphalt. The NAASRA count for this surface shall be an average value less than 30 and a maximum value less than 50.

#### A15.1.3 Building Modification

A.15.1.3.1 The design and construction of building acoustic treatment shall adhere to the guidance in the 2015 version of the NZ Transport Agency State highway guide to acoustics treatment of buildings.

#### A15.1.4 Rail noise and vibration

A.15.1.4.1 All new rail track shall be continuously welded and on ballast, or of a form that generates and transmits less noise and vibration.

#### A15.1.5 Post-construction review

A15.1.6 A post-construction review shall be conducted meeting the requirements of both the specification NZTA P40:2014 and the designation conditions.

A15.1.7 The post-construction review shall include noise measurements for a period of at least seven days at each of three locations, for the purpose of verifying the noise model. The noise measurements shall be made between six and nine months after the expressway has opened to traffic. The measurements and analysis shall be in accordance with the NZ Transport Agency Noise monitoring requirements.

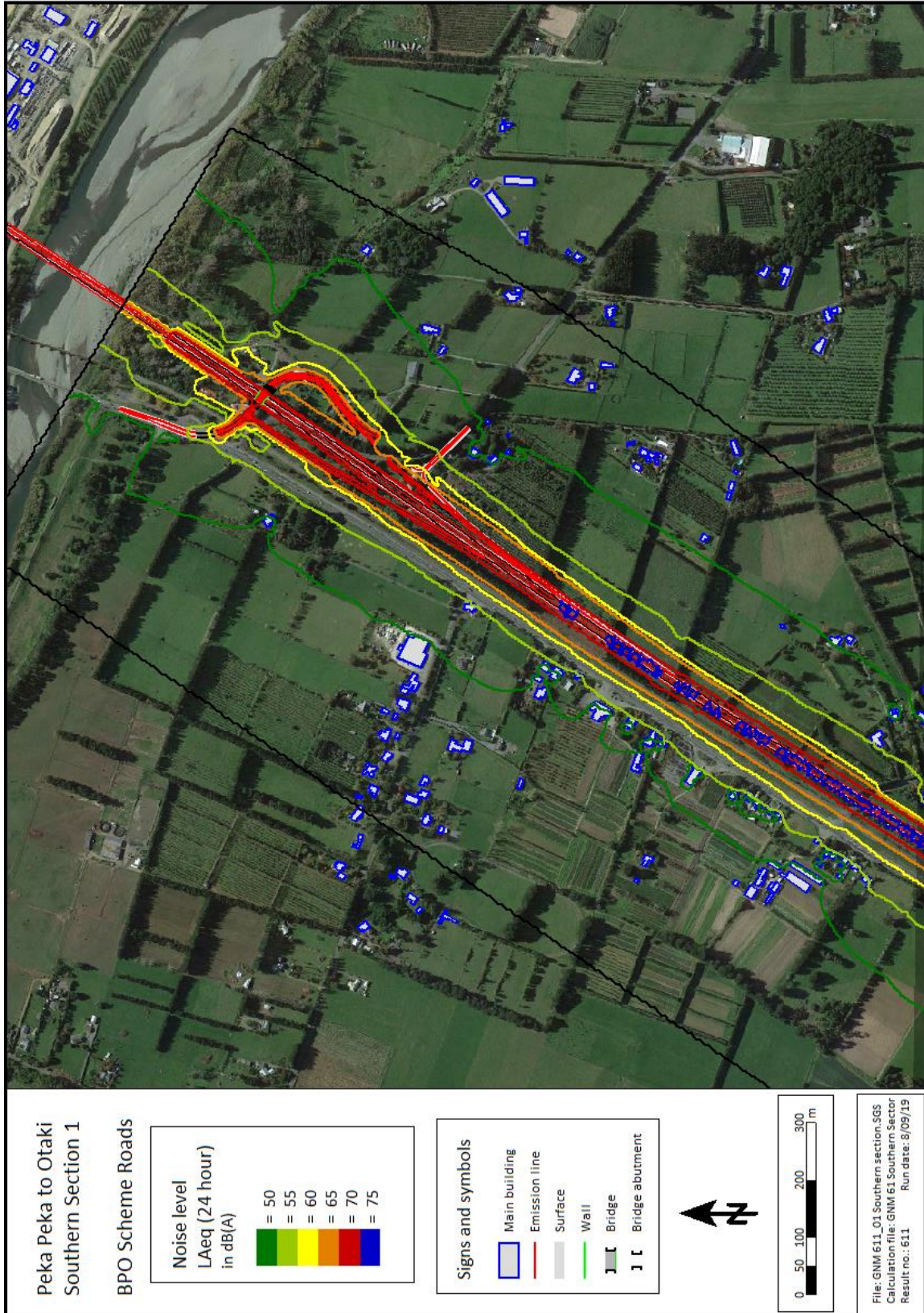
The results of the measurements shall be compared to the predicted road-traffic noise levels. If discrepancies are found, these shall be investigated and findings reported in the post-construction review report.

A15.1.8 The three locations for noise measurements shall be determined by the Principal following agreement with property owners. It is intended that the measurements will be at houses on Suttons Road, Old Hautere Road and County Road.

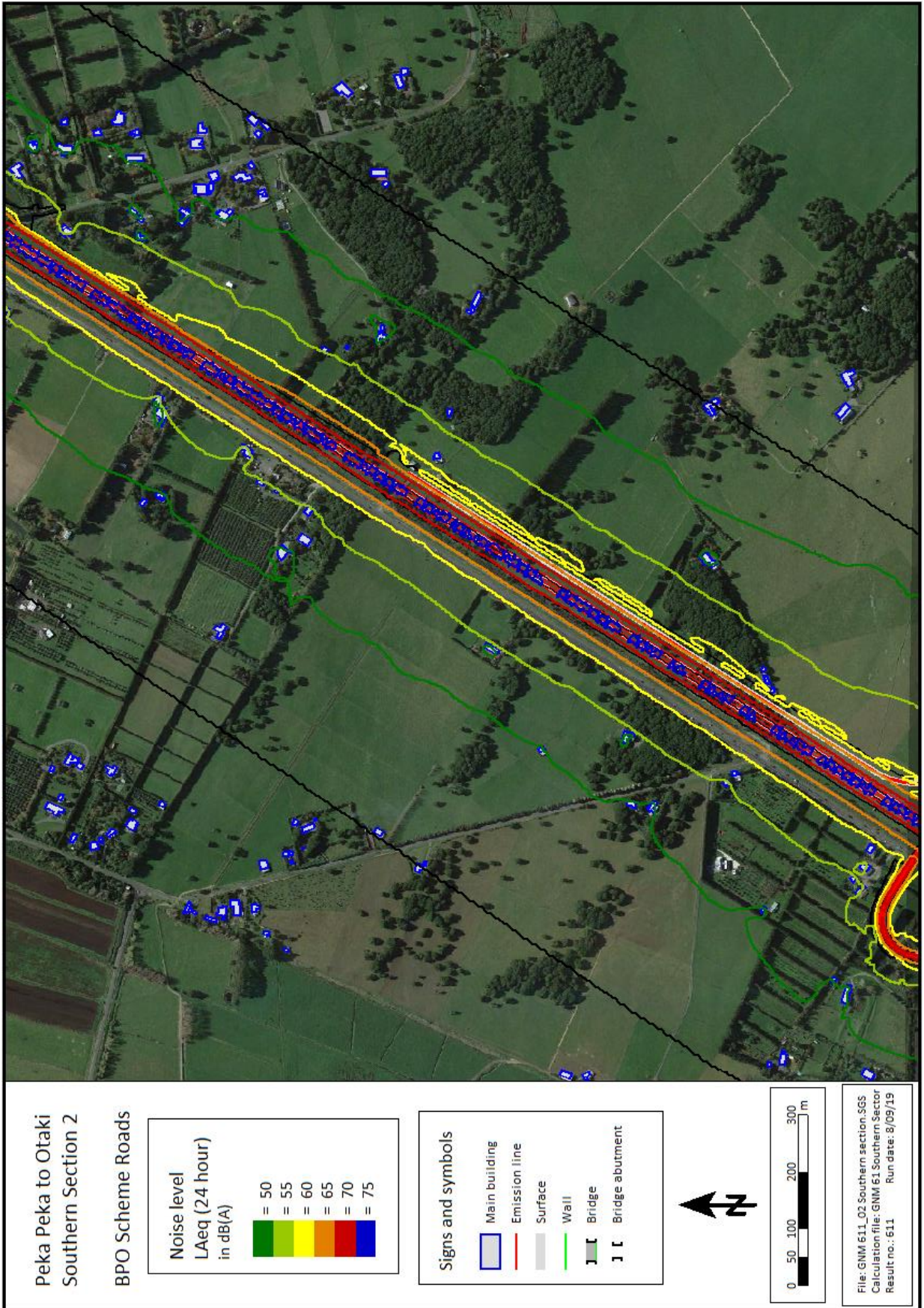
A15.1.9 The Contractor shall be responsible for any additional noise mitigation measures required as a result of the noise assessments not meeting the designation conditions.



