Chapter 8
Part D
VOLUME 2

Construction of the Project

Overview

This chapter provides an overview of the proposed methodologies for the construction of the Project. The information presented in this section is further detailed in the Construction Methodology in Technical Report 5, Volume 3.

Construction of the Project will cause adverse environmental effects. These will be mitigated through a variety of detailed measures, including noise, vibration, dust, water and traffic effects, as summarised in Part G of this report. The draft CEMP (Volume 4) addresses the anticipated construction elements, environmental management, and monitoring procedures for the Project to deliver appropriate environmental outcomes.

The construction of the Project will take approximately 3.5 – 4 years to complete and will be progressed in several stages throughout the approximate 13km length of the Project. The management plans to support construction and the mitigation of construction effects are controlled through conditions outlined in Part H.

8 Construction of the Project

8.1 Introduction

The Project construction methodology described within this Chapter has been developed and refined to identify and assess the potential environmental effects of construction. Final construction methodology will be developed by the contractor once conditions are confirmed and further design has been undertaken. Potential options are identified to avoid, remedy or mitigate these effects as appropriate.

This Chapter provides an overview of the proposed construction methodology across the Project, followed by further information in regard to the nature, scale and duration of construction activities throughout the separate Project areas including:

- Pre-construction considerations;
- Construction programme;
- Construction establishment; and
- Construction activities.

Technical Reports and Plans are referred to where relevant; more detailed information about the Project and specific plans can be found in these reports and plans. Volume 4 contains the draft CEMP, as well as the appended suite of specific Management Plans.

The approach adopted by the NZTA and KiwiRail is to treat construction of the Project – both the Expressway and the NIMT realignment aspects – as an integrated process. This is achieved through largely identical proposed construction conditions (albeit that the final form of the Expressway and NIMT aspects of the Project will be different, and fit for their respective purposes). The NIMT realignment, however, is expected to be completed before the construction of the Expressway starts. This will enable rail services to continue while the Expressway is under construction.

8.2 Pre-Construction Considerations

8.2.1 Construction Environmental Management

During construction, specific mitigation measures and environmental monitoring will be required to ensure that potential adverse effects on the environment are avoided, remedied or mitigated, as appropriate.

A draft CEMP has been prepared for the Project (refer to Volume 4). The CEMP outlines the environmental management and monitoring procedures to be implemented during the Project's construction phase. The CEMP outlines details of the "who, what, where and when" in respect of the environmental management and mitigation measures to be implemented. The CEMP appended to this AEE report is a draft and will be updated and modified as appropriate once a contractor is on board.

The principles and general approach to managing the environmental effects are set out in the main body of the CEMP. The management of specific construction effects (such as discharges to air, noise and vibration) is set out in more particular detail within the suite of environmental management plans (subplans) that form the appendices to the CEMP.

The CEMP, its subplans, and other site-specific environmental management plans for locations along the route, are to be consistent with and complement the AEE report, and have been developed in accordance with the proposed designation/consent conditions.

Once the conditions have been confirmed through the consenting process, the CEMP will be reviewed and updated (if required) in conjunction with the contractor prior to works commencing.

8.2.2 Erosion and Sediment Control

The most significant component for compliance during construction is typically erosion and sediment control measures. The Project design makes significant use of swales and ponds for dealing with stormwater during the operation of the Project, which have a complementary function of controlling any sediment run-off during construction. Designs for temporary basin requirements have been completed, however for construction effects it is expected that a large portion of the permanent stormwater devices will be able to be used as they are built, minimising the need for additional temporary erosion and sediment control measures.

Effects will be managed in accordance with GWRC erosion and sediment control guidelines, namely:

- *Greater Wellington Regional Council's Sediment and Erosion Control Guidelines (2006).*

Erosion and sediment control measures will be installed, monitored and maintained throughout the works to control and mitigate the effects of sediment run-off until the site is stabilised.

The draft ESCP provides an overview of the erosion and sediment management techniques and measures that will be used by the Project. It outlines methodologies and management techniques that will be applied to achieve the environmental management outcomes required by the Conditions. Given the scale of the Project, SSEMPs for all areas along the alignment will be developed to detail the specific erosion and sediment control measures to be utilised.

