



**INDICATIVE SITE SPECIFIC
ENVIRONMENTAL MANAGEMENT PLAN
(SSEMP)**

Mary Crest
(from Chainage 9600 to 10600)

DRAFT





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1 Introduction

This SSEMP relates to those construction matters that have potential or actual effects on aspects of the local natural and human environment.

It covers the construction of a four lane highway including a new local arterial with significant cut batters, establishment of erosion and sediment control structures, installation of culverts, the formation of stream diversion, and installation of a variety of stormwater treatment devices, and post construction landscape and mitigation planting. This SSEMP covers a length of alignment of approximately 1.0 kilometre in the area of Mary Crest. A separate SSEMP will be developed for the Mary Crest Overpass works (Bridge 9).

Note that the CEMP contains generic details common to the route including standard details and methodologies for a range of activities such as diversions, culvert installation, sediment and erosion control, monitoring and mitigation which are not repeated in this SSEMP.

This site specific management plan relates to those matters that are unique to this section of the alignment.

This Document, that is in the form of an SSEMP, is one of two that have been developed for key focus areas along the proposed expressway. The focus areas were chosen to be representative of the range of sites along the route and to have between them the full range of environmental management issues likely to be encountered during construction of the route.

In the Mary Crest area, it will be particularly important to ensure complete avoidance of a significant area of indigenous vegetation (etc) and ensure successful establishment of ecological mitigation measures.

There are a number of consents and designation conditions that are relevant to this SSEMP, these are contained in the AEE.

2 Drawings

Refer to Appendix A of this SSEMP for Drawings 01 to 04. These drawings should be read in conjunction with this document and show the location of the proposed works, indicative construction sequencing and proposed erosion and sediment control practices.

The following drawings are included in Appendix A:

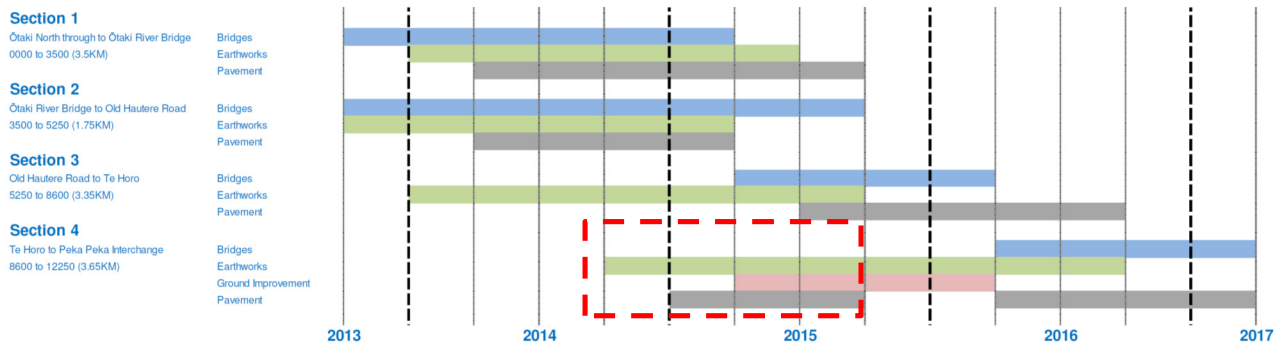
- Drawing 01 – Indicative Construction Sequence
- Drawing 02 – Mary Crest Stages 1 and 2
- Drawing 03 – Mary Crest Stages 3 and 4
- Drawing 04 – Landscape Plan

3 Management Plans

3.1 Construction Works

3.1.1 Programme

The indicative programme below shows possible durations of bridges, earthworks and pavement construction in the various Construction Sections.



Specific to this SSEMP the programme for the works could be as follows:

No.	Activity	Estimated Duration	Preceding Activity
1.1	Fencing of native bush areas	To be completed by contractor	
1.2	Services diversions		
1.3	Site clearance		
2	Stage 1		
2.1	Temporary stream diversion		
2.2	New culverts and divert stream		
2.3	Construct diversion channels		
2.4	Sediment retention ponds		
	Stage 2		
3.1	Install silt fences		
3.2	Construct earthworks/pavement		
3.3	Install contour drains		
3.4	Progressively stabilise earthworks		
	Stage 3		
4.1	Switch traffic to new local road		
4.2	Install stage 4 E&SC practices		
	Stage 4		
5.1	Construct earthworks		
5.2	Construct permanent swales		
5.3	Establish final wetlands / planting		

3.1.2 Earthworks

During construction the area of earthworks open will be contained, as much as is practicable, to the road corridor. Construction will be staged (refer section 3.3) to manage the area of earthworks open concurrently with progressive stabilisation treatment including re-vegetation to limit erosion and mobilisation of sediment.

Generally the earthworks operation in the Mary Crest area will consist of a staged cut to fill operation. Cut material will be sourced from the sand dunes to the south of this area to form fill embankments to the north. All suitable surplus material within this section has been identified for re-use on the adjacent sections.

Approximate earthworks quantities for the Mary Crest alignment are given in the table below:

EARTHWORKS CATEGORY	AREA (m ²)	QUANTITY (m ³)
Earthworks cut from 9,600 – 10,600m		169,000
Earthworks structural fill required from 9,600 – 10,600m		52,000
Net earthworks balance from 9,600 – 10,600m		+107,000

3.1.3 Cut & Fill Treatments

The final form and treatment of cut and fill batters has a bearing on both landscape and visual effects. In order to reduce the degree of these effects the following actions will be undertaken:

- Use of geotextile erosion matting or similar measures on erodible sand dune batters to prevent erosion;
- Progressive re-vegetation of batters;
- Tops of cuts and ends of cut/ fills rounded off to reduce hard edges.
- Vegetated treatment swales will remove suspended solids and contaminants for road runoff.

3.1.4 Fencing

Two sites have been identified for temporary fencing to provide protection during works. They are the Mary Crest bush remnant and an existing spring located near the Valentine Basin.

The location of the fence is to be decided by the Site Environmental Manager and fencing contractor. The fencing will be undertaken prior to any earthworks commencing.

3.2 Stormwater

3.2.1 Stormwater

Two culverts are proposed within the Mary Crest alignment. The first culvert is the Edwin Culvert, which is a tributary to the Jewell stream and conveys flow from a nominal catchment to provide ecological flows to the downstream environment. The culvert is a 1.2m dia pipe, which is the same size as the upstream culvert.

The second culvert is the Jewell Culvert. This is a significant culvert located directly downstream of the existing culverts under the rail embankment and SH1. The new expressway culvert has been designed to not affect the flows through the existing upstream culverts and is likely to be constructed using two large box culverts (or similar). Fish passage is proposed for both the Edwin and Jewell culverts by embedding the invert. The Jewell culvert will incorporate a roughened low flow channel using a combination of rocks and boulders.

The main Jewell culvert design summary is provided in the table below:

Chainage	Water Crossing	Fish Passage	Culvert Cross Section (m)	Culvert Length	Grade (%)	Disturbed Waterway Length	Q10 (m ³ /s)	Q100 (m ³ /s)	Q100 Flow Height Below Soffit (m)
10,080	Jewell Culvert	Yes	Twin 3.5*2.5	120	1.6	140	17.7	21.8	0.3

The primary construction methodology for mitigation against sediment release to the environment is to utilise treatment swales and best practice erosion and sediment controls outlined in section 3.3 of this SSEMP.

