# 4 Options for Providing a SH1 Expressway North of Waikanae

Between Pukehou Bridge and Peka Peka an alignment for a four lane expressway has been approved by the NZTA Board (formerly Transit NZ). The preliminary design, prepared by Maunsell in 2002, closely follows the rail corridor. In the scheme assessment report[3] the preferred alignment is referred to as the "enhanced eastern alignment". The preferred alignment as presented in the Scheme Assessment report is shown in Appendix A. The board approved this alignment with changes to the form of interchanges. The alignment adopted by the then, Transit NZ Board is shown in Appendix A.

In each, the expressway follows the eastern side of the railway. South of Te Horo, the expressway crosses the railway to follow the existing SH1 alignment on the western side. The preferred alignment involves closure of all side roads and the provision of grade separated interchanges and / or local connections across SH1 at strategic locations. No at-grade connections to the expressway are proposed. Service roads would provide access to local roads.

The cross section for the proposed expressway north of Peka Peka is consistent with that proposed south of Peka Peka[4]. This chapter describes the expressway design. It also presents the findings of a review that aimed to update:-

- the Maunsell cost estimate;
- the transport economic efficiency benefit forecasts; and
- whether the project could be staged to maximise return on investment.

## 4.1 SH1 Expressway Alignment between Pukehou Bridge and Peka Peka

This section describes the alignment adopted by the NZTA board (see Appendix A). The expressway passes to the east of the Otaki retail village. The old SH1 would continue to provide access to these shops. Motorists travelling on the new SH1 expressway towards Wellington or Levin would be able leave the expressway to access Otaki shops. Within Otaki, a minor realignment of the railway is required to minimise the overall effects of the expressway.

**Interchanges**

Maunsell recommended the provision of interchanges at:

- Peka Peka Road (full diamond),
- Gear Road, Te Horo (full diamond);
- Otaki Gorge Road, (a north and southbound exit ramp) and
- at Otaki (a three-quarter interchange without a northbound exit ramp).

[3] North Otaki to Peka Peka Road Scheme Assessment Report, Contract TNZ 114PN, Maunsell, Sept 2002
[4] See Chapter 3, Kapiti SH1 Strategy Scoping Report, Opus, July 2008

**Structures**

The alignment adopted by the Transit NZ Board includes a new bridge north of Otaki, close to the site of the existing SH1 rail overbridge. This new bridge will carry the old SH1 over the new expressway and the existing NIMT railway. Other connections across the railway and the expressway are provided at:

- Te Horo, linking Te Horo Beach Road and School Road over the expressway; and
- south of the Otaki River, linking Addington Road and Otaki Gorge Road under the expressway.

Two new bridges carrying the four lane SH1 expressway are required:

- to cross the Otaki River; and
- to cross the NIMT railway immediately to the south of Te Horo.

**Local Access**

Between Otaki and Te Horo, the old state highway would become a local north-south arterial, providing access to adjacent properties and local access roads. In this section, only a limited number of new service roads would need to be provided. South of Te Horo, the expressway will be built on the existing SH1 and a new service road would be built on its western side.