Specific details of the erosion and sediment control measures that have been developed for the Project works can be found in the ESCP (Appendix C, Volume 4).

Principles for Erosion and Sediment Control

The main philosophy in relation to erosion and sediment control for construction of the Project is to limit sediment run-off beyond the construction site to an acceptable level.

The principles followed to deliver sediment control for the Project include one or more of those set out below:

- Preparatory environmental works:
  - Environmental controls will be established ahead of major works, such as sediment fences, bunds, ponds or other devices.
- Stage construction:
  - The construction will be staged so as to limit the areas of open earthworks.
- Minimise disturbance:
  - The design of the location and detail that has occurred to date has been to minimise the earthworks footprint as far as practicable.
- Protection of water bodies:
  - The Project will require construction in several water bodies (including culverts and bridges) as well as temporary and permanent stream diversions. There are also earthworks proposed throughout the Project length; as the Project crosses a number of watercourses, there will also therefore be earthworks adjacent to water bodies that require special measures to manage environmental effects. The erosion and sediment control measures adopted will consider the site-specific requirements of each structure or diversion. The measures to be implemented are identified in the ESCP, as contained in Appendix C to the CEMP in Volume 4.
  - Careful planning and placement of diversion bunds, rock check dams and erosion control techniques within water bodies, will be implemented to minimise uncontrolled release of sediment during rain events.
- Installation of perimeter controls:
  - Diversion drains, silt fences and earth bunds will be used both downstream and within all earthworks sites, as appropriate.
- Sediment retention devices:
  - Sediment retention devices will be installed prior to the commencement of works. In areas where space is limited, earth decanting bunds, structures or traps may need to be used instead of ponds.

Chemically Treated Ponds

All sediment retention ponds and smaller settlement devices will include a rain gauge and flow activated chemical treatment that will enhance settling performance. Depending on soil type, there may be requirements for dual doses of chemicals, the first to correct high or low pH of the inflow and the second being the addition of a settling agent. The chemical dosing is a means of ensuring the sediment settles out of the water, and thereby improves the visual clarity of the water ultimately discharged.

Performance Monitoring

A set of performance criteria to monitor erosion and sediment control for the Project have been developed as part of the management plan suite submitted with this AEE Report and are included in the ESCP. These will contain clear statements of what is being measured, and what this is being assessed against. This will enable feedback to be given by the statutory monitoring bodies to the contractor and the requiring authority, on the performance of sediment control features.

Temporary Stormwater Management

Works in and around urban areas will need to ensure that run-off from the Project construction site does not contaminate the existing stormwater system. The erosion and

sediment control measures detailed above will be utilised as and where required, however additional bunding and/or water diversions may be required to ensure stormwater systems are not contaminated. Where construction works require the relocation of existing stormwater infrastructure, this will be undertaken in a manner and supported through the use of physical management and mitigation measures, that ensures that uncontrolled run-off is unable to enter the stormwater network. Further details on stormwater management and sedimentation control are contained in the Management Plans submitted with the application, Volume 4.

Site Stabilisation

An essential aspect of the erosion and sediment control measures will be the stabilisation of disturbed land as soon as practicable. The treatment options for site stabilisation include the use of top soil (where necessary), seed and mulch. Detail on this is contained in the Construction Methodology Report, Technical Report 5, and in the Management Plans in Volume 4.

Stabilisation will apply particularly with respect to batter establishment, and will be designed for both erosion control and dust minimisation. Water carts will be used to disperse water to be used for dust suppression.

Stream Works

Given the high risk of sedimentation and the sensitivity of the receiving environment, any works required within streams or rivers will be undertaken in a "dry" environment where this is feasible. This will apply to the diversion of flows around the area of works or when working directly above the stream with no formal stream diversion required. In determining the type of works, consideration will also be given to fish spawning and migration periods, during which time in-stream works will be restricted. These restrictions are identified in the technical reports, and reflected in conditions proposed in Part H, Chapter 32 of this AEE report.