3.2.2 Stormwater Treatment Devices (Operational)

In this particular area there is insufficient road corridor width to provide attenuation swales, which have been provided elsewhere on the project. Instead, smaller treatment swales have been provided to treat stormwater runoff. Over a long term average basis, these swales are expected to remove approximately 70% of suspended solids together with a proportion of other pollutants bound to them.

The treatment swales will direct stormwater flow to the proposed Valentine Basin, where it is expected that flows will be attenuated to a post-development flow that is less than the pre-development flow. Consequently, this is likely to have a small positive effect on catchment flood flows.

3.3 Erosion & Sediment Control

3.3.1 Indicative Construction Sequencing

This section demonstrates how the Mary Crest alignment can be constructed in accordance with the principles and practices outlined in the draft Erosion and Sediment Control Plan.

In order to minimise adverse construction effects, it is proposed that construction of the Mary Crest alignment is broken down into 5 stages. The indicative methodology for each stage, including sequencing and proposed erosion and sediment control practices, are outlined in the table below. This table should be read in conjunction with drawings 1 to 4 in Appendix A of this SSEMP.

Construction Stage	Appendix A Drawing Reference	Indicative Methodology
Stage 1	01 & 02	<ul style="list-style-type: none"> • Northbound and southbound traffic remains on the existing SH1, no bulk earthwork activities occur at this stage; • Ensure clean water from the Jewell and Edwin catchments is separated from dirty water by realigning the two streams through the new Edwin and Jewell culverts. An Indicative stream realignment sequence is outlined below: <ul style="list-style-type: none"> ○ Construct temporary off line stream diversion channels ○ Realign streams through temporary channels ○ Construct new culverts and stabilise channel ○ Permanently realign streams through new culverts ○ Realignment to occur in low flow conditions. • Install stage 2 perimeter E&SC practices prior to stage 2 earthworks commencing: <ul style="list-style-type: none"> ○ Control stage 2 upper catchment by installing runoff diversion channels as shown on drawing 02. Clean water from these channels will be directed away from earthwork areas to the Jewell and Edwin streams; ○ Install silt fences at the toe of proposed fill batters and around the outlets of the two streams; ○ Install sediment retention ponds 1, 2 and 3 to capture and treat sediment laden water from the stage 2 disturbed areas. Note pond 2 is a large pond collecting flow from areas B and C. This pond will be constructed in the proposed Valentines Basin.
Stage 2	01 & 02	<ul style="list-style-type: none"> • Northbound and southbound traffic remains on the existing SH1, bulk earthwork operations for construction of the new local road begin by cutting areas A&B to fill areas C&D; • The cutting of areas A and B will form a box cut in dune sand. During construction, this cut will be graded to the east towards a low point (swale) shown on drawing 2. These swales will outfall to sediment retention ponds 1, 2 and 3; • If longitudinal scour occurs at the low point in the box cut then rock check dams (using river run or similar) can be placed longitudinally along the invert; • Splash, sheet and rill erosion will be mitigated during construction by: <ul style="list-style-type: none"> ○ Installing silt fences at the toe of cut and fill batters. These fences will periodically be moved to the toe of the batter as construction progresses and the cut batters get larger. ○ Progressive stabilisation through one or a combination of topsoiling, grassing, and use of geotextile erosion matting. ○ Installing intermediate contours drains along shallow batters to interrupt sheet and rill erosion (i.e. at the base of the box cut). • Trim formation to final levels, place and compact pavement layers, and seal new local road.

Construction Stage	Appendix A Drawing Reference	Indicative Methodology
Stage 3	01 & 03	<ul style="list-style-type: none"> • Northbound and southbound SH1 traffic is realigned to the new local road, no bulk earthwork activities occur at this stage; • All E&SC practices installed for stages 1 and 2 remain in place unless prior approval to remove the control practices is agreed with GWRC; • Install Stage 4 perimeter E&SC devices prior to stage 4 earthworks: <ul style="list-style-type: none"> ○ Control stage 4 upper catchment by installing runoff diversion channels. Clean water from these channels is directed away from earthwork areas to the Jewell and Edwin streams; ○ Install silt fences at the toe of proposed fill batters; ○ Install sediment retention ponds 4 and 5 to capture and treat sediment laden water from the stage 4 disturbed areas.
Stage 4	01 & 03	<ul style="list-style-type: none"> • Northbound and southbound SH1 traffic remains on the new local road and bulk earthwork operations for construction of the new expressway begin by cutting area E to fill area F; • The cutting of area E will form a large cut in dune sand. During construction, this cut will be graded to the east towards a low point (swale) shown on drawing 3. These swales will outfall to sediment retention ponds 4 and 5; • Splash, sheet and rill erosion will be mitigated for the cut and fill sites by: <ul style="list-style-type: none"> ○ Installing silt fences at the toe of cut and fill batters. These fences will periodically be moved to the toe of the batter as construction progresses and the cut batters get larger. ○ Progressive stabilisation through topsoiling grassing and/or use of geotextile erosion matting. ○ Installing intermediate contours drains along shallow batters (i.e. the graded base of cutting) • Trim formation to final levels place and compact pavement layers and seal new expressway
Stage 5	01 & 03	<ul style="list-style-type: none"> • Northbound and southbound SH1 traffic is realigned to the new expressway once all furniture has been installed; • New local road is opened; • Old SH1 becomes local road; • All E&SC practices installed for during stages 1-4 remain in place until the area has stabilised and approval to remove controls is given by the Consenting Authority.

3.3.2 Sediment Retention Ponds

The risk based approach for sizing of sediment retention ponds outlined in NZTA’s draft standard was initially applied to determine pond sizes. The NZTA draft standard required ponds that were smaller than that required by the Greater Wellington Regional Council Guidelines, however. Consequently, the more stringent larger pond volumes required by GWRC have been adopted, with

the pond size calculated as 2% of the contributing catchment area. A further 10% has been added to this volume for the forebay.

The table below provides a summary of ponds 1 to 5:

Chainage	Pond Reference	Catchment Area (Ha)	Pond Volume ^{*1} (m ³)	Indicative Dimensions (m) (not including forebay)	Length to Width Ratio
10,620	Pond 1	1.31	262	1.5D x x25L x 7W	3.6
10,150	Pond 2	2.8	560	1.5D x x38L x 10W	3.8
9,600	Pond 3	0.76	152	1.5D x x21L x 5W	4.2
10,130	Pond 4	1.62	324	1.5D x x27L x 8W	3.4
10,610	Pond 5	1.14	228	1.5D x x25L x 6W	4.2

^{*1} Pond volumes indicated are storage volumes only and do not include for the forebay. In accordance with the appropriate guidelines, in this case the GWRC guidelines, an additional 10% of the design storage volume will be added to allow for the forebay.

3.3.3 Monitoring During Construction

All E&SC practices will be installed in accordance with best practice as outlined in the GWRC and NZTA guidelines.

Freshwater turbidity monitoring may take place in one of either the Te Manuao or Cavallo waterways. Freshwater monitoring will apply to this particular SSEMP if the Cavallo waterway is chosen. This will be confirmed in the final version of this SSEMP.

The proposed trigger level is a 50% or greater increase in turbidity (as nephelometric turbidity units (NTU)) between upstream and downstream monitoring sites when the downstream turbidity exceeds 5 NTU.

