


Settlement Effects Management Plan (SEMP)

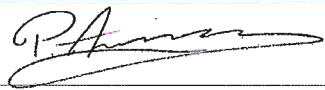
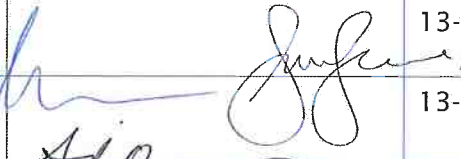
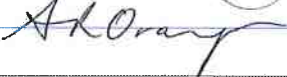
Settlement Effects Management Plan (SEMP) Revision History

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Action	Name	Signed	Date
Reviewed by	Geoffrey Farquhar		23-05-13

Document Acceptance

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Prepared by	Phil Ainsworth		13-06-13
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Approved by	Alan Orange Alliance Project Manager		13-06-13
on behalf of	M2PP Alliance		

Certification

Action	Name	Signed	Date
Regulatory Manager Approval	Andrew Guerin		26 August 2013
on behalf of	Kāpiti Coast District Council		

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Quick Reference Guide to Conditions

Condition Number	Condition Requirement	Comments	Key Final SEMP Reference
DC.67(a)(i)	The monitoring of ground settlement in the vicinity of the Expressway during and immediately after construction to identify whether any effects on adjacent buildings are occurring	Outcomes and Guidelines	Section 3.2
DC.67(a)(ii)	The establishment and implementation of actions to rectify any more than negligible adverse effects on buildings created by ground settlement from the Project		Section 3.1, Section 4
DC.67(b)(i)	Shall be consistent with the guidelines: Burland, J.B.(1997), "Assessment of Risk of Damage to Buildings Due to Tunnelling and Excavation"...		Section 1.3
DC.68(a)	Submit the SEMP for certification. Purpose of the SEMP	Purpose of SEMP	Section 1.1
DC.68(b)(i)	Implementation and operational procedures to manage the adverse effects of ground settlement	The SEMP shall include but not be limited to these details	Section 3.1
DC.68(b)(ii)	Estimated total settlements at end of construction		Section 2
DC.68(b)(iii)	Methods to monitor settlement		Section 3.2
DC.68(b)(iv)	Monitoring locations set out on a plan		Appendix B

DC.68(b)(v)	Monitoring frequency		Section 3.2
DC.68(b)(vi)	Reporting requirements		Section 3.3
DC.68(b)(vii)	Alert and action programmes		Section 3.3
DC.68(b)(viii)	Process for reviewing the settlement implementation and operational procedures where necessary		Section 6
DC.69	Independent Review of the SEMP required		Appendix G
DC.70	Confirm the locations of each type of settlement monitoring marks in the SEMP	Monitoring marks	Section 3.2.1, Appendix B
DC.71	Frequency for surveying monitoring marks pre, during and post construction	Frequency of surveying monitoring marks	Section 3.2
DC.72(a)	Immediately following each monitoring round, reassess the building damage categories	Reassessment of building damage categories	Section 3.3
DC.72(b)	If reassessment indicates increase to damage category, additional specific assessment of the structure shall be carried out to confirm this reassessment within 72 hours of the reassessment being completed	Additional specific assessment of structures	Section 3.3
DC.72(c)	If additional assessment confirms increase in damage category the owner and occupier shall be notified within 72	Notification of owners/occupiers	Section 3.3

	hours of the additional assessment being completed		
DC.72(d)	Following consultation with the property owner and occupier subsequent actions may include those mentioned in this condition	Subsequent actions post consultation with owners/occupiers	Section 3.3
DC.73	Situations where the frequency of settlement monitoring at a monitoring mark can be reduced	Reducing frequency of survey monitoring marks	Section 3.2.1
DC.74	Collate results of settlement monitoring and prepare a report that shall be made available to Council.	Report for Council	Section 3.3
DC.75	Review and update the schedule of buildings and structures considered at risk in accordance with the criteria of the SEMP and maintain this schedule	Schedule of buildings and structures at risk	Section 3.2.3; Appendix E
DC.76	Consult with owners of buildings and structures identified in Conditions DC.75(a) - (c) and subject to owner approval, shall undertake a pre-construction condition assessment of these structures in accordance with the SEMP	Consultation	Section 3.2.3
DC.77	Employ a suitably qualified person to undertake building assessments required	Building assessment	Section 3.2.3

	by DC. 76		
DC.78	Undertake monthly visual inspections of properties identified in this condition during active construction	Monthly visual inspections	Section 3.2.3
DC.79(a)	Subject to owner approval (for properties stated in DC.75), undertake post-construction condition assessment of buildings and structures covering the matters identified in the SEMP and provide a copy to the owner	Condition assessment of buildings and structures	Section 3.2.3 and 3.3
DC.79(b)	Agree with the owner appropriate remedial work (if any) in conjunction with arrangements for implementation and/or compensation	Remediation	Section 3.4
DC.80	Provide a copy of the pre, post - construction and any additional building condition assessment reports for each building to the respective property owner within 15 working days of completing the reports and notify council that the assessments have been completed.	Providing reports to owners and notifying council of assessment completion	Section 3.3
DC.81	Prior to construction commencing, undertake CCTV or	Surveying services	Section 3.2.5

	alternative surveys of services identified in the SEMP as being susceptible to damage or particularly critical. Undertake remedial action as required in consultation with the service provider		
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A copy of the final Settlement management Conditions is contained in Appendix A of this Plan.

1 Introduction

1.1 Purpose and scope

The Settlement Effects Management Plan (SEMP) forms part of a comprehensive suite of environmental controls within the Construction Environmental Management Plan (CEMP) for the MacKays to Peka Peka Expressway (the Expressway).

The purpose of this Settlement Effects Management Plan (SEMP) is to fulfil the requirements of the MacKays to Peka Peka Expressway designation condition DC.68(a) which states:

DC.68(a) "...The purpose of the SEMP is to outline the measures to be adopted to manage potential ground settlements (settlements) associated with construction and operation of the Expressway on existing buildings, services and transport infrastructure in order to achieve the outcomes required under condition DC.67."

This management plan is submitted to the Manager (KCDC) in accordance with DC.68(a) for certification.

For the initial Assessment of Ground Settlement Effects refer to Assessment of Environmental Effects Technical Report 35, Volume 3. The Assessment of Ground Settlement Effects and the SEMP will be updated as the design of the various sections of the expressway is finalised.

This update of the SEMP has been prepared for initial independent review and Certification. It is based on the AEE stage assessment of settlement and its effects, except where the extent of "excavate and replace" peat treatment has now been confirmed. This approach greatly reduces the magnitude of settlement directly beneath fill embankments on peat.

The settlement effects outside the earthworks footprint have been assessed as being low based on the predicted settlements. Settlements may affect the existing environment in the following ways:

- Aesthetic damage to buildings
- Structural damage to buildings
- Damage to existing services
- Damage to local roads
- Damage to railway.

This SEMP contains a settlement monitoring procedure for the Expressway which is consistent with resource consent condition DC.67 – DC.81. The monitoring regime provides a method for measuring the actual settlements and the resulting effects. The

settlement predictions and resulting effects assessment will be refined as the Project proceeds based on these measurements. Condition DC.67(a)(ii) requires “the establishment and implementation of action to rectify any more than negligible adverse effects on buildings created by ground settlement from the Project.”.

The potential mitigation measures for settlement effects are described in the operating and management procedures within the SEMP. A variety of mitigation measures are available that may be implemented should the measured settlements or the settlement effects require it.

The SEMP will be updated, with the necessary Certification, throughout the course of the Expressway Project, to reflect significant changes associated with detailed design development, with construction techniques, to the existing built environment or as a result of actual monitoring results. Certification from the Kāpiti Coast District Council (KCDC) will be required for revisions of a material nature¹.

This Plan relies in part upon and should be read in conjunction with the Groundwater (Level) Management Plan (GMP) appended to the Construction Environmental Management Plan (CEMP).

