
Site Specific Environmental Management Plan

– Peka Peka to Ōtaki Project

SC1: Southern Transverse Culverts

FCCL-EV-MPN-0028

June 2018 – Revision C

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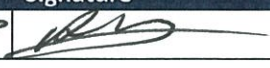
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AUTHORISATION AND REVISION RECORD

Revision	Status	Author	Date	Description
A	Draft	Alice Naylor	16/04/18	For Review
A.1	Draft review for	Alice Naylor	27/04/18	For Review
A.2	Draft review for	Alice Naylor	25/05/18	For Review
B	Final Draft	Alice Naylor	8/06/18	For Review
C	Final	Alice Naylor	22/06/18	For Certification

Revision	Action	Name	Position	Date
A.1	Internal Review	Sevasti Hartley	Environmental Coordinator	27/04/18

Certification Record

Revision	Action	Name	Position	Date	Signature
	Approved by:	<i>Richard Perry</i>	<i>Project Leader</i>	<i>10/7/18</i>	
	On behalf of GWRC:				
	Approved by:				
	On behalf of KCDC:				

CERTIFIED
VJAYSONA
 Resource Consents & Compliance Manager
 Kapiti Coast District Council
 DATE: *29/6/18*



1 INTRODUCTION

This Site Specific Environmental Management Plan (SSEMP) provides the necessary information to demonstrate how the project team plan to avoid or mitigate potential adverse environmental effects relating to construction of the Peka Peka to Ōtaki Expressway.

This document covers works relating to installation of six transverse culverts that pass beneath the main expressway alignment or local roads, three of which will require temporary stream diversions to allow construction of the culverts within the existing stream locations. This SSEMP also includes temporary works required to tie the permanent School Road Drain Diversion into the existing School Road Drain to allow permanent works to progress in accordance with SSEMP SLR1 'Southern Local Roads'.

This SSEMP reflects the requirements of the Construction Environmental Management Plan (CEMP) and its appendices, and is intended to be utilised by the construction team to clearly identify any site specific environmental requirements that must be adhered to prior to, and during works. A suite of over-arching environmental management plans have been drawn from to inform the contents of this SSEMP. All works will be carried out in general accordance with these management plans.

Works are not to commence on site until certification of this SSEMP has been confirmed in writing by Kapiti Coast District Council (KCDC) and Greater Wellington Regional Council (GWRC).

1.1 Location of works

Works will take place in the following locations:

- Culvert 23 (chainage 7260)
- Culvert 24 (chainage 7260)
- Culvert 28 (chainage 7500)
- Culvert 35 (chainage 8600)
- Culvert 36 (chainage 8640)
- Culvert 39 (chainage 8920)
- Temporary School Road Drain diversion (chainage 7660)

1.2 Programme

The expected programme for the activities covered by this SSEMP are as follows:

Table 1: Programme for southern critical culverts

Activity	Commencement	Duration
Culvert 23	June 2018	2-3 weeks
Culvert 24 and associated temporary stream diversion	July 2018	3-4 weeks
Culvert 39 and associated temporary stream diversion	July 2018	3-4 weeks
Culvert 35	August 2018	2-3 weeks
Culvert 36 and associated temporary stream diversion	July 2018	3-4 weeks
Culvert 28	August 2018	2-3 weeks
Temporary School Road Drain Diversion and associated works	August 2018	1-2 weeks

A detailed programme can be found in Appendix E.

2 PLAN IMPLEMENTATION

2.1 Responsibilities

The following provides a summary of responsibilities relevant to the planning and implementation of this SSEMP.

Table 2: Roles and responsibilities

Role	Person	Contact Details	Responsibilities
Construction Manager	Steve Findlay	stevef@fcc.co.nz	<ul style="list-style-type: none"> Ensures there is a system in place so that construction works do not proceed until required environmental sign-offs are completed. Overviews systems and processes to ensure consent requirements are captured for construction works. Ensures adequate resources are provided to ensure environmental issues are appropriately managed. Reviews environmental incidents and complaints with the Environmental Manager and acts to address issues where needed. Reviews and monitors construction work methods to ensure compliance with RMA conditions
Environmental Manager	Alice Naylor	A.Naylor@Higgins.co.nz	<ul style="list-style-type: none"> Develops, implements and reviews environmental management systems and environmental management plans. Coordinates all environmental auditing functions and ensures relevant records are maintained. Responds to and investigates all environmental complaints, issues or incidents. Coordinates the SSEMP implementation process and pre-works requirements to ensure that environmental requirements are adhered to. Provides training and briefings to site staff to ensure that there is sufficient

			<p>knowledge of environmental requirements in the field.</p> <ul style="list-style-type: none"> • Acts as the primary point of communication between regulatory bodies and the project. • Coordinates a team of experts in specialist disciplines such as contaminated land, ecology, groundwater, noise and vibration. • Communicates environmentally sensitive areas to the construction team.
Environmental Coordinator	Sevasti Hartley	sevastih@fcc.co.nz	<ul style="list-style-type: none"> • Supports the Environmental Manager and provides leadership to ensure all staff comply with environmental management systems. • Provides support in the formation of SSEMPs. • Undertakes as-building of environmental controls. • Undertakes regular site inspections and audits. • Coordinates all site monitoring including but not limited to groundwater, water quality, ecological, dust, noise, and vibration monitoring. • Manages maintenance and monitoring of Chemical Treatment Systems (if used). • Ensures spill kits are available and stocked and provides training on equipment use. • Conducts regular site inspections of erosion and sediment control devices and co-ordinates maintenance where necessary. • Monitors site controls during rain storms. • Trains staff in site specific environmental procedures.
Stakeholder & Communications Manager	Ed Breese	ebreese@tonkintaylor.co.nz	<ul style="list-style-type: none"> • Organises, co-ordinates and facilitates engagement with affected property holders and community prior to and during construction.

			<ul style="list-style-type: none"> Works in partnership with Environmental Manager on engagement and construction activities in accordance with RMA conditions
Site Superintendent / Supervisors / Foreman	Simon Fifield	SimonF@fcc.co.nz	<ul style="list-style-type: none"> Provides leadership to the site construction team. Ensures environmental controls including erosion and sediment control works are protected and maintained on a day to day basis. Ensures that the SSEMPs and Archaeological Authority requirements are implemented appropriately by the construction team. Maintains contactability 24/7 during construction and has authority to initiate immediate response actions. Reports all environmental incidents, compliance issues and complaints to the Environmental Manager. Reviews the need to use a water cart or sprinklers to control dust.
Project Engineers	Richard Rakovics (Civil) Craig Service (Structural)	RichardR@fcc.co.nz CraigS@fcc.co.nz	<ul style="list-style-type: none"> Responsible for ensuring environmental controls and erosion and sediment control works are installed and modified as appropriate for each stage of construction. Develop, implements and monitors construction methods and environmental protection measures to ensure compliance with the SSEMPs. Demonstrate understanding of major environmental and community issues and environmentally sensitive areas. Coordinate environmental interfaces with subcontractors and suppliers. Reports all environmental incidents, compliance issues and complaints to the Environmental Manager.

Specialist support (contaminated land, ecology, noise and vibration)	Dean Miller (Principal Ecologist)	DCMiller@tonkintaylor.co.nz	<ul style="list-style-type: none"> • Provide expert advice to the Environmental Manager and Environmental Coordinator regarding specific site requirements. • Submits reports to the Environmental Manager to fulfil requirements of consents relevant to their field. • Briefs the construction team of site specific requirements for environmentally 'sensitive areas'.
Iwi	Te Waari Carkeek (Ngā Hapū o Ōtaki)	TeWaariC@fcc.co.nz	<ul style="list-style-type: none"> • Provide input into project documentation such as management plans, design processes, planning documents. • Reviews permits to work and coordinates the level of involvement of kaitiaki in site activities • Coordinates all aspects of iwi monitoring. • Key point of contact for Ngā Hapū o Ōtaki.
Iwi	Caleb Royal (Ngā Hapū o Ōtaki Consents Processing Officer)		<ul style="list-style-type: none"> • Reviews consents and coordinates cultural monitoring activities. • Provides specialist advice to Ngā Hapū o Ōtaki
Iwi	Muaupoko Tribal Authority		<ul style="list-style-type: none"> • Point of contact for any archaeological discoveries in accordance with the agreed accidental discovery protocols and MTA agreement.