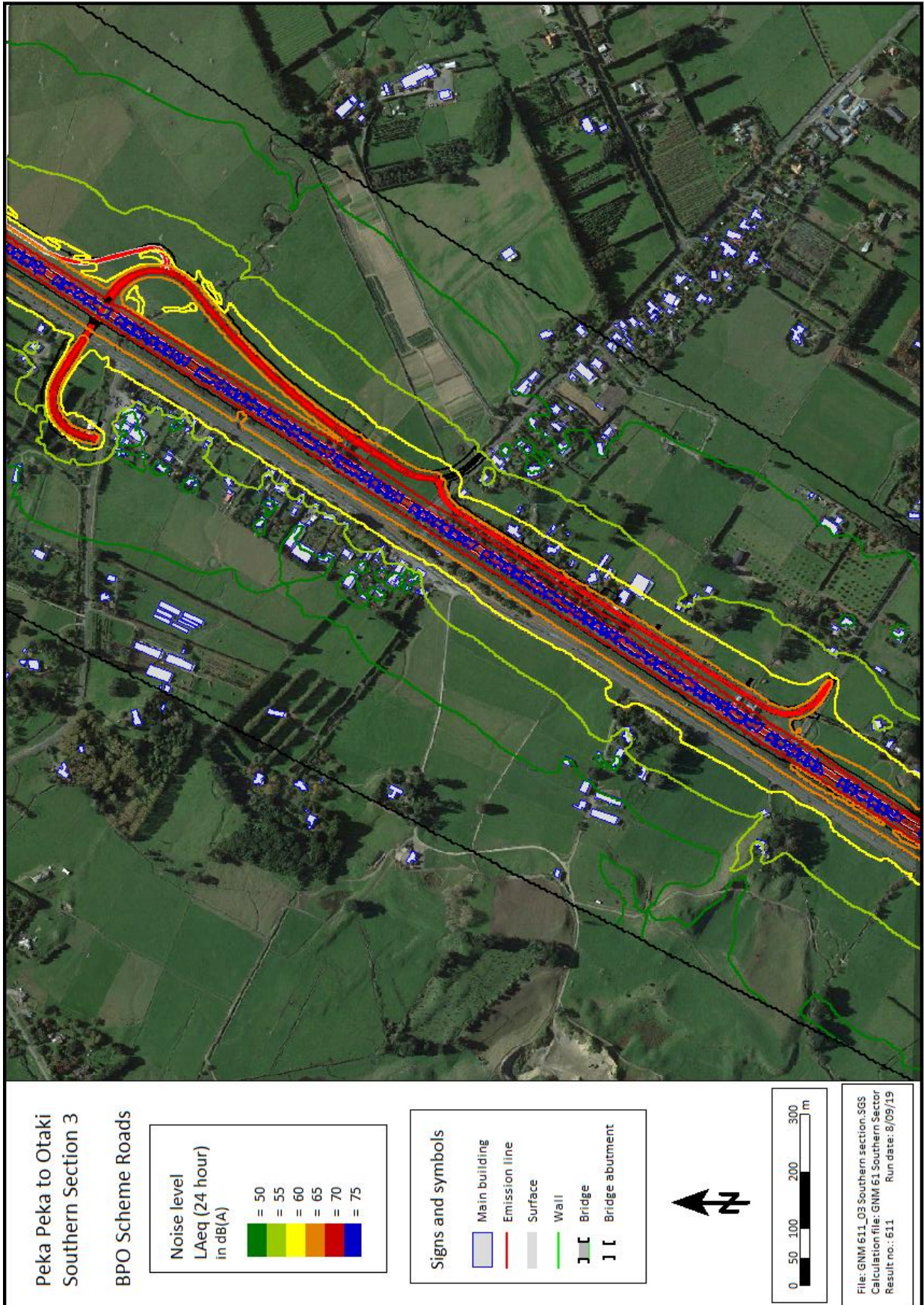
## Appendix C Noise Contours



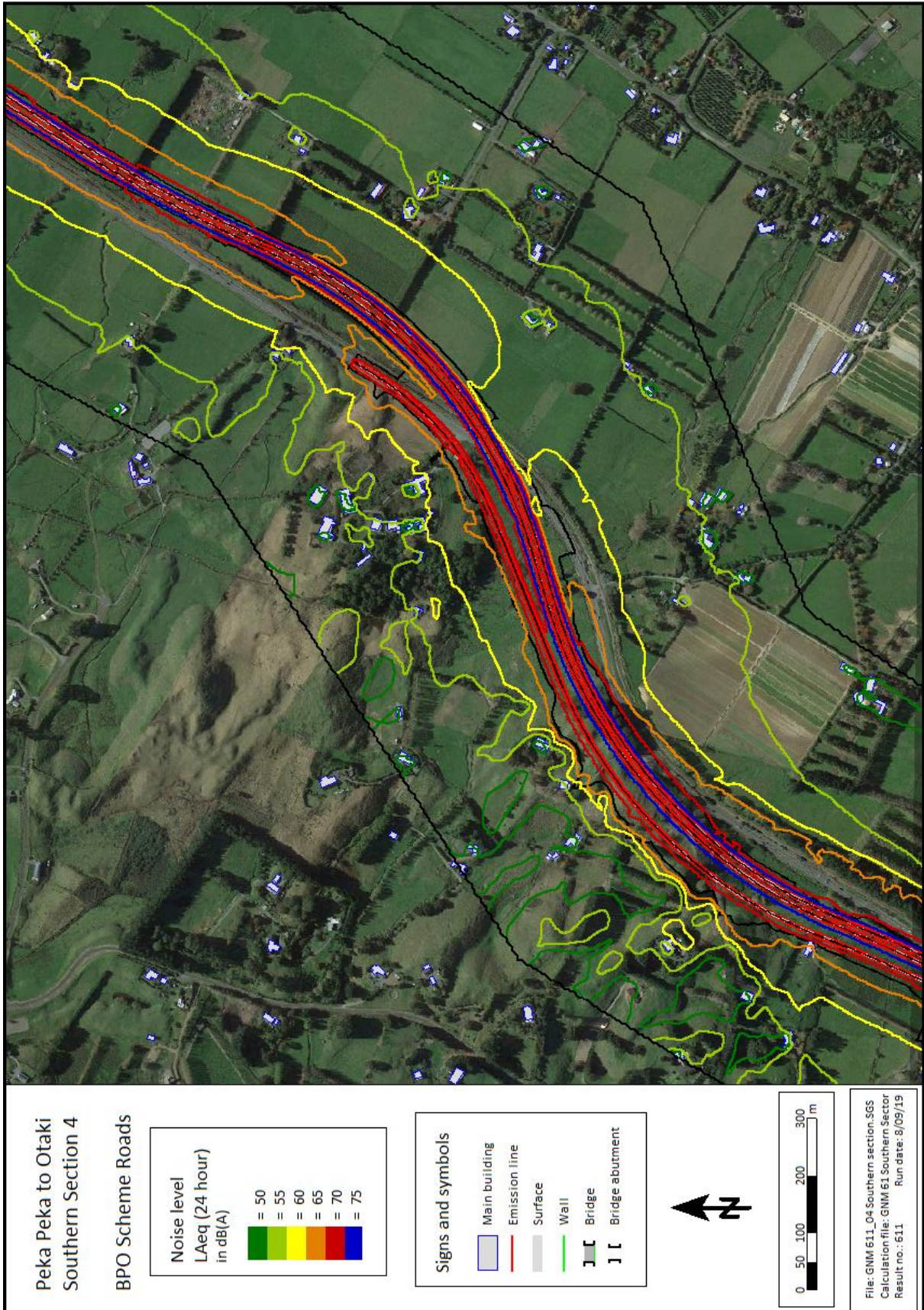




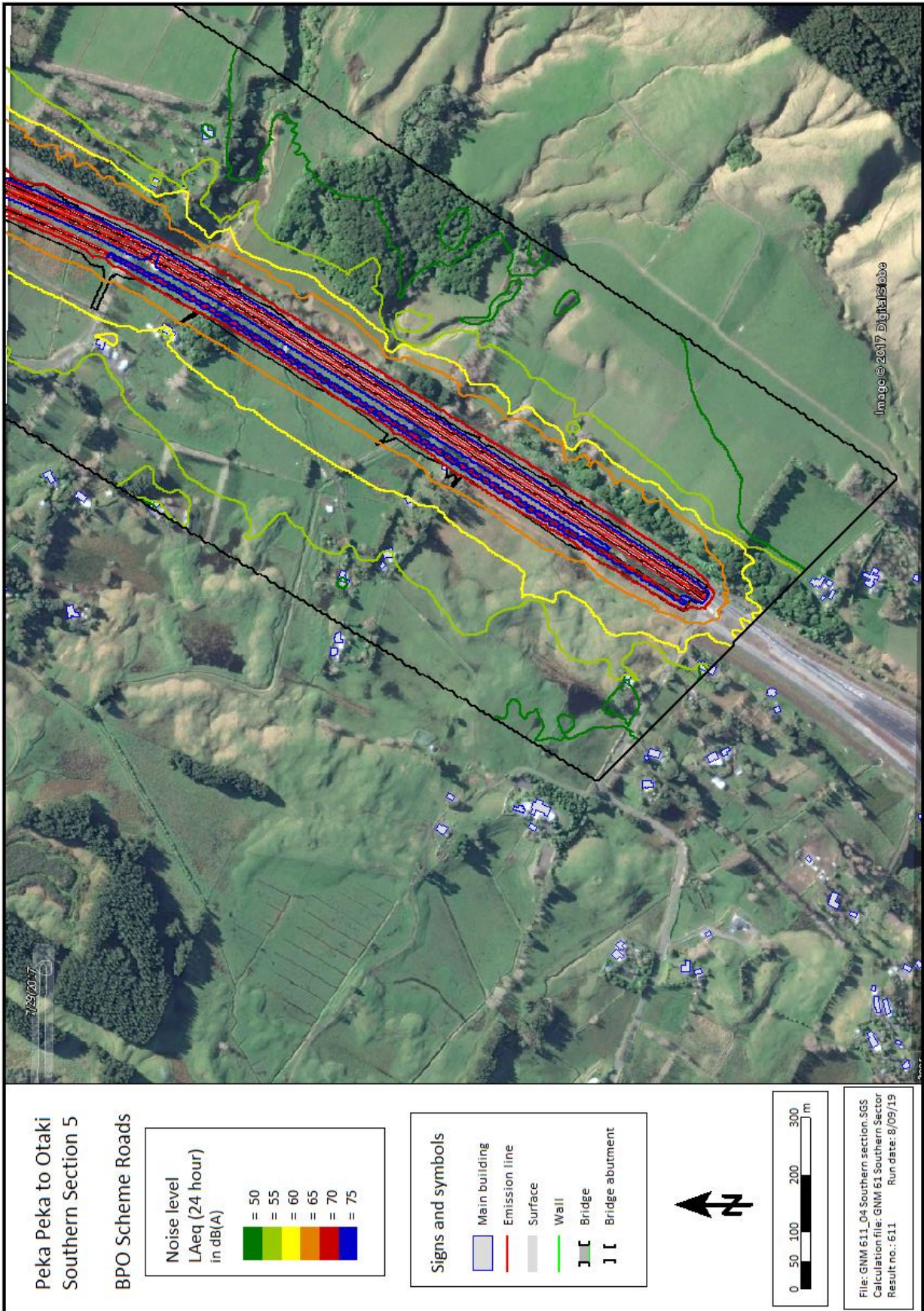












## Appendix D Predicted noise levels

PPF	Address	Exisitng 2010	Detailed design for construction <sup>1</sup>
R074	1277 SH1	62 dB	55 dB
R075	69 Otaki Gorge Rd	51 dB	52 dB
R076	53 Otaki Gorge Rd	51 dB	52 dB
R077	34 Otaki Gorge Rd	52 dB	56 dB
R078	32 Otaki Gorge Rd	55 dB	55 dB
R079	65 Otaki Gorge Rd	50 dB	49 dB
R080	1217 SH1	57 dB	52 dB
R081	1215 SH1	66 dB	57 dB
R082	1209 SH1	66 dB	57 dB
R083	44 Otaki Gorge Rd	50 dB	50 dB
R084	1195 SH1	67 dB	58 dB
R085	1191 SH1	68 dB	58 dB
R086	1189 SH1	67 dB	58 dB
R087	38 Otaki Gorge Rd	52 dB	52 dB
R088	1173 SH1	66 dB	58 dB
R089	1171 SH1	69 dB	59 dB
R090	1169 SH1	68 dB	58 dB
R091	1167 SH1	68 dB	58 dB
R092	1155 SH1	57 dB	53 dB
R093	1165 SH1	69 dB	59 dB
R094	1153 SH1	66 dB	57 dB
R095	1149 SH1	68 dB	59 dB
R096	11 Old Hautere Rd	53 dB	53 dB
R097	1149 SH1	68 dB	59 dB
R098	1147 SH1	68 dB	59 dB
R099	1127 SH1	66 dB	59 dB
R100	9 Old Hautere Rd	56 dB	57 dB
R101	15 Old Hautere Rd	53 dB	54 dB
R102	19 Old Hautere Rd	53 dB	54 dB
R103	14 Old Hautere Rd	59 dB	61 dB
R104	23 Old Hautere Rd	51 dB	51 dB
R105	26 Old Hautere Rd	55 dB	55 dB
R106	33 Old Hautere Rd	52 dB	53 dB
R107	22 Old Hautere Rd	55 dB	57 dB
R108	1115 SH1	67 dB	61 dB
R109	36 Old Hautere Rd	54 dB	55 dB

**Waka Kotahi NZ Transport Agency  
Peka Peka to Otaki (Southern Section)  
Noise Mitigation Plan**

PPF	Address	Exisitng 2010	Detailed design for construction <sup>1</sup>
R110	46 Old Hautere Rd	53 dB	54 dB
R111	1081 SH1	56 dB	53 dB
R112	1081 SH1	64 dB	59 dB
R113	56 Old Hautere Rd	54 dB	53 dB
R114	1070 SH1	56 dB	60 dB
R115	1039 SH1	60 dB	57 dB
R116	12 Te Weka Rd	61 dB	57 dB
R117	990B SH1	54 dB	55 dB
R118	12 Te Horo Beach Rd	52 dB	55 dB
R119	40 Te Horo Beach Rd	50 dB	52 dB
R120	961 SH1	68 dB	62 dB
R121	13 Te Horo Beach Rd	51 dB	58 dB
R122	11 Te Horo Beach Rd	52 dB	59 dB
R123	3 Te Horo Beach Rd (Bld 2)	53 dB	54 dB
R124	3 Te Horo Beach Rd (Bld 1)	65 dB	61 dB
R125	941 SH1	64 dB	60 dB
R126	939 SH1	63 dB	59 dB
R127	931 SH1	66 dB	62 dB
R128	921 SH1	59 dB	58 dB
R129	915A SH1	57 dB	55 dB
R130	915 SH1	68 dB	63 dB
R131	913 SH1	66 dB	62 dB
R132	909 SH1	69 dB	62 dB
R133	907 SH1	67 dB	62 dB
R134	901A SH1	56 dB	55 dB
R135	903 SH1	66 dB	61 dB
R136	901 SH1	66 dB	62 dB
R137	895 SH1	59 dB	57 dB
R138	893 SH1	61 dB	58 dB
R139	32 School Rd	56 dB	61 dB
R140	34 School Rd	55 dB	58 dB
R141	42A School Rd	52 dB	54 dB
R142	40 School Rd	53 dB	59 dB
R143	42B School Rd	53 dB	55 dB
R144	45 Gear Rd	58 dB	62 dB
R145	91 Gear Rd	56 dB	59 dB
R146	97 Gear Rd	53 dB	55 dB
R147	82 Gear Rd	57 dB	60 dB
R148	737 SH1	63 dB	58 dB
R149	36 Sutton Rd	55 dB	58 dB

**Waka Kotahi NZ Transport Agency  
Peka Peka to Otaki (Southern Section)  
Noise Mitigation Plan**

PPF	Address	Existing 2010	Detailed design for construction <sup>1</sup>
R150	38 Sutton Rd	54 dB	58 dB
R151	17 Sutton Rd	53 dB	53 dB
R152	31 Sutton Rd	51 dB	54 dB
R153	35 Sutton Rd	57 dB	59 dB
R154	31A Sutton Rd	54 dB	57 dB
R155	34 Sutton Rd	52 dB	55 dB
R156	635 SH1	48 dB	53 dB
R157	633 SH1	47 dB	52 dB
R158	33 Sutton Rd	55 dB	56 dB
R159	12 Derham Rd	57 dB	60 dB
R160	670 SH1	57 dB	55 dB
R161	664 SH1	56 dB	55 dB
R162	36 Te Hapu Rd	55 dB	57 dB