1.2 Project description

This SEMP forms part of a suite of environmental management plans within the Construction Environmental Management Plan (CEMP) for the MacKays to Peka Peka Expressway.

The Project Zone diagram is included in Appendix C of the Construction Environmental Management Plan (CEMP), and provides an overview of the extent and works for the Project. This SEMP covers all zones of the Project. For the purposes of the construction methodology and this SEMP, the Project is split into 3 specific zones referred to as follows:

1.2.1 South Zone

This zone includes chainage 1900 to 4500 and includes the following specific construction sections:

- Poplar Avenue (POP)
- Poplar Avenue–Raumati Road (POP–RAU)
- Raumati Road–Wharemauku Stream (RAU–WHA)
- Wharemauku Stream–Kāpiti Road (WHA–KAP)
- Kāpiti Road Interchange (KAP).

¹ Revisions of a material nature would result from adverse changes to settlement predictions as a result of further design development and detailed analyses, changes to buildings identified in the schedules, adverse changes to building damage predictions, or changes to the arrangement and distribution of framework settlement marks.

1.2.2 Central Zone

This zone includes chainage 4500 to 11500 and includes the following specific construction sections:

- Kāpiti Road–Mazengarb Road (KAP–MAZ)
- Mazengarb Road Bridge
- Mazengarb Road–Otaihanga (MAZ–OT)
- Otaihanga Road Bridge
- Otaihanga Project Office/Yard
- Otaihanga Road–Waikanae River (OT–WAI)
- Waikanae Bridge
- Waikanae River–Te Moana Road (WAI–TEM).

1.2.3 Northern Zone

This sector includes chainage 11500 to 18050 and includes the following specific construction sections:

- Te Moana Interchange (TEM)
- Te Moana Road–Ngarara Road (TEM–NGA)
- Ngarara Road (NGA)
- Smithfield Road (SMI)
- Smithfield to CH15400 (SMI – 15400)
- 15400 to Peka Peka (15400 – PP)
- Peka Peka Interchange (PP).

1.3 Performance standards

The general performance and legislative standards for the Project are detailed in the Construction Environmental Management Plan (CEMP). The following guidelines for assessing the effects of ground settlement on buildings shall be used:

Burland, J.B. (1997), “Assessment of Risk of Damage to Buildings Due to Tunnelling and Excavation”, Earthquake Geotechnical Engineering, Ishihara (Ed.), Balkema, Rotterdam, 1997.

This is consistent with Condition DC.67(b)(i).

The outcomes of Technical Report 35, Volume 3 are detailed below:

- There is the potential for settlement effects on dwellings and other structures where settlement of 25mm or greater is calculated. No buildings have been identified in this category.

- Building condition assessments for structures and measurement of the settlement and groundwater levels is proposed where predicted settlements exceed 12.5mm and/or predicted groundwater drawdowns exceed 0.2m.

1.4 Environmental plans and maps

The SEMP relies on other management plans within the wider Construction Environmental Management Plan (CEMP), in particular the Groundwater (Level) Management Plan (GMP). Monitoring of the groundwater drawdown provides advanced warning of settlement during construction. Environmental plans and maps relevant to the management of the settlement effects are summarised in Table 1.

Table 1 – Relevant Environmental Plans and Maps

Plan/ Map	Relevance	Location
Groundwater (level) Management Plan (GMP)	Settlements may result from changes in groundwater level. The groundwater monitoring is an early indicator of settlement.	Appended to the Construction Environmental Management Plan (CEMP)
Construction Noise and Vibration Management Plan (CNVMP)	Settlements may result from construction vibrations.	Appended to the Construction Environmental Management Plan (CEMP)
Combined Settlement Contour Plans	Extent and Magnitude of anticipated settlements.	Appendix B to this document, which is derived from Appendix 35.G, Technical Report 35, Volume 3
Peat Thickness Contour Plans	Potential for ground settlement is directly related to peat thickness.	Appendix B to this document which is derived from Appendix 35.B, Technical Report 35, Volume 3 and updated to reflect additional ground investigation.
Effects on Services Plans	Services within the area of anticipated settlement effects.	Appendix C to this document, which is derived from Appendix 35.I, Technical Report 35, Volume 3 and updated to reflect revised settlement estimates.

2 Environmental impacts summary

The construction and operation of the Expressway will result in ground settlement. This settlement has the potential to affect existing buildings, services and transport infrastructure. The assessment of potential settlements and associated effects is presented in Technical Report 35, Volume 3, and is summarised below.

The Expressway traverses dune sands and peat swamps of the Kāpiti Coast Lowlands. Key geotechnical considerations for settlement potential are the presence of peat deposits, and the thickness and nature of these deposits.

The settlement will predominantly result from loading (by earthworks) of the peat deposits that remain beneath the Expressway embankments, and lowering of the groundwater levels in the peat (by excavation or drainage). There are four sources of settlement associated with the construction and operation of the Expressway, as follows:

- Consolidation of the ground due to construction of embankments
- Consolidation of the ground due to lowering of the groundwater
- Mechanical settlement of ground due to movement of the retaining walls
- Mechanical settlement of ground due to vibrations.

The predicted settlement is generally less than 25mm beyond the edge of the earthworks. In areas of thicker peat deposits, the predicted settlement is in the order of 25 to 50mm up to 20m from the earthworks footprint, reducing to less than 25mm beyond this.

Settlement has the potential to affect the existing built environment in close proximity to the Expressway. The main features of the existing environment are the buildings, services and transport infrastructure. These features are described below, along with the predicted effects.

In general, the land adjacent to the Expressway is a mix of urban residential and rural in nature. The urban housing is located close to Paraparaumu and Waikanae town centres. Rural farming and lifestyle properties are located between Otaihanga Road and the Waikanae River, and north of Te Moana Road. The majority of residential buildings have been built over the last 50 years, with a number of newer subdivisions. The residential buildings are located where settlement is predicted to be less than 25mm, and typically less than 12.5mm. The residential building damage has been assessed as Building Damage Category 'negligible', described as hairline cracks at worst, refer Table 10 of Technical Report 35, Volume 3.

There are some commercial and light industrial buildings in Paraparaumu town centre. These are typically two storey portal frame structures. The settlement effects on the commercial and light industrial buildings, along with the KCDC Wastewater Treatment Plant and the Waikanae Christian Holiday Park (El Rancho), will be further assessed during detailed design and specifically monitored during construction.

There are a number of services crossing or in close proximity to the Expressway Alignment. These services are typical of residential areas and include water, wastewater and stormwater networks, electricity and gas distribution, and telecommunications. The Vector Gas Transmission Pipeline Corridor crosses the Expressway Alignment at several locations within a 1.6 km stretch north of the Waikanae River. The Expressway passes under the Transpower Bunnythorpe to Haywards A and B 220kV Transmission Lines north of Smithfield Road. The services that are located below the footprint and founded above the base of the peat deposits will require relocation or active protection due either to anticipated settlement effects or physical construction works. The services that are located outside the proposed earthworks extents are expected to be subject to relatively small changes in grade and horizontal strain.

The Expressway crosses the existing local road network at nine locations, including several secondary arterials. There are also a number of local roads that are in close proximity to the Expressway within the expected area of effects. The existing local roads are generally two lanes (one lane in each direction) and are finished with a chip-sealed surfacing. The local roads that are located outside the proposed earthworks extents are expected to be subject to relatively small changes in grade.

The North Island Main Trunk (NIMT) Railway line runs roughly parallel with the existing State Highway (SH1). At the southern and northern extents of the Expressway, the NIMT is located on embankment to the east of the existing SH1. At the southern end, the NIMT is not within the area of predicted settlements. At the northern end, relatively small settlements are predicted. A detailed assessment of potential effects is proposed at this location, and an appropriate mitigation strategy will be developed with KiwiRail if required.

The settlement effects outside the earthworks footprint have been assessed as being low based on the predicted settlement. Monitoring is proposed to confirm that ground settlement effects are consistent with the settlement effects assessment. The settlement assessment is based on the modelled groundwater drawdown, and as such the actual groundwater drawdown must also be confirmed. Monitoring will include building condition assessments for structures, together with measurement and reporting of ground settlement and groundwater levels. Monitoring of groundwater levels for ground settlement management is described in the GMP.