2.2 SSEMP amendments

In the event that changes in works scope or methodology are required, changes may need to be made to this document in accordance with resource Consent Condition's DC.18B and / or G.21A. Any 'major'

changes will be submitted to the respective Manager for certification at least 5 working days prior to implementation of that change.

In accordance with Condition G.21A, a 'minor change' may be submitted to the Manager for certification at least 2 working days prior to implementation of that change, unless an alternative process of approving a 'minor change' is agreed to by the Manager, Greater Wellington Regional Council.

2.3 Specific consent conditions

There are a number of consent conditions specific to in-stream works which must be adhered to prior to, duration, and following works carried out under this SSEMP. The following table summarises these conditions and indicated where the relevant information can be found throughout this document.

Table 3: Specific consent conditions

Condition	Description summary	Relevant section within SSEMP
25(i)	i) Measures/methods to maintain fish passage during and following completion of the works along the stretches of stream affected by the exercise of this designation.	3.3.4 and 4.1
G.12(b)(ii)	Environmental awareness training is to be provided specific to stream requirements.	4.7
G.33(j)	Details of waterway diversions	3, 4, App C, D
G.33(l)	Measures proposed to minimise impacts on fish passage, stream habitat and water quality.	4, 5
G.40	Requirement for pre-works baseline mudfish surveys.	Section 5.2
WS.1	Natural rock and soil material shall be used where practicable to reclaim the stream bed. All material shall be placed and compacted so as to minimise any erosion and/or instability.	3.2.2

WS.2	Undertake construction works in the dry bed of the stream as far as practicable, prior to diversion of the stream into that portion of the stream bed	4.1
WS.3	Maintain the volume and velocity of stream flows in a similar state to the pre-Project situation	3.2.2, 4
WS.4	Mangaone and Mangapouri design requirements for fish passage	Appendix C
WS.6c	Bridge abutment, culvert and river/stream bank protection works shall not impede flood flows.	Appendix C
WS.7	Methodology to manage the migration of native fish.	5.2 and 4 (as well as the EMP)
WS.8	The maximum extent of reclamation or diversion of all waterbodies for the Project shall not exceed 2750 linear metres.	3.1, Appendix C
WS.9	Fish passage visual assessment 1 and 4 years post construction.	3.2.2

3 DESIGN COMPONENTS

3.1 Permanent Culvert details

Relevant culvert design details have been included as Appendix C 'Construction Drawings' based on the Culvert Design Report. The following table provides a summary of information based on the current design information.

Once final design details are confirmed for the stream diversion channels immediately upstream and downstream of these culverts (and prior to placement of any permanent features within the permanent channels), detailed design will first need to be certified by GWRC as an amendment to this SSEMP in accordance with Condition G.21A.

Table 3: Summary of Culvert Requirements (culverts specific to this SSEMP are outlined in red)

Culvert No.	Location	Chainage	Type	Size	Fish Passage	Additional requirements	Permissible "heading up" based on condition WS.6, PR A21.4.3, A21.4.5, A21.5.6 and A21.8.2					
							10% AEP CC2130	2% AEP CC2130	1% AEP CC2130	0.1% AEP CC2130	0.04% AEP CC2130	3,000m ³ /s on the Ōtaki River with breach of Chrystall's Stopbank
Pipe 66	Milk Station	2100	Concrete pipe	0.9m dia	N	Convey 5% AEP present climate outflow from Culvert 7 without activating existing overland flow path through private property						
Pipe 69	Milk Station	2150	Concrete pipe	0.9m dia	N							
14	Racecourse Stream	2,200	Concrete pipe	1.2m dia	N	To match existing culvert capacity (PR A21.5.3e)	0m to soffit		0.5m to road			
15b	Ōtaki flood plain	2,750	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			No collapse in ULS
15c	Ōtaki flood plain	2,830	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			No collapse in ULS
15d	Ōtaki flood plain	2,920	Concrete pipe	2 no. 1.05m dia	N		0m to soffit		0.5m to road			No collapse in ULS
15e	Ōtaki flood plain	3,040	Corrugated steel (multi-plate)	3.8m x 2.9m underpass (WxD)	N	Vehicle access per PR A21.5.4I as modified by NTT-083			0.5m to road			No collapse in ULS
18	Overland flow path (connects eastern and western parts of off-river storage basin)	3,200	Corrugated steel (multi-plate)	3.8m dia pipe	N	No premature flooding to the eastern part (PR A21.5.5i)			0.5m to road			No collapse in ULS
157	Swale (Ōtaki Gorge Road)	4,150	Concrete pipe	0.9m dia	N		0m to soffit		0.5m to road			
156	Swale (Southbound On-ramp)	4,250	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			
155	Swale (Old Hautere Road)	4,320	Concrete pipe	2 no. 1.05m dia	N		0m to soffit		0.5m to road			
136	Swale (Southbound On-ramp and Expressway)	4,600	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			
22	Overland flow path (Winiata Link)	7,120	Concrete pipe	3 no. 1.2m dia	N		0m to soffit		0.5m to road			
23a	Overland flow path (School Road)	7,200	Corrugated steel (multi-plate)	6.0mx2.9m arch (WxD)	N	Minimum width 5m (PR A21.5.6s)		0.5m to road (Importance Level 2 assumed)		No collapse in ULS		
23	Mangaone Stream (School Road)	7,350	Concrete box	5.5mx3.5m (WxD)	Y - 0.5m embedment as per condition WS.4	To match existing culvert system capacity up to 1% AEP CC2130 to maintain existing flood		0.6m to soffit (PR A21.4.5h)	0.6m to soffit (PR A21.5.6e, to be clarified)	No collapse in ULS		