<sup>1</sup> Includes a 1.5 dB safety factor

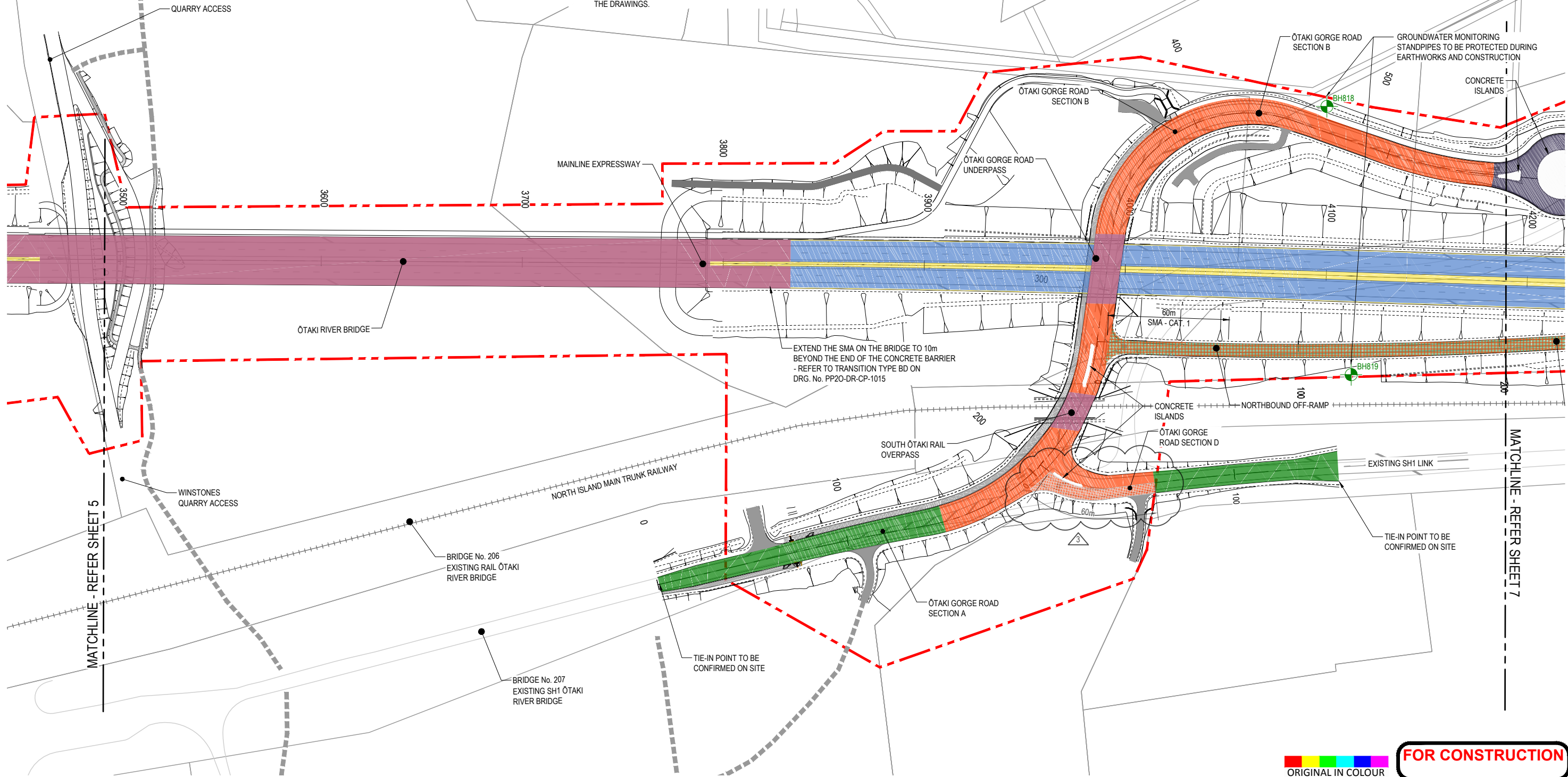
## Appendix E Road surface layouts





SURFACING LEGEND:	
	EXPRESSWAY CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP
	EXPRESSWAY RAMPS 45mm SMA
	DESIGNATION BOUNDARY
	RAIL DESIGNATION
	LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	TYPE 5 - REFER TO NOTE 4
	LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

- NOTES:**
- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
  - REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
  - REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS. FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
  - THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
  - EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
    - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
    - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
    - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
    - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
  - EMOGPA AND SMA ON THE EXPRESSWAY RAMPS SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.



ORIGINAL IN COLOUR **FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT AND RAMPS DESIGN UPDATED. HIGH PSV CHIP ADDED AT NEW SH1 LINK & OTAKI GORGE ROAD INTERSECTION	AK	RT	SW	23.03.20
2	MINOR UPDATES. HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale (A1)	Design	Drawn	Checked	Approved For Construction
1:1000	R.Theron	G.Down	J.Hallett	S.Waters
Scale (A3)	Design	Drawn	Checked	Approved For Construction
1:2000	R.Theron	G.Down	J.Hallett	S.Waters

\*Refer to Original Hardcopy for Signature

**NZ TRANSPORT AGENCY** **Peka Peka to Otaki Expressway** **Fletcher HIGGINS** **BECA** **Tonkin+Taylor**

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1166
	SHEET 6 OF 18	Rev.:	3

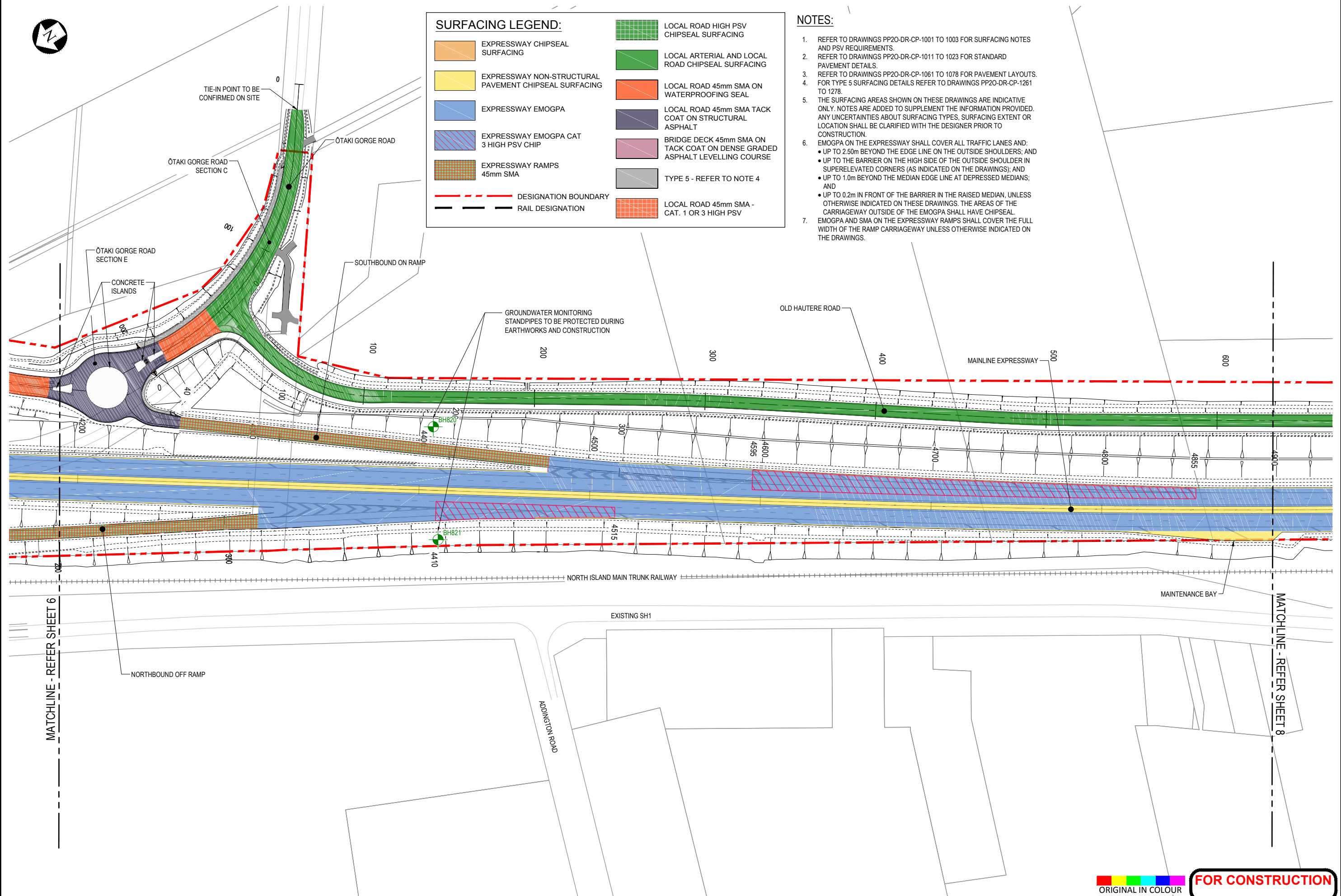


### SURFACING LEGEND:

	EXPRESSWAY CHIPSEAL SURFACING		LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA		LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP		LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	EXPRESSWAY RAMPS 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

### NOTES:

- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
- REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
- REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS.
- FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
- THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
- EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
  - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
  - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
  - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
  - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
- EMOGPA AND SMA ON THE EXPRESSWAY RAMPS SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.



ORIGINAL IN COLOUR **FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY AND RAMPS PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES. HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
Scale (A3) 1:2000					19.04.18	
					20.04.18	

\* Refer to Original Hardcopy for Signature

**NZ TRANSPORT AGENCY** WAIKATO REGION

**Peka Peka to Otaki Expressway**

**Fletcher HIGGINS**

**BECA** **Tonkin+Taylor**

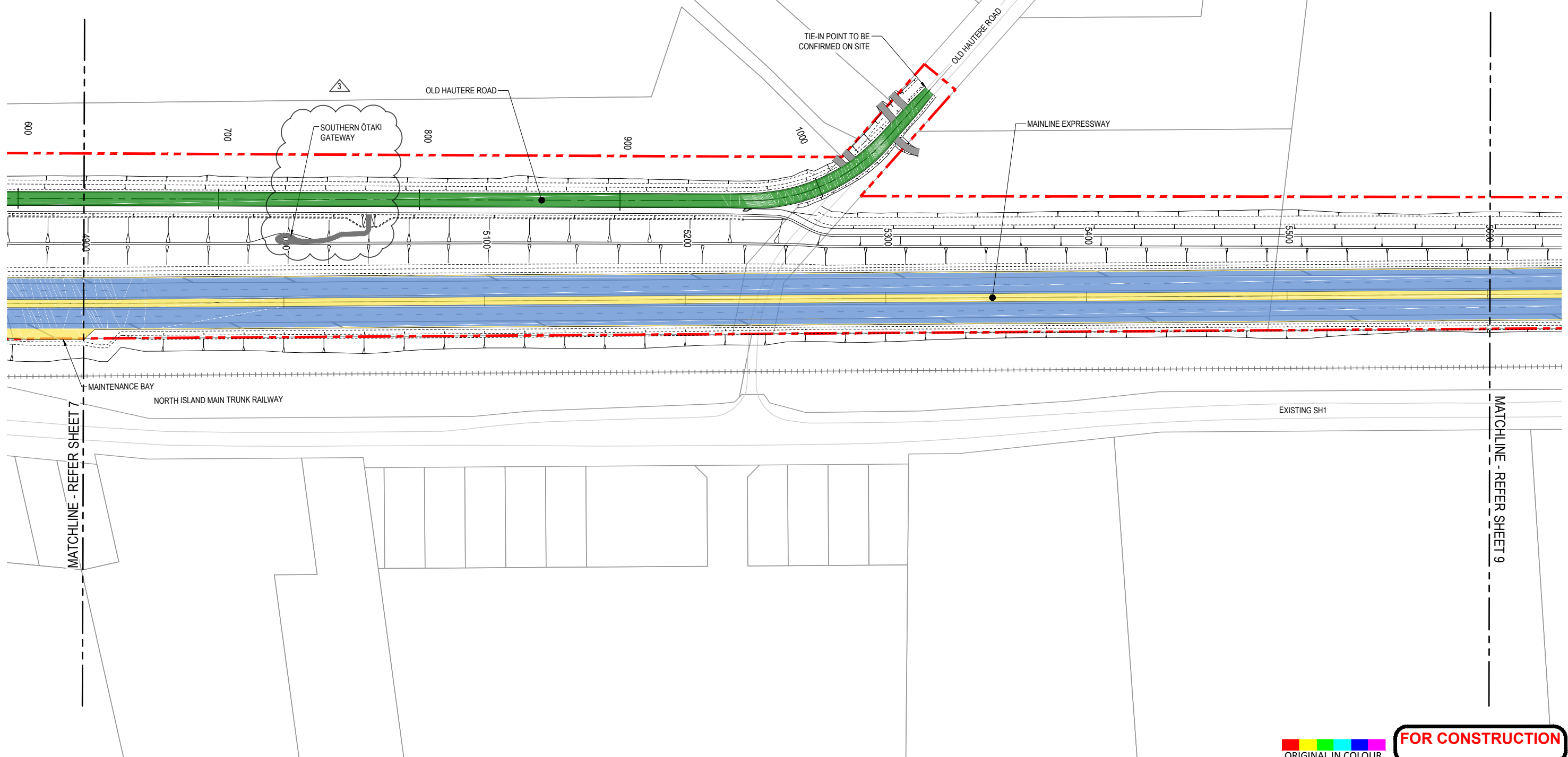
Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1167
	SHEET 7 OF 18	Rev.:	3





SURFACING LEGEND:	
	EXPRESSWAY CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP
	EXPRESSWAY RAMPS 45mm SMA
	DESIGNATION BOUNDARY
	RAIL DESIGNATION
	LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	TYPE 5 - REFER TO NOTE 4
	LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

- NOTES:**
- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
  - REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
  - REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS.
  - FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
  - THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
  - EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
    - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
    - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
    - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
    - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
  - EMOGPA AND SMA ON THE EXPRESSWAY RAMPS SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.