Should settlements appear likely to result in damage to the built environment, mitigation measures are available that can be implemented. Similarly, should groundwater changes appear likely to result in greater settlement than predicted, a response plan has been prepared for implementation.

3 Implementation and operation

3.1 Operating and management procedures

Mitigation measures are not expected to be required based on the Settlement Effects Assessment. There are, however, mitigation measures available that can be implemented should the measured settlement or its effect require it. This section outlines a variety of mitigation measures that could be used. The Project team² will determine the most appropriate measures for each specific case. The measures will be implemented in accordance with the Conditions and in agreement with the Kāpiti Coast District Council.

3.1.1 Road embankment settlement contingency measures

Consolidation settlement of the underlying peat deposits will occur due to increased loading from the road embankments. The road embankment construction, and consequently the modification of the underlying materials, will result in short-term and long-term changes to the shallow groundwater levels where a “preload and surcharge” approach is adopted. Lowering of groundwater levels beneath the road embankments is expected to result in further consolidation settlement in this situation. This settlement is expected to be of relatively large magnitude within the road embankment footprint, with only limited settlement expected beyond it. Little settlement of the final embankment is expected where an “excavate and replace” peat treatment approach is adopted.

If the actual settlement beyond the earthworks footprint is of greater magnitude and/ or extends further beyond the footprint, the following actions may be taken:

- Change the ground improvement approach where the Expressway is constructed over peat deposits. The two proposed treatment methods are 1) Excavate and Replace and 2) Preload and Surcharge. These methods are interchangeable.
- Modify the ground improvement approaches, for example:
 - For the Preload and Surcharge method, a more permeable material may be used for the starter/ drainage layer, to reduce the “damming” effect of compressed peat on the groundwater flows across the alignment.
 - For the Excavate and Replace method, the length and drained duration of the temporary excavation may be limited, to reduce the magnitude and extent of groundwater changes.
- Use alternative ground improvement approach for localised areas i.e. a load transfer platform combined with foundations, to avoid excavating or loading the underlying peat.

² This Plan refers to the Project team as carrying out works on behalf of and as contracted by the NZTA. The NZTA is the requiring authority and the consent holder.

- Reduce the embankment footprint over localised areas. This may be achieved by using geogrid reinforcement to allow steepening of embankment slopes, to increase the distance between the construction activity and the sensitive items.

It is acknowledged that these modifications are reactive and will take time to implement. In order to reduce the likelihood of such effects developing, groundwater “neutrality” can be targeted in the design of significant embankments on peat. Full neutrality is unlikely to be achieved, but steps can be taken to limit the potential damming or draining effects of peat treatment.

3.1.2 Groundwater drawdown settlement contingency measures

Consolidation settlement of the underlying peat deposits will result from groundwater lowering. Lowering of the groundwater level will occur due to construction of the road embankment (as described above) and at unlined stormwater features. In addition, short-term groundwater lowering will occur due to temporary excavations. The groundwater drawdown contingency measures are detailed in the GMP, and summarised below:

- Change to construction methodology i.e.
 - Alternative peat treatment (surcharge);
 - Lining (temporary and/ or permanent) of cuts below the groundwater level; or
 - Limit the length and drained duration of temporary excavations.
- Local cut off (clay bund or slurry wall).
- Recharge trenches/ wells.

3.1.3 Retaining wall settlement contingency measures

Lateral movement of embedded retaining walls (as the ground is excavated in front of them) will result in localised settlement of the ground above. This occurs relatively quickly, during and immediately following wall construction. If the retaining wall deflections exceed the anticipated limits, a review of the design will be undertaken. If required, the following actions may be taken:

- Remove surcharge close to the wall
- Place a berm in front of the wall
- Reduce the extent of temporary over excavation in front of the wall
- Install additional or stiffer structure
- Install props or ground anchors.

3.1.4 Building damage repair measures

a. Non-structural effects

If the Expressway works result in building damage, then general repairs may be required. These repairs may include repointing of brickwork, repainting and redecorating. In severe cases, repairs may require some partial re-building work, although this is considered

highly unlikely. The timing of such repairs would depend on the stage of construction, the building owner's preference and the degree of damage.

b. Structural effects

The settlement effects assessment has not identified any buildings with a Building Damage Criteria of greater than 'negligible'. As such, structural building damage is highly unlikely and not envisaged on this Project. However, if any effects of a structural nature are identified during the course of the monitoring programme then a detailed evaluation will be required by a Structural Engineer. Any recommendations for repair and an increased level of monitoring arising from this evaluation will then be implemented. In extreme cases where local repair or re-construction is not sufficient, then additional measures such as underpinning or strengthening may be required.

In the event of a "substantial injurious affection" to a person's land resulting from the construction of the MacKays to Peka Peka Expressway, section 63 of the Public Works Act would entitle that person to compensation.

3.1.5 Services repair measures

The services that are located below the footprint and founded above the base of the peat deposits will require relocation or active protection due to either the settlements effects or physical construction works. These works will be agreed with the service providers prior to Project works commencing.

The services located outside the proposed earthworks extents are likely to be subject to relatively small changes in grade and horizontal strain, as indicated on the settlement effects plans. The services outside the earthworks extents which are assessed as being susceptible to damage or particularly critical will be monitored during the active construction period at a frequency that will be guided by the magnitude of predicted and monitored settlement, in agreement with the services provider.. If this monitoring indicates damage may have occurred, a detailed investigation of the area and affected services will be promptly carried out. This assessment will include a detailed examination of the site, coordination with the relevant service providers to ascertain what effects their network is experiencing, and an assessment of what remedial action is required. Any remedial works will be carried out as soon as possible. If the investigation reveals no immediate damage, the services will continue to be monitored closely until all parties are satisfied no damage has occurred.

There are a number of measures available to mitigate damage to services. The specific measures selected would depend on the type of service, location and severity of the damage and agreement with the service provider. If required, the following actions may be taken:

- Permanently divert the service through another nearby service and abandon the original service line (the capacity of the nearby service would need to be checked).
- Temporarily divert the service and repair the original service.

- Expose the service and undertake a repair.
- Replace the service. In cases of severe damage, a length of the service may be replaced.

3.1.6 Transport infrastructure repair measures

The effects on the local roads outside the proposed construction designation are assessed as negligible, with the predicted changes in grade being relatively small. Settlements may result in grade changes and differential movements. If the measured effects are greater than anticipated, the following actions may be taken:

- Overlay the road surface to raise to the previous level and re-shape any differential movements.
- Reconstruct the kerb and channels, and footpaths to mitigate changes in grade and/ or differential settlements.
- Install additional drainage if new areas of ponding are identified.

The effects on the NIMT at the northern end are expected to be able to be remediated by regular maintenance track releveling. This will be agreed with KiwiRail if necessary once more detailed assessments have been undertaken.

3.2 Monitoring

This section details the proposed settlement monitoring regime. This monitoring regime provides a method for measuring the actual settlement and the resulting effects. Monitoring is required prior to construction, during construction and following construction to provide a comprehensive assessment of effects. The measured settlement and resulting effects will be compared with the predicted values. The settlement predictions will be updated as designs are finalised. They will be calibrated as the monitoring results become available, and the assessment of potential effects updated.

The settlement monitoring outlined in this section is proposed to extend beyond the earthworks extent and the expected area of resulting effects. It does not cover settlement monitoring required for the embankment construction control (i.e. to determine the surcharge duration and/or to predict the long-term pavement performance).

3.2.1 Survey of general monitoring points

A series of survey marks will be installed and regularly monitored to provide information to compare to the settlement estimates. Monitoring will be undertaken using conventional survey monitoring equipment.

Framework marks will extend out from the Expressway and be placed, as far as practical, to match with the cross sections that have been used for the settlement estimates. The number of marks at each cross section will depend on the location of buildings or other features relative to the section (i.e. where there are more buildings there will be more frequent marks and where there is open land the spacing of marks may be increased) and access to those locations for surveying (Condition DC.70(a)). Marks will be placed at

specific storm water features where groundwater drawdown of more than 0.1m (Condition DC.70(b)) is predicted (refer Assessment of Groundwater Effects). The marks will be placed to coincide with the groundwater level monitoring in selected locations.

In addition to the above, survey monitoring marks will be placed on or around building or features that are considered to be particularly sensitive. The number and layout of these marks will be specific to each building or feature.

The framework marks will serve as the main monitoring points. The framework marks have been or will be placed as detailed below:

- Along the cross-sections used for settlement predictions as far as practical. The marks will extend out from the Expressway, where settlements are expected to be greater than 12.5mm. Typically 2 - 4 marks will be installed per cross-section, noting that in some locations marks are located close to particular features of interest, rather than directly on the cross-section (Condition DC.70 (a)).
- Adjacent to storm water features where groundwater drawdown of greater than 0.1m is predicted (Condition DC.70 (b)).
- KCDC Wastewater Treatment Plant (Condition DC.70 (c)).
- At buildings identified in the course of detailed design, and in particular where more than 12.5mm of settlement is predicted (Condition DC.70 (d)).

Additional marks will be placed in areas where buildings are located close to the Expressway and in areas where the settlement predictions extend beyond the Expressway footprint.

The proposed marks are identified on the Settlement Monitoring Plans; refer Drawings GT-SE-320 to 331, Appendix B of this Plan.

Intermediate marks may be installed between and around the framework marks to provide additional detail as required and to allow level traverses to be undertaken.

A series of datum points have been established for the surveys and these are connected to 1st order LINZ control marks. These are located well outside the area expected to be affected by the settlements and are protected.

The initial framework marks will be installed initially and monitored for vertical movement with 13 sets of baseline values taken during the year prior to the Expressway construction commencing. The 13 sets comprise the initial installation survey and the subsequent survey rounds on a monthly basis. The remaining marks will be installed and monitored monthly for at least 12 months prior to construction commencing in that area (Condition DC.71 (a)).

The on-going frequency of monitoring will then vary depending on the stage of construction. At the start of the Project construction, each framework mark will be monitored for vertical movement on a quarterly basis (Condition DC.71 (b) (i)).

As the active construction stage starts to affect the relevant section, all marks in that section will be monitored monthly for vertical movement (Condition DC.71 (b) (ii)).

For this Project, ‘active construction’ can be defined as:

Starting when earthworks commence within 200m of a particular location and ending when pavement construction is complete at that location (Condition DC.71 (b) (ii)), and

Starting when excavation in front of a retaining wall comes within 50m of a section and ending when the permanent wall supports are in place beyond a distance of 50m (Condition DC.71 (b) (iii)).

Once the active construction for each section is complete, the monitoring can then reduce to the pre-active construction frequency (i.e. quarterly monitoring for all marks) if the results indicate that the settlements and effects are within an acceptable range (Condition DC.71 (c) (i)). Following a six month period of this quarterly monitoring and if results indicate that the settlements and effects are still within an acceptable range, then the framework marks will be monitored on a six month basis for an additional period of at least 2 years (Condition DC.71 (c) (ii)).

The survey monitoring is summarised in Table 2.

Table 2 – Survey Monitoring Regime

Project Phase	Vertical Survey Monitoring Frequency of Framework Marks
Preconstruction	Monthly for 12 months
During Construction	Quarterly
During Active Construction	Monthly
Post Active Construction ⁽¹⁾	Quarterly for 6 months, reducing to half yearly
<p>(1) ‘active construction’ can be defined as:</p> <ul style="list-style-type: none"> ■ Starting when earthworks commence within 200m of a particular location and ending when pavement construction is complete at that location, and ■ Starting when excavation in front of a retaining wall comes within 50m of a section and ending when the permanent wall supports are in place beyond a distance of 50m. 	

If the monitoring results indicate the movements are outside the expected range, or if there are other reasons for concern, then the monitoring frequency and/ or extent can be increased to cover those areas of concern. For example, the quarterly monitoring of framework marks pre and post active construction could be increased to monthly and/ or intermediate marks installed for monitoring. The number of marks and frequency of monitoring can be modified to address any specific concerns identified.

Condition DC.73 sets out the pre-conditions to reduction in the frequency of the settlement monitoring.

3.2.2 Groundwater monitoring for ground settlement

Monitoring of groundwater levels for ground settlement management is described in the Groundwater Management Plan (GMP). Trigger levels are nominated in Table 4 of the GMP and an extract is reproduced in Appendix D of this Plan.

3.2.3 Building condition assessments

A schedule of buildings (attached at Appendix E) that lie within areas where settlement may occur as a result of the project (but which are not necessarily considered to be at risk) has been prepared based on the following criteria:

- Dwellings within 20m of the proposed peat treatment extents
- Dwellings adjacent to new storm water features where predicted groundwater drawdown is greater than 0.1m (as identified in Assessment of Groundwater Effects)
- Dwellings in areas where the predicted settlements are greater than 12.5mm, including (as a precautionary measure) 10m beyond the predicted 12.5mm settlement contour shown on the drawings in Appendix AB of this Plan.
- KCDC Wastewater Treatment Plant structures (refer Table 4 of the Assessment of Ground Settlement Effects, reproduced in Appendix E of this Plan)
- El Rancho buildings (refer Table 5 of the Assessment of Ground Settlement Effects, reproduced in Appendix E of this Plan)
- Specific buildings identified in the course of detailed design

This list is contained in Appendix E and is intentionally more extensive than the schedule of buildings and structures considered being at risk (Condition DC.75). Individual pre-construction assessment of all of these structures shall be carried out (subject to agreement of terms, Condition DC.76).

The initial assessment will comprise an inspection of each building and significant structure on the property to establish and record its condition. Each assessment will produce a written description including photographs of any existing damage and a copy of this report will be provided to the owner. These assessments will be carried out prior to the commencement of the earthworks, excavation and retaining wall construction. These assessments will provide a baseline of the condition of each building.

In addition, monthly visual assessments of the following buildings will be carried out during the 'active construction' phase of the Project (Condition DC.78):

- Dwellings where the total settlements are estimated to be greater than 25mm
- Dwellings where the predicted Building Damage Category is greater than 'negligible' (noting that there are none in this category at this stage)
- KCDC Wastewater Treatment Plant
- All other specifically identified buildings.

The purpose of the assessment will be to look for any evidence of effects, with reference to the initial condition (baseline) survey. If mitigation is required, options available are outlined in Section 3.1 above.

Assessments of other buildings or on a more frequent basis will also be carried out if the monitoring indicates that there may be significant settlement effects. All inspections would be subject to the approval of the owner to enter their property.

The inspections shall be undertaken by a suitably qualified person (Condition DC.77), following owner consultation and approval (Condition DC.79(a)).

Post-construction building condition assessments (Condition DC.79) shall be carried out on the following properties and on any other properties considered to be at risk. This is not expected to be the full list of properties identified in Appendix E, as that list intentionally includes a buffer zone where properties are not considered to be at risk.

- KCDC Wastewater Treatment Plant
- Specific buildings identified in the course of detailed design.
- The NIMT Railway at the northern end of the Project, if detailed analysis indicates it is warranted.

It is also proposed that the above dwelling types and specific buildings/locations be the subject of level surveys on a monthly basis during the 'active construction' phase of the Project.

The purpose of the level survey will be to provide a basis for evaluating the rate of any movement and to enable a correlation with the visual survey. If mitigation is required, possible options for action are discussed above in Section 3.1.

3.2.4 Retaining wall monitoring

The retaining walls will be specifically monitored for movement using survey monitoring. These values will be compared to the estimated values and if the results indicate movements greater than those anticipated the mitigation measures outlined in Section 3.1 may be implemented. The locations for the instrumentation and trigger levels for action will be determined during detailed design.

3.2.5 Services monitoring

In addition to the survey marks monitoring described above, CCTV inspections of some storm water and wastewater services will be carried out to assess the effects of the settlements. For storm water and wastewater services identified as being susceptible to damage or particularly critical, an initial preconstruction CCTV inspection will be carried out to provide a baseline for assessing any future damage. As the construction progresses, additional CCTV inspections may be carried out depending on the results of the survey monitoring and feedback from service providers (Condition DC.81).

For other services identified as being susceptible to damage or particularly critical, visual inspections may be undertaken by excavating to expose the service if required.

3.3 Reporting

The settlement monitoring and resulting effects will be reported to Kāpiti Coast District Council. In accordance with DC.74, a settlement report shall be prepared:

- a) Prior to the commencement of work; and
- b) At 3-monthly intervals throughout the construction period; and
- c) Following completion of construction following each round of settlement monitoring undertaken (i.e. 3 monthly and then 6 monthly).

Preconstruction monitoring will be carried out as described above in Section 3.2 and reported following the final set of data, prior to the start of construction (Condition DC.74 (a)). This data will be factual in nature, with assessment only required for anomalous results. The report will form part of the input for the construction phase assessments.

The monitoring data will be processed and compared to the results of relevant groundwater monitoring and to the design analyses (Condition DC.72 (a)). Once construction starts, the data will be used to reassess the building damage categories and these categories will then be compared to the results in the settlement assessment report. The effects on services will also be assessed from the settlement gradients. If this reassessment indicates that the damage category has increased then additional analyses or more frequent monitoring may be required and the affected buildings identified for potential mitigation work. Similarly, an increase in estimated effects on the services will require additional review and potentially amended monitoring and mitigation. Consideration may also need to be given modifying the construction approach to reduce ground settlements, if groundwater drawdown is greater than expected due to ground excavation.

If the reassessment indicates that a building or structure has increased its damage category, this shall be considered to be an Alert Level and additional specific assessment of the structure shall be carried out by the Requiring Authority to confirm this reassessment within 72 hours of the reassessment being completed (Condition DC.72 (b)).

If the additional assessment confirms the increase in damage category, this shall be considered an Action Level and the owner and occupier of the structure shall be notified within 72 hours of the additional assessment being completed (Condition DC.72 (c)).

Following consultation with the property owner and occupier, subsequent actions may include increased frequency and/or extent of monitoring, modification to the construction approach with a contingency measure (or measures) as outlined in Technical Report 35 and summarised on Section 3.1 of this plan, or mitigation work to the affected structure (Condition DC.72 (d)).

Groundwater monitoring results will be compared against the trigger levels nominated in Table 4 of the GMP (reproduced in Appendix D) in the course of groundwater monitoring. Exceedance of trigger levels will result in a survey of all ground and building settlement monitoring marks within a 200mm radius of the affected monitoring bore within five (5) days of the trigger event. The survey levels will be compared with the nominated surface level triggers for those marks. Surveys will be carried out on a twice monthly basis, with every second survey occurring mid-way between the regular monthly survey rounds. The groundwater level in the bore will also be monitored twice monthly. The results shall be submitted to the Project Team's Project Manager and to the Consenting Authority (KCDC) with the regular monitoring report until the affected monitoring bore shows either:

- Recovery of the groundwater level at that monitoring bore to above the trigger level; OR
- A trend of increasing groundwater level over at least three (3) consecutive rounds; OR
- Ground surface level monitoring mark levels over at least three (3) months from the triggering event indicate that surface ground settlement around the bore is within the consented range (i.e. seasonal plus project effects); OR
- Analysis of the data indicates that adverse effects are not anticipated, in which case revised trigger levels would be set with the approval of the Project Manager, KCDC and Greater Wellington Regional Council (being the Consenting Authority for groundwater effects).

Reporting will be determined by the stage of construction and actual results. During the active construction stage it is anticipated that initial internal review of monitoring results will take place shortly after receipt of the processed data. As long as the results show no significant anomalies or assessed increase in building damage category, these monitoring results would be presented on a quarterly basis (Condition DC.74 (b)). If there are any significant anomalies or increased risk to buildings, then following a more detailed review of the data, those parties would be notified and mitigation measures agreed. The results of this more detailed work and the outcomes, along with the agreed way forward will then be reported.

The post active construction stage results (quarterly and six monthly) will be reviewed and reported shortly after receipt of the processed data (Condition DC74 (c)). Where any significant anomalies or assessed significantly increased risk to buildings occurs, then the reporting will follow the process as described above for active construction.

An example settlement monitoring report from another project is provided in Appendix F. This will be further developed as the pre-construction monitoring report is prepared (condition DC.74 (a)). It is envisaged that the settlement monitoring report will be accompanied by a spreadsheet containing the monitoring results, a set of plans showing the area of active construction for the monitoring period, and a set of plans showing, by colour, the status (within limits/alert/action) of each of the settlement monitoring points. The relevant groundwater monitoring results will also be attached and indicated on the plans.

A copy of the pre, post-construction and any additional building condition assessment reports for each building to the respective property owner within 15 working days of completing the reports. The Requiring Authority shall notify the Council that the assessments have been completed (Condition DC.80).

3.4 Remediation

If the proposed Expressway works result in building damage, then general repairs may be required. These repairs may include repointing of brickwork, repainting and redecorating. In severe cases, repairs may require some partial re-building work, although this is considered highly unlikely. The timing of any repairs will depend on the stage of construction, the building owner's preference and the degree of damage.

The settlement effects assessment has not identified any buildings with a Building Damage Criteria of greater than 'negligible'. As such, structural building damage is highly unlikely and not envisaged on this Project. However, if any effects of a structural nature are identified in the course of the monitoring programme then a detailed evaluation will be required by a Structural Engineer. Any recommendations for repair and an increased level of monitoring arising from this evaluation will then be implemented, in agreement with the owner. In extreme cases where local repair or re-construction is not sufficient, then additional measures such as underpinning or strengthening may be required.

In all cases, the appropriate remedial work (if any) in conjunction with arrangements for implementation and/or compensation shall be agreed with the owner (Condition DC.79 (b)).

3.5 Training

The Project team (staff and subcontractors) will undergo general environmental awareness training and training about their responsibilities under the SEMP and the Construction Environmental Management Plan (CEMP). The site induction programme is described in 5.1 of the Construction Environmental Management Plan (CEMP).

The Environmental Induction will include information on the following aspects of the settlement effects management:

- Information about activities and stages of construction that may cause settlements, including excavation and loading from earthworks;
- Consent requirements;
- Settlement monitoring and management procedures;
- Roles and responsibilities for management of settlement on the Project.

3.6 Complaints

The complaints management plan is described in 7.1 of the Construction Environmental Management Plan (CEMP).

4 Roles and responsibilities

Roles and responsibilities for the Project are described in Section 4.2 of the Construction Environmental Management Plan (CEMP). Specific roles and responsibilities relating to managing settlements are described below.

The Project team (acting on behalf of NZTA) will manage and monitor the settlement effects on buildings, services and roads.

A Project surveying team will measure the actual settlement and groundwater levels, and an assessment team within the Project team will assess the impacts of the settlement through monitoring the condition of buildings and services. The actual settlements and resulting effects will be compared with the predicted values from the settlement effects assessment.

If the settlement effects have occurred beyond those estimated or if the results indicate that there is the potential for greater settlement effects than estimated, then the team will immediately notify the Project Manager. The Project team will pass on the findings and coordinate any discussions with the affected party. The Project team will implement measures to minimise settlements and carry out remedial actions on affected buildings, services and roads.

All personnel working on the Project (including Project team employees and subcontractors) have the responsibility for following the requirements of this Plan.

A suitably qualified person will be engaged to undertake the building assessment (Condition DC.77).

5 Transition phase

The transition phase is the crossover period between construction and operation phases of the Project, where the responsibility of the management is transferred from the Project team to the network operator. The specialist monitoring and assessment team will continue monitoring on a six monthly basis through the post construction stage where practicable, for at least the 2 year period following completion of the Project.

6 SEMP review

This section describes how the Plan will be reviewed, including considering the environmental controls and procedures to make sure that they are still applicable to activities being carried out.

The SEMP has been reviewed by the Project team after confirmation of the resource consent and designation conditions and has been revised in accordance with these conditions. The SEMP will be updated, with the necessary approval, throughout the course of the Project to reflect material changes associated with changes to construction

techniques or the existing environment. Approval from the Kāpiti Coast District Council will be required for any relevant revisions of a material nature.

The review of the SEMP will take following items into consideration:

- Any significant changes to construction activities or methods;
- Any significant changes in volume or nature of the groundwater encountered;
- Key changes to roles and responsibilities within the Project;
- Changes in industry best practice standards or recommended pollution controls;
- Changes in legal or other requirements (social and environmental legal requirements, NZTA objectives and relevant policies, plans, standards, specifications and guidelines);
- Results of monitoring, inspection and maintenance programmes, logs of incidents, corrective actions, internal or external assessments; and
- Public complaints.

Reasons for making changes to the SEMP will be documented. A copy of the original SEMP document and subsequent versions will be kept for the Project records, and marked obsolete. Each new/ updated version of the SEMP documentation will be issued with a version number and date to eliminate obsolete SEMP documentation being used.

7 References

Bradshaw, J. Geotechnical Factual Report: Technical Report 37, Volume 3 of the MacKays to Peka Peka Expressway Project AEE.

Burland, J.B. (1997), "Assessment of risk of damage to buildings due to tunnelling and excavation", Earthquake Geotechnical Engineering, Ishihara (ed.), Balkema, Rotterdam, 1997.

Coe, L. Assessment of Ground Settlement Effects: Technical Report 35, Volume 3 of the MacKays to Peka Peka Expressway Project AEE.

France, S. & Michaelsen, J. Assessment of Groundwater Effects: Technical Report 21, Volume 3 of the MacKays to Peka Peka Expressway Project AEE.

Wilkening, S. and Whitlock, J. Construction Noise and Vibration Management Plan (CNVMP): Appended to the Construction Environmental Management Plan (CEMP) for the MacKays to Peka Peka Expressway Project.

Williams, A. Groundwater (Level) Management Plan (GMP): Appended to the Construction Environmental Management Plan (CEMP) for the MacKays to Peka Peka Expressway Project.

Appendix A

Resource Consent Conditions

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INDEX OF CONFIRMED NOTICE OF REQUIREMENT AND RESOURCE CONSENTS

Table of Notice of Requirement and Resource Consent condition references

	Notice of Requirement	General Conditions	Specific Conditions
NSP 12/01.001	Notice of requirement for a new designation for the construction, operation and maintenance of a state highway (MacKays to Peka Peka Expressway) from 2 km north of MacKays Crossing to Te Kowhai Road, Peka Peka in the Kāpiti Coast District.	DC.1 - DC.81	N/A
	Resource Consent from KCDC	General Conditions	Specific Conditions
NSP 12/01.002	<p>Consent pursuant to the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health</p> <p>The site to which the consent application relates is at 55 Rata Road, Paraparaumu. Land use consent for disturbing soil containing contaminants where there is a risk to human health and changing the use of land containing contaminants where there is a risk to human health pursuant to Regulation 10 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (SR 2011/361).</p>		NES.1- NES.3
	Resource Consent from GWRC	General Conditions	Specific Conditions
NSP 12/01.003	<p>Land Use Consent s9(2)</p> <p>Land use consent to disturb soil for the construction of roading and tracking for the MacKays to Peka Peka Expressway.</p>	G.1-G.44	E.2-E.11
NSP 12/01.004	<p>Land Use Consent s9(2)</p> <p>Land use consent to disturb soil in areas identified as being erosion prone, and to undertake large scale vegetation clearance for the MacKays to Peka Peka Expressway.</p>	G.1-G.44	E.2-E.11
NSP 12/01.005	<p>Discharge Permit s15(1)(b)</p> <p>Discharge permit to discharge sediment and chemical flocculant in treated stormwater runoff to water, and to land where it may enter water, in association with bulk earthworks for the MacKays to Peka Peka Expressway.</p>	G.1-G.44	E.2-E.11

NZTA Resource Consent from GWRC (contd) - Whareroa Stream Catchment			
NSP 12/01.006	<p>Land Use Consent s13(1)(a) & s13(1)(e)</p> <p>Land use consent to undertake the following activities within Queen Elizabeth Park Drain:</p> <ul style="list-style-type: none"> · To place structures (culverts, rip rap, and storm water outlets) and the associated diversion and reclamation of a section of the bed in this catchment; and · To remove an existing culvert; <p>including the associated disturbance of, and deposition of material on, the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.007	<p>Water Permit s14(1)</p> <p>Water permit to temporarily divert the flow of the Queen Elizabeth Park Drain during construction of the culvert and associated structures in the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.008	<p>Water Permit s14(1)</p> <p>Water permit to permanently divert the full flow of the Queen Elizabeth Park Drain in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NZTA Resource Consent from GWRC (contd) - Wharemauku Stream Catchment			
NSP 12/01.009	<p>Land Use Consent s13(1)(a) & s13(1)(e)</p> <p>Land use consent to undertake the following activities within and over Drain 7, an unnamed tributary of Drain 7 and the Wharemauku Stream:</p> <ul style="list-style-type: none"> · To place structures (bridges, culverts, rip rap, and storm water outlets) and the associated diversion and reclamation of a section of the bed in this catchment; and · To remove an existing culvert; <p>including the associated disturbance of, and deposition of material on, the bed of the watercourses in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.010	<p>Water Permit s14(1)</p> <p>Water permit to temporarily divert the flow of Drain 7, an unnamed tributary of Drain 7 and the Wharemauku Stream during construction of the culvert and bridges and associated structures in the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.011	<p>Water Permit s14(1)</p> <p>Water permit to permanently divert the full flow of Drain 7 and an unnamed tributary of Drain 7 in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3

NZTA Resource Consent from GWRC (contd) - Waikanae River Catchment			
NSP 12/01.012	<p>Land Use Consent s13(1)(a) & s13(1)(e)</p> <p>Land use consent to undertake the following activities within and over Mazengarb Drain, Waste Water Treatment Pond Drain, Landfill Drain, Otaihanga Drain, an unnamed tributary of the Muaupoko Stream, Muaupoko Stream and the Waikanae River:</p> <ul style="list-style-type: none"> · To place structures (bridges, culverts, rip rap, and storm water outlets) and the associated diversion and reclamation of a section of the bed in this catchment; and · To remove an existing culvert; <p>including the associated disturbance of, and deposition of material on, the bed of the watercourses in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.013	<p>Water Permit s14(1)</p> <p>Water permit to temporarily divert the flow of Mazengarb Drain, Waste Water Treatment Pond Drain, Landfill Drain, Otaihanga Drain, an unnamed tributary of the Muaupoko Stream and the Waikanae River; during construction of the culvert and bridges and associated structures in the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.014	<p>Water Permit s14(1)</p> <p>Water permit to permanently divert the full flow of the Mazengarb Drain, Waste Water Treatment Pond Drain, Landfill Drain, Otaihanga Drain, an unnamed tributary of the Muaupoko Stream, Muaupoko Stream and the Waikanae River in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NZTA Resource Consent from GWRC (contd) - Waimeha Stream Catchment			
NSP 12/01.015	<p>Land Use Consent s13(1)(a) & s13(1)(e)</p> <p>Land use consent to place structures (bridges, culverts, rip rap, and storm water outlets) within and over Market Garden Drain and Waimeha Stream; and the diversion and reclamation of a section of the bed in this catchment, including the associated disturbance of, and deposition of material on, the bed of the watercourses in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.016	<p>Water Permit s14(1)</p> <p>Water permit to temporarily divert the flow of the Market Garden Drain and Waimeha Stream during construction of the culvert and bridges and associated structures in the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.017	<p>Water Permit s14(1)</p> <p>Water permit to permanently divert the full flow of the Market Garden Drain in the vicinity of the MacKays to Peka Peka</p>	G.1-G.44	WS.1- WS.12 and SW.1-

	Expressway.		SW.3
NZTA Resource Consent from GWRC (contd) - Ngarara Creek Catchment			
NSP 12/01.018	<p>Land Use Consent s13(1)(a) & s13(1)(e)</p> <p>Land use consent to undertake the following activities within and over Ngarara Creek, Kakariki Stream, Smithfield Drain, unnamed tributary of Paetawa Drain and Paetawa Drain:</p> <ul style="list-style-type: none"> · To place structures (bridges, culverts, rip rap, and storm water outlets) and the associated diversion and reclamation of a section of the bed in this catchment; and · To remove an existing culvert; <p>including the associated disturbance of, and deposition of material on, the bed of the watercourses in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.019	<p>Water Permit s14(1)</p> <p>Water permit to temporarily divert the flow of the Ngarara Creek, Kakariki Stream (at the local road bridge), Smithfield Drain, an unnamed tributary of Paetawa Drain and the Paetawa Drain; during construction of the culvert and bridges and associated structures in the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.020	<p>Water Permit s14(1)</p> <p>Water permit to permanently divert the full flow of the Ngarara Creek, Kakariki Stream (at local road and Expressway bridges), Smithfield Drain, an unnamed tributary of Paetawa Drain and the Paetawa Drain; in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NZTA Resource Consent from GWRC (contd) - Hadfield/Te Kowhai Stream Catchment			
NSP 12/01.021	<p>Land Use Consent s13(1)(a) & s13(1)(e)</p> <p>Land use consent to undertake the following activities within Hadfield/Te Kowhai Stream:</p> <ul style="list-style-type: none"> · To place structures (culverts, rip rap, and storm water outlets) and the associated diversion and reclamation of a section of the bed in this catchment; and · To remove an existing culvert; <p>including the associated disturbance of, and deposition of material on, the bed of the watercourse in the vicinity of the MacKays to Peka Peka Expressway.</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NSP 12/01.022	<p>Water Permit s14(1)</p> <p>Water permit to temporarily divert the flow of the Hadfield/Te Kowhai Stream; during construction of the culvert and bridges and associated structures in the bed of the watercourse in the</p>	G.1-G.44	WS.1- WS.12 and SW.1- SW.3

	vicinity of the MacKays to Peka Peka Expressway.		
NSP 12/01.023	Water Permit s14(1) Water permit to permanently divert the full flow of the Hadfield/Te Kowhai Stream; in the vicinity of the MacKays to Peka Peka Expressway.	G.1-G.44	WS.1- WS.12 and SW.1- SW.3
NZTA Resource Consent from GWRC (contd) - General consents			
NSP 12/01.024	Land Use Consent s9(2) Land use consent for the construction of boreholes for groundwater extraction, and for the formation of holes for bridge piles and other excavations where this may intercept groundwater.	G.1-G.44	BC.1-BC.6, GT.1-GT.6 and GD.1- GD.8A
NSP 12/01.025	Water Permit s14(2) Water permit to take and use groundwater for bore testing, dewatering of excavations, dust suppression and construction purposes.	G.1-G.44	BC.1-BC.6, GT.1-GT.6 and GD.1- GD.8A
NSP 12/01.026	Water Permit s14(2) Water permit to divert groundwater from wetlands adjacent to the MacKays to Peka Peka Expressway.	G.1-G.44	BC.1-BC.6, GT.1-GT.6 and GD.1- GD.8A
NSP 12/01.027	Land Use Consent s13(1)(e) Land use consent for the partial reclamation of wetlands (defined as lakes), being the Raumati Manuka Wetland, Otaihanga Southern and Northern Wetlands and El Rancho Wetland, in the vicinity of the MacKays to Peka Peka Expressway Project alignment, including the associated disturbance of the beds.	G.1-G.40	WR.1
NSP 12/01.028	Land Use Consent s13(1)(c) Land use consent to remove vegetation in the beds of various watercourses and wetlands (defined as lakes), being the Raumati Manuka Wetland, Otaihanga Southern and Northern Wetlands and El Rancho Wetland, including the associated disturbance of the beds.	G.1-G.40	VC.1
NSP 12/01.029	Discharge Permit s15(1)(a) Discharge permit to discharge treated cement contaminated water to water, and to land where it may enter water, associated with the construction of the MacKays to Peka Peka Expressway	G.1-G.44	E.2-E.11
NSP 12/01.030	Discharge Permit s15(1)(b) Discharge permit to discharge contaminants to land from the Otaihanga Construction Yard.	G.1-G.44	E.2-E.11

NOTICE OF REQUIREMENT

GUIDE TO READING THE CONDITIONS

The proposed suite of conditions to manage effects of the Project has been numbered in order to eliminate confusion, specifically to avoid multiple 'Condition 1' and so forth. The numbering format is as follows:

Set of proposed conditions	Numbering format
NZTA designation conditions	DC.1, DC.2. and so on

The table below provides explanation to a number of the acronyms and terms used in the conditions.

Definitions	
Active Construction	Means the commencement of earthworks within 500m of a particular location and ending when pavement construction is complete at that location
AEE	Means the MacKays to Peka Peka Expressway Assessment of Effects on the Environment Volumes 1 to 5 dated April 2012
CEMP	Means the Construction Environmental Management Plan
Commencement of Work	Means the time when the first works that are the subject of these designations commence
CAQMP	Means the Construction Air Quality Management Plan
CNVMP	Means the Construction Noise and Vibration Management Plan
Council	Means the Kāpiti Coast District Council
CTMP	Means the Construction Traffic Management Plan
CWB	Means Cycleways, Walkways and Bridleways.
District	Means the Kāpiti Coast District
District Plan	Means the Kāpiti Coast Operative District Plan
Existing network utilities	Means all network utilities existing at 15 August 2011 (the date of notification of this Notice of Requirement). "Network utility" has the same meaning as in section 166 of the Resource Management Act 1991
Final Completion of Work	Means the time when the last construction work(s) within an identified stage are completed
GWRC	Means the Wellington Regional Council
HMP	Means the Hazardous Substances Management Plan
the Council	Means the Kāpiti Coast District Council
LMP	Means the Landscape Management Plan
Manager	Means the Regulatory Manager of the Kāpiti Coast District Council
NUMP	Means the Network Utilities Management Plan
NIF	Means Neighbourhood Impact Fora
NIP	Means the Network Integration Management Plan
Operational	Means when construction of the Project is complete and the Expressway is open to traffic
Outline Plan	Means an outline plan prepared in accordance with section 176A of the RMA
Project	Means the construction, maintenance and operation of the MacKays to Peka Peka Expressway
Requiring Authority	Means the NZ Transport Agency

RMA or 'the Act'	Means the Resource Management Act 1991
Road Asset Manager	Means the Kāpiti Coast District Council's Road Asset Manager
SCMP	Means the Stakeholder and Communications Management Plan
Sector	Means a sector of the Project as nominated by the Requiring Authority and shown in the Sector plans required by this designation (may include several 'stages')
SEMP	Means the Settlement Effects Management Plan
SSCNMP	Means a Site Specific Construction Noise Management Plan
SSCVMP	Means a Site Specific Construction Vibration Management Plan
SSLMP	Means a Site Specific Landscape Management Plan
SSMP	Means a Site Specific Management Plan
SSTMP	Means a Site Specific Traffic Management Plan
SSUDP	Means a Site Specific Urban Design Plan
Stage	Means a stage of the Project as nominated by the Requiring Authority and shown in the staging plans required by this designation
Work	Means one or more of the various activities undertaken in relation to the Project under this designation
Working Day	Has the same meaning as in section 2 of the Resource Management Act 1991

Settlement Management	
DC.67	<p>a) In managing the construction of the Project and its potential effects on ground settlement, the Requiring Authority shall achieve the following outcomes:</p> <ul style="list-style-type: none"> i) The monitoring of ground settlement in the vicinity of the Expressway during and immediately after construction to identify whether any effects on adjacent buildings are occurring; ii) The establishment and implementation of actions to rectify any more than negligible adverse effects on buildings created by ground settlement from the Project. <p>b) In achieving these outcomes, the Requiring Authority shall be consistent with the following guidelines for assessing the effects of ground settlement on buildings:</p> <ul style="list-style-type: none"> i) Burland, J.B. (1997), "Assessment of Risk of Damage to Buildings Due to Tunnelling and Excavation", Earthquake Geotechnical Engineering, Ishihara (Ed.), Balkema, Rotterdam, 1997.
DC.68	<p>a) The Requiring Authority shall submit the Settlement Effects Management Plan (SEMP) to the Manager for certification at least 15 working days prior to work commencing. The purpose of the SEMP is to outline the measures to be adopted to manage potential ground settlements (settlements) associated with construction and operation of the Expressway on existing buildings, services and transport infrastructure in order to achieve the outcomes required under condition DC.67.</p> <p>b) The SEMP shall include, but need not be limited to, information required in other conditions of this consent and details of the following:</p> <ul style="list-style-type: none"> i) implementation and operational procedures to manage the adverse effects of ground settlement; ii) estimated total settlements at end of construction; iii) methods to monitor settlement; iv) monitoring locations set out on a plan; v) monitoring frequency; vi) reporting requirements; vii) alert and action programmes; and viii) process for reviewing the settlement implementation and operational procedures where necessary.
DC.69	<p>The SEMP shall be reviewed by a suitably qualified independent person, prior to being submitted to the Council for certification. Any comments and inputs received from the independent reviewer shall be clearly documented, along with clear explanation of where any comments have not been incorporated and the reasons why. For the purpose of this condition "independent person" shall be a suitably qualified and experienced person who is not an employee of the Requiring Authority or does not work for any of the companies contracted to design and/or construct the Project.</p>
DC.70	<p>The Requiring Authority shall establish a series of ground settlement monitoring marks to monitor potential settlement that might occur as a result of construction of embankments and drawdown of the groundwater table. The survey marks will be generally located as follows:</p> <ul style="list-style-type: none"> a) 2 to 4 marks, established in cross-sections along the length of the Expressway as set out in Appendix D of the draft SEMP; b) Adjacent to stormwater features where groundwater drawdown of more than 0.1 m has been predicted; c) At the Council wastewater treatment plant; and d) At structures identified close to the Expressway where settlement of more than 12.5 mm is

	<p>predicted.</p> <p>The locations of each type of settlement monitoring marks shall be confirmed in the SEMP.</p>
DC.71	<p>The Requiring Authority shall survey the settlement monitoring marks at the following frequency:</p> <ul style="list-style-type: none"> a) Pre-construction - vertical at monthly intervals starting at least 12 months prior to construction commencing in the area of active construction; b) During construction: <ul style="list-style-type: none"> i) Except as specified in (ii) and (iii) vertical at 3 monthly intervals; ii) within 500 m of active construction – vertical at monthly intervals; iii) within 50 m of excavation in front of retaining walls – vertical at monthly intervals. c) Post-construction: <ul style="list-style-type: none"> i) Vertical at 3 monthly intervals for 6 months; and ii) Vertical at 6 monthly intervals for a further period of at least 2 years.
DC.72	<ul style="list-style-type: none"> a) Immediately following each monitoring round, the Requiring Authority shall use the settlement monitoring results (together with the results of groundwater monitoring where they may provide an earlier indication of future settlements) to reassess the building damage categories and compare them to those estimated in Technical Report 35 - Assessment of Ground Settlement Effects. b) If the reassessment indicates that a building or structure has increased its damage category, this shall be considered to be an Alert Level and additional specific assessment of the structure shall be carried out by the Requiring Authority to confirm this reassessment within 72 hours of the reassessment being completed. c) If the additional assessment confirms the increase in damage category, this shall be considered an Action Level and the owner and occupier of the structure shall be notified within 72 hours of the additional assessment being completed. d) Following consultation with the property owner and occupier, subsequent actions may include increased frequency and/or extent of monitoring, modification to the construction approach with a road embankment settlement contingency measure (or measures) in accordance with section 7.2 of Technical Report 35 or mitigation work to the affected structure.
DC.73	<p>The Requiring Authority may reduce the frequency of settlement monitoring required at a monitoring mark by Condition DC.71:</p> <ul style="list-style-type: none"> a) Once the active construction Stage has passed; and b) 3-monthly monitoring has been carried out for a minimum of 6 months; and c) The monitoring indicates that any potential settlement effects are within a satisfactory range as specified in the SEMP; and d) The Council has provided written confirmation (on request from the Requiring Authority) that the criteria in DC.73(a)-(c) have been met.
DC.74	<p>The Requiring Authority shall collate the results of the settlement monitoring (undertaken pursuant to Conditions DC.70-DC.73) and prepare a report that shall be made available to the Council.</p> <p>A settlement monitoring report shall be prepared:</p> <ul style="list-style-type: none"> a) prior to the commencement of Work; and b) at 3-monthly intervals throughout the construction period; and c) following completion of construction following each round of settlement monitoring undertaken (i.e. 3 monthly and then 6 monthly). <p>The purpose of the reports is to highlight any Alerts or Actions (as outlined in DC.68 above) and</p>

	provide a full interpretation and/or explanation as to why these occurred, the likely effects and any mitigation measures initiated as a result.
DC.75	<p>The Requiring Authority shall review and update the schedule of buildings and structures considered to be at risk in accordance with the criteria of the SEMP and maintain this schedule for review by the Council. This schedule shall include but not be limited to, the following properties:</p> <ul style="list-style-type: none"> a) the Council wastewater treatment plant; b) The Waikanae Christian Holiday Park (El Rancho); and c) Specific buildings identified during the course of detailed design where the total end of construction settlements are estimated to be greater than 25 mm.
DC.76	The Requiring Authority shall consult with owners of buildings and structures identified in Condition DC.75 (a)-(c) and, subject to the owner's approval of terms acceptable to the Requiring Authority, shall undertake a pre-construction condition assessment of these structures in accordance with the SEMP.
DC.77	The Requiring Authority shall employ a suitably qualified person to undertake the building assessments required pursuant to Condition DC.76 and identify this person in the SEMP.
DC.78	<p>The Requiring Authority shall undertake monthly visual inspections of the following properties during active construction:</p> <ul style="list-style-type: none"> a) Dwellings where the total settlements are estimated to be greater than 25mm; b) Dwellings where the predicted Building Damage category is greater than 'negligible' as defined in Table 10 of Technical Report 35 (noting that there are none in this category at the time the designation was confirmed); c) The Council wastewater treatment plant; and d) All other specifically identified buildings in Condition DC.75.
DC.79	<ul style="list-style-type: none"> a) The Requiring Authority shall, subject to the approval of the owners identified in Condition DC.75, undertake a post-construction condition assessment of buildings and structures covering the matters identified in the SEMP and provide a copy to the owner. The assessment report shall include a determination of the cause of damage identified (if any) since the pre-construction condition assessment. b) The Requiring Authority shall agree with the owner appropriate remedial work (if any) in conjunction with arrangements for implementation and/ or compensation. The requirements of this condition need not be fulfilled for any particular building with the written approval of the current owner of a building or where the Requiring Authority can provide reasonable evidence to the Council that the current owner of the building has agreed they do not require such a survey.
DC.80	The Requiring Authority shall provide a copy of the pre, post-construction and any additional building condition assessment reports for each building to the respective property owner within 15 working days of completing the reports. The Requiring Authority shall notify the Council that the assessments have been completed.
DC.81	Prior to construction commencing, the Requiring Authority shall undertake CCTV or alternative surveys of services identified in the SEMP as being susceptible to damage or particularly critical. The Requiring Authority shall monitor these services by undertaking additional CCTV surveys throughout the construction period. If damage is determined in relation to the Project, the Requiring Authority shall undertake remedial action as required in consultation with the service provider.

Appendix B

Settlement Monitoring Plans