Culvert No.	Location	Chainage	Type	Size	Fish Passage	Additional requirements	Permissible "heading up" based on condition WS.6, PR A21.4.3, A21.4.5, A21.5.6 and A21.8.2					
							10% AEP CC2130	2% AEP CC2130	1% AEP CC2130	0.1% AEP CC2130	0.04% AEP CC2130	3,000m ³ /s on the Ōtaki River with breach of Chrystall's Stopbank
24	Mangaone Stream (Expressway)	7,250	Concrete box	5.0m x 2.0m (WxD)	Y - 0.15m concreted cobbles as per A21.5.6f	patterns to the west of the Expressway (PR A21.5.6m)			0.6m to top of flood bund		No collapse in ULS	
34	Mangaone Stream (western link road)	7,250	Concrete box	4.0mx3.65m (WxD)	Y - embedment 0.85m upstream and 0.5 downstream (0.5m required by condition WS.4)			0.6m to soffit (PR A21.4.5h, WS.6iv). No flooding down Te Horo Beach Road from headwater (PR A21.5.6u)	0.6m to soffit (PR A21.5.6e, to be clarified)	No collapse in ULS		
27	Mangaone Overflow (School Road)	7,470	Corrugated steel (Supercor)	6.2mx2.9m custom arch (WxD)	N			0.3m to road (PR A21.5.6g)		No collapse in ULS		
28	Mangaone Overflow (Expressway)	7,470	Corrugated steel (Supercor)	5.7mx2.1m custom box (WxD)	N				0.6m to top of flood bund		No collapse in ULS	
35	Gear Stream (Gear Road)	8,600	Corrugated steel (multi-plate)	4.0mx2.5m pipe arch (WxD)	Y - 0.35m embedment			0.5m to road (Importance Level 2 assumed)		No collapse in ULS		
36	Gear Stream (Expressway)	8,620	Concrete box	5.0mx2.0m (WxD)	Y - 0.35m embedment				0.5m to road		No collapse in ULS	
39	Settlement Stream (Expressway)	8,920	Concrete boxes	Upper: 4.5mx2.0m (WxD) Lower: 5.0m x 2.0m (WxD)	Y - embedment 0.5m lower barrel 0.285m upper barrel				0.5m to road		No collapse in ULS	
42	Coolen Stream	9,020	Concrete pipe	1.35m dia	Y - spat ropes			0m to soffit		0.5m to road		
45	Avatar Stream	9,400	Concrete pipe	1.2m dia	N			0m to soffit		0.5m to road		
50/50a	Edwin Stream	9,950	Concrete pipes	Both 1.2m dia	Y - spat ropes			0m to soffit		0.5m to road		
53	Jewell Stream	10,080	Corrugated steel (multi-plate)	Upper and Lower: 2.9mx2.1m pipe arch (WxD)	Y - 0.25m embedment of lower barrel with concreted cobbles at regular spacing					0.5m to road	No collapse in ULS	
59	Cavallo Stream	10,830	Concrete pipe	1.2m dia	Y - 0.15m embedment			0m to soffit		0.5m to road		
61	Cording Stream	10,970	Concrete pipe	0.75m dia	N			0m to soffit		0.5m to road		
64	Awatea Stream	11,220-11,380	Concrete pipes	64a, b & c: 1.05m dia 64d: 1.2m dia 64f: 1.05m dia 64g: 1.8m dia	Y - 0.3m embedment of lower barrel 64g					0.5m to road	No collapse in ULS	
66	Kumototo Stream	11,680	Concrete pipes	Upper: 1.2m dia Lower: 1.8m dia	Y - 0.3m embedment of lower barrel			0m to soffit		0.5m to road		

3.2 Permanent Stream Diversions

The final design details for permanent stream channels will require separate approval through GWRC prior to placement of any permanent features within the channels. These details will be included as an amendment to this SSEMP in accordance with Condition G.21A. The following information provides general information regarding stream channel details based on the current Culvert Design Report.

3.2.1 Channel Shape and Erosion Protection

The geometry of the diversion channels has generally been developed to mimic the existing stream in terms of conveyance capacity, longitudinal grade, cross-sectional shape, tightness (bend radius) and frequency of meanders.

Where necessary, channel bed and erosion protection measures have been designed. These include rock rip-rap armouring, designed using the USACE method EM 1601 (implementation referenced in NCHRRP Report 568), and for validation, compared against Austroads Waterway Design Rock Size Recommendation. Reinforced turf armouring has been specified for channel design velocities under 2m/s, using Enkamat Design Guide EM-18-GB-A. Final erosion protection details have been outlined in the *Culvert Design Report*.

Typical stream diversion design is included in Appendix C drawings (refer to PP2O-DR-SW-1151). Voids in the rip-rap armouring will be filled with natural substrate material sourced from the existing stream bed excavation. The hyporheic zone within the channel will therefore comprise a mix of rip-rap and existing stream bed material thereby avoiding flows being consumed by the rip-rap voids. Diversion channels will also be formed with a cross fall to focus low flows.

To achieve the proposed hyporheic zone the construction method will require rip-rap to be placed in a layer followed by natural material to fill voids progressively, and the process completed to the desired thickness as outlined on the attached drawing.

3.2.2 Fish Passage

Fish passage will be provided where required for diversion channels through the following measures:

- Providing cantered cross section inverts to provide flow depth for fish passage at low flows. This is particularly important for intermittent streams crossed by the expressway;
- Avoiding channels that are significantly steeper than natural grades; and
- Substrate will be matched to existing stream bed material. Rip rap will be covered with material that matches stream bed material where necessary to avoid interstitial flows and ensure flow depth for fish passage during low flows.

Appendix C contains relevant drawings relating to the culverts covered in this SSEMP.

Visual checks to assess fish passage will be carried out 1 year and 4 years following construction by a suitably qualified ecologist and engineer in accordance with Condition WS.9.

A summary of permanent stream diversion information is provided in table 4 below.

Table 4: Summary of Permanent Stream Diversions (stream diversions relevant to this SSEMP are outlined in red)

Stream / Drainage Channel	Existing stream / drain removed	Proposed diversion channel	Headwall / rip rap where not included in diversion channel length	Proposed culvert
Greenwood Stream (Culvert 1)	73m	16m	10m	47m
Southern tributary to Waitohu Stream (Culvert 3)	93m	55m	5m	58m
Mangapouri Stream (Culverts 9 and 10)	131m	44m	0m	81m
Racecourse Stream (Culvert 14)	116m	83m	7m	56m
Mangaone Stream (Culverts 23, 24 and 34)	255m	142m	43m	96m
Lucinsky Overflow Weir and Channel (new section of channel not shown on drawings, located northwest of Culvert 34)	0m (overland flow, no defined channel)	40m	0m	0m (side weir off Mangaone Stream)
Mangaone Stream Overflow / Flood Diversion Channel (separate channel south of Mangaone Stream) (Culverts 27 and 28)	0m (overland flow, no defined channel)	33m	15m	83m
Gear (Culverts 35 and 36)	192m	105m	9m	72m
Settlement Heights (Culvert 39)	217m	79m	0m	39m
Coolen (Culvert 42)	131m	57m	0m	33m
Edwin (Culvert 50 and 50a)	255m	136m	0m	122m
Jewell (Culvert 53)	171m	112m	0m	91m
Cavallo (Culvert 59)	717m	421m incl wetland	0m	67m
Cording (Culvert 61)	173m	23m	0m	66m
Awatea (Culvert 64)	166m (incl separate drains to the north)	0m	33m	106m
Kumototo (Culvert 66)	38m	0m	24m	76m
	Total: 2728m			Total: 2585m

4 SITE MANAGEMENT

4.1 Works methodology

4.1.1 On-line culvert construction

Three culverts are to be constructed on-line of existing watercourses as follows:

- Culvert 39 (Settlement Stream)
- Culvert 36 (Gear Stream)
- Culvert 24 (Mangaone Stream)

The methodology for construction of each of these culverts will generally be as follows:

Stage One: Temporary stream diversion

- Where appropriate, early fish salvage and relocation methods will be carried out within the existing live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site (refer to Section 4.2.1 for details). This will be the only stage where fish passage will temporarily be impeded. All other works will allow for fish passage during construction via use of a temporary stream diversion.
- The necessary erosion and sediment controls will be constructed in accordance with the attached drawings in Appendix C.
- The temporary stream diversion will be constructed off-line of the existing stream in accordance with the temporary stormwater information outlined in Appendix D, leaving existing ground in place at the upstream and downstream end of the stream diversion as 'plugs'.
- Erosion and sediment controls are to be certified in accordance with Consent Condition E.6.
- Livening of the new channel and subsequent decommissioning of the existing channel can then proceed as follows:
 - Ecologist and Kaitiaki / Pūkenga to be present on site.
 - Removal of the downstream plug, allowing water to backflow up the new channel.
 - Removal of the upstream plug to fully liven the new channel.
 - Installation of an earth plug at the upstream end of the original channel.
 - Installation of an earth plug at the downstream end of the original channel.
 - Ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the original channel (now blocked).
 - Following approval from the project ecologist, water can be pumped from the channel in accordance with a permit to pump and the original channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
 - Construction of the new culvert can then commence.