ORIGINAL IN COLOUR **FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES, HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
Scale (A3) 1:2000					20.04.18	

\* Refer to Original Hardcopy for Signature

**Peka Peka to Ōtaki Expressway**

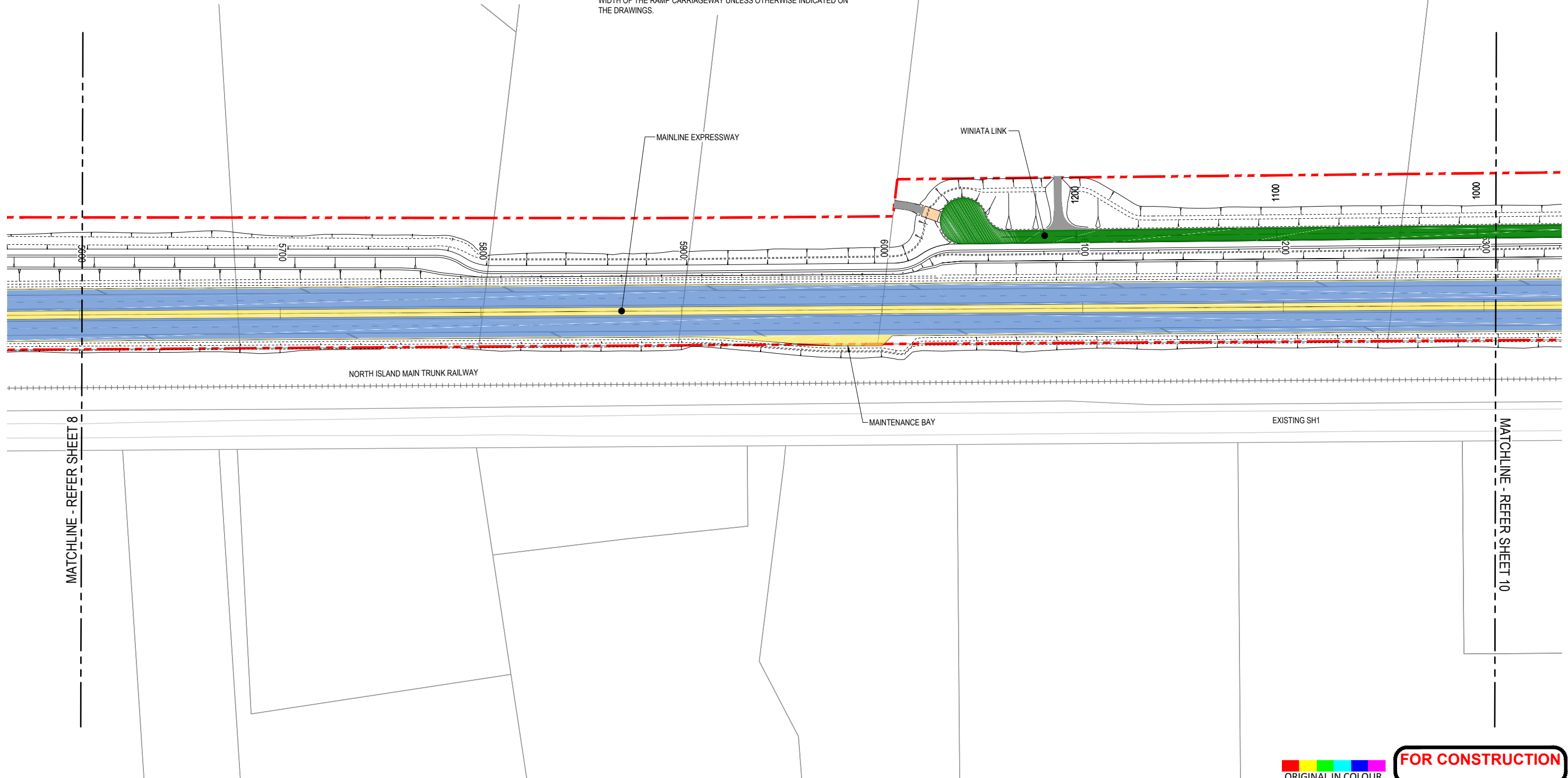
Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1168
	SHEET 8 OF 18	Rev.:	3



SURFACING LEGEND:	
	EXPRESSWAY CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP
	EXPRESSWAY RAMPS 45mm SMA
	DESIGNATION BOUNDARY
	RAIL DESIGNATION
	LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	TYPE 5 - REFER TO NOTE 4
	LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

**NOTES:**

- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
- REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
- REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS.
- FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
- THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
- EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
  - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
  - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
  - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
  - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
- EMOGPA AND SMA ON THE EXPRESSWAY RAMPS SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.



ORIGINAL IN COLOUR

**FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES - HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale (A1)	Design	R.Theron	23.06.17	Approved For Construction
1:1000	Drawn	G.Down	23.06.17	S.Waters
Scale (A3)	Dwg Verifier	J.Hallett	19.04.18	
1:2000	Dwg Check	G.Down	20.04.18	Date 20.04.18

\* Refer to Original Hardcopy for Signature



Peka Peka to Otaki Expressway



Subject:	PAVEMENTS AND SURFACING
Title:	SURFACING LAYOUT PLAN SHEET 9 OF 18

Discipline:	CIVIL
Drawing No.:	PP20-DR-CP-1169
Rev.:	3

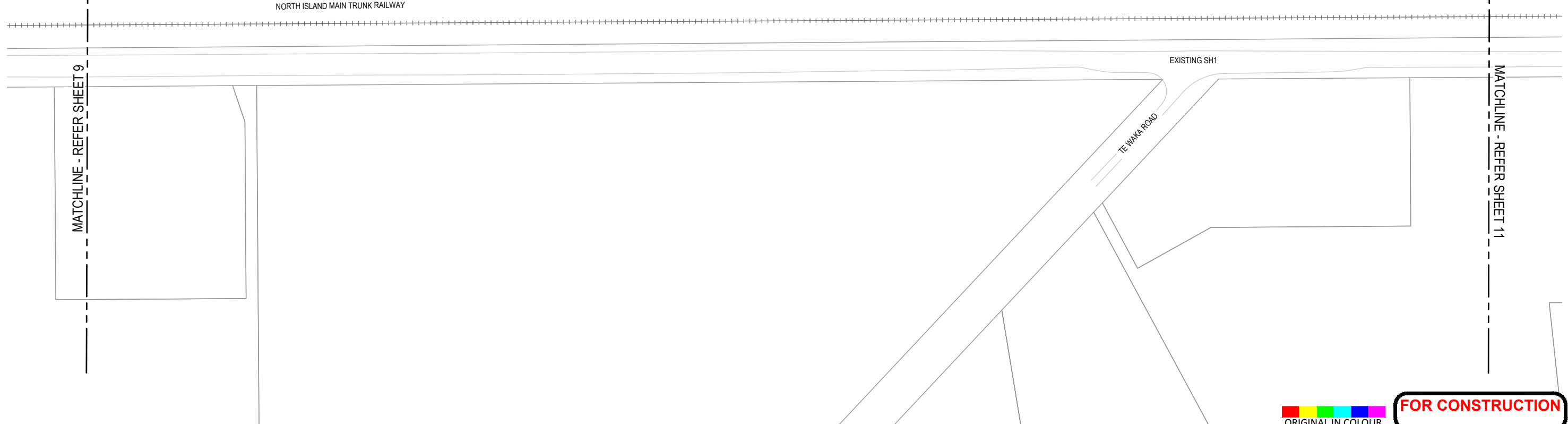
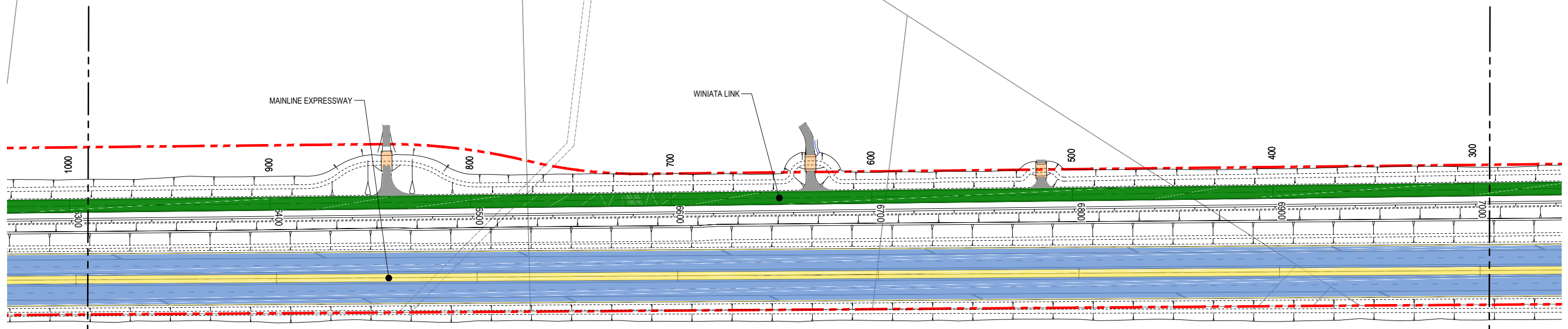


**SURFACING LEGEND:**

	EXPRESSWAY CHIPSEAL SURFACING		LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA		LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP		LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	EXPRESSWAY RAMP 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

**NOTES:**

- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
- REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
- REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS. FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
- THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
- EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
  - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
  - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
  - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
  - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
- EMOGPA AND SMA ON THE EXPRESSWAY RAMP SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.



ORIGINAL IN COLOUR

**FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES - HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
Scale (A3) 1:2000					20.04.18	

\* Refer to Original Hardcopy for Signature



**Peka Peka to Ōtaki Expressway**



Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN SHEET 10 OF 18	Drawing No.:	PP20-DR-CP-1170
		Rev.:	3

















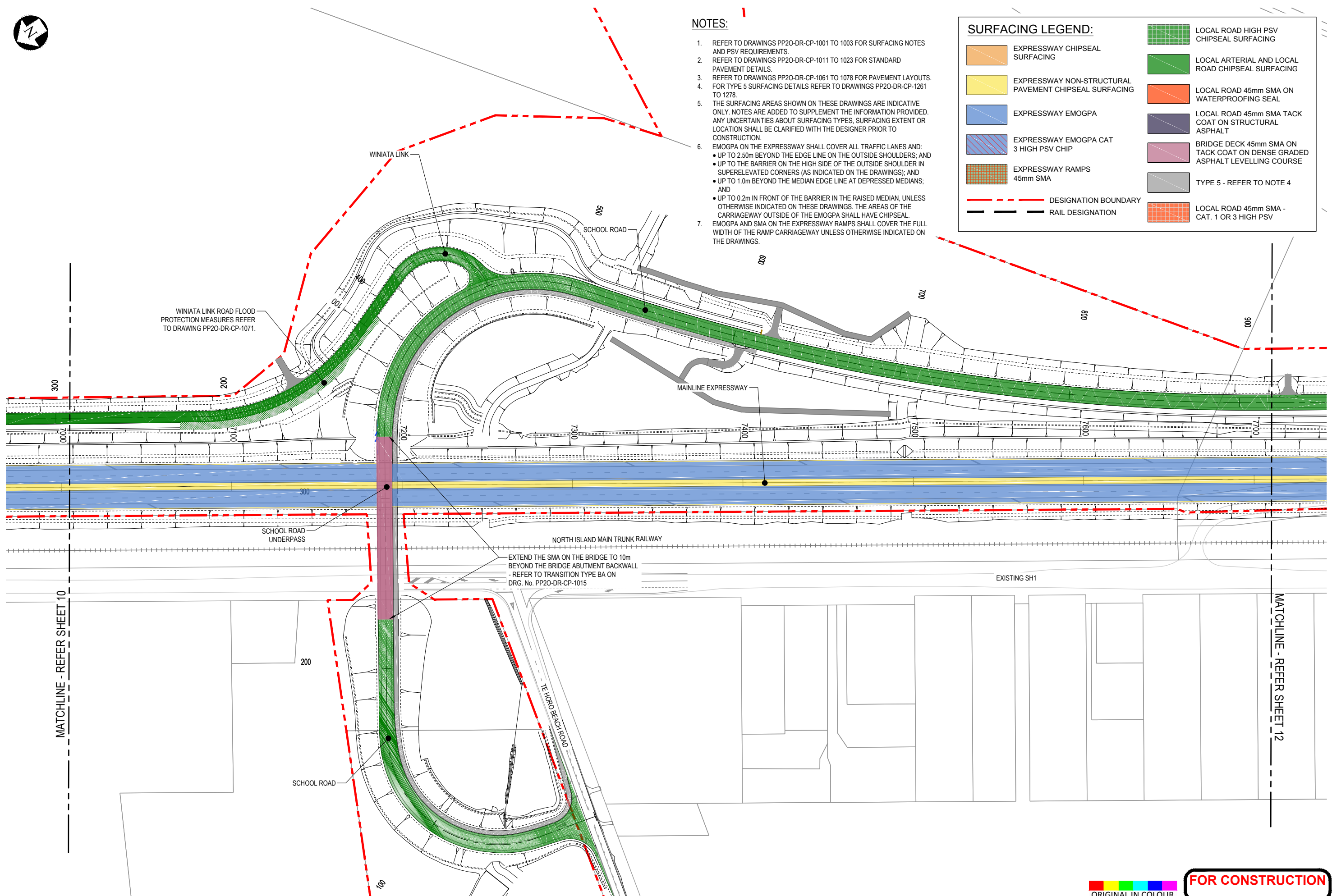


**NOTES:**

1. REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
2. REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
3. REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS. FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
4. THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
5. EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
  - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS, AND
  - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
  - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
  - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
6. EMOGPA AND SMA ON THE EXPRESSWAY RAMP SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

**SURFACING LEGEND:**

	EXPRESSWAY CHIPSEAL SURFACING		LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA		LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP		LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	EXPRESSWAY RAMP 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV



ORIGINAL IN COLOUR

**FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
4	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	SW	SW	30.04.20
3	FLOOD PROTECTION TREATMENTS ADDED WHERE SHOWN	GD	RT	SW	20.02.19
2	MINOR UPDATES - HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Checked	Approved For Construction
Scale (A1) 1:1000	R.Theron	23.06.17	G.Down	23.06.17
Scale (A3) 1:2000	J.Hallett	19.04.18	G.Down	20.04.18