Where there is no ability to work within a dry watercourse environment, appropriate temporary diversions will be installed and managed to minimise the potential for downstream adverse effects on water quality as a result of disturbance of the riverbed.

8.2.3 Temporary Traffic Management and Access

Construction of the Project involves truck movements, lane and intersection closures and periods of lowered speed limits on some roads, all of which have the potential to cause inconvenience to road users and residents. A draft CTMP is included as Appendix G of the CEMP, Volume 4, detailing traffic management methodologies and mitigation measures to be adopted for the Project during construction.

The CTMP details the traffic control activities and the effects on pedestrians, cyclists, residents, businesses, public transport, and general traffic. Typical mitigation measures that will be considered in the development of SSEMPs are presented that will form the basis for management of construction traffic and traffic affected by construction.

8.2.4 Noise and Vibration

Noise and vibration will result from construction activities. To mitigate the effects of this, a draft CNVMP has been prepared, outlining the specific effects of noise and vibration during construction and how these can be mitigated where these are at a level that is of concern (Appendix A of the CEMP, Volume 4). Conditions are proposed to ensure that the CNVMP contains the detail it is required to.

Figure 8-1:
Project Sections

8.3 Construction Programme

An indicative Construction Programme for the Project has been developed and is described in detail in the Construction Methodology Report (Technical Report 5, Volume 3). This was developed for two reasons:

- To understand the duration of the Project to enable a better understanding of cost; and
- To recognise the potential complexities in the construction programme, allowing identification of potential opportunities and to recognise the critical path activities.

The programme has been developed using the Project team's construction knowledge.

8.3.1 Construction Duration

The construction period is 3.5 – 4 years, as determined by the indicative Construction Programme.

Commencement of construction is dependent on securing funding and the contractor being engaged. Specific details such as when road closures might occur will be developed at a later date with the contractor, immediately prior to construction starting. This will form part of the CEMP.

Works will generally be undertaken during daylight hours except where operations are being carried out on or adjacent to an existing road or over roads and rail that will require work to be undertaken during off-peak hours at night.

8.3.2 Construction Sections

Figure 9-1 above shows the Project sections that have been used to develop the Indicative Construction Programme.

The stages (identified as STA) are (from north to south):

- Section 1 – Ōtaki North through to Ōtaki River Bridge STA 0 to STA 3500 including NIMT;
- Section 2 – Ōtaki River Bridge to Old Hautere Road STA 3500 to STA 5250;
- Section 3 – Old Hautere Road to Te Horo STA 5250 to STA 8600; and
- Section 4 – Te Horo to Peka Peka Interchange STA 8600 to STA 12250.

8.3.3 Construction Sequence

The construction sequence has been broken down into several stages over the 3.5 – 4 year construction period, and is depicted in Figure 8-2 below.

Prior to any construction activities commencing on a particular site, a number of site establishment activities will be required, which will include site clearance, service relocations, establishment of erosion and sediment control measures and ground preparations.

The Ōtaki River bridges and the bridge crossings over the railway line north of Ōtaki and at Rahui Road will be commenced early in the programme. This is to facilitate the movement of cut material and to assist works required for the Project in the vicinity of the Ōtaki township.

While commencing works at Section 2 may not immediately seem logical, the construction of the bridges over the railway line at North Ōtaki and Rahui Road are required before any earthworks can occur in Section 1. By undertaking the works in this order the Project can complete the realignment of the NIMT, works relating to Ōtaki Railway Station and service relocations prior to any roading works occurring, giving the space and opportunity for works to be unhindered.

As the road over rail bridge abutments at Mary Crest are founded in an area of peat, preloading of materials is required prior to construction taking place. This preloading imposes a 12 month waiting period prior to any bridge works being able to occur in that area. As such, construction of the Mary Crest Bridge will not be undertaken until later in the construction sequence.

Finishing works such as landscaping and planting will be undertaken at the end of the Project construction.