In addition to freshwater monitoring, daily visual inspections and weekly self-auditing of all E&SCs will be undertaken by suitably qualified and experienced members of the project team. pH monitoring will also be undertaken for ponds where flocculants are required.

Refer to section 7 of the draft Erosion and Sediment Control Plan and section 8 of the Draft Ecological Management Plan for further details.

3.4 Revegetation

Following completion of bulk earthworks restoration planting will be carried out as per plan SSEMP/BO4, refer Appendix A. The treatments will include.

- Grassed batter slopes that will be occasionally mown grass on the Expressway batters;
- Re-vegetate swales primarily with low groundcovers

3.5 Water Take and Dust Control

3.5.1 Water Take

In order to meet construction water demands, a proposed groundwater take borehole has been identified in the vicinity of the Valentine basin, on the western side of the proposed expressway.

3.5.2 Water Abstraction and Dust Control

The harvesting of treated water from sediment ponds for dust management may occur.

Selections of the following controls are to be deployed as required, on the construction sites.

- Water (water cart irrigation) provides a good short-term solution. Caution is required to avoid erosion from over application of water. All areas identified as dust sources including roads are to be kept dampened during dry weather periods to minimise public nuisance from windborne dust.
- Chemical adhesive spray, provide longer-term solutions to small areas which are not able to be treated by water, such as hill slopes or long term stock piles.
- Wind fences are good for small areas and provide for effective control for areas of up to ten times the height and length of the fence. The Wellington City District Plan Wind Design guide gives an indication of how wind effects may be avoided - or markedly reduced.
- Mechanical treatment, such as slopes rolled with mulch or aggregate provide effective control for wind erosion. However, these cannot be used in active work areas, so require careful planning for installation.
- Cover blankets may be used for stock piles.

Where dust control is identified as a specific issue, an investigation by the Construction Supervisor into the cause will be required. When the cause has been identified the specific controls can be applied to the problem area(s).

3.6 Quarrying

No aggregate sourcing will occur within this area; aggregates will be brought in from consented sources.

3.7 Transporting of Materials

Adverse environmental effects may arise from the delivery and removal of materials from the sites. All materials transported to and from the sites will need to be assessed for the risk of dust release during transit. Where the load is identified as being a potential dust nuisance such as crushed concrete or topsoil, etc, then the load may need to be covered or dampened down prior to transporting.

Care will also be required to ensure that weeds are not imported with materials such as aggregate or topsoil, or on delivery trucks.

The Construction Supervisor will be responsible for keeping a record of:

- Date and time of movement;

- Transport provider;
- Material moved on and off site;
- Potential for dust release; and
- Actions taken to control the material.

3.8 Ecology

3.8.1 Wetland Habitat Creation

To offset the loss of wetland habitat from the Otaki Railway Wetland a new area of wetland adjacent to the Mary Crest bush is proposed as shown in Appendix A Sheet B02. The area identified for the wetland habitat is currently damp pasture, low lying and the plant species present indicate high water content in the soil or high water table. It is proposed to increase the wetness of the area by digging down into the water table. By doing this it is expected that conditions will be created where native wetland plant species can be introduced and wetland habitat created. The area where it is proposed to create the wetland slopes gently from east to west. Consequently a low bund with impermeable lining may be required around the western edge of the wetland to assist in water retention. A weir is likely to be required to control water outflow from the wetland.

3.8.2 Bush Habitat Creation

Two options are presented in the Ecological Management Plan (EMP) regarding bush habitat. The first option proposes to protect and enhance existing areas of bush for areas outside of the scope of this SSEMP. The second option is to create a new bush habitat as compensation for areas of bush lost elsewhere along the new alignment.

If the protection of an existing area of bush cannot be achieved elsewhere (option1), an area has been identified adjacent to the existing Mary Crest bush, and within the designation, where new bush habitat can be established by planting. This area is defined by native bush to the north, the designation boundary to the west and south and the new expressway to the east.

A suitably qualified ecologist will develop the habitat creation plan and advise on species selection, planting method, vegetation zoning, weed control and develop the maintenance and monitoring programme.

3.8.3 Fish Passage and Temporary Stream Diversions

Fish passage shall be provided for Edwin, Jewell and Cavallo culverts.

The sections of the Edwin and Jewell Streams that require temporary diversions to install new culverts are to be block-netted upstream and downstream to keep fish out of the affected area.

3.8.4 Riparian Buffers

As mitigation for the loss and alteration of existing stream channel habitat caused by the new expressway, mitigation actions such as riparian retirement, planting riparian buffers, and fencing are proposed to substantially improve the ecological condition of existing waterways that will cross the Expressway.

Such enhancement work has been identified for the Jewell Stream as outlined in the table below:

Location	Buffer length (m)	Buffer width (m)
Jewell Stream (east of Expressway)	160	20
Mary Crest Stream (west of Expressway)	340	20
Total	500	

3.8.5 Ecological Monitoring During Construction

As well as freshwater turbidity monitoring outlined in section 3.3.3, the following ecological variables will be monitored:

- Fine sediment deposits;
- Oil and grease;
- Aquatic macroinvertebrates; and
- Fish.

The data from the monthly measurements of fine sediment deposits and oil and grease should be provided to NZTA within 1-2 weeks of collection to enable remedial or mitigation measures in cases of water quality degradation.

Further details about construction monitoring for these other variables will be set out in the EMP prior to it being submitted to the Manager.

3.8.6 Ecological Monitoring Post Construction

Post-construction monitoring is recommended for a two-year period to ensure that water quality, biotic communities, fish passage are not adversely affected by Expressway operation. Monitoring of the constructed wetlands for three years after they are completed is recommended to confirm that the wetlands achieve a level of aquatic ecological value equal to that of established wetlands. Finally, monitoring of the planted riparian buffers for three years after planting is recommended to ensure that plants have established and are not being replaced by non-native plant species.

Refer to the EMP for further details.

3.9 Air Quality

There are no issues for this SSEMP other than management of dust as covered in section 3.5 above.

3.10 Contaminated Land

Potential sources of ground contamination within the designated project corridor include:

- Former farm operations on the southwest portion of the property, including foundations of former farm structures and an uncharacterised ground depression.
- Potential for a septic tank located within the vicinity of the dwelling at the entrance to the Mary Crest site.

There is also potential for ground contamination outside the designated project area but within the confines of the Mary Crest site, including underground storage tanks (locations unconfirmed) and former farm operations.

In these locations, procedures will be employed for management of contaminated material as outlined in the draft Bulk Earthworks Contaminated Land Management Plan (BECLMP).

3.11 Construction Noise and Vibration

Management of noise will be an important environmental consideration for this SSEMP given its proximity to existing residential buildings. A Construction Noise Management Plan (CNMP) forms part of the CEMP. Issues specific to this SSEMP include:

- Transport of heavy and oversized structural components (Bridge 9) – separate SSEMP
- Bulk earthworks including formation and compaction of fill sites.
- Placement and compaction of pavement materials

3.12 Culture and Heritage

Sites of cultural significance within the general area covered by this SSEMP include:

- Te Horo Pa –south of Mary Crest (just to the west of the Mary Crest bush remnants)
- Makahuri –cultivation area and known burial ground near Mary Crest

These sites are outside the designation and will not be affected by the Project works. In addition [dunes]

Approximate areas of interest and Accidental Discovery protocols are contained within the CEMP Appendix E.