Culvert commissioning:

- Upon completion of the new culvert and associated permanent diversions, erosion and sediment controls are to be completed and certified in accordance with Condition E.6.
- An ecologist and Kaitiaki / Pūkenga are to carry out a fish passage assessment prior to livening if necessary.
- The downstream plug can be removed, followed by the upstream plug to liven the new culvert.
- The inlet to the temporary diversion will be plugged using an earth bund, followed by the outlet to block the temporary diversion.
- The ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the redundant temporary diversion. If appropriate then early fish salvage and relocation will occur within the live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site.
- Following approval by the project ecologist, water can be pumped from the temporary diversion in accordance with a permit to pump and the channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
- Following final approval by the project ecologist, the temporary diversion channel can be backfilled.

4.1.2 Off-line culvert construction

Two culverts are to be constructed off-line of any existing watercourses as follows:

- Culvert 23
- Culvert 35
- Culvert 28

The methodology for construction of each of these culverts will be as follows:

Culvert construction and commissioning

- Installation of erosion and sediment controls in accordance with Appendix C drawings and Section 4.1 below.
- The culvert will be constructed offline of any watercourse, leaving existing ground in place as plugs at either end if adjacent to a watercourse.
- Following as-built check points and the upgrade of any erosion and sediment controls, the culvert will be livened by removing the outlet plug, followed by the inlet.

Stream decommissioning (if applicable)

The following only applies to Culvert 23 and Culvert 35 where decommissioning of the redundant Managaone Stream and Gear Road Drain sections is required following livening of Culvert 23 and Culvert 35.

- If appropriate, early fish salvage and relocation methods will be carried out within the existing live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site (refer to Section 4.2.1 for details).
- Earth bunds will be installed at the inlet and the outlet of the redundant section of stream (refer to Culvert 23 and Culvert 35 methodology in Appendix C).
- The ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the redundant channel.
- Following approval by the project ecologist, water can be pumped from the channel in accordance with a permit to pump and the channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
- Following final approval by the project ecologist, the redundant channel can be backfilled.

4.1.3 School Road Drain diversion

- The permanent School Road Drain diversion will be constructed as part of the new local road (refer to SSEMP SLR1).
- The Permanent diversion will be extended temporarily (same dimensions) further north to tie into the existing School Road Drain downstream.
- Existing earth plugs will be left in place either end until the diversion is ready to live.
- The downstream plug will be removed, followed by the upstream plug to live the new permanent / temporary diversion.
- If appropriate, early fish salvage and relocation methods will be carried out within the existing live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site (refer to Section 4.2.1 for details).
- The existing drain will be plugged at the inlet and outlet.
- The ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the redundant channel.
- Following approval by the project ecologist, water can be pumped from the channel in accordance with a permit to pump and the channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
- Following final approval by the project ecologist, the redundant channel can be backfilled.

4.1.4 Dewatering

Given the low groundwater levels in the locations covered under this SSEMP, it is not anticipated that dewatering will be required during culvert construction. If required, any localised dewatering will be carried out in accordance with an approved permit to pump and as a minimum must adhere to the following general conditions:

- The discharge must not increase the downstream water quality within the receiving watercourse by >20% (compared to upstream levels if applicable).

- The discharge must not cause obvious visual discolouration of the downstream environment beyond 'reasonable mixing' (deemed as 30m from initial discharge point unless otherwise specified due to access restrictions).
- Permit to pump documentation must be available for inspection by GWRC upon request.

4.2 Temporary Stream Diversions

- Temporary stream diversion channels have been sized to cater for the 2 year ARI flow (present climate). This is consistent with NZTA guidelines for stream diversions of less than 30 days duration. Note that in accordance with Condition G.19, the project ESCP has been prepared in accordance with the objectives outlined in the NZTA guidelines.
- Diversion bunds along the upper banks of each temporary diversion will be sized to convey the 20 year ARI flow (refer to Figure 1 below). Confirmation that bunds have been sized accordingly will be submitted through the as-built certification process required by Condition E.6. Note that flow may be restricted by the existing downstream railway culverts and therefore consideration will be given to the whether there is value in building diversion bunds to cater for the 20 year ARI. This will be reviewed by the project stormwater team prior to construction and any deviation from sizing for the 20 year ARI event is to be approved by GWRC prior to livening the relevant stream diversion.
- HEC HMS software with the SCS method has been used to estimate design flow, applied in accordance with "Subdivision and Development Principles and Requirements" (KCDC 2012) as described in Section 3.3.4 of the PP20 Stormwater Design Philosophy Report Rev 2 (PP20 August 2017).
- Manning's equation has been used to estimate channel capacity, flow depths and velocities.
- Existing stream levels have been based on KCDC LiDAR collected in 2010, supplemented by conventional survey collected for the purposes of the PP20 project.
- All vertical levels are in terms of NZVD 2009.
- Temporary diversion channels will be lined such that flows do not result in erosion of the channel. As a minimum, geotextile will be used to line each of these diversion channels.
- Diversion channels will generally be constructed in accordance with the stormwater requirements outlined in Appendix D.

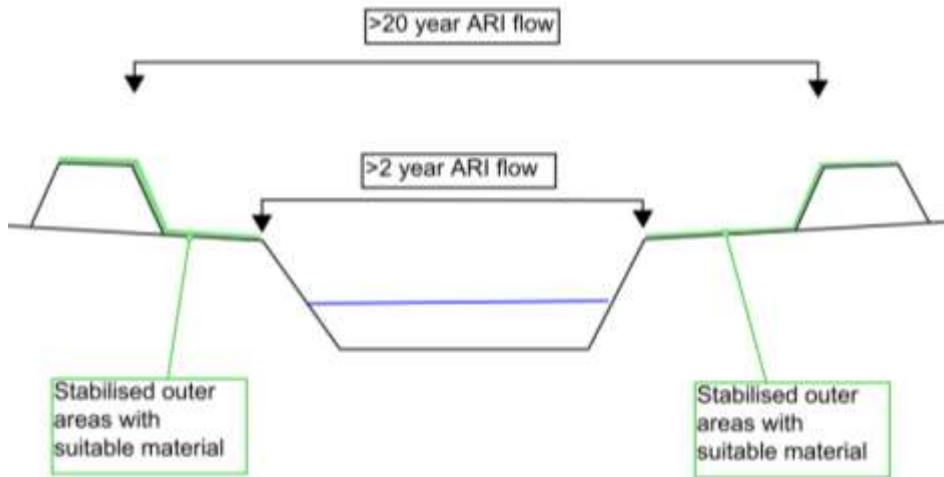


Figure 1: Typical temporary stream diversion and diversion bund set-up

4.3 Site access

Existing site access points will be utilised for these works from Old Hautere Road (SAP-8), School Road (SAP-6) and Gear Road (SAP-5) as originally identified through SSTMP PW1 'Vegetation Clearance and Enabling Works'.

The access/egress point will be stabilised using clean aggregate or sealed to avoid any construction related material leaving the site.

4.4 Construction plant

The plant items to be used are generally as follows:

- 6 – 20T excavators
- Trucks
- Water carts as required
- Light vehicles
- 50 T crane
- Concrete trucks where required

All plant will require to be inspected prior to start of works and during construction activities at regular intervals. Unwanted vegetation, seeds or contaminants will be cleared prior to plant entering the site to avoid the introduction or spread of weeds or pest species.

Plant inspections will be recorded on daily plant inspection forms to demonstrate that all plant used on this project are in good working order and have been cleared of unwanted weeds or pest species. Any faulty equipment will be stood down until the necessary repairs are carried out and the given plant is fit for purpose.

Spill control kits will be available on site at the sig-in areas (refer to Appendix C layout drawings) and areas where heavy machinery is working (as a minimum) to assist with the clean-up in the event of

any spillages. Plant storage during non-working hours will take into consideration high risk areas such as flood prone areas to ensure that machinery is located outside of these locations. Refuelling activities will take place using a mini-tanker away from watercourses to prevent additional risk of spillage to water. Machinery will not enter live watercourses at any stage throughout these works.