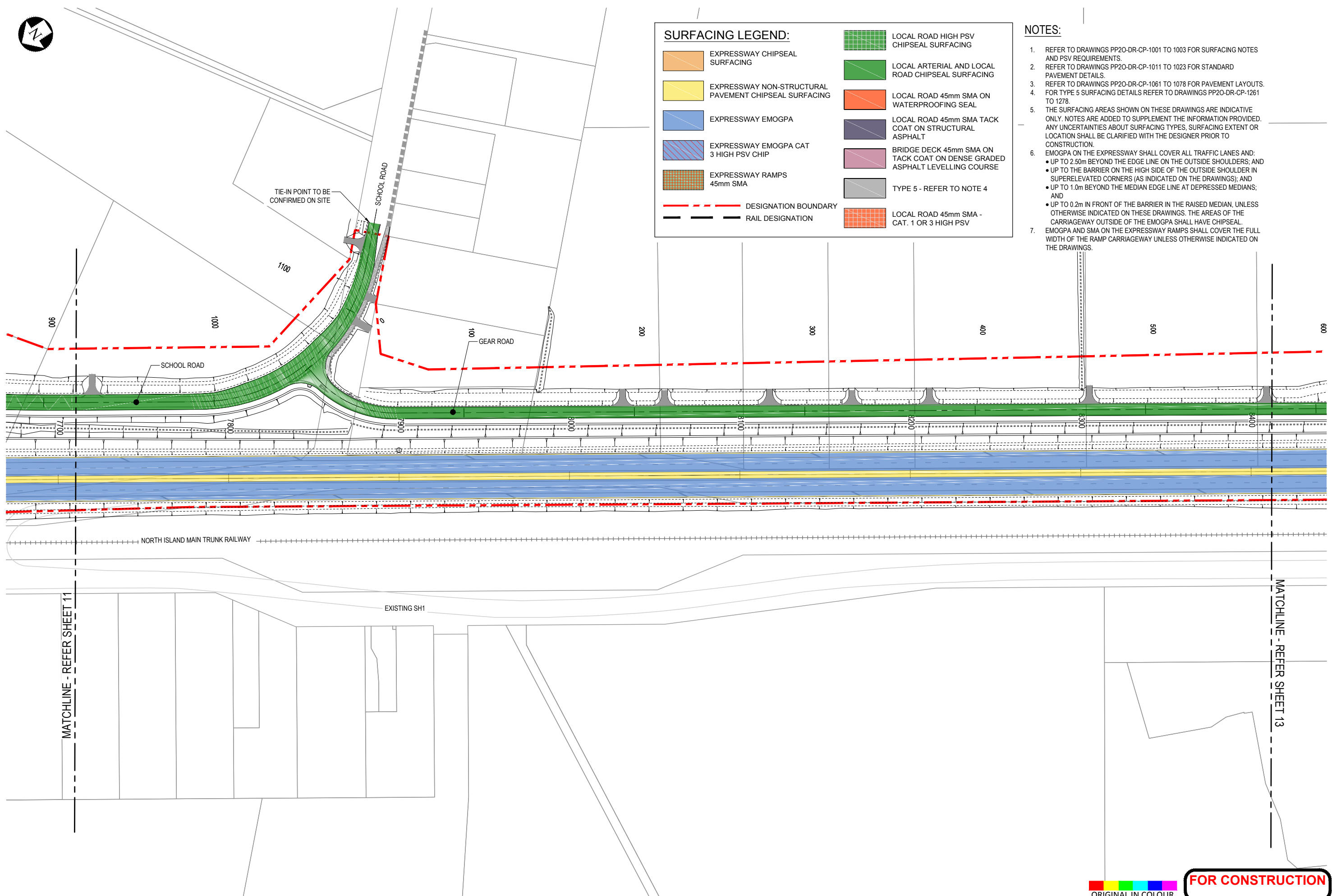


**Peka Peka to Otaki Expressway**

**Fletcher HIGGINS**

**BECA** **Tonkin+Taylor**

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1171
	SHEET 11 OF 18	Rev.:	4



**SURFACING LEGEND:**

EXPRESSWAY CHIPSEAL SURFACING	LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING	LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
EXPRESSWAY EMOGPA	LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP	LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
EXPRESSWAY RAMP 45mm SMA	BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
DESIGNATION BOUNDARY	TYPE 5 - REFER TO NOTE 4
RAIL DESIGNATION	LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

- NOTES:**
- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
  - REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
  - REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS.
  - FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
  - THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
  - EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
    - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
    - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
    - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
    - UP TO 0.2m IN FRONT OF THE BARRIER IN THE RAISED MEDIAN, UNLESS OTHERWISE INDICATED ON THESE DRAWINGS. THE AREAS OF THE CARRIAGEWAY OUTSIDE OF THE EMOGPA SHALL HAVE CHIPSEAL.
  - EMOGPA AND SMA ON THE EXPRESSWAY RAMP SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES - HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
Scale (A3) 1:2000					19.04.18	
					20.04.18	

\* Refer to Original Hardcopy for Signature

**NZ TRANSPORT AGENCY** WAKA KOTAHU

**Peka Peka to Otaki Expressway**

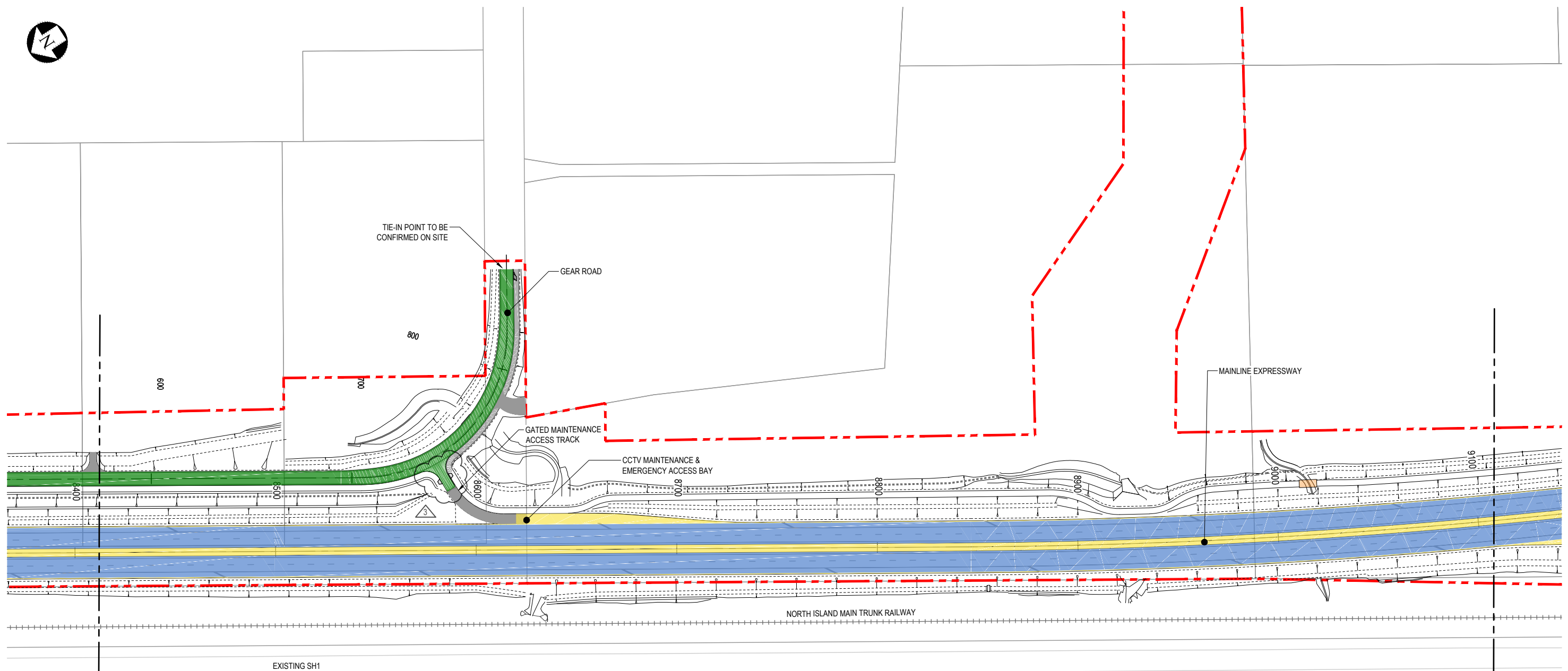
**Fletcher HIGGINS**

**BECA** **Tonkin+Taylor**

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1172
	SHEET 12 OF 18	Rev.:	3

**FOR CONSTRUCTION**

ORIGINAL IN COLOUR



SURFACING LEGEND:			
	EXPRESSWAY CHIPSEAL SURFACING		LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA		LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP		LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	EXPRESSWAY RAMPS 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

- NOTES:**
- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
  - REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
  - REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS.
  - FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
  - THE SURFACING AREAS SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. NOTES ARE ADDED TO SUPPLEMENT THE INFORMATION PROVIDED. ANY UNCERTAINTIES ABOUT SURFACING TYPES, SURFACING EXTENT OR LOCATION SHALL BE CLARIFIED WITH THE DESIGNER PRIOR TO CONSTRUCTION.
  - EMOGPA ON THE EXPRESSWAY SHALL COVER ALL TRAFFIC LANES AND:
    - UP TO 2.50m BEYOND THE EDGE LINE ON THE OUTSIDE SHOULDERS; AND
    - UP TO THE BARRIER ON THE HIGH SIDE OF THE OUTSIDE SHOULDER IN SUPERELEVATED CORNERS (AS INDICATED ON THE DRAWINGS); AND
    - UP TO 1.0m BEYOND THE MEDIAN EDGE LINE AT DEPRESSED MEDIANS; AND
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  - EMOGPA AND SMA ON THE EXPRESSWAY RAMPS SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

ORIGINAL IN COLOUR **FOR CONSTRUCTION**

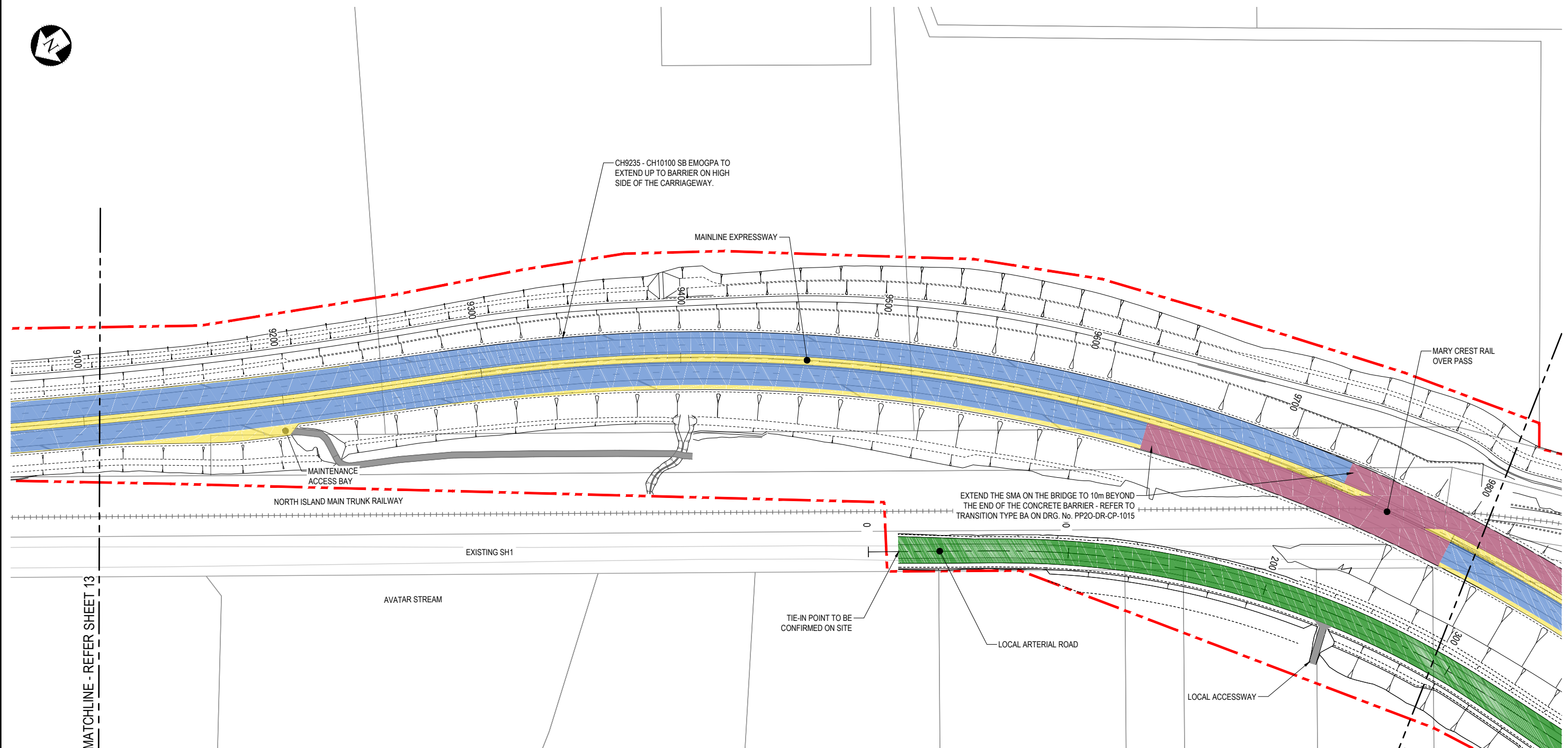
No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	ENTRANCE TO GATED MAINTENANCE ACCESS CHANGED FROM TYPE 5	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
1:1000 (A1)	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
1:2000 (A3)					20.04.18	