## 4.2 Opus Design Review

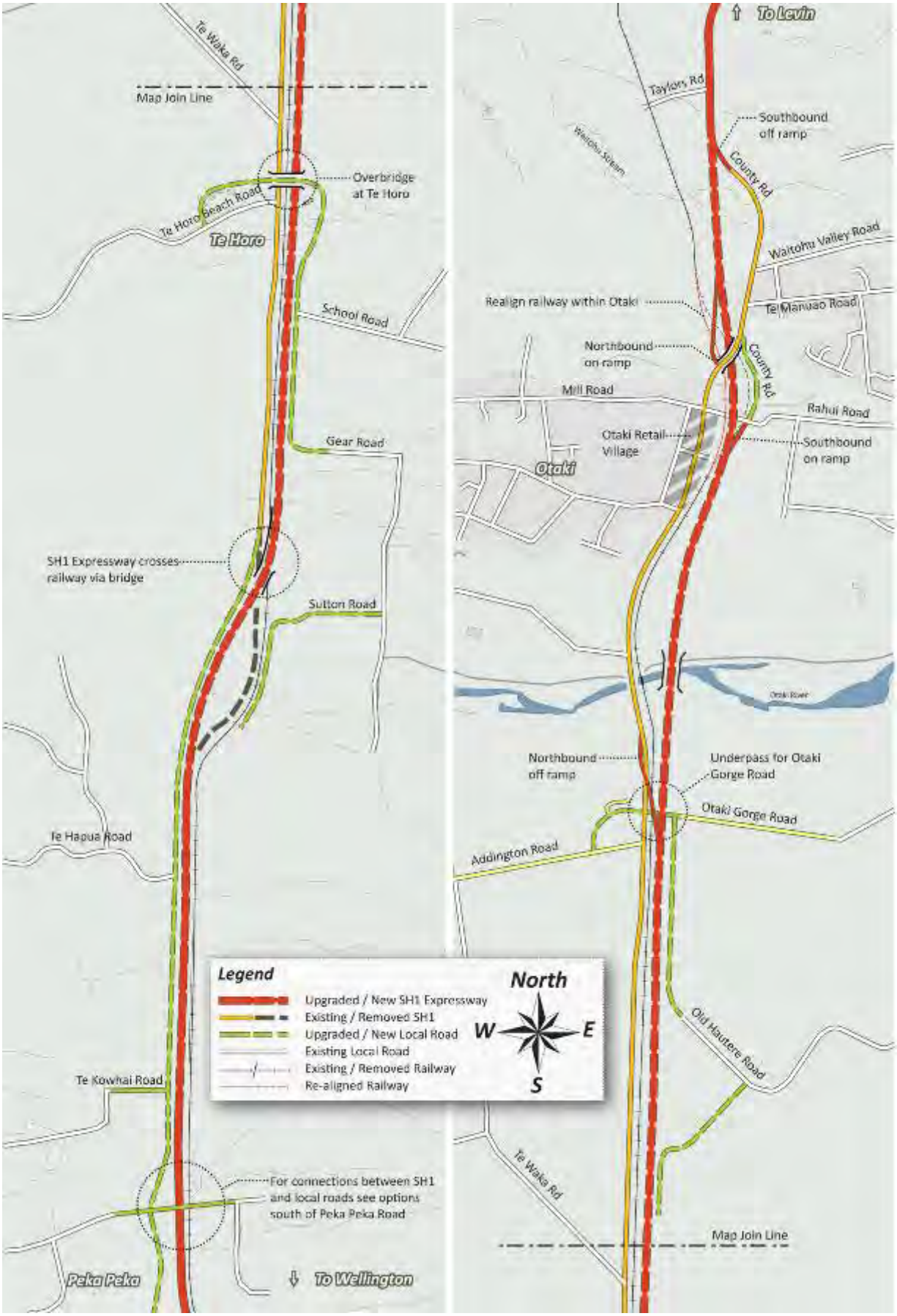
The project team reviewed the adopted alignment and recommended several changes. The alignment we recommended was taken to public consultation is shown in Figure 4.1, below. Appendix A includes the approved alignment developed by Maunsell, revised to reflect our recommendations.

The project team felt that the provision of several interchanges within 4km is excessive for an area that is basically rural. We concluded that the interchange at Te Horo could be eliminated as long as a direct east-west link under the expressway, rail and SH1 is constructed between Otaki Gorge and Addington Road.

We also concluded that the southbound exit ramp at Otaki Gorge Road could be removed. Motorists travelling on the expressway from north of Otaki to Otaki Gorge Road could instead leave the expressway north of Otaki and use the old SH1 to travel to Otaki Gorge Road.

The recommended alignment would have motorists travelling from Otaki Gorge Road, towards Wellington would join the expressway at Peka Peka Road. It would be possible to provide a southbound entry slip from Otaki Gorge Road. If this were provided it would not be necessary to also provide an entry ramp from County Road in Otaki. The preferred location should be investigated further in a Scheme Assessment.

**Figure 4.1 – Preferred Expressway Alignment between Pukehou Bridge & Peka Peka**



In the recommended option (see Figure 4.1 and Appendix A) motorists travelling from Te Horo or Otaki to the north (e.g. Levin) would join the expressway north of Otaki. When returning they would be able to leave the expressway north of Otaki and drive to their homes using the old SH1. These journeys would be no longer than they are at present.

People travelling from this part of the study area to the Wellington would be able to use an interchange north of Waikanae. Ideally such an intersection would be located outside the Waikanae urban area. It would need to provide south facing ramps. Options for an intersection north of Waikanae are described in chapter 5.

In summary the changes to the alignment adopted by the NZTA Board are:

(a) remove Te Horo Intersection but provide an overbridge;

(b) remove the southbound exit ramp at Otaki Gorge Road; and

(c) provide for all movements (e.g. full diamond) at an interchange north of Waikanae.

### Staging

The opportunity for staging construction of this section was also assessed. The majority of the transport economic efficiency benefits result from the ability for motorists to bypass Otaki. To avoid costs and delays associated with a bridge over the Otaki River, an Otaki bypass would need to reconnect with the existing SH1 alignment north of the river. The limited space and constraints associated with the location of the NIMT railway mean that this is not geometrically feasible. The section from Pukehou Bridge to Peka Peka must therefore be treated as one stage.