4.5 Disposal sites

A number of temporary stockpile sites will be required to cater for the excess topsoil / unsuitable material that is not temporarily disposed of into dirty or clean water diversion bunds. Stockpile sites have indicatively been marked on the drawings in Appendix C. These will typically be located at least 50m from watercourses, except in instances where space does not allow. In accordance with D.C 25(g), appropriate treatment of stormwater runoff from temporary stockpiles will be managed by use of a dirty water diversion bund to prevent sediment laden stormwater entering the adjacent watercourses. This level of protection is considered appropriate to provide sufficient treatment. Stockpiling of rip rap will also be required prior to use at the culvert inlet / outlets.

4.6 Water supply

Water may be required to prevent dust discharge from site during works. Water required for these works will be collected from off-site.

Any water supply bores required on site must be constructed in accordance with BC.1 – 4 and any water take done so in accordance with GT. 4-7.

4.7 General pre-works requirements

As part of the site preparation and establishment works the following mitigation measures will be implemented to avoid or minimise adverse environmental effects:

- Site specific information, including environmental constraints and requirements, will be discussed at the relevant pre-construction site meetings with input from specialists as required. All contractors involved in works under this SSEMP will be briefed on specific requirements relating to stream values, objectives for culvert and diversion design, and the importance of protecting watercourses using appropriate erosion and sediment controls.
- Prior to works commencing in this area, the project surveyors will use GPS to identify the extent of works. The works area will be clearly marked-out with regular input from the survey team throughout works as required.
- Areas identified as 'retained vegetation' as per the approved vegetation retention plans will be clearly delineated using physical markers on site.
- Environmental requirements for any given area will be noted on each project 'Permit to Work'. These permits are required for any activity on site and must be in place and signed off by the environmental team prior to works commencement.
- Areas of the site will be set up to deal with rubbish, construction materials and other miscellaneous materials to ensure that the site is maintained in a tidy and organised state.

Majority of required supplies will be located at the main project site compound at Bridge Lodge.

5 ENVIRONMENTAL REQUIREMENTS

5.1 Erosion and Sediment Control

- Location and heights of erosion and sediment control measures are outlined on Appendix C drawings.
- Dirty and clean water diversion bunds fitted with T-Bar decants at the low points will typically be utilised for these works.
- Dirty water and clean water diversion bunds have been sized in accordance with the project ESCP to convey the 5% AEP rainfall event. Individual work sites for each culvert have varying catchment sizes which dictate the required height of diversion bunds. The attached drawings in Appendix C outline the required diversion bund heights based on these catchment sizes and in some cases dirty water diversion bunds have been increased in size to allow clean water to be accepted into the site.
- Floating T-Bar decants may need to be installed at the low points of dirty water diversion bunds with a stabilised emergency spillway in accordance with the ESCP to ensure that site runoff is sufficiently treated prior to discharge. The exact location of the floating T-Bar will be determined on site. Any decants will be held up using a pulley system or suitable alternative as the default position and be lowered as required following sufficient treatment. Any lowering of decants will be carried out under an approved permit to pump as specified in the project ESCP, and as a minimum must adhere to the following general conditions:
 - The discharge must not increase the downstream water quality within the receiving watercourse by >20% (compared to upstream levels if applicable).
 - The discharge does not cause obvious visual discolouration of the downstream environment beyond 'reasonable mixing' (deemed as 30m from initial discharge point unless otherwise specified due to access restrictions).
 - Permit to pump documentation must be available for inspection by GWRC upon request.
- In instances where it is not required to fit a decant at the low point (i.e. if ground soakage proves to be adequate) then this will be identified and documented through the Condition E.6 certification process.
- Temporary stockpile areas will be controlled within diversion bunds, or be located such that runoff is contained by existing ground topography.

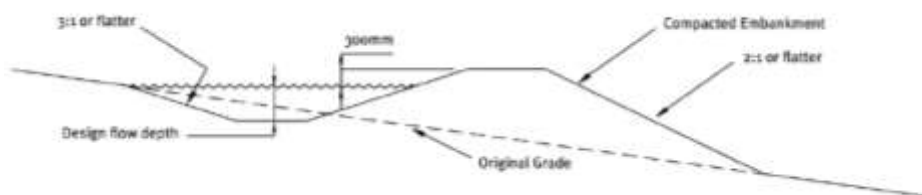


Figure 2: Typical cross section of dirty water diversion bund in accordance with the project ESCP.

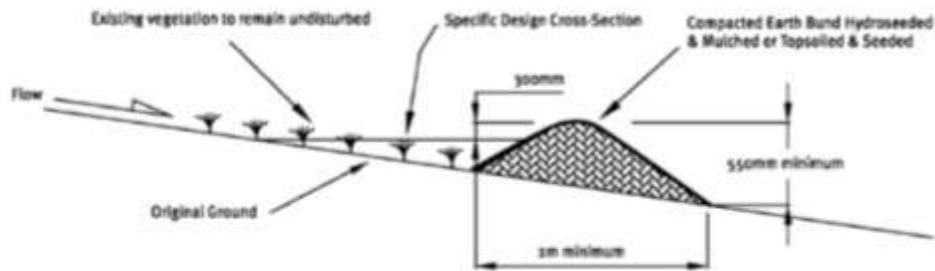


Figure 3: Typical cross section of clean water diversion bund.

5.2 Ecological requirements

Project ecological requirements are set out in the Ecological Management Plan (EMP) which outlines a number of locations that have specific requirements in regards to terrestrial and aquatic species that need to be considered prior to and during works. These have been further refined following input from the project ecologists to ensure that potential effects related to streamworks are minimised as far as practicable. Table 5 below summarises the site specific ecological requirements for each watercourse.

Table 5: Key ecological information specific to each watercourse

Culvert	Relevant watercourse	Stream classification	Actual or likely fish present	Mud fish survey required	Fish passage required	Fish migration management	Fish rescue methods	Specific requirements
Culvert 23	Mangaone Stream	Permanent	Diverse fish community	No	Yes	Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Water quality / stream ecological monitoring
Culvert 24	Mangaone Stream	Permanent	Diverse fish community	No	Yes	Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Water quality / stream ecological monitoring
Culvert 28	Mangaone overflow	Ephemeral	NIL	No	No	N/A	N/A	No requirements
Culvert 35	Gear Stream	Intermittent	Intermittent habitat Potential for mudfish	Yes - complete	Yes	No mudfish found during initial survey. Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing (redundant stream section only)	Fish passage assessment Fish salvage and relocation Mud fish survey (complete)
Culvert 36	Gear Stream	Intermittent	Intermittent habitat Potential for mudfish	Yes - complete	Yes	No mudfish found during initial survey. Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Mud fish survey (complete)
Culvert 39	Settlement Stream	Intermittent	Intermittent habitat for eels and banded kokopu	Yes - complete	Yes	Avoid peak upstream migration period for banded kokopu and eels where practicable (September to March).	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Mud fish survey (complete)
n/a	School Road Drain	Intermittent	Intermittent habitat for eels	No	n/a	No particular requirements specified in the EMP.	Netting and electric fishing (redundant stream section only)	Fish salvage and relocation

5.2.1 Fish salvage and relocation

The primary methods for capturing fish will be netting with baited nets set overnight, and electric fishing. In some cases early fishing of the live watercourse will not be practical due to soft bottomed streams and fast flows placing pressure on stop nets, and instead the ecologist may advise to commence fishing once the new channel is livened and redundant channel blocked. In instances where early fish salvage and relocation *is* possible, the general fishing procedure will be as follows.