\* Refer to Original Hardcopy for Signature

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1173
	SHEET 13 OF 18	Rev.:	3





MATCHLINE - REFER SHEET 13

MATCHLINE - REFER SHEET 15

SURFACING LEGEND:			
	EXPRESSWAY CHIPSEAL SURFACING		LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA		LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP		LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	EXPRESSWAY RAMP 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

**NOTES:**

- REFER TO DRAWINGS PP20-DR-CP-1001 TO 1003 FOR SURFACING NOTES AND PSV REQUIREMENTS.
- REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
- REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS.
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- EMOGPA AND SMA ON THE EXPRESSWAY RAMP SHALL COVER THE FULL WIDTH OF THE RAMP CARRIAGEWAY UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

ORIGINAL IN COLOUR **FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES - HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
Scale (A3) 1:2000					19.04.18	
					20.04.18	

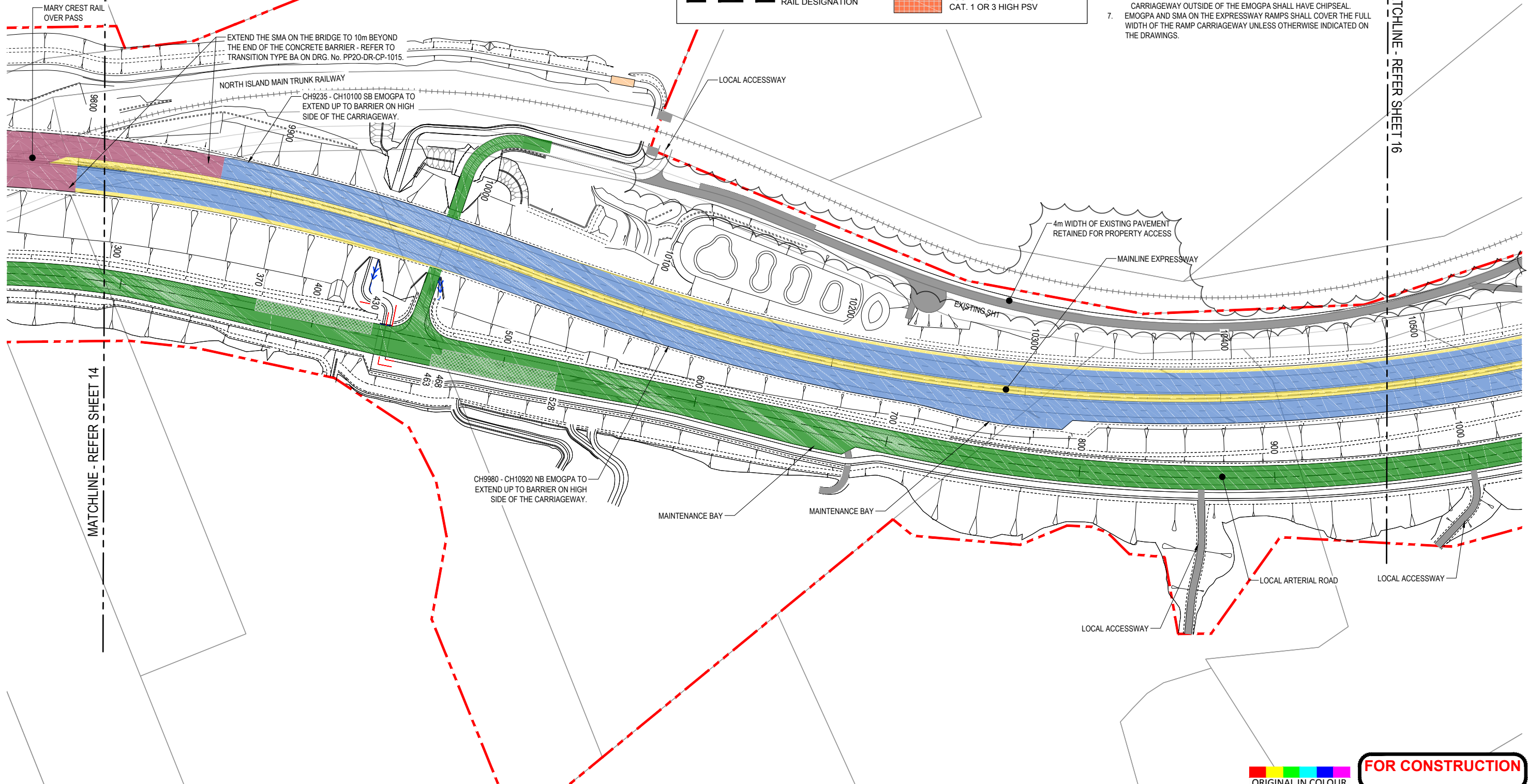
\* Refer to Original Hardcopy for Signature

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN SHEET 14 OF 18	Drawing No.:	PP20-DR-CP-1174
		Rev.:	3



SURFACING LEGEND:	
	EXPRESSWAY CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP
	EXPRESSWAY RAMPS 45mm SMA
	DESIGNATION BOUNDARY
	RAIL DESIGNATION
	LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	TYPE 5 - REFER TO NOTE 4
	LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

- NOTES:**
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  - REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
  - REFER TO DRAWINGS PP20-DR-CP-1061 TO 1078 FOR PAVEMENT LAYOUTS. FOR TYPE 5 SURFACING DETAILS REFER TO DRAWINGS PP20-DR-CP-1261 TO 1278.
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MATCHLINE - REFER SHEET 14

MATCHLINE - REFER SHEET 16

ORIGINAL IN COLOUR

**FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT AND LOCAL ARTERIAL DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES - HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Checked	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	23.06.17	S.Waters
Scale (A3) 1:2000				19.04.18	
				20.04.18	

\* Refer to Original Hardcopy for Signature

**Peka Peka to Otaki Expressway**

Subject:	PAVEMENTS AND SURFACING
Title:	SURFACING LAYOUT PLAN SHEET 15 OF 18

Discipline:	CIVIL
Drawing No.:	PP20-DR-CP-1175
Rev.:	3



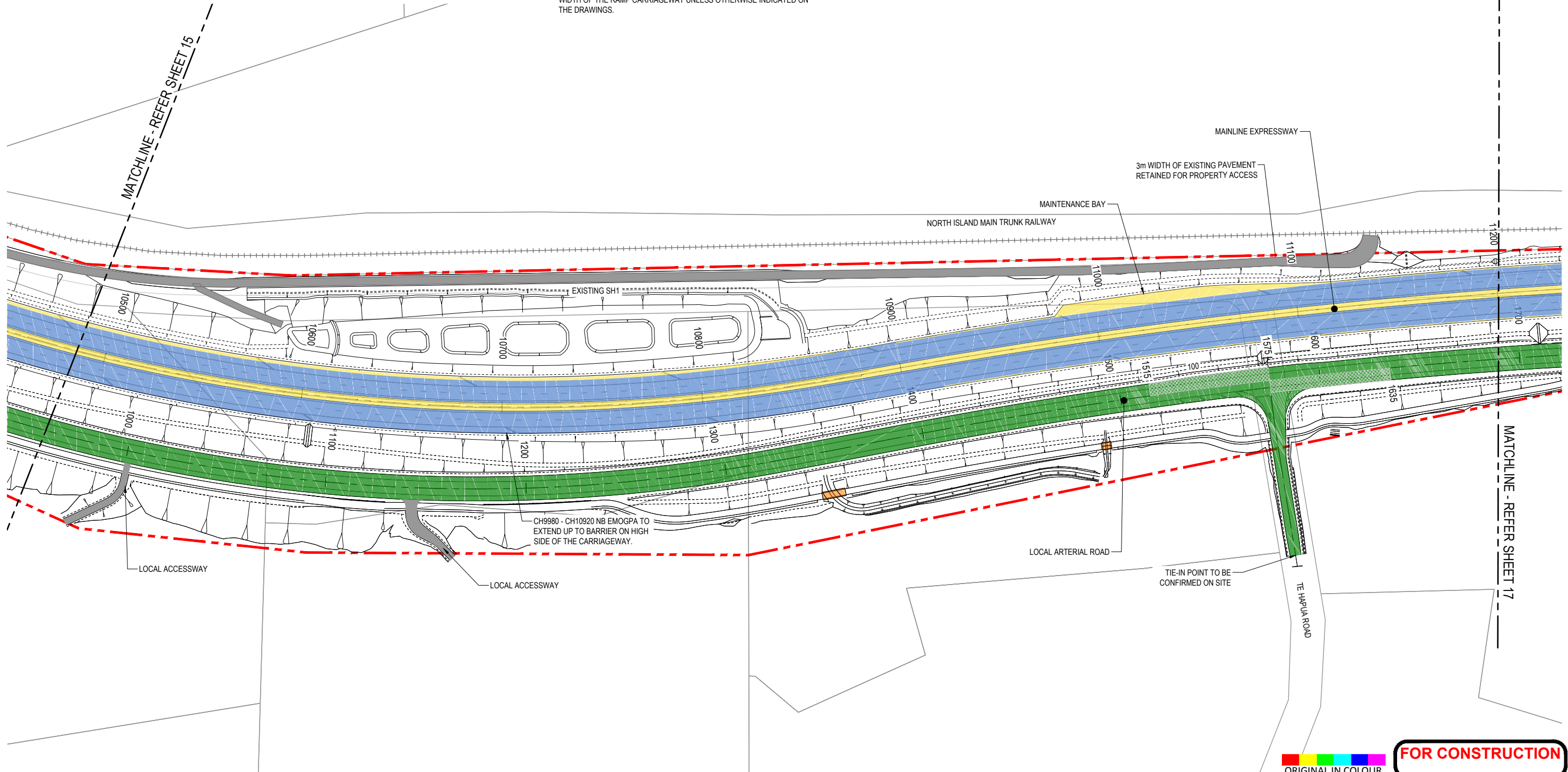


**SURFACING LEGEND:**

	EXPRESSWAY CHIPSEAL SURFACING		LOCAL ROAD HIGH PSV CHIPSEAL SURFACING
	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
	EXPRESSWAY EMOGPA		LOCAL ROAD 45mm SMA ON WATERPROOFING SEAL
	EXPRESSWAY EMOGPA CAT 3 HIGH PSV CHIP		LOCAL ROAD 45mm SMA TACK COAT ON STRUCTURAL ASPHALT
	EXPRESSWAY RAMPS 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

**NOTES:**

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- REFER TO DRAWINGS PP20-DR-CP-1011 TO 1023 FOR STANDARD PAVEMENT DETAILS.
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ORIGINAL IN COLOUR **FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
3	EXPRESSWAY PAVEMENT AND LOCAL ARTERIAL DESIGN UPDATED	AK	RT	SW	30.04.20
2	MINOR UPDATES. HOLDS REMOVED	RMT	RT	BS	25.06.18
1	ISSUED FOR CONSTRUCTION - LOCAL ROAD ELEMENTS ONLY	LW	RT	BS	13.03.18

Scale	Design	Drawn	Design	Drawn	Design	Drawn	Design	Drawn
Scale (A1) 1:1000	R.Theron	G.Down	23.06.17	23.06.17	23.06.17	23.06.17	23.06.17	23.06.17
Scale (A3) 1:2000	J.Hallett	G.Down	19.04.18	20.04.18	20.04.18	20.04.18	20.04.18	20.04.18

\* Refer to Original Hardcopy for Signature

**NZ TRANSPORT AGENCY** WAIKATO REGION

**Peka Peka to Otaki Expressway**

**Fletcher HIGGINS**

**BECA** **TFT** **Tonkin+Taylor**

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1176
	SHEET 16 OF 18	Rev.:	3