### Cost Estimate

An indication of the costs for upgrading the existing SH1 alignment was estimated using a parameter based approach. The parameters were developed from a database of detailed design estimates and outcome costs for completed projects. Appendix B documents the parameter values and other assumptions used in developing the estimate. Table 4.1 presents our estimate of the indicative costs for providing an expressway between Peka Peka and Pukehou Bridge.

**Table 4.1 – Indicative Cost Estimates (2009 Prices)**

| | Cost Indication ($ Millions) | |
|---|---|---|
| **Option** | **Expected** | **95%ile** |
| Alignment Approved by Transit NZTA Board | 215 | 355 |

## 4.3 Forecast Transport Economic Efficiency Benefits

Traffic forecasts and transport economic efficiency calculations for SH1 between Peka Peka and Pukehou Bridge were developed using spreadsheet analysis. The following data was used as inputs to these calculations:

- traffic count data from NZTA's monitoring database;
- crash history data for the existing highway from the NZTA Crash Analysis System;
- Weekday AM, Inter and PM Peak period travel times (June 2009); and,
- Weekend and holiday peak period journey times (October 2008).

Neither the Wellington (Regional) Transport Strategic Model (WTSM) nor the Kapiti SATURN model are able to accurately forecast traffic flows on SH1 north of Peka Peka. Instead traffic growth included in the Kapiti SATURN model for SH1 between Waikanae and Peka Peka was used. The benefit forecasts therefore assume that SH1 traffic will increase by 2.2% between 2009 and 2016 and by 0.9% between 2016 and 2026. These are conservative growth projections. Table A2.5 of the NZTA Economic Evaluation Manual (EEM) Part 1 specifies 2% per annum for a rural strategic highway in the Wellington Region. The effect of this assumption was challenged using a sensitivity test.

**Traffic Benefits**

On the basis of the growth forecasts and using the recorded traffic data the following performance statistics were forecast for 2009, 2016 and 2026 for both the do nothing and option:

- Traffic Flow (Veh/h);
- Journey Time (seconds);
- Speed (km/h);
- Travel Time (Veh-hrs/h);
- Congestion Relief (Veh-hrs/h); and
- Travel Distance (Veh-km/h).

Performance statistics were forecast on the basis that average operating speeds for the expressway would be 105km/h. The forecasts indicate that traffic volumes would be well below the capacity of the new expressway in 2026 and the preceding years. This would mean that there would be no congestion and that motorists would be able to drive at or close to the speed limit and overtake slower vehicles at will.

Currently it takes just over four minutes to drive through Otaki between Addington Road and Taylors Road. On Friday evenings or public holidays the same trip can take significantly longer. An expressway would enable motorists to legally drive at speeds of up to 100kmph and would accommodate higher traffic volumes than at present. It is expected the expressway would enable motorists to drive between Addington Road and Taylors Road in approximately two and a half minutes.

**Crash Benefits**

The crash saving was forecast by assuming that particular types of crashes would be eliminated as a result of the new expressway. The validity of this assumption was tested by comparing the results against a crash rate forecast. The crash reduction percentages used in this assessment were found to be conservative. They are however appropriate for a strategy study. The following crash savings were applied to the historic crash record:

- 100% Head On;
- 100% U-Turn;
- 40% Fatal, 30% Serious, 10% Minor, 10% Non-Injury for Loss of Control, Changing Lanes, Overtaking;
- 100% Pedestrian (only 1 minor pedestrian crash observed);
- 100% Train Related;
- 100% Parking Related;
- 25% Reduction for miscellaneous (trailer loss of control/hitting misc. objects) due to improved geometrics; and
- 50% Manoeuvring, Turning, Rear-End.

**Transport Economic Efficiency Benefits**

Net present value (NPV) benefits for the project are shown in Table 4.2, below. Detailed results of the transport benefits are included as Appendix C.

**Table 4.2 – Peka Peka to North of Otaki NPV Benefits**

| Description | NPV Benefits ($ Millions) |
|---|---|
| Travel Time | 60.5 |
| Congestion Relief | 1.3 |
| Vehicle Operating | -25.3 |
| Accidents | 56.0 |
| Carbon Dioxide (4% of VOC) | -1.0 |
| **Total NPV Benefits** | **91.5** |

**Transport Economic Efficiency**

Although significant benefits are forecast to result from the scheme over the 30 year benefit period, they are not sufficient to cover the expected costs. A BCR of between 0.5 and 0.9 is forecast.

In the main assessment an annual 2.2% traffic growth rate is assumed in the early years to 2016, with 0.9% per annum assumed thereafter. If traffic growth is assumed as the EEM default for Wellington Region (2% per annum) a slightly higher BCR of between 0.6 and 1.0 is forecast (see Appendix C).