- A stop net will be deployed across the channel at the upstream and downstream ends of the works area at the commencement of the fish rescue operation to prevent fish from re-colonising the works areas. Stop nets will remain in place until a diversion at any particular site is livened.
- In non-wade-able streams baited fyke nets and gee minnow traps will be placed throughout the isolated section of water course. The fishing effort (number of nets) will vary according to the area being fished. Nets will be left over night and cleared the next morning. If high numbers of fish are encountered following the second night of trapping further trapping may be required. Subsequent nights netting will be undertaken until the catch rate is below 50% of the previous pass or less than 10 individual fish captured.
- In wade-able streams the entire length of stream will be electric fished by qualified technicians with repeat passes undertaken until the catch rate is below 50% of the previous pass or less than 10 individual fish captured in conjunction with netting if required.
- A freshwater ecologist will be present on site at the time of dewatering the stream or the pond environments to ensure that any remaining fish are captured and relocated.
- All indigenous fish recovered will be transported and released to an appropriate relocation site (with input from Nga Hapu o Ōtaki regarding preferable locations).
- Appropriate handling methods will be used to minimise stress to the fish. Fish will be held in covered bins that will be regularly refreshed with stream water and transferred and released typically within 1 hour of being caught. Bubblers will be used if necessary to prevent asphyxiation.
- Exotic species captured through fish rescue exercises will not be transferred. Any exotic fish species captured will be euthanized humanely and disposed of appropriately.
- Records of all fish relocated will be kept and provided in the written statement along with details on monitoring methodology, release location and monitoring dates.

5.3 Water quality monitoring

During livening of any culvert or diversion, turbidity monitoring will be undertaken upstream and downstream of the work site. In accordance with the EMP, if the turbidity level downstream of the works has not returned to levels within 10% of upstream levels within 48 hours of livening then GWRC will be notified and an investigation will be carried out to address the source of sediment release. Two turbidity monitoring methods will be utilised depending on the location of works as follows:

Method 1: Continuous turbidity monitoring (roaming loggers)

The following method will be applied for the livening of temporary diversions and permanent culverts within Gear Stream and Settlement Stream:

- Roaming turbidity loggers will be installed upstream and approximately 30m downstream of the diversion / new culvert at least 24 hours prior to livening.
- The loggers will record continuously throughout the livening process to record to the peak discharge and the duration of increased turbidity.
- The loggers will continue to record turbidity until it can be demonstrated that downstream levels are within 10% of upstream levels.
- If downstream levels are elevated above 10% after 48 hours from livening then GWRC will be notified and an investigation will be carried out to address the source of sediment release.
- Monitoring results will be sent to GWRC within 10 working days of livening the diversion / culvert.

Method 2: Telemetered turbidity monitoring

The following method will be applied for the livening of the temporary diversion and permanent Culvert 39 within the Mangaone Stream:

- Continuous turbidity loggers will be installed upstream and downstream of the works site prior to earthworks or streamworks commencing in the Mangaone catchment. These will remain in place for the project duration.
- Following livening, if downstream levels are elevated above 10% after 48 hours from livening then GWRC will be notified and an investigation will be carried out to address the source of sediment release.
- Monitoring results will be sent to GWRC within 10 working days of livening the diversion / culvert.

5.4 Cultural monitoring

A Kaiarahi (iwi guide / leader) is the key point of contact and coordination for Ngā Hapū o Ōtaki. The Kaiarahi will be involved in the design process, construction supervision and environmental monitoring. The Kaiarahi will be supported by Pūkenga (specialists / experts) and Kaitiaki (guardians)

who provide support in supervision, monitoring activities and provision of specialist advice in regards to cultural monitoring. Ngā Hapū o Ōtāki will be informed of all works on site and invited to be present for all works with particular emphasis placed on initial topsoil stripping and streamworks.

Contact must also be maintained with Muaupoko Tribal Authority (MTA) in accordance with MTA agreement and confirmed accidental discovery protocols, summarised in Appendix F.

5.5 Archaeology

All works under this SSEMP will be carried out in accordance with the approved archaeological authority and the Archaeological Site Management Plan. The Archaeological Site Management Plan outlines high, medium, and low probability archaeological areas across the project footprint.

One area of works associated with the construction of the new School Road Drain (and associated School Road) is considered to be 'high probability' at Matenga Moroati's house and has undergone pre-works archaeological investigations. Any works in this area will also require the presence of an archaeologist and kaitiaki to monitor the works, particularly during initial topsoil stripping. Contractors will be briefed on the Accidental Discovery Protocol if the archaeologist is unable to be on site.

All remaining areas covered under this SSEMP are deemed to be low-probability areas and will be covered by Accidental Discovery Protocols. Accidental discovery protocols are outlined in the Archaeological Site Management Plan and must be adhered to in instances where subsurface archaeological remains, kōiwi tangata, or taonga are exposed during construction.

The agreed protocols and high probability area are provided in Appendix F.

5.6 Noise and vibration

The Construction Noise and Vibration Management Plan (CNVMP) identifies the noise and vibration performance standards that must, where practicable, be complied with. It also sets out best practicable options for noise and vibration management for the Project, including mitigation measures, monitoring requirements, and communication and complaint procedures. All works under this SSEMP will be carried out in general accordance with the CNVMP.

High-risk areas in regards to potential noise and vibration effects as a result of works have been identified in Appendix C. Individual dwellings located within the high risk areas have also been listed below.

In accordance with the CNVMP, works carried out under this SSEMP will generally be restricted to take place between the hours of:

- 0630 and 2000hrs on weekdays; and
- 0730 and 1800hrs on Saturdays.

As far as practicable, works will be scheduled to avoid noisy activities in areas identified as sensitive receivers on the attached drawings between 0630 – 0730hrs in the morning, and between 1800 – 2000hrs in the evening to align with noise level criteria outlined in the CNVMP.

It is not anticipated that works will be required to take place outside of normal working hours for works outlined in this SSEMP. In the event that this changes, the procedures outlined in the CNVMP will be followed. Any works outside of the hours of 7am to 7pm require written approval from the Project Engineer.

The primary mitigation measure in regards to reducing the impacts from construction noise and vibration will be ongoing effective community consultation, particularly when transitioning from one works phase to another.

Noise and vibration monitoring will take place throughout the works to assess the impacts on adjacent properties at various locations. In the event that noise or vibration criteria is exceeded, mitigation options will be reassessed in an effort to comply with the construction limits, and a site specific noise 'schedule' will be submitted to Kapiti Coast District Council in accordance with the CNVMP.

Dwellings located within the noise and vibration boundary are as follows:

- 32 School Road
- 34 School Road
- 36 School Road

Dwellings within the vibration boundary only are as follows:

- 38 School Road
- 42 School Road
- 45 Gear Road
- 95 Gear Road
- 96 Gear Road
- 97 Gear Road

5.6.1 Pre-condition building surveys

Section 7 of the CNVMP outlines activities that are expected to generate vibration that will potentially cause medium and high level vibration and therefore must be assessed to determine whether a pre-condition building survey is required.

Given the nature of works and the distance from each localised work site to nearby dwellings, pre-condition building surveys will not be required prior to works carried out under this SSEMP.

5.7 Air quality

There is potential for works to generate dust discharge if the site is not managed effectively. The Construction Air Quality Management Plan (CAQMP) outlines methods to be used to prevent dust and odour nuisance during construction from the site. All works under this SSEMP will be carried out in general accordance with the CAQMP.

To ensure that dust does not become an issue across the boundary of the site, the following measures will be implemented as a minimum:

- Use of water carts as required, particularly around public interface points such as site entry/exits to local roads
- Imposing a speed limit if required
- Use of stabilising agents such as polymers if required
- Assessing wind speed and direction on a daily basis and implementing additional mitigation based on conditions (or ceasing / re-programming works as required).

Certain properties fall within the 'high risk air quality' zone as identified in Appendix C drawings. Provided that the site is managed effectively, it is not anticipated that these works will cause an adverse impact in these locations.