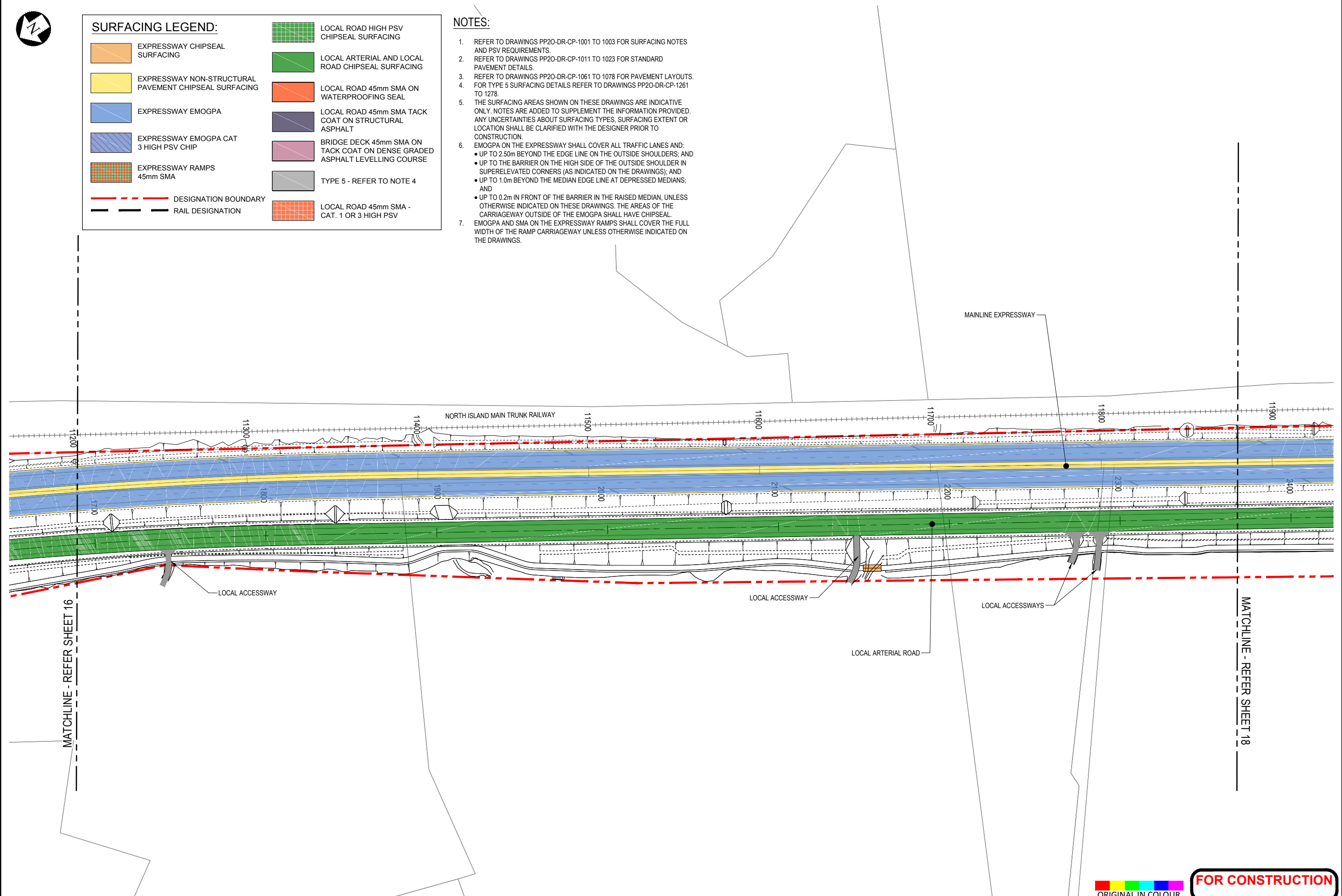


**SURFACING LEGEND:**

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	EXPRESSWAY NON-STRUCTURAL PAVEMENT CHIPSEAL SURFACING		LOCAL ARTERIAL AND LOCAL ROAD CHIPSEAL SURFACING
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	EXPRESSWAY RAMPS 45mm SMA		BRIDGE DECK 45mm SMA ON TACK COAT ON DENSE GRADED ASPHALT LEVELLING COURSE
	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
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Scale	Design	Drawn	Dwg Verifier	Dwg Check	Date	Approved For Construction
Scale (A1) 1:1000	R.Theron	G.Down	J.Hallett	G.Down	23.06.17	S.Waters
Scale (A3) 1:2000					19.04.18	
					20.04.18	20.04.18

\* Refer to Original Hardcopy for Signature

**Peka Peka to Otaki Expressway**

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN SHEET 17 OF 18	Drawing No.:	PP20-DR-CP-1177
		Rev.:	3

**FOR CONSTRUCTION**

ORIGINAL IN COLOUR

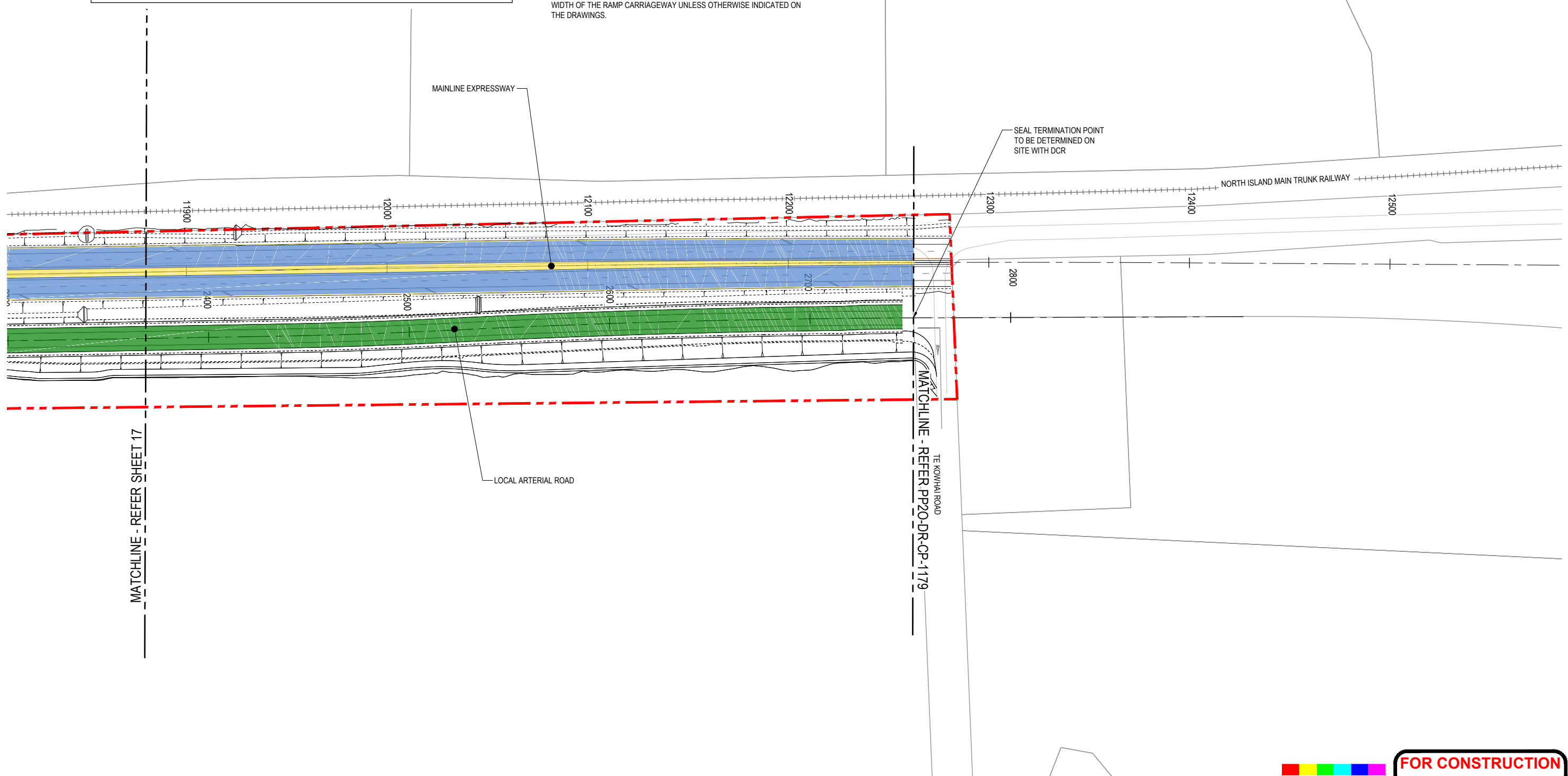


**SURFACING LEGEND:**

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	DESIGNATION BOUNDARY		TYPE 5 - REFER TO NOTE 4
	RAIL DESIGNATION		LOCAL ROAD 45mm SMA - CAT. 1 OR 3 HIGH PSV

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Scale (A3) 1:2000	G.Down	G.Down	G.Down	20.04.18	20.04.18

\* Refer to Original Hardcopy for Signature

Subject:	PAVEMENTS AND SURFACING	Discipline:	CIVIL
Title:	SURFACING LAYOUT PLAN	Drawing No.:	PP20-DR-CP-1178
	SHEET 18 OF 18	Rev.:	3

## Appendix F Noise Mitigation Assessment Matrix



<b>Project name</b>
PP20

Area	Area name	Noise mitigation options	
F	Cluster 6	A	varying height barrier up to 5m
	Old Hautere Road (10 PPF)	B	3m barrier (184m)
		C	3m barrier (90m)

Area	Area name	Noise mitigation options	
G	Cluster 7	A	varying height barrier up to 3.6m
	1070 SH1	B	3m barrier (107m)

Area	Area name	Noise mitigation options	
H	Cluster 8	A	4.8m barrier (229m)
	School Road (5 PPF)	B	2.4m barrier (114m)

Area	Area name	Noise mitigation options	
I	Clusters 9/10	A	use finest chip seal on Gear Road
	45, 91, 97 Gear Rd	B	Finest chip seal on Gear Rd and 3m barrier beside EW (761 m)

Area	Area name	Noise mitigation options	
J	Cluster 11	A	4m barrier (222m)
	82 Gear Rd	B	5m barrier (135m)

Area	Area name	Noise mitigation options	
K	Cluster 12	A	1.5m barrier (357m)
	35 Sutton and 42A School Rd		

Area	Area name	Noise mitigation options	
L	Cluster 13	A	5m barrier (252m)
	12 Dernham Rd		



# NZS 6806 – Assessment matrix

Project		Assessment area						
PP20		F - Cluster 6						
Assesment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the extent to which NZTA would need to acquire land, or interests in land	Property	It look like the only dwelling in this cluster that is Category B is owned by the Transport Agency. Suggest that no noise mitigation is required.	-- Land/space: Sufficient space available within designation Landowner/affected party approvals: 14 Old Hautere Road is owned by NZTA. Within designation however, scale of visual/amenity effect could require limited or public notification – a 5m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required – note that approval for a 5m structure may be very difficult to obtain. Other comment: 9 and 14 Old Hautere Road are owned by NZTA so all privately owned properties are already Cat A. I suspect no mitigation is required.	-- Land/space: Sufficient space available within designation Landowner/affected party approvals: 14 Old Hautere Road is owned by NZTA. Within designation however, scale of visual/amenity effect could require limited or public notification – a 3m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required Other comment: 9 and 14 Old Hautere Road are owned by NZTA so all privately owned properties are already Cat A. I suspect no mitigation is required.	-- Land/space: Sufficient space available within designation Landowner/affected party approvals: 14 Old Hautere Road is owned by NZTA. Within designation however, scale of visual/amenity effect could require limited or public notification – a 3m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required Other comment: 9 and 14 Old Hautere Road are owned by NZTA so all privately owned properties are already Cat A. I suspect no mitigation is required.			
Compliance with relevant safety standards and guidelines	Roading	No issues or risks. Noise wall is not adjacent to a road	+	+	+			
Public safety and security	Roading	Wall will be in between the shared path and the property boundaries.	+	+	+			
Constructability/technical feasibility	Stormwater	Minimal stormwater impact if on landscape bund	o	o	o			
Constructability/technical feasibility	Structures	Decent size walls – quite imposing. Would be piled.	--- 5m is very high. Varying heights would mean a few different designs.	--	-- long			
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	No Constructability or technical feasibility issues	+	+	+			
			Should be easy to construct	Should be easy to construct	Should be easy to construct			
Consistency with NZ urban design protocol	Urban design	- May be a visual barrier to sight lines to the designated southern sculpture zone - Views to the east, to the Tararua is a requirement in BOI. - Can the landscape bunding be increased / accommodated in this area to minimise a wall above the bunding? - The form, scale and appearance of any barriers will need to be considered closely, as will their association with planting to soften general appearance.	--- This would be a particularly bad outcome visually for the community and road users.	--- This would be a particularly bad outcome visually for the community and road users.	--- This would be a particularly bad outcome visually for the community and road users.			
Value for money, including maintenance costs and consideration	Acoustics		-- Benefit cost ratio 0.29	-- Benefit cost ratio 0.38	-- Benefit cost ratio 0.36			
Compliance with NZS 6806 noise criteria	Acoustics		+++ 10 PPFs in Category A	+	+			
Achievement of the NZS 6806 structural mitigation performance	Acoustics		-- 1 dB reduction achieved	-- 1.1dB reduction achieved	-- 0.7dB reduction achieved			
Requirement for building-modification measures	Acoustics		+++ No PPFs in Category C	+++ No PPFs in Category C	+++ No PPFs in Category C			

# NZS 6806 – Assessment matrix

Project		Assessment area						
PP20		G - Cluster 7						
Assessment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the compliance with relevant safety standards and guidelines	Property	There is no longer a dwelling at this property. It was removed to allow construction of Winiata Link.	There is no dwelling here. Noise mitigation is not required.	There is no dwelling here. Noise mitigation is not required.				
	Roading	The noise wall for Option A is adjacent to the cul de sac head. The cul de sac diameter or location may need changing	- Option A is adjacent to the Winiata cul de sac turning head. It has been designed for a 10m rigid truck to perform a u-turn as per KCDC requirements for a rubbish truck. The noise wall will push all the earthworks east and the earthworks are already right up against the designation. The cul de sac turning head diameter may need to be reduced outside of KCDC standards or the stormwater swale may need to be piped and a retaining wall maybe required.	+ No issues or risks for roading				
Public safety and security	Roading	No issues or risks. Noise wall located in between mainline and landscape bund so no safety concerns	+ No issues or risks for roading	+ No issues or risks for roading				
Constructability/technical feasibility	Stormwater	Minimal stormwater impact if on landscape bund	o	o				
Constructability/technical feasibility	Structures	Decent size walls. Would be piled.	- Varying heights would mean a few different designs, however better transition-wise.	-				
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	Option A will increase the earthworks in a pinch point location	- Option A requires a concrete noise wall adjacent to the Winiata cul de sac turning head. The earthworks in this location are already right up against the designation boundary. Pushing the cul de sac east will affect the stormwater swale which may need to be piped and possibly a retaining wall be introduced.	+ No traffic issues with this option				
Consistency with NZ urban design protocol	Urban design	- Views to the east, to the Tararua is a requirement in BOI. - Large and long concrete walls are inconsistent with materials / structures in the existing landscape and road corridor - Can the landscape bunding be increased / accommodated in this area to minimise the height of a wall above the bunding?	- - - This would be a particularly bad outcome visually for the community and road users.	- - - This would be a poor outcome visually for the community and road users.				
Value for money, including maintenance costs and consideration	Acoustics		- - - Benefit cost ratio 0.18	- - - Benefit cost ratio 0.19				
Compliance with NZS 6806 noise criteria	Acoustics		+ + + 1 PPF in Category A	+ 1 PPF in Category B				
Achievement of the NZS 6806 structural mitigation performance	Acoustics		o 2.8 dB reduction achieved	- 2.3 dB reduction achieved				
Requirement for building-modification measures	Acoustics		+ + + No PPFs in Category C	+ + + No PPFs in Category C				



