3 Design Considerations

This section outlines the design considerations, key planning opportunities and the constraints that will be used to guide the formulation of a robust strategy for developing State Highway 1 through the Kapiti Coast. Much of the assessment undertaken thus far has been generic. As the project is progressed a more detailed assessment will be completed as improvement options are identified.

3.1 Engineering Design

To help identify potential alignments for SH1, the project team has reviewed design standards and development policies in order to develop generic design criteria[2]. These will be used during the design process to assess the design and constructability of potential options as well as their alignment with planning opportunities and constraints. In developing these design criteria the following have been considered:

- Design standards for expressways;
- Access to existing and upgraded railway stations in Paraparaumu and Waikanae;
- Proposed duplication of the NIMT between MacKays Crossing and Waikanae;
- Access to and from and across SH1;
- The interface with adjacent development;
- The effect of the alignment on existing services.

The following text documents the key assumptions made in finalising the design criteria.

3.1.1 Standards / Guidelines

Initial work is based on the assumption that horizontal alignments will be designed to expressway standard with grade separated intersections. Alignments will be based on Austroads guidance and on Transit NZ geometric standards for roads with 100km/hr posted speed limit. Where short term solutions or options are developed designs will be prepared in accordance with the existing speed environment. These locations will be highlighted in the evaluation and reporting process.

The Transit NZ Geometric Design Manual specifies higher vertical alignment standards than Austroads. The vertical alignment that will be used is based upon a posted speed limit of 100 km/hr. The gradient on SH1 will not exceed 3% except where local roads pass over SH1 where a maximum 10% grade will be used. Designs will also aim to ensure that the gradient of new local roads associated with the design does not exceed 10%.

A minimum clearance of 5m will be provided beneath SH1 where it passes over local roads. Where SH1 must pass under local roads, our designs will maintain 6m clearance

[2] A full list of Design Guides is included in Appendix A

3.1.2 Cross-section

A desirable and a minimum cross section have been developed to help determine the most appropriate alignment options for SH1. These cross sections are illustrated in Figure 3.1 and Figure 3.2 respectively. Both cross sections assume two lanes in each direction. This is consistent with the project brief and with designs for state highway improvement projects to the north. The differences between the cross sections relate to the width of the clear zones, shoulders and central median.

Figure 3.1 – Desirable SH Cross Section

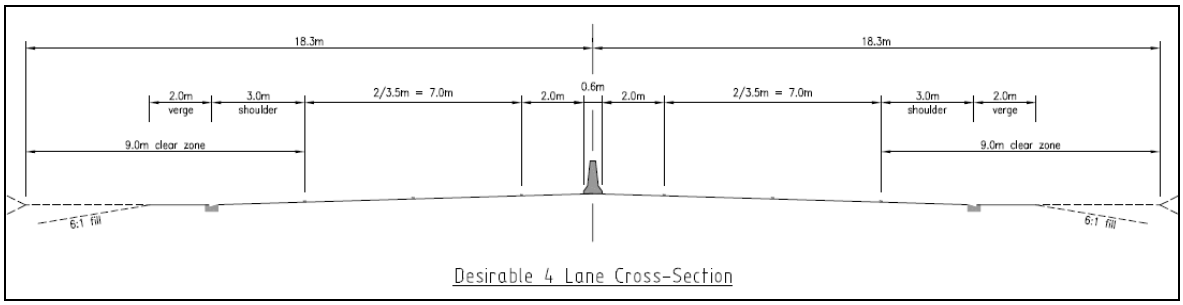
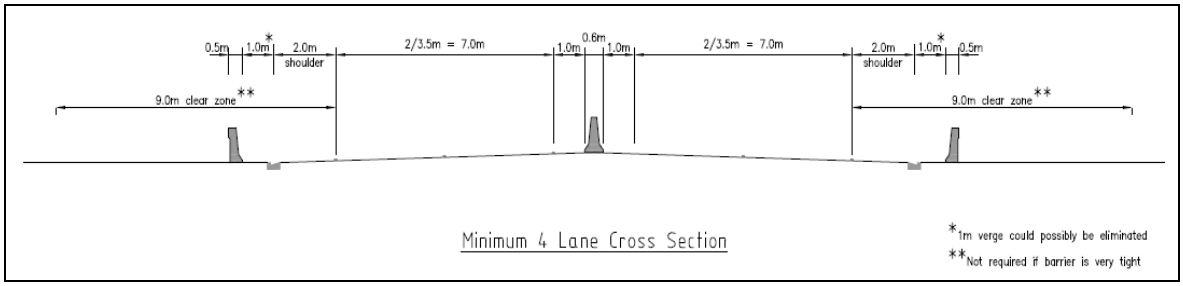


Figure 3.2 – Minimum SH Cross Section



Initial work has tested each of the cross sections for the existing SH1 alignment which runs adjacent to the NIMT railway for some length. This assessment has identified several locations where it is not possible to provide the desirable separation between the road and the railway. To minimise the risk and potential severity of motor vehicle incursion onto the railway, a 13m clearance is needed between the road edge line and the centre line of the rail track[3]. Should the existing alignment be maintained, this separation would need to be reduced to 4m and appropriate barrier protection installed in order to provide four traffic lanes.

Where re-alignment of local roads is identified as necessary, new carriageway will be designed to the existing standard. New one-way service lanes are generally based on a cross section consisting of 10m (including footpath, parking, through lane and shoulder). Two-way service road would be designed for a 16m cross section. Designs may deviate

[3] 9m clear zone from the white edge line a appoint 4m from the centreline of the nearest railway track.

from these cross sections in order to reflect the need to provide for pedestrians and cyclists and / or for waiting and loading associated with retail activity.

3.1.3 Intersection Design Options

Intersection design is largely driven by the form and functionality of the proposed state highway. Given the assumption that SH1 within the study area will be consistent with work undertaken north and south of this location and the form will be an expressway design, it is expected that grade separated intersections will provide the preferred solution.

This does not preclude the study looking at other options, such as at-grade large roundabouts or traffic signals. These options may offer staged benefits prior to the complete scheme being developed.

Each of the intersections will be assessed and designed in order to maximise performance, match the demands of particular links and achieve provision for all users (in particular non-motorised users and passenger transport (PT)).

Solutions aim to improve the safety, efficiency, capacity, and performance of the proposed intersection layouts, whether they will be on SH1 or associated with the wider package of transport network improvements. Designs for these intersections which incorporate facilities for walking, cycling and PT were appropriate for future growth and the long term strategy for SH1.

3.1.4 Median Barrier & Side Protection

Both cross sections described above would require a physical barrier in the median to reduce the likelihood of head-on collisions. The Transit NZ specification for road barriers (TNZ M/23:1999) requires median barriers on expressways to be designed to Test Level 3. The barrier could be designed as either a concrete barrier or a wire rope barrier. A wire rope barrier is only suitable where the width of the median is sufficient to accommodate deflection in the event of a crash and therefore cannot be used with the minimum cross section.

Roadside safety barriers must also be designed to Test Level 3. Either wire rope, w-section guardrail or a concrete barrier may be used depending on the hazard from which motorists are being shielded. Designs that are developed will incorporate roadside safety barriers unless a 9m clear zone with a gradient of less than 20% can be achieved.

3.2 Environmental Considerations & Resource Consents

Resource consents may be required from Kapiti Coast District Council and Greater Wellington Regional Council before the strategy to be implemented. Kapiti Coast District Council can process consent applications without public notification consultation if approvals are obtained in advance from landowners, iwi, Fish and Game Council and Department of Conservation.

Consents would also not be necessary if the preferred alignment were designated within the District Plan. At present only the existing state highway is designated. However during

the forthcoming review there is an opportunity to designate the preferred route in the updated District Plan.

Designation within the District Plan does not remove the need to obtain Regional Council resource consents relating to environmental effects. Alignment options will be developed in order to minimise the effect construction and operational of State Highway will have on:

- Water bodies identified as possessing a high degree of natural character, nationally threatened fish species and aquatic plants, and regionally important amenity and recreation values;
- Erosion prone land and the disturbance of extensive areas of soil and vegetation; and
- Contaminated or potentially contaminated sites.

The following paragraphs document the findings of an initial high level assessment of issues which may be subject to resource consent from either KCDC or GWRC. Plans showing such features adjacent to the existing state highway corridor are included as Appendix B.

3.2.1 Landscape and Amenity

The landscape within the study area is dominated by exotic vegetation, shelter belts and pasture as well as by urban growth areas. While new roads and intersections will impact upon the natural landscape, it is considered that the changes will be in pace with the urban growth happening now and proposed in future. Upgrades to SH1 along its existing alignment would result in minimal effects on landscape and amenity. More significant landscape effects would be expected as a result of earthworks where new alignments passing through greenfield areas are adopted.

There are also several sites of geographical importance which should be avoided. The only one in the study area is the Te Horo abandoned sea cliff, which runs between 1 and 2 km east and parallel to SH1 for about 3.5km from Otaki River south.

46 protected tree sites were identified within the study area. Alignment options for SH1 should avoid these sites. If this cannot be achieved, measures to mitigate their loss or modification will need to be included within the proposed strategy.

3.2.2 Heritage

The Historic Places Act defines a heritage site as somewhere associated with human activity prior to 1900 or that is important to the history of New Zealand. There are 41 heritage sites within the study area (see Appendix B). Such sites should be avoided. Where this is not possible, proposals may be subject to serious delays and a lengthy appeals process. Significant clusters of heritage and cultural sites which should be avoided include:

- Land immediately to the east of the NMIT Railway in Otaki;
- Parata Cemetery in Waikanae which is a recognised Wahi Tapu site; and
- Land adjacent to SH1 at MacKays Crossing.

It is expected that consultation with the Historic Places Trust and relevant iwi will determine whether there are any other sites or issues that need to be considered. Recognised iwi authorities which should be consulted on proposals within the study area include:

- Ngati Toa Rangatira;
- Ngati Raukawa; and
- Te Ati Awa ki Whakarongotai.

3.2.3 Ecology

The three environmental features which are most susceptible to damage or that have most ecological value are indigenous forest remnants, streams/gullies and wetlands. In assessing the impact of a new or upgraded road would have on these features, it is important to include not only direct effects, but also indirect and cumulative effects.

35 sites of ecological significance have been identified within the study area. The sites include swamps and wetlands, bush, scrubland, coastal scarp and dunes. Along the SH1 corridor between Otaki and Waikanae, sites tend to be smaller and more sparsely located, such as Staples Bush. Between Waikanae and MacKay's Crossing sites there are a greater number of larger sites such as Simon Brown Bush (refer to Appendix B).

3.2.4 Flooding Risk

There are several areas at risk from flooding located within the study area. Where newly constructed bridges constrict channel flows during flood conditions, this can result in flooding upstream of the bridge. Bridges that have sufficient width between abutments and bridge piers are less likely to increase the risk of flooding. Where this cannot be achieved and land needs to be protected from flooding, it will be necessary to construct stop banks.

Stop banks can be designed to wholly mitigate the impacts of new bridges and potential flooding. This is therefore not a primary consideration in route selection. Nonetheless, flood hazard areas will be a consideration in developing the preferred option. Most of those identified are close to existing urban settlements including either side of the Otaki urban zone and to the west of SH1 in Paraparaumu. Less extensive hazard areas are located either side of the Te Horo, and southern Waikanae areas. The locations are shown in Appendix B. More detailed investigation into the need for flood protection works and any resource consents will be undertaken once the preference route is chosen.

3.2.5 Utilities

The locations of utilities infrastructure of national and regional importance have been identified within the study area. If any of these facilities or infrastructure is affected by new or upgraded roads, it will increase capital cost associated with construction. Therefore in order to minimise the expected capital costs for developing SH1, these facilities should be avoided. Key infrastructural utilities include:

- Te Horo telecommunications and radio communications facility;
- Waikanae Electricity Substation;
- Paraparaumu Reservoir;
- Paekakariki Electricity Substation;
- National Grid Electricity Transmission Lines (Waikanae); and
- Natural Gas Mains (Paraparaumu).

3.2.6 Water Quality

The construction of the new roads and new bridges will result in short term effects during construction. There are various measures in the short term to minimising the risks to water quality and ensure the effects are negligible. These measures will be specified in consents from Greater Wellington Regional Council at the investigation and reporting stage. New roads and bridges are unlikely to affect water quality in the longer term although a resource consent relating to discharges to water may be required. Where there are longer term effects resulting from the use of the road, these are likely to be minor and will be common to each option developed. They will therefore not be a major consideration during route selection.

3.2.7 Social and Community Impacts

Initial scoping has identified a number of community facilities within the study area that need to be recognised in the planning process. The strategy will be developed so as to limit the impact the people that use these facilities. Where impacts are unavoidable, decisions will be based upon a comparison of the effect resulting from alternative options. Further assessment will be undertaken as alternative options are identified. The community facilities initially identified include:

- Waitohu Primary School;
- Otaki College;
- Paraparaumu Primary School;
- Queen Elizabeth Park ;
- Paekakariki Primary School;
- Centenial Park;
- Motuiti Scientific Reserve;
- Edgewater Park;
- Paraparaumu Domain;
- Kaitawa Reserve;
- Parata Cemetery;
- Waikanae Public Walkway; and
- Waikanae Town Centre.

3.2.8 Noise

The KCDC District Plan requires that new dwellings in rural or residential zones within 80m of the existing SH1 are constructed such that internal noise levels are lower than a specified maximum. The same standards are applied to new dwellings proposed within 80m of the Sandhills Arterial route designation. Should Council decide to designate the recommended alignment for SH1, there would be an opportunity to apply noise-related building controls to new dwellings proposed close to the new route.

Appendix 6 to the Transit Planning Policy Manual (Dec 1999) provides Guidelines for the Management of Traffic Noise. The guidelines specify the activities where noise interruption would create a significant disruption to people within the community. The affects of ground vibration are not addressed. The guidelines indicate that where existing residential, teaching and hospital facilities are affected by a new road or road alignment, measures to mitigate the impacts will be funded by Transit NZ.

The owners of hotels and motels affected by increases in traffic flows on existing road alignments would not be compensated because they would be expected to benefit from increased custom. Although retail or industrial premises may be affected as much as residential premises, the guidelines indicate that the consequences would be less and that Transit NZ would not fund mitigation. Open spaces and recreation areas are not protected by the planning policy manual.

Noise will result from construction activity whichever alignment is adopted. It will be managed by the construction team and limited by controls agreed with the local and regional councils.

3.2.9 Air Quality

Local air quality can be strongly influenced by road traffic. Localised congestion and queuing motor vehicles often results in concentrations of CO2 and PM10 emissions. Where these occur close to residential areas, schools and other community facilities there is increased risk of bronchial disease amongst the community. Improving air quality through reduced congestion can be achieved by reducing the number of motor trips that are made or by increasing road capacity available for motor vehicles. The risk of negative health effects can also be minimised by increasing the distance between community facilities and congested roads. It can also be possible to use topography and natural air movements as a way of reducing the impact upon the community.

3.3 Development within Kapiti Coast District

In preparing a strategy for improving SH1 through the Kapiti Coast, the study team will be mindful of proposed land development in the District. New infrastructure proposed for the district will also be taken into consideration as the strategy is developed. In the coming 20 years the number of job opportunities in the district is expected to double and the population is expected to increase in parallel.

Figure 3.3, shows the areas of the District where development is expected to be concentrated in the coming years. It also shows the land areas needed for development.

The figure shows that the greatest population growth (33%, +4266) is expected in Paraparaumu and that this will be achieved through in-fill development. More intensive land-use has the potential to increase the proportion of trips that are made using active forms of travel. Chapter 5 documents the existing travel patterns and demographic characteristics of the District and explores how future changes will affect travel demand.

The population of Waikanae is expected to grow by 1719 (20%). Some of the growth will be achieved through in-fill and increased density of dwellings but also by developing green-field land on the northern fringe of the existing urban area. The population of Otaki is expected to remain relatively stable.

The population living in rural areas is also expected to increase by approximately 800. This is a relatively small number, compared to the growth forecast for urban areas and is consistent with a strategy to make active travel and passenger transport more viable.

Figure 3.3 – Focus of Projected Population Growth and Development