5.8 Contaminated land

The Bulk Earthworks Contaminated Land Management Plan (BECLMP) provides a framework and general procedures for the management of contaminated soil and other contaminated materials/structures potentially present in ground that may be disturbed or require removal to complete the Project. A number of potentially contaminated sites located within the Project corridor were identified during the desk based Phase 1 Contaminated Land Assessment. The works programmed to take place under this SSEMP are not located within any locations identified as contaminated land sites and therefore there are no specific requirements regarding handling of contaminated soils.

6 TRAFFIC

Existing site access points will be utilised for these works from Old Hautere Road (SAP-8), School Road (SAP-6) and Gear Road (SAP-5) as originally identified through SSTMP PW1 'Vegetation Clearance and Enabling Works'. A Site Specific Traffic Management Plan (SSTMP) has been included as Appendix G.

APPENDIX A – SSEMP AUTHORS

Name	Role	Company	Input
Alice Naylor	Environmental Manager	Higgins	All
Richard Rakovics	Project Civils Manager	Fletcher Construction	General sequencing and works methodology
Macu Waga	Site Engineer	Fletcher Construction	General sequencing and works methodology
Dewi Knappstein	Stormwater Lead Engineer	Tonkin & Taylor	Temporary stormwater design
Tyler Campbell	Design Engineer	Tonkin & Taylor	Temporary stormwater design
Dean Miller	Lead Ecologist	Tonkin & Taylor	Ecological input

APPENDIX B – CONSULTATION RECORD

Group	Date
Community Liaison Group	Distributed to CLG Group for comment – no comments received.

Outstanding Queries

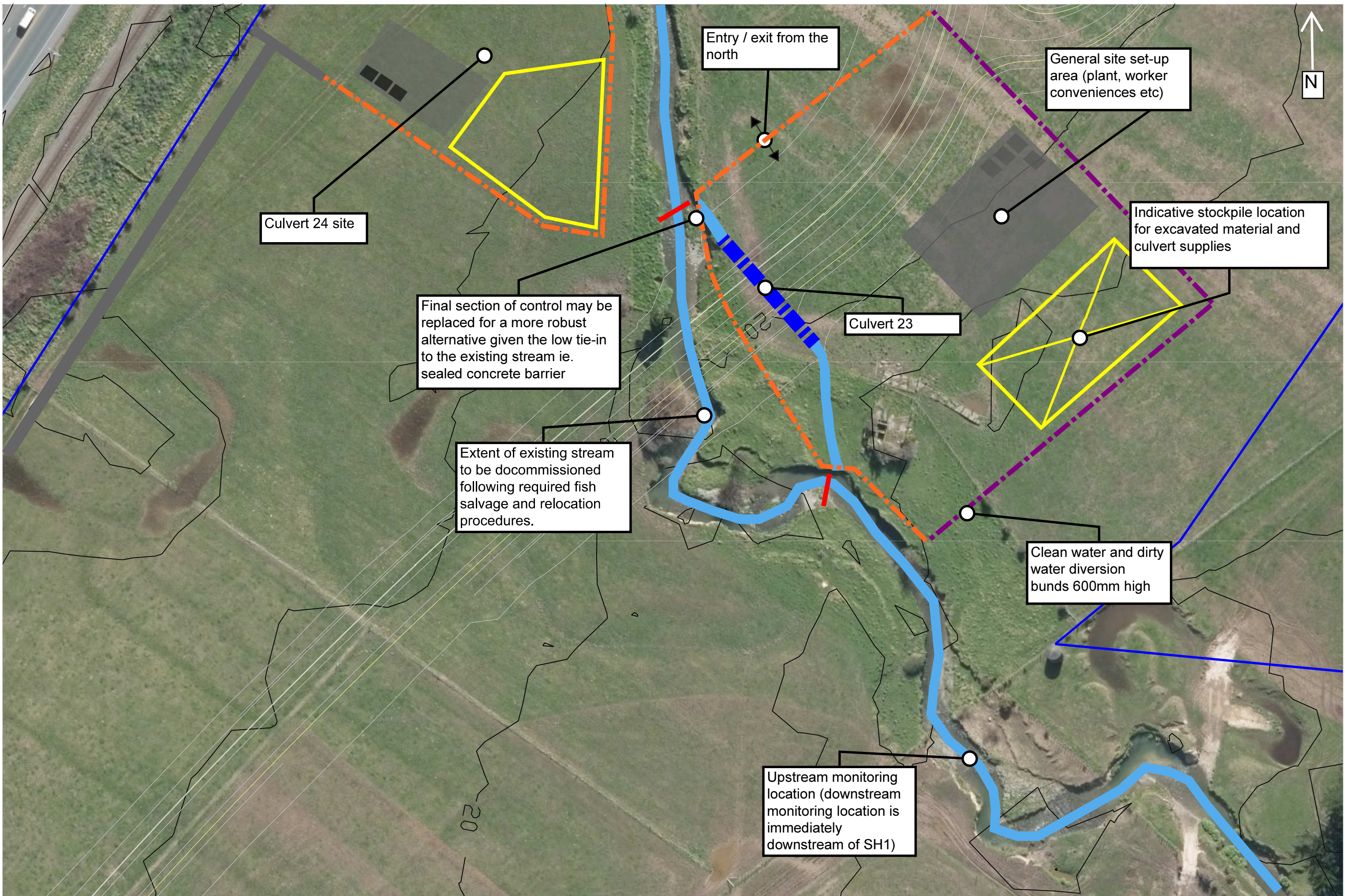
The following outlines any queries (relevant to works covered under this SSEMP) that have not been resolved through the SSEMP preparation process, but will instead be closed out via alternative project stakeholder and communication channels:

NIL

APPENDIX C – DRAWINGS

Works Methodology / Layout Plan

Culvert 23:



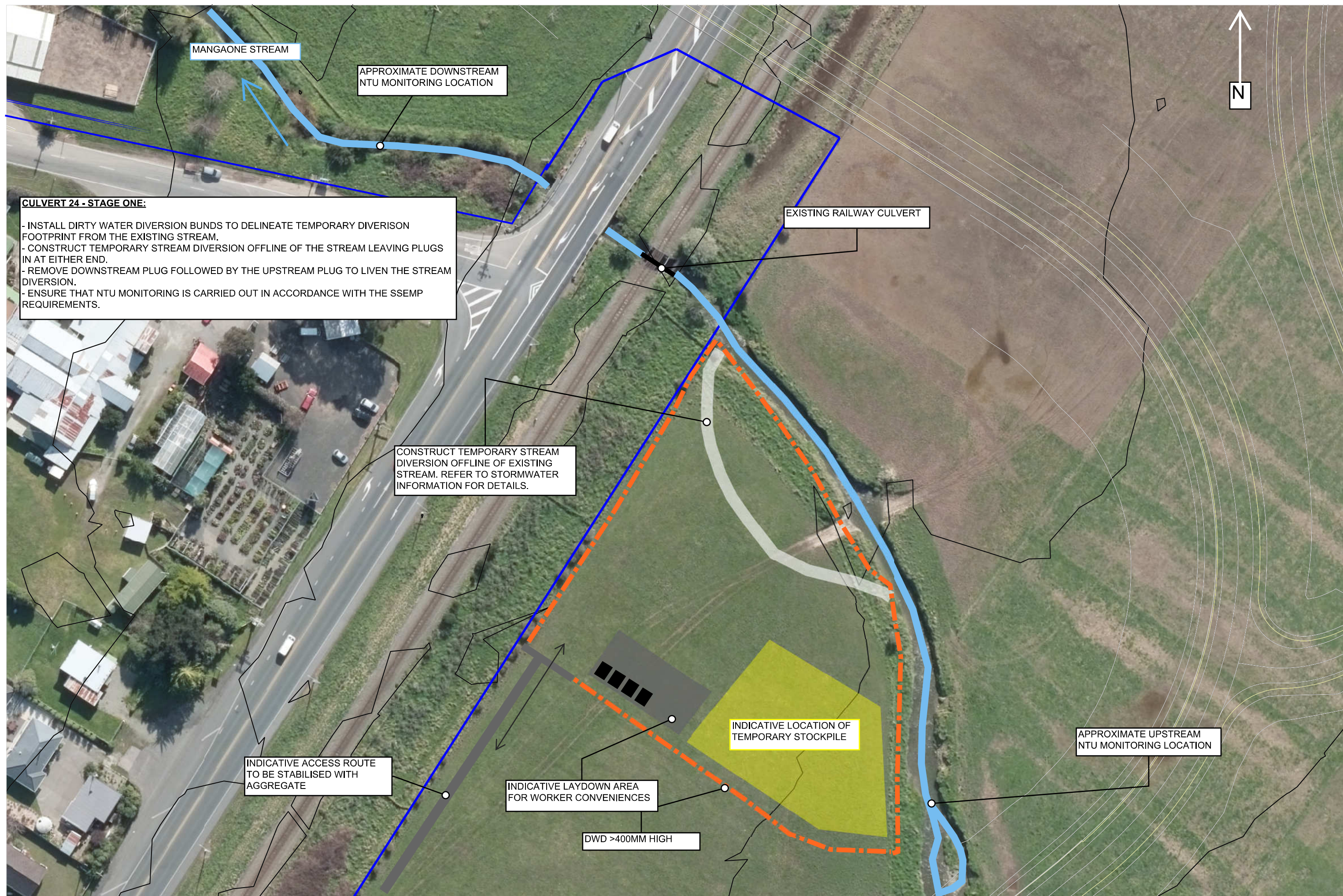
Scale (A1)	1:500	Design	S. Perrett	15.06.17	Approved For Construction	B. Systems
Scale (A2)		Drawn	A. Kitcher	15.06.17		
		Design Checker	P. O'Connell	09.03.18		
		Drawn	G. Down	09.03.18		

Peka Peka to Ōtaki Expressway

Project	SSEMP SC1: CULVERT 23
Discipline	CIVIL

Drawing No.	SSEMP-SC1-23	Page	1
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Culvert 24:



CULVERT 24 - STAGE ONE:

- INSTALL DIRTY WATER DIVERSION BUNDS TO DELINEATE TEMPORARY DIVERSION FOOTPRINT FROM THE EXISTING STREAM.
- CONSTRUCT TEMPORARY STREAM DIVERSION OFFLINE OF THE STREAM LEAVING PLUGS IN AT EITHER END.
- REMOVE DOWNSTREAM PLUG FOLLOWED BY THE UPSTREAM PLUG TO LIVE THE STREAM DIVERSION.
- ENSURE THAT NTU MONITORING IS CARRIED OUT IN ACCORDANCE WITH THE SSEMP REQUIREMENTS.

CONSTRUCT TEMPORARY STREAM DIVERSION OFFLINE OF EXISTING STREAM. REFER TO STORMWATER INFORMATION FOR DETAILS.

EXISTING RAILWAY CULVERT

INDICATIVE ACCESS ROUTE TO BE STABILISED WITH AGGREGATE

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

DWD >400MM HIGH

INDICATIVE LOCATION OF TEMPORARY STOCKPILE

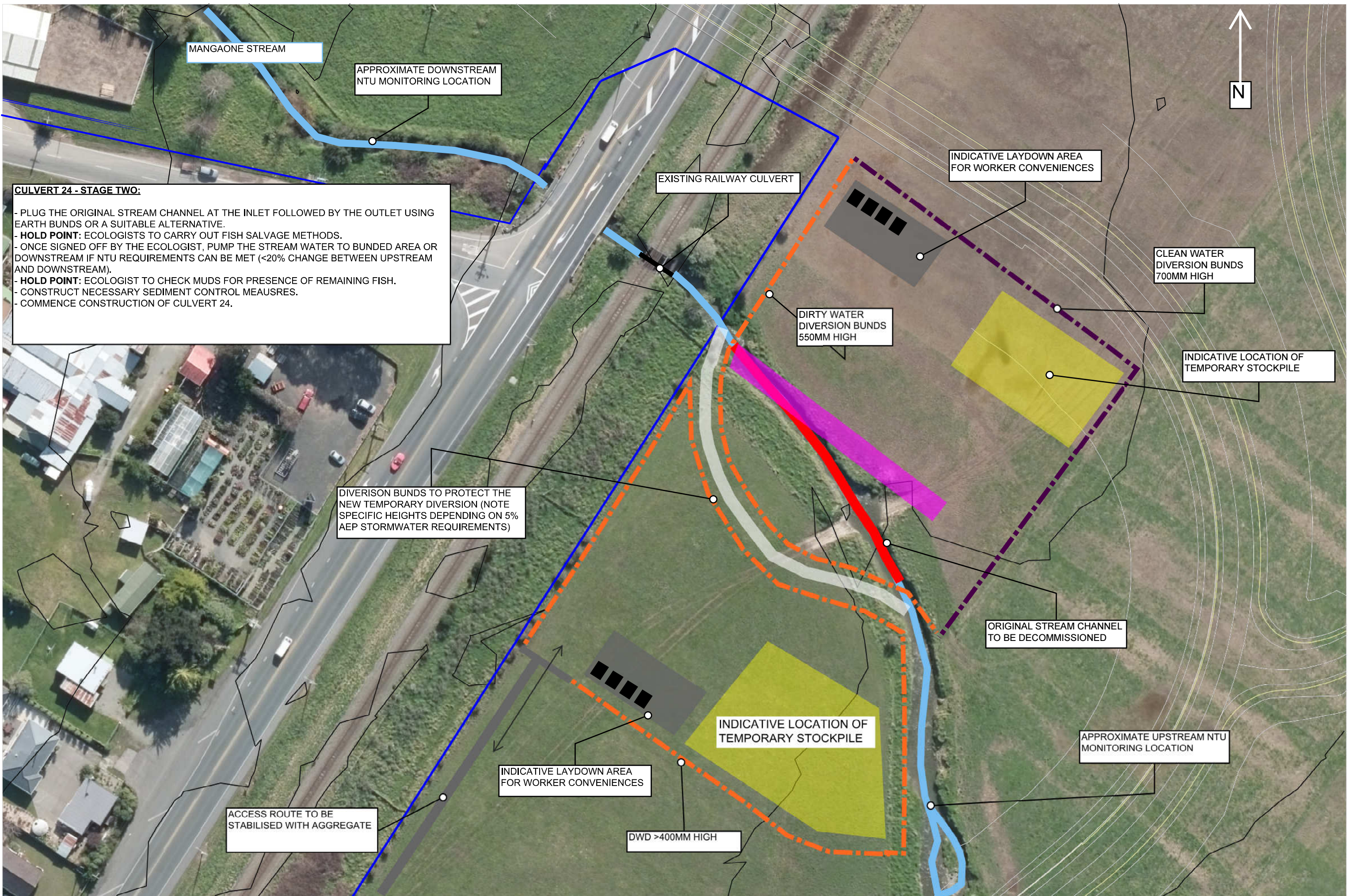
APPROXIMATE UPSTREAM NTU MONITORING LOCATION

1	FOR CONSTRUCTION	JK	SP	BIS	9/03/18
No.	Revision	By	Chk	Appd	Date

Scale (A1)	1:500
Design	S. Perrin 15/08/17
Drawn	A. Rocher 15/08/17
Eng/Inch	P. Chatterley 09/03/18
Eng Check	G. Down 09/03/18
Drawn	09/03/18

Subject	SSEMP SC1: CULVERT 24 STAGE 1
Drawn	