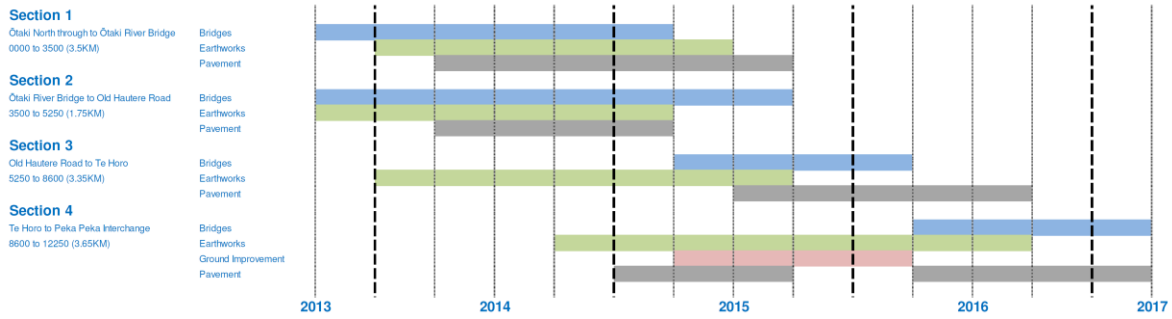

Figure 8-2: Indicative Project construction sequence

8.4 Construction Establishment

8.4.1 Site Access

Local roads will provide the access points to much of the construction site. A CTMP will be implemented along with the stabilisation of entrance ways and areas to be used by construction traffic. The Expressway alignment will be used as a haul road once it has been established. Details on likely local roads and effects, as well as the timing around construction, are contained in Technical Report 5, Volume 3.

8.4.2 Site Security and Fencing

Site fencing and security gates will be installed throughout access points along the extent of the Project and at construction compounds.

8.4.3 Construction Compounds

Due to the lineal extent of the Project, several site construction compounds will be required. All yards will be fully fenced and made secure. Site establishment activities for construction yards will include site clearance, ground preparation, and establishing erosion and sediment control measures prior to any construction activities occurring. Upon completion of the works, the construction yards will be disestablished and the areas reinstated. All construction yard and compounds are located within the designation boundaries.

Main Contractor's Compound

The main contractor's compound is proposed to be located between the existing SH1 and the Expressway north of the Ōtaki River. This location is on the outskirts of Ōtaki and is separated from residential properties by both SH1 and the NIMT. Safe access to this area is provided from both sides of SH1 through access points used currently by Winstone Quarry and Stresscrete Ōtaki.

The functions of the main contractor's compound are as follows:

- Main administrative centre and welfare facility;

- Plant/equipment storage and workshop;
- Local access to alignment;
- Delivery point for materials into site; and
- Management and disposal of site and office waste.

The main contractor's compound will be approximately 1.5ha in size.

Local Construction Compounds

A local construction compound will be set up in each of the four Construction Sections, mainly in conjunction with bridge construction. The locations of these are shown on the plan set within Volume 5.

The services provided through the local construction compounds will be:

- Welfare/small office facility;
- Local plant/equipment storage;
- Local access to alignment;
- Delivery point for construction materials; and
- Collection of site waste.

8.4.4 Water Required for Construction

Water will be required to carry out a number of construction activities, including dust suppression, compaction of granular materials, ground improvements and structural work.

Where practicable, and to minimise the impact on water availability, water from sediment retention devices will be reused in construction operations. Bores are likely to be required and consent for the construction of these and the taking and use of ground water for construction purposes has been sought.

Proposed locations for water take have been identified as follows:

- Mary Crest area by the proposed attenuation pond;
- Te Horo Beach Road area near the local road ;
- North of the Ōtaki River;
- South of the Waitohu Stream; and
- Peka Peka Interchange area (ex-M2PP Project bore).

Peak water demand is likely to occur during drier months and at peak construction periods in each bore location. Even though the required volume would be expected to decrease during periods of wet weather, up to 300m^3 of water will be required per day at peak times during construction.

8.4.5 Materials Required for Construction

The sourcing of material for fill (where there is no excess within the Project length) will be carefully managed during construction to minimise both haul distances to each embankment and truck movements from each site.

There are a number of local options for sourcing the imported fill, which include:

- Kāpiti Quarry;
- Ōtaki Quarry (including Ōtaki River); and
- Waitohu Quarry.

The rate of consumption of specialised materials, e.g. base course of the required standard, may not be manageable from one source, and therefore multiple supply sources may be required.

Other materials that are likely to be manufactured off-site and then transported to site as required include:

- Steel required for structural components;
- Surfacing materials (including bitumen);
- Bridging materials;
- Road furniture such as lights, signage, barriers;
- Stormwater treatment and erosion and sediment control devices; and
- Pipes and drainage materials.

8.4.6 Construction Lighting / Night Work

Typically construction will occur during the day. However, in limited instances where construction operations are on or very near existing roads or rail, and are likely to cause disruption to traffic, work will take place at night. In these areas temporary lighting towers will be utilised. Portable generator driven lighting towers will be brought to the site and used where required.

In some of the construction areas permanent lighting will be required. This will be provided as early as possible and supplemented with portable lighting where necessary.

Each construction yard area will utilise temporary lighting to enable operations to proceed during the hours of darkness during the winter period should this be identified as required by the contractor. In addition, lighting will be provided to guide staff, plant and vehicles at the start and end of each shift during the winter months.

The effects of the lighting will be controlled through placement and orientation of the lights so they direct into the construction area, rather than over adjoining properties and dwellings. Further, the lights will be oriented downward and shielding will be installed where required to manage light spill.

Conditions are proposed in Part H, Chapter 31 to address these issues.

8.5 Construction Activities

8.5.1 Earthworks

The Project involves approximately 800,000m^3 of cut-to-fill and 45,000m^3 of imported fill across the 4 construction sections. Figure 8-3 and Figure 8-4 show the cut/fill comparison and the earthwork ground profiles respectively. It can be seen in both figures that there is a general balance of materials throughout the Project area.

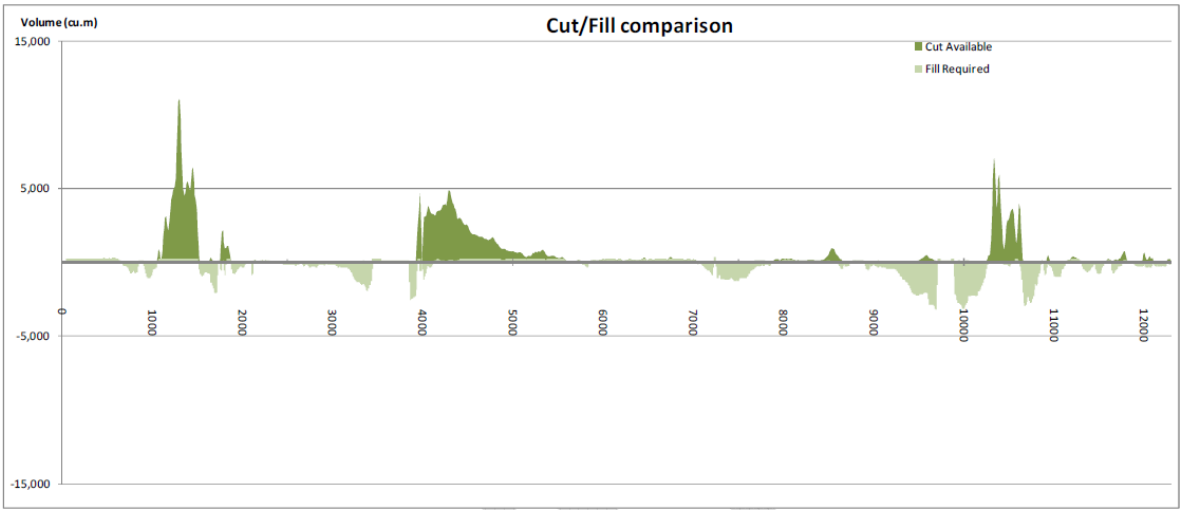

Figure 8-3: Cut/Fill Comparison

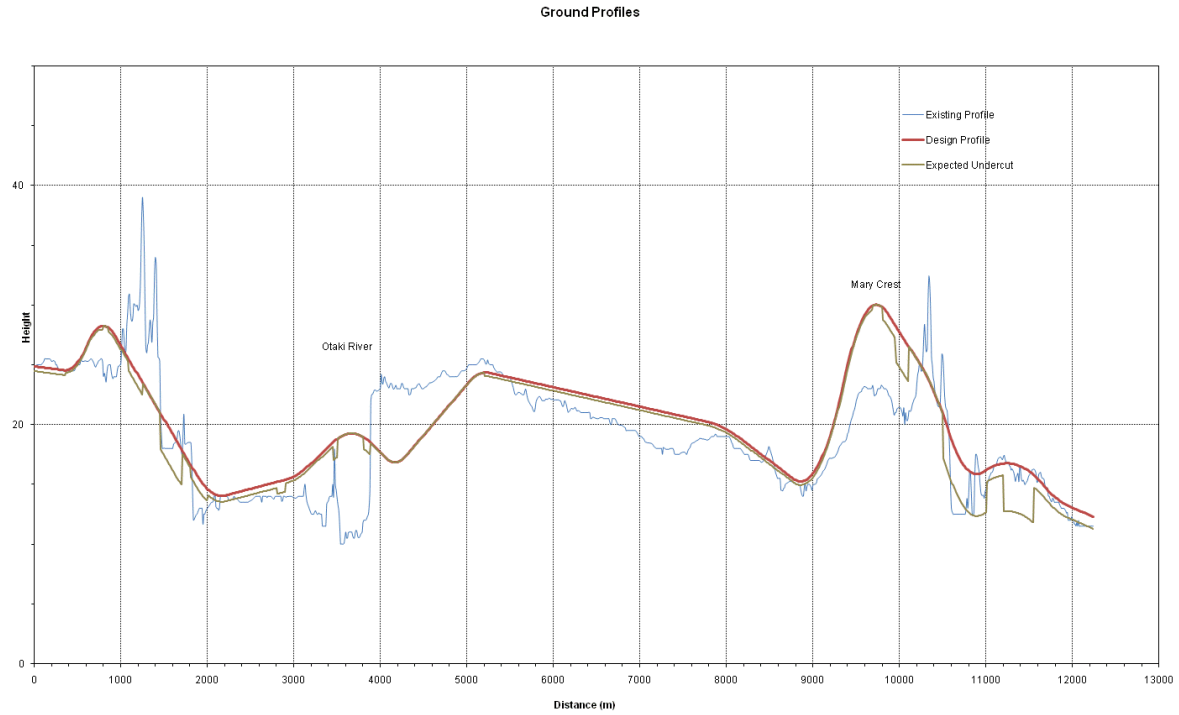

Figure 8-4: Earthworks Ground Profiles

Each section of the Project will be progressed as an individual work package. Erosion and sediment control measures will be implemented to suit earthworks phasing. Initial topsoil stripping will be undertaken by grading topsoil into bunds along the edge of the works. This will serve as temporary storage and as a clear water diversion and rationalise the cartage of topsoil around the site.

The swales at the sides of the Expressway alignment can be progressively excavated from the outset along with the implementation of other drainage elements such as wetlands, basins and flood offset storage areas. These form temporary erosion and sediment control devices. Topsoil can be spread and stabilised through grass seed and straw.

Earthworks Undercutting and Cut-to-Fill

All undercut fill can be disposed of on site. Undercut areas will be backfilled with sand for compaction purposes, reducing the impact on groundwater. Unsuitable undercut material will be used for non-structural fill material and for use in landscape bunds.

Ground Improvements

The Project traverses dune sands, river gravels, and there are known peat deposits south of Mary Crest. Peat deposits present in the low lying inter-dunal depressions are generally soft, with high organic content. Groundwater is typically encountered at a shallow depth in the peat deposits.

Where peat deposits are present below the new road embankments, ground improvements are required to limit post-construction settlement of the Expressway. The treatment approaches will be specifically tailored along the length of the Expressway to the south of Mary Crest depending on the depth and extent of the peat expected to be encountered and the sensitivity of adjacent areas.

Peat deposits will be undercut to a depth of 3m below existing ground or new subgrade level, whichever is lower. Excavated material will be replaced with imported engineered

fill. If unsuitable ground remains at a depth below 3m, preload will be utilised which may be left in place for up to 12 months, allowing consolidation to occur. Due to the potential shortage of suitable earthworks fill material, any suitable materials for preload use may be re-used once the settlement period has been completed. Where possible, preload embankments will utilise material generated from the construction of the Expressway, however in some cases there may be a requirement for imported fill to be utilised.

Other ground improvement methods that may be utilised if unforeseen ground conditions arise, including:

- Soil mixing using lime or other cement materials, to bind the soil particles together and stabilise the soil;
- Vibro-compaction/replacement, to provide a denser soil base; and
- Installing stone columns to reduce slope movement.

Dust Control During Construction

Water carts will spread water to suppress dust. Water will be extracted from bores or sediment ponds, where possible, along the alignment. Where there is material mounded on a construction site, an alternative means of managing dust is to cover it.

8.5.2 Haul Roads

The Project intends to use the Expressway alignment, once possible, as a haul road prior to the commissioning of the Project. This will minimise construction traffic effects, particularly for large loads on the surrounding local roads.

8.5.3 Bridge Construction

The construction of the bridges will be a significant part of the Project. There are 10 bridges to be constructed, three of which are within the existing watercourses of the Waitohu Stream and the Ōtaki River where the crossing consists of two parallel bridges. The management of the construction effects of these structures will be included within the SSEMPs.

Site access, fencing, and erosion and sediment control measures will be developed for each bridge prior to construction, regardless of whether the bridge is a road or rail crossing, or stream/river crossing.

Bridge construction will typically involve piling operations and reinforced concrete column and crosshead construction. Bridge beams will likely be cast off-site and then transported to site and placed in position with the top slab cast in situ. Barriers will also be precast and settlement slabs and wing walls cast in situ. The likely sequence of bridge construction is detailed within the Construction Methodology (Technical Report 5, Volume 3).

Concrete supply will likely be from a supplier local to the Ōtaki / Peka Peka area. Concrete deliveries to all sites will be via SH1 or local roads.

Environmental controls for the various bridges will be designed dependent on the risks and location of the bridge. This will include the design, size, and location of piles, abutments, and the height of the deck of the structure. Road bridges will have differing environmental controls to stream/river crossings and SSEMPs will be required for each.

The Draft CTMP (Appendix G, Volume 4) details methods to manage vehicular, pedestrian, cyclist and equestrian traffic during bridge construction.

8.5.4 Pavement Construction

Upon completion of the earthworks subgrade and stormwater drainage in each section, pavement construction will be undertaken, along with traffic services. One carriageway of

the Expressway will be completed and sealed to enable immediate protection of the sub grade pavement layers while the construction of the opposite carriageway is completed.

Materials for pavement use will be imported to site via SH1 and local roads, with completed sections of the Expressway utilised as a haulage route – reducing the effects of construction on the local roading network.

Final surfacing will be a two-coat chip seal and, where required through Ōtaki township, OGPA surfacing (or similar) for acoustic purposes.

Once all works are complete within each carriageway section, traffic services, roadside furniture and landscaping, including acoustic barriers, will be installed.

8.6 Sector-Specific Construction Activities

The Construction Methodology Report (Technical Report 5, Volume 3) outlines the construction methodology specific for each of the four sections of the Project listed below:

- Section 1 – Ōtaki North through to Ōtaki River Bridge STA 0000 to STA 3500 including NIMT;
- Section 2 – Ōtaki River Bridge to Old Hautere Road STA 3500 to STA 5250;
- Section 3 – Old Hautere Road to Te Horo STA 5250 to STA 8600; and
- Section 4 – Te Horo to Peka Peka Interchange STA 8600 to STA 12250.

The construction methodology specific to each section ensures that the principles discussed above that apply to the whole Project are followed and adopted and that best practice is adhered to.