3.13 Landscape

There are no significant landscape issues for this SSEMP although the final form and landscape treatment of cut batters will require specific consideration. The primary mechanisms used include the design of batter slopes; contouring of fill areas; and revegetation of all earth-worked areas.

Refer to SSEMP/BO5, refer Appendix A for intended treatment.

3.14 Construction Traffic Management

A site specific traffic management plan will be developed for this specific location and will detail the following:

- Outlines the requirements, methodologies and standards required in observing the SSTMP and the required approvals required/ obtained.
- Engineering Exception Decisions. All EEDs applicable will be appended to the SSTMP.
- CAD drawings will be used for illustrating the closures defined by the proforma, and will include all relevant road features that require consideration in managing the impacts of construction.

Specific to this SSEMP, the site specific traffic management plan will identify:

- Services diversions / protection within the existing State highway corridor.
- The tie in works and the construction of the new local road (inc maintaining access to properties).
- Any night time works that may be required for the construction of Bridge 9.
- Site access and maintenance of access to private properties.

3.15 Network Utilities

There are a number of existing network utilities within the area covered by this SSEMP, as part of the works the contractor will co-ordinate and liaise with the relevant utility owners below:

Electricity distribution

Overhead power will require relocation at Mary Crest over a distance of 1.1km. These will be relocated to the west of the new local road and works undertaken prior to the commencement of any earthworks.

Telecommunications facilities

Telecom has underground copper and/or fibre lines of which all will require protecting at the northern end of Mary Crest at the new local road tie in and adjacent to the Bridge 9.

Water, Wastewater and Stormwater

KCDC provides water, wastewater and stormwater services for all the urban areas on the Kāpiti Coast. These services are predominantly located in the road corridors. Several water and stormwater lines will require either protection or relocation within the Project footprint.

Gas distribution

There are two locations within the Project area where local gas distribution assets are situated in the vicinity of the Main Alignment corridor. These assets are owned and operated by Vector Gas Limited. From Te Horo Beach Road (chainage 7200m) and running along the existing SH1 to Mary Crest (chainage 10,000m) Vector Gas assets are located in the western verge and may require locally protecting, however, no major relocation works are required.

4 Re-Instatement

Re-instatement works will entail the removal of temporary culverts placed along the construction access track. The stream channel will be reinstated to a form that reflects the existing characteristics of the stream on either side of the culvert. This may involve revegetation works as well as topographic correction.

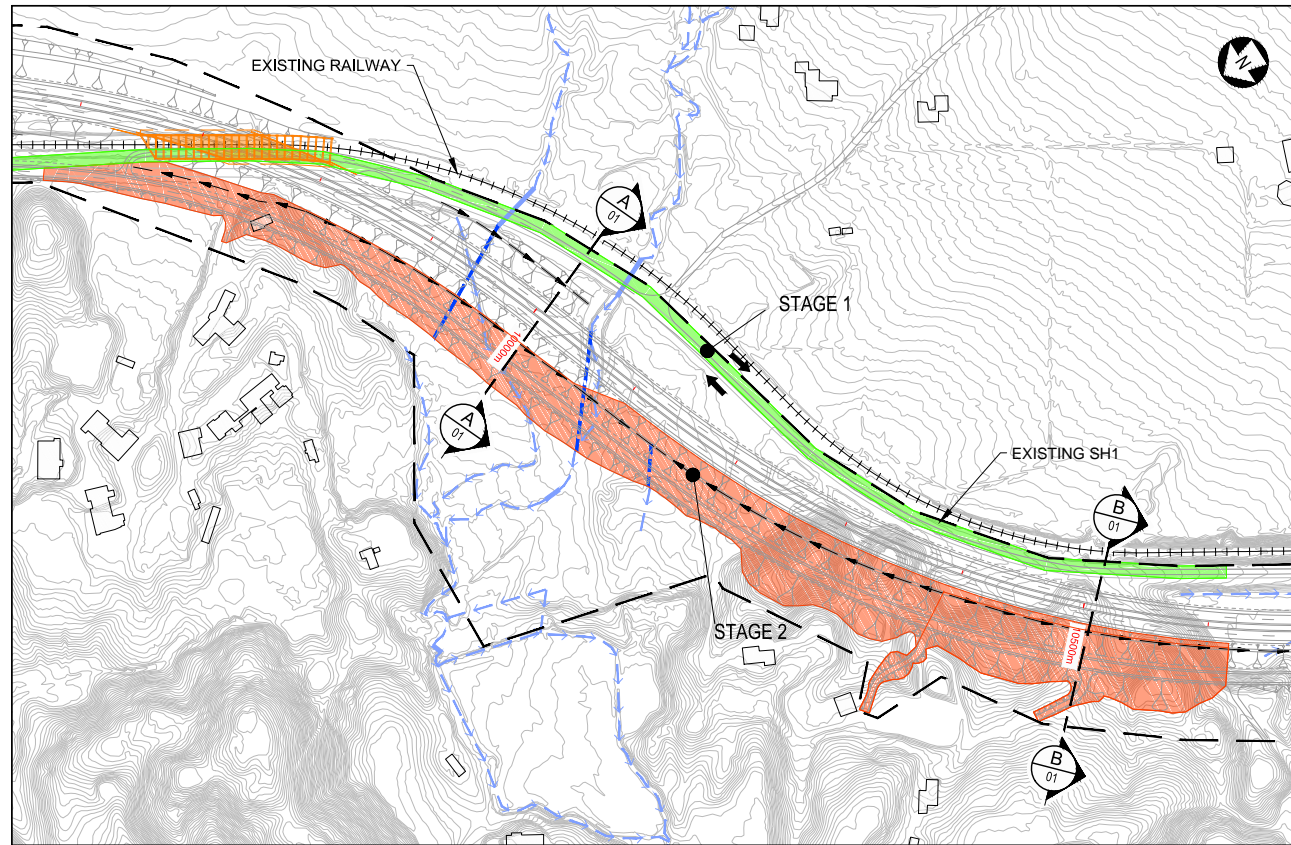
5 Training and Monitoring

Within this SSEMP site, all contractors will receive a full briefing on the environmental considerations including avoidance of NO-GO sites, recognition of habitats of significant species,

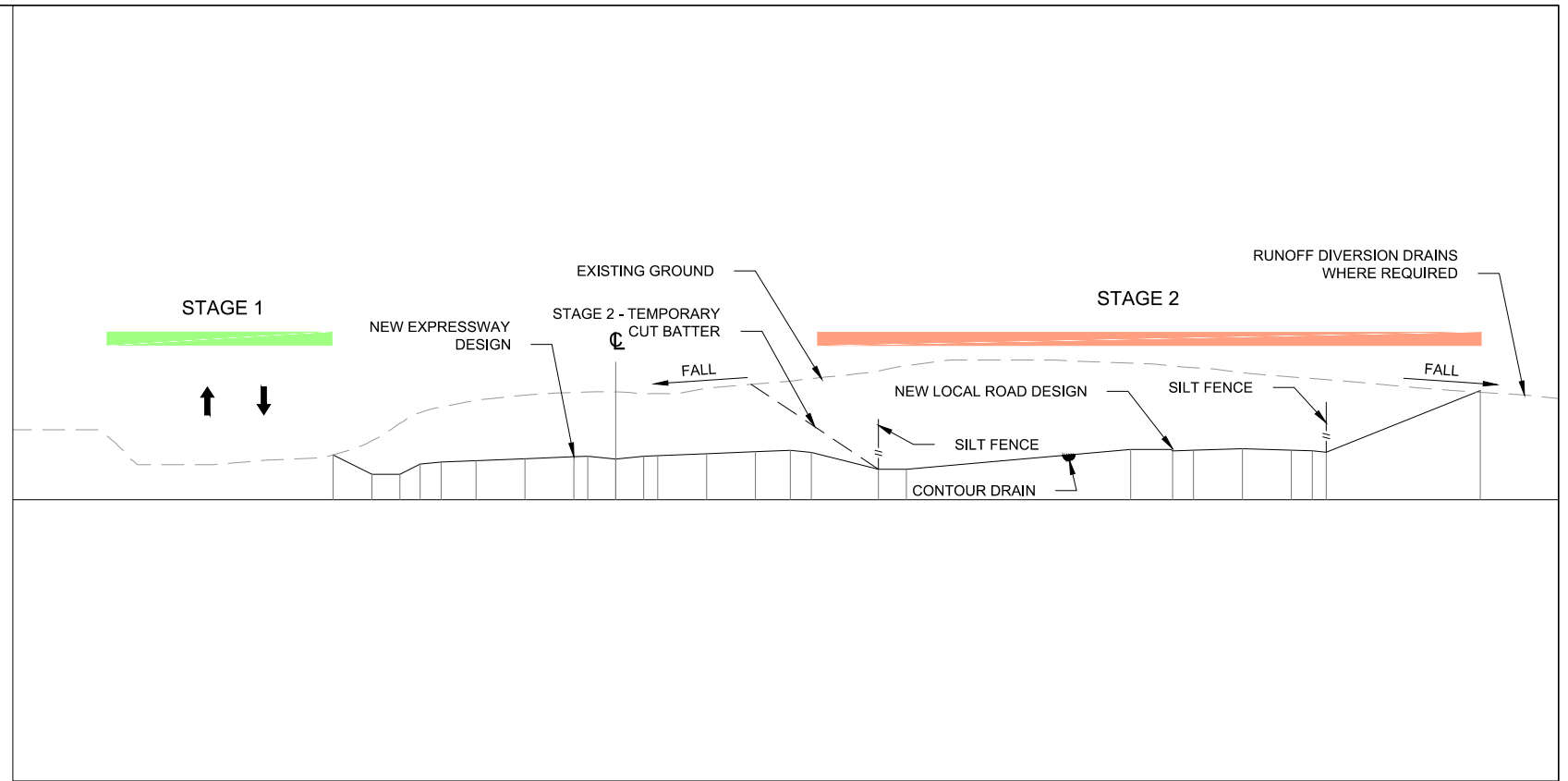
timing of ecological and water quality monitoring and recognising potential archaeological/cultural sites and responding appropriately.

The monitoring will be undertaken in accordance with the procedures outlined in the CEMP. Some of the aspects that will be monitored in this SSEMP site will be erosion and sediment control devices, freshwater quality, aquatic habitat quality, macro-invertebrate health, fish passage, revegetation success, weeds management.

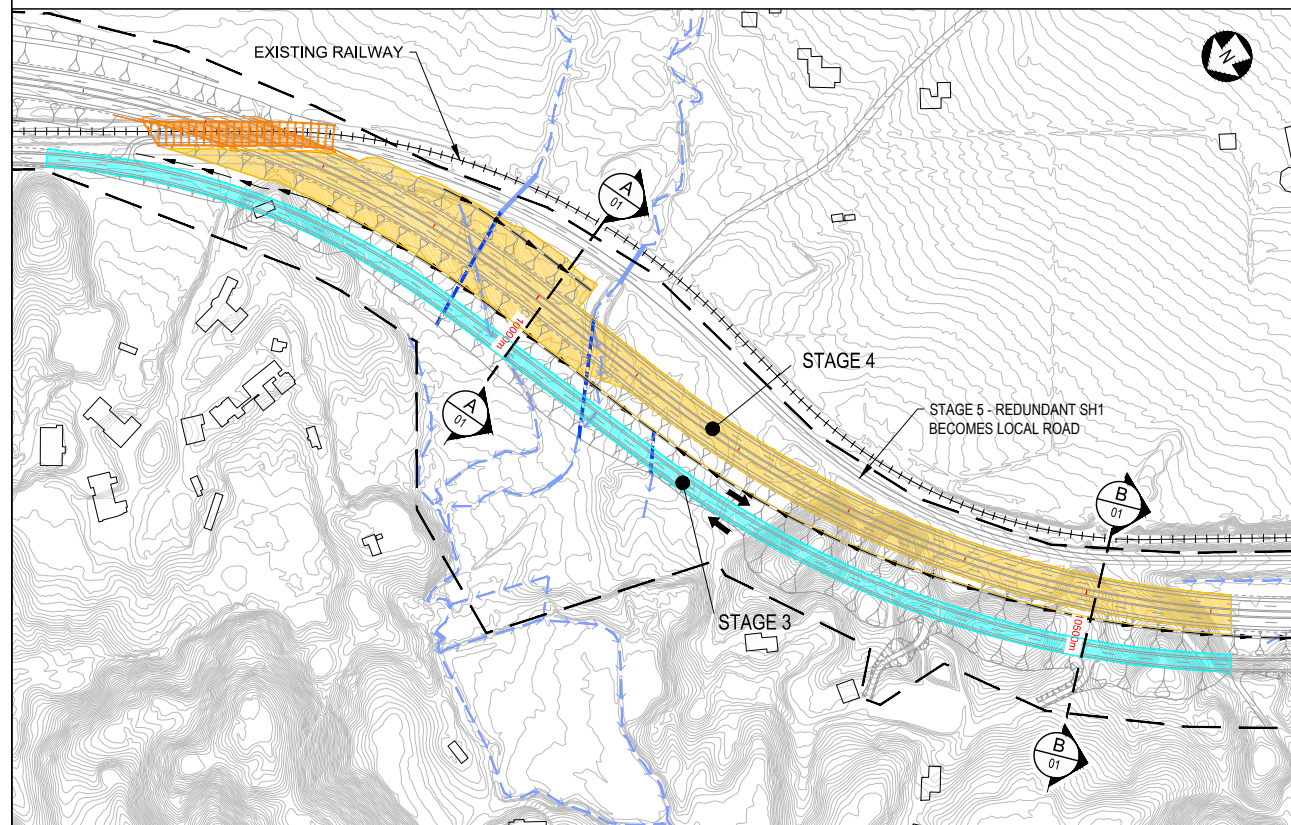
Appendix A: Drawings



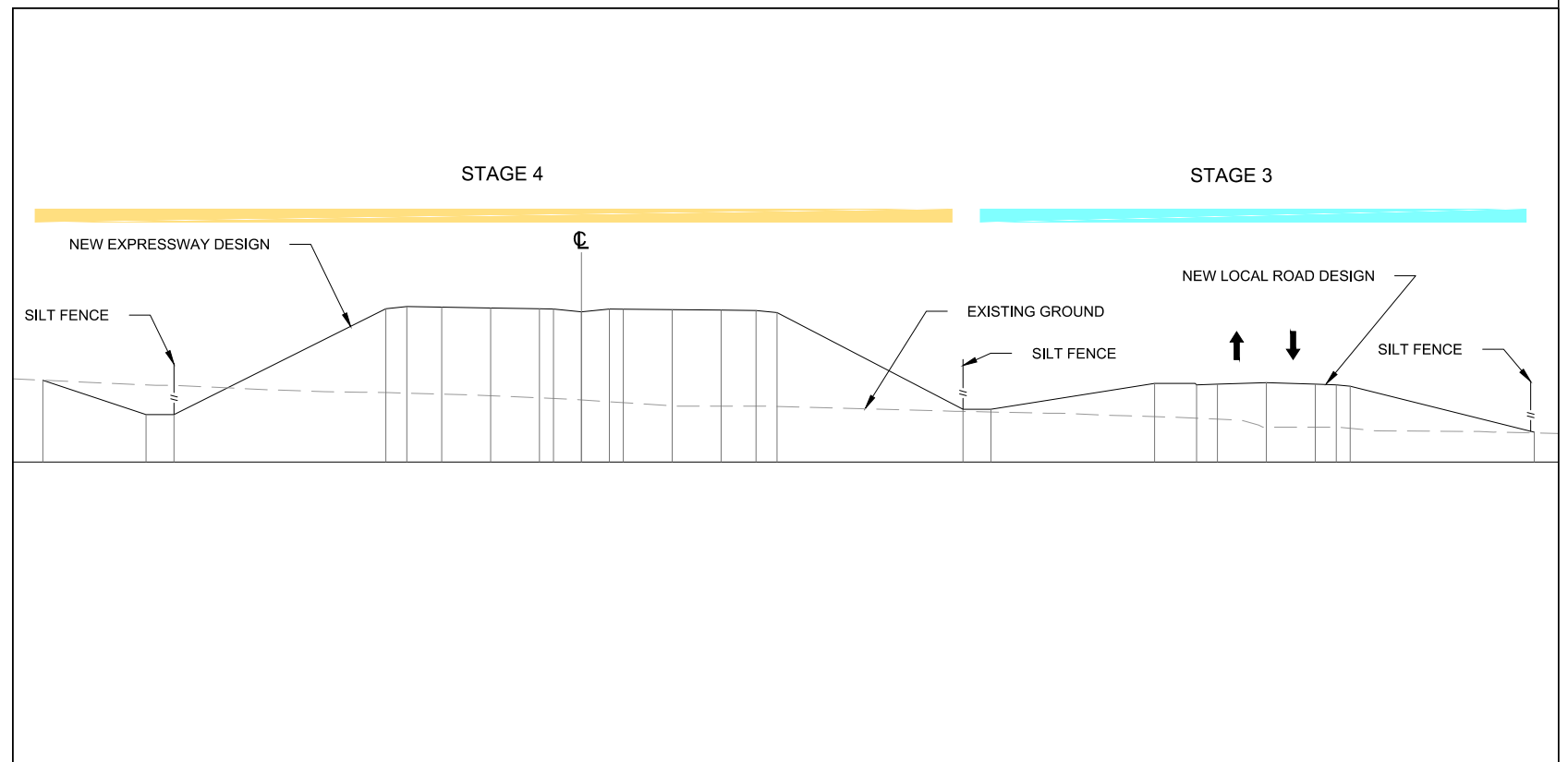
PLAN VIEW STAGES 1 AND 2
SCALE : N.T.S



SECTION B AT APPROX STN. 10500m SHOWING EXTENTS OF STAGES 1 AND 2
SCALE : 1:500 (A3)



PLAN VIEW STAGES 3 AND 4
SCALE : N.T.S



SECTION A AT APPROX STN. 1000m SHOWING EXTENTS OF STAGES 3 AND 4
SCALE : 1:500 (A3)

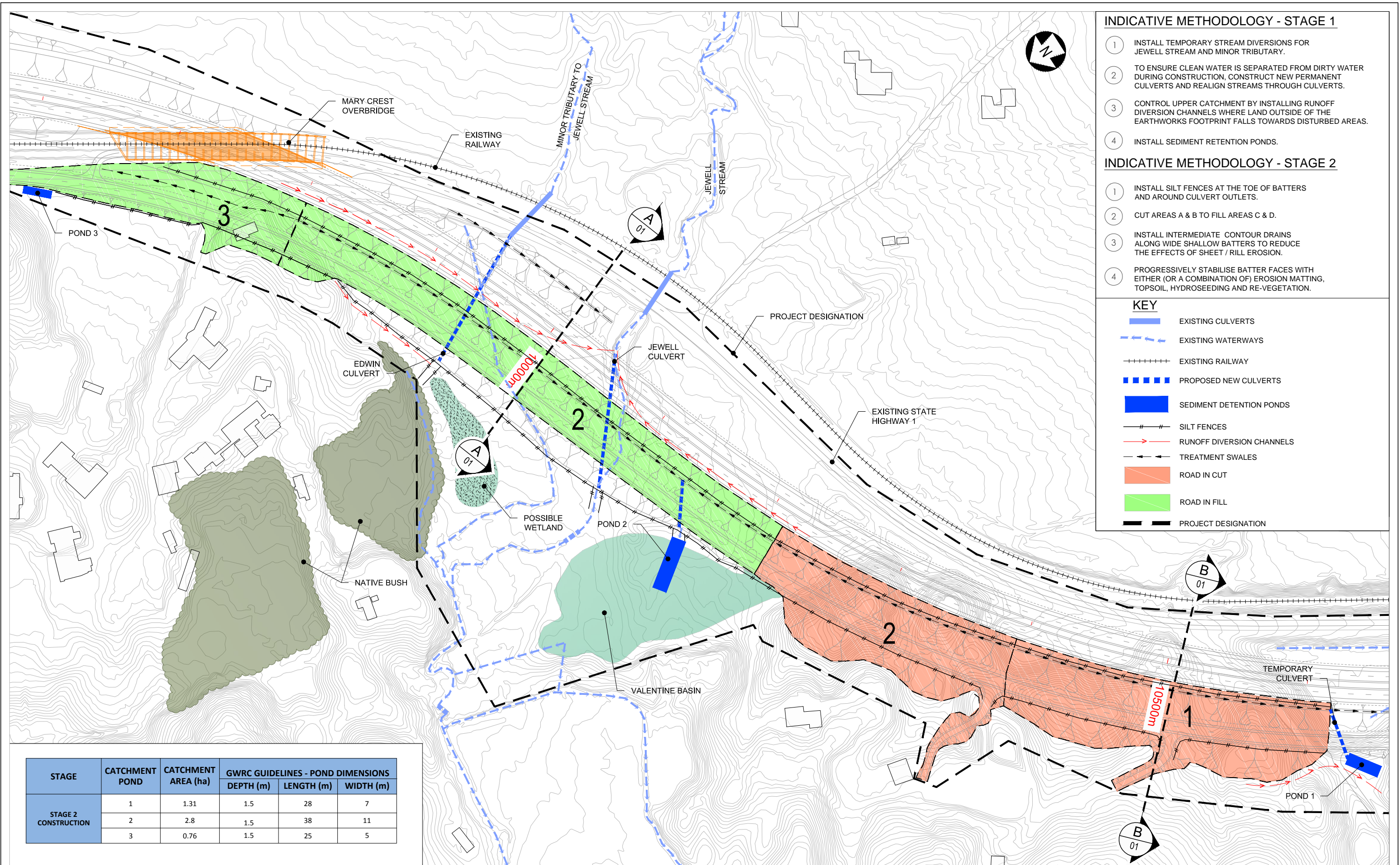
INDICATIVE WORKS SEQUENCING

- STAGE 1 - MAINTAIN EXISTING SH1 MOVEMENTS
- STAGE 2 - CONSTRUCT LOCAL ROAD
- STAGE 3 - REALIGN SH1 TRAFFIC TO NEW LOCAL ROAD
- STAGE 4 - CONSTRUCT NEW EXPRESSWAY
- STAGE 5 - REALIGN SH1 TRAFFIC TO NEW EXPRESSWAY. REDUNDANT SH 1 BECOMES LOCAL ROAD

Revision	Amendment	Approved	Date



Project. PEKA PEKA TO NORTH OTAKI EXPRESSWAY PROJECT		
Title. INDICATIVE SSEM MARY CREST SECTION INDICATIVE CONSTRUCTION SEQUENCE		Status. FOR CONSENTING
Sheet No. B01	Version No. A	



INDICATIVE METHODOLOGY - STAGE 1

- 1 INSTALL TEMPORARY STREAM DIVERSIONS FOR JEWELL STREAM AND MINOR TRIBUTARY.
- 2 TO ENSURE CLEAN WATER IS SEPARATED FROM DIRTY WATER DURING CONSTRUCTION, CONSTRUCT NEW PERMANENT CULVERTS AND REALIGN STREAMS THROUGH CULVERTS.
- 3 CONTROL UPPER CATCHMENT BY INSTALLING RUNOFF DIVERSION CHANNELS WHERE LAND OUTSIDE OF THE EARTHWORKS FOOTPRINT FALLS TOWARDS DISTURBED AREAS.
- 4 INSTALL SEDIMENT RETENTION PONDS.

INDICATIVE METHODOLOGY - STAGE 2

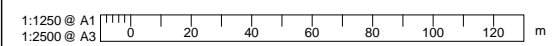
- 1 INSTALL SILT FENCES AT THE TOE OF BATTERS AND AROUND CULVERT OUTLETS.
- 2 CUT AREAS A & B TO FILL AREAS C & D.
- 3 INSTALL INTERMEDIATE CONTOUR DRAINS ALONG WIDE SHALLOW BATTERS TO REDUCE THE EFFECTS OF SHEET / RILL EROSION.
- 4 PROGRESSIVELY STABILISE BATTER FACES WITH EITHER (OR A COMBINATION OF) EROSION MATTING, TOPSOIL, HYDROSEEDING AND RE-VEGETATION.

KEY

	EXISTING CULVERTS
	EXISTING WATERWAYS
	EXISTING RAILWAY
	PROPOSED NEW CULVERTS
	SEDIMENT DETENTION PONDS
	SILT FENCES
	RUNOFF DIVERSION CHANNELS
	TREATMENT SWALES
	ROAD IN CUT
	ROAD IN FILL
	PROJECT DESIGNATION

STAGE	CATCHMENT POND	CATCHMENT AREA (ha)	GWRC GUIDELINES - POND DIMENSIONS		
			DEPTH (m)	LENGTH (m)	WIDTH (m)
STAGE 2 CONSTRUCTION	1	1.31	1.5	28	7
	2	2.8	1.5	38	11
	3	0.76	1.5	25	5

NOTES:
 1. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH THE MARY CREST SSEMP DOCUMENT.



Revision	Amendment	Approved	Date

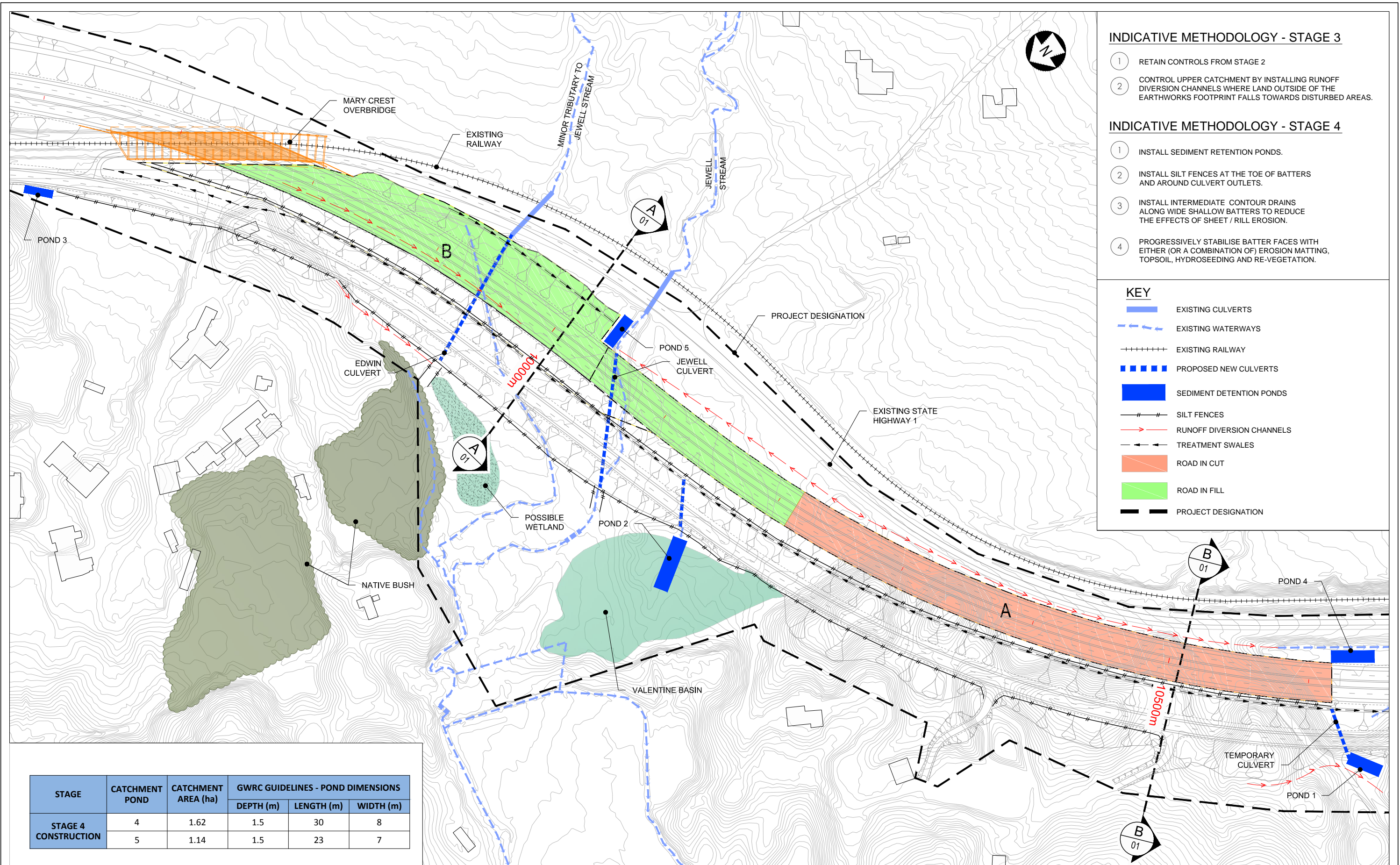


Project: **PEKA PEKA TO NORTH OTAKI EXPRESSWAY PROJECT**

Title: **INDICATIVE SSEMP MARY CREST STAGE 2**

Status: **FOR CONSENTING**

Sheet No. **B02** Version No. **A**



INDICATIVE METHODOLOGY - STAGE 3

- 1 RETAIN CONTROLS FROM STAGE 2
- 2 CONTROL UPPER CATCHMENT BY INSTALLING RUNOFF DIVERSION CHANNELS WHERE LAND OUTSIDE OF THE EARTHWORKS FOOTPRINT FALLS TOWARDS DISTURBED AREAS.

INDICATIVE METHODOLOGY - STAGE 4

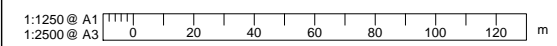
- 1 INSTALL SEDIMENT RETENTION PONDS.
- 2 INSTALL SILT FENCES AT THE TOE OF BATTERS AND AROUND CULVERT OUTLETS.
- 3 INSTALL INTERMEDIATE CONTOUR DRAINS ALONG WIDE SHALLOW BATTERS TO REDUCE THE EFFECTS OF SHEET / RILL EROSION.
- 4 PROGRESSIVELY STABILISE BATTER FACES WITH EITHER (OR A COMBINATION OF) EROSION MATTING, TOPSOIL, HYDROSEEDING AND RE-VEGETATION.

KEY

- EXISTING CULVERTS
- EXISTING WATERWAYS
- EXISTING RAILWAY
- PROPOSED NEW CULVERTS
- SEDIMENT DETENTION PONDS
- SILT FENCES
- RUNOFF DIVERSION CHANNELS
- TREATMENT SWALES
- ROAD IN CUT
- ROAD IN FILL
- PROJECT DESIGNATION

STAGE	CATCHMENT POND	CATCHMENT AREA (ha)	GWRC GUIDELINES - POND DIMENSIONS		
			DEPTH (m)	LENGTH (m)	WIDTH (m)
STAGE 4 CONSTRUCTION	4	1.62	1.5	30	8
	5	1.14	1.5	23	7

NOTES:
 1. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH THE MARY CREST SSEMP DOCUMENT.
 2. CROSS - FALL NORTH TO SOUTH FOR THE EXPRESSWAY DURING CONSTRUCTION



Revision	Amendment	Approved	Date

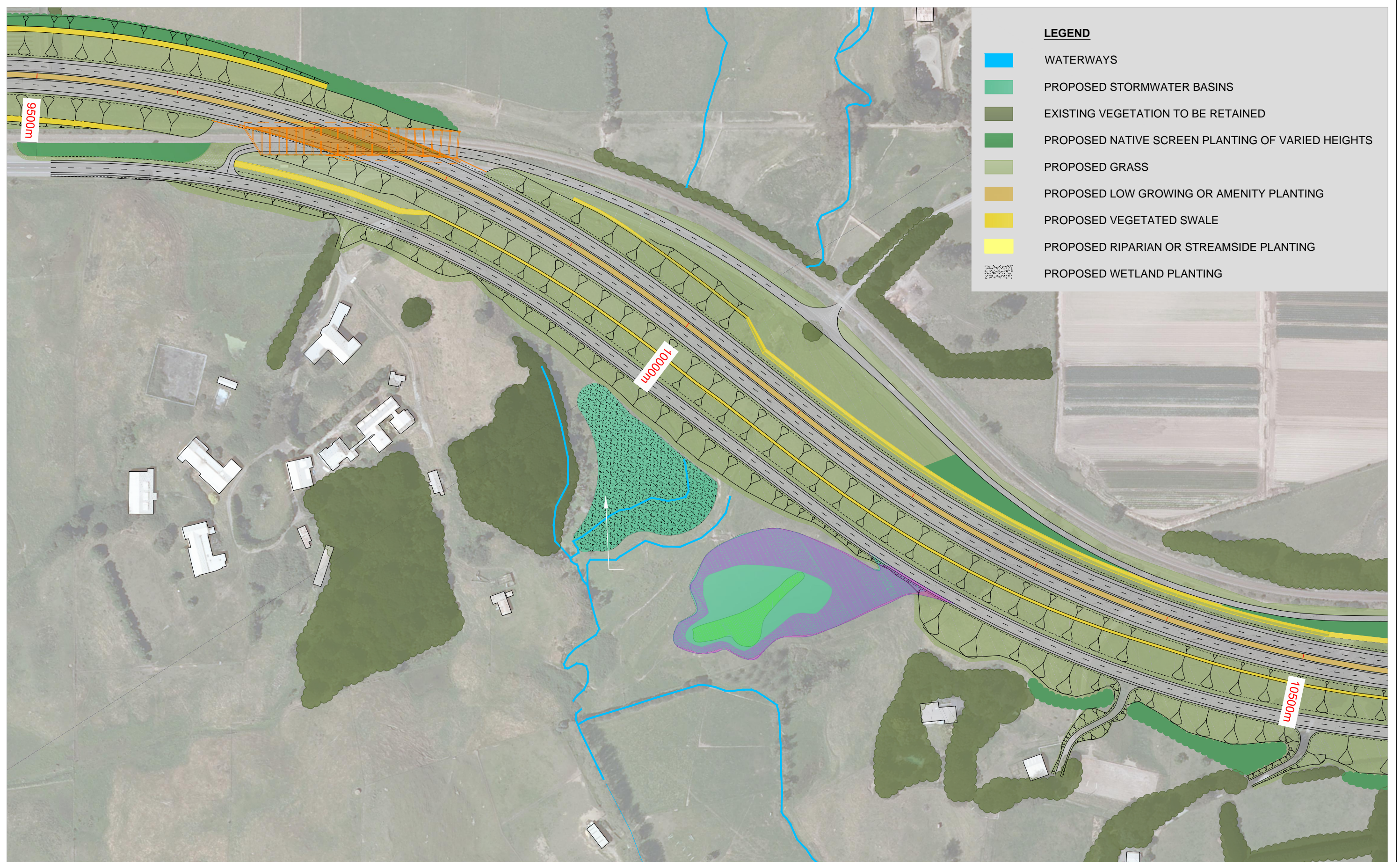


Project: **PEKA PEKA TO NORTH OTAKI EXPRESSWAY PROJECT**

Title: **INDICATIVE SSEMP MARY CREST STAGES 3 & 4**

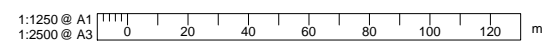
Status: **FOR CONSENTING**

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LEGEND

- WATERWAYS
- PROPOSED STORMWATER BASINS
- EXISTING VEGETATION TO BE RETAINED
- PROPOSED NATIVE SCREEN PLANTING OF VARIED HEIGHTS
- PROPOSED GRASS
- PROPOSED LOW GROWING OR AMENITY PLANTING
- PROPOSED VEGETATED SWALE
- PROPOSED RIPARIAN OR STREAMSIDE PLANTING
- PROPOSED WETLAND PLANTING



Revision	Amendment	Approved	Date



Project: PEKA PEKA TO NORTH OTAKI EXPRESSWAY PROJECT	
Title: INDICATIVE SSEMP LANDSCAPING	Status: FOR CONSENTING
Sheet No. B04	Version No. A