# NZS 6806 – Assessment matrix

Project		Assessment area						
PP20		H - Cluster 8						
Assesment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the extent to which NZTA would need to acquire land, or interests in land	Property		<p>---</p> <p>Land /space: Wall on landscape bund so space available. Landowner /affected party approvals: Within designation so landowner approval not required; however, scale of visual/amenity effect could require limited or public notification – a 5m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required – note that approval for a 5m structure may be very difficult to obtain. Other comment:</p>	<p>-</p> <p>Land /space: Wall on landscape bund so space available. Landowner /affected party approvals: Within designation so landowner approval not required; however, scale of visual/amenity effect could require limited notification Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required Other comment:</p>				
Compliance with relevant safety standards and guidelines	Roading	Noise fence for option A behind the landscape bund so no issues. Noise fence for Option B is adjacent to Gear Road and Close to School Road so may need barrier	<p>+</p> <p>Option A noise fence is behind the landscape bund so no barrier required</p>	<p>-</p> <p>Option B noise fence is adjacent to Gear Road and is near School Road so may need protecting with a barrier. The barrier may also reduce sight lines around the inside of the corner on approach to the School Gear intersection</p>				
Public safety and security	Roading		<p>+</p> <p>No issues</p>	<p>-</p> <p>Adding barrier to the roadside introduces a hazard to hit. So this reduces safety.</p>				
Constructability/technical feasibility	Stormwater		<p>o</p> <p>Minimal stormwater impact if on flood bund provided doesn't compromise water tightness of bund</p>	<p>- -</p> <p>Potential clash purple property, Chorus cabinet, swale, and overland flow paths.</p>				
Constructability/technical feasibility	Structures		<p>- - -</p> <p>Very high, imposing wall. Would be piled.</p>	<p>o</p> <p>may need design if higher than a standard gwrc fence allows.</p>				
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	Option A may cause earthwork issues near the School and Gear Intersection Option B is in a purple property	<p>-</p> <p>There is room to move Gear Road east if required except for the very northern end where the alignment is restricted by a Chorus box. A retaining wall or steepened slopes may be required to accommodate the concrete fence footprint</p>	<p>- - -</p> <p>The noise fence is shown in a purple property. We are not allowed to construct inside the purple property. If constructed right on the inside of the corner, outside the purple property this will introduce the need for barriers and may reduce sight distance lines. The noise fence will also need to avoid the chorus chamber on the corner</p>				
Consistency with NZ urban design protocol	Urban design	<ul style="list-style-type: none"> <li>- Views to the east, to the Tararua is a requirement in BOI. This would be contrary to these requirements.</li> <li>- Can the landscape bunding be increased / accommodated in this area to minimise the height of a wall above the bunding?</li> </ul>	<p>- - -</p> <p>This would be a particularly bad outcome visually for the community and road users.</p>	<p>-</p> <p>2.4m timber barrier is better than a 4.8 concrete wall BUT would be inconsistent with materials / structures in the existing landscape and road corridor - Some landscape treatment may help to mitigate the visual appearance of the barrier</p>				
Value for money, including maintenance costs and consideration	Acoustics		<p>- - -</p> <p>Benefit cost ratio 0.12</p>	<p>- - -</p> <p>Benefit cost ratio 0.09</p>				
Compliance with NZS 6806 noise criteria	Acoustics		<p>+</p> <p>4 PPFs in Category A, 1 PPF in Category B</p>	<p>+</p> <p>2 PPFs in Category A, 3 PPFs in Category B</p>				
Achievement of the NZS 6806 structural mitigation performance	Acoustics		<p>- -</p> <p>1.2dB reduction achieved</p>	<p>- -</p> <p>0.6dB reduction achieved</p>				
Requirement for building-modification measures	Acoustics		<p>+ + +</p> <p>No PPFs in Category C</p>	<p>+ + +</p> <p>No PPFs in Category C</p>				

# NZS 6806 – Assessment matrix

Project		Assessment area						
PP2O		I - Clusters 9/10						
Assessment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the extent to which NZTA would need to acquire land, or interests in land	Property		Land/space: NA – change of pavement type only Landowner/affected party approvals: NA but assume KCDC agreement required as they will take over the local road Maintenance: No access issues but would require KCDC agreement if finer chip would have different maintenance requirements Planning approvals: NA – change of pavement type only Other comment: The Transport Agency appear to own 45 and 91 Gear Road so I'm not sure that mitigation is required.	Land/space: Wall on landscape bund so space available. Within designation so landowner approval not required; scale of visual/amenity effect could require limited notification – but appears all properties along Gear Road between 17 and 91 are owned by the Transport Agency. Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required Other comment: The Transport Agency appear to own 45 and 91 Gear Road so I'm not sure that mitigation is required (97 is Category A anyway)				
Compliance with relevant safety standards and guidelines	Roading	Suggest Riaan provides feedback on asphalt surfacing on Gear Road. Will asphalt provide enough skid	+	+				
Public safety and security	Roading	Suggest Riaan provides feedback on asphalt surfacing on Gear Road. Concrete barrier for option B is less forgiving than wire rope barrier	Check with Riaan	Barrier to be added to mainline to protect noise wall				
Constructability/technical feasibility	Stormwater		o	o				
		Minimal stormwater impact if on landscape bund. Type of seal not a concern provided no change in total sealed area.		Minimal stormwater impact if on landscape bund. Type of seal not a concern provided no change in total sealed area.				
Constructability/technical feasibility	Structures		+++ no structure	- decent size wall, probably piled.				
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	Concrete barrier adjacent to Expressway increases footprint at the pinch point of School and Gear Road Intersection	+	--				
			Should be easy to construct but more expensive	3m barrier beside the expressway will widen the verge and the earthworks. There is a pinch point at the Gear and School Road intersection due to the Chorus Chamber and purple property. It is very tight here and will be hard to fit everything in without design compromises				
Consistency with NZ urban design protocol	Urban design	- Views to the east, to the Tararua is a requirement in BOL. This would be contrary to these requirements. - Large and long timber walls are inconsistent with materials / structures in the existing landscape and road corridor	+++	---				
Value for money, including maintenance costs and consideration	Acoustics		---	---				
			Benefit cost ratio 0.02	Benefit cost ratio 0.05				
Compliance with NZS 6806 noise criteria	Acoustics		+	+				
			1 PPF in Category A, 2 PPFs in Category B	2 PPFs in Category A, 1 PPF in Category B				
Achievement of the NZS 6806 structural mitigation performance	Acoustics		---	-				
			0.4dB reduction achieved	2dB reduction achieved				
Requirement for building-modification measures	Acoustics		+++	+++				
			No PPFs in Category C	No PPFs in Category C				

# NZS 6806 – Assessment matrix

Project		Assessment area						
PP20		J - Cluster 11						
Assesment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the extent to which NZTA would need to acquire land, or interests in land	Property		Land/space: Sufficient space available Landowner/affected party approvals: Within designation so landowner approval not required; however, scale of visual/amenity effect could require limited or public notification – a 4m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required – note that approval for a 4m structure may be difficult to obtain. Other comment:	Land/space: Sufficient space available Landowner/affected party approvals: Within designation so landowner approval not required; however, scale of visual/amenity effect could require limited or public notification – a 5m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required – note that approval for a 5m structure may be very difficult to obtain. Other comment:				
Compliance with relevant safety standards and guidelines	Roading	Concrete barrier required if noise wall is adjacent to mainline	- Concrete barrier required in front of noise wall	- Concrete barrier required in front of noise wall				
Public safety and security	Roading	Concrete barrier less forgiving than wire rope barrier	-- Concrete barrier is a rigid barrier system and therefore impact energy is increased. Option A is longer than option B so is less preferable	- Concrete barrier is a rigid barrier system and therefore impact energy is increased. Option B is preferred shorter option				
Constructability/technical feasibility	Stormwater		-- Potential clash with Culvert 36, swale and Gear Stream. May need extra swale to convey overland flow blocked by wall	-- Potential clash with Culvert 36, swale and Gear Stream. May need extra swale to convey overland flow blocked by wall				
Constructability/technical feasibility	Structures	Decent size walls – quite imposing. Would be piled.	-- high and long	-- high and long				
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	No construction or technical feasibility issues, there is room to increase earthworks to the east.	+ No construction or technical feasibility issues	+ No construction or technical feasibility issues				
Consistency with NZ urban design protocol	Urban design	- Views to the east, to the Tararua is a requirement in BOI. This would be contrary to these requirements. - Large and long concrete walls are inconsistent with	-- This would be a particularly bad outcome visually for the community and road users.	-- This would be a particularly bad outcome visually for the community and road users.				
Value for money, including maintenance costs and consideration	Acoustics		-- Benefit cost ratio 0.05	-- Benefit cost ratio 0.06				
Compliance with NZS 6806 noise criteria	Acoustics		+ 1 PPF in Category B	+ 1 PPF in Category B				
Achievement of the NZS 6806 structural mitigation performance	Acoustics		- 1.8dB reduction achieved	- 1.9dB reduction achieved				
Requirement for building-modification measures	Acoustics		+++ No PPFs in Category C	+++ No PPFs in Category C				

# NZS 6806 – Assessment matrix

Project		Assessment area						
PP20		K - Cluster 12						
Assesment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the extent to which NZTA would need to acquire land, or interests in land	Property		Assuming this is a road edge barrier – no property, maintenance access, or planning approval issues. Other comment: The Transport Agency appear to own 35 Sutton Road so I'm not sure that mitigation is required.					
Compliance with relevant safety standards and guidelines	Roading	Concrete barrier required if noise wall is adjacent to mainline	- Concrete barrier required in front of noise wall					
Public safety and security	Roading	Concrete barrier less forgiving than wire rope barrier	- Concrete barrier is a rigid barrier system and therefore impact energy is increased.					
Constructability/technical feasibility	Stormwater	Expressway flow is towards median drain if wall is located on edge of Expressway should be ok, will need to make sure flow in front of the wall falls to the road	o Expressway flow is towards median drain if wall is located on edge of Expressway should be ok, will need to make sure flow in front of the wall falls to the road					
Constructability/technical feasibility	Structures		o relatively simple, shouldn't need to be piled.					
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	Increased earthworks footprint from noise wall pushes outside designation	- The increased width for concrete barrier and noise wall will increase the earthworks footprint. The earthworks are close to the designation at this location so further measures such as steepened geotech reinforced slopes maYbe required to stay within designation					
Consistency with NZ urban design protocol	Urban design		- - - This would be a particularly bad outcome visually for the community and road users.					
Value for money, including maintenance costs and consideration	Acoustics		- - - Benefit cost ratio 0.04					
Compliance with NZS 6806 noise criteria	Acoustics		+ + + 2 PPFs in Category A					
Achievement of the NZS 6806 structural mitigation performance	Acoustics		- - 1.3dB reduction achieved					
Requirement for building-modification measures	Acoustics		+ + + No PPFs in Category C					

# NZS 6806 – Assessment matrix

Project		Assessment area						
PP20		L - Cluster 13						
Assessment criteria	Discipline	Issues / Risks	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Availability of sufficient land for construction and maintenance and the extent to which NZTA would need to acquire land, or interests in land	Property		Land/space: Within designation so space available but appears to clash with stormwater infrastructure. Landowner/affected party approvals: Within designation so landowner approval not required; however, scale of visual/amenity effect could require limited or public notification – a 5m concrete wall would be a significant structure in the rural zone Maintenance: Within designation so no maintenance access issues Planning approvals: Authorisation of new structure would be required – note that approval for a 5m structure may be difficult to obtain. Other comment: Themitigation options drawing says this is a 3m wall but the summary sheet and noise calc both show 5m so					
Compliance with relevant safety standards and guidelines	Roading	Concrete barrier required if noise wall is adjacent to mainline	- Concrete barrier required in front of noise wall					
Public safety and security	Roading	Concrete barrier less forgiving than wire rope barrier	- Concrete barrier is a rigid barrier system and therefore impact energy is increased.					
Constructability/technical feasibility	Stormwater	Depending on location will block flow from reaching swale either from Local Arterial Rd or from the area between the mainline and arterial road.	-					
Constructability/technical feasibility	Structures	Decent size wall – quite imposing. Probably piled.	-- is this 3m (drawing) or 5m (summary sheet)?					
Compliance with relevant safety standards and guidelines	Structures							
Constructability/technical feasibility	Traffic	Noise wall and associated barrier may cause sight distance issues on Local Arterial Road if located on inside of the curve. If located on mainline there should be no problems constructing it	o If noise wall is on inside of curve on Local Arterial Road it will reduce sight distances so will need to be offset from the road to avoid this. If adjacent to the mainline then this should not be a problem.					
Consistency with NZ urban design protocol	Urban design	– Highly sensitive ecological and landscape amenity area – Large and long concrete walls are inconsistent with materials / structures in the existing landscape and road corridor	-- This would be a particularly bad outcome visually for the community and road users.					
Value for money, including maintenance costs and consideration	Acoustics		-- Benefit cost ratio 0					
Compliance with NZS 6806 noise criteria	Acoustics		+ 1 PPF in Category B					
Achievement of the NZS 6806 structural mitigation performance	Acoustics		-- 0.3dB reduction achieved					
Requirement for building-modification measures	Acoustics		+++ No PPFs in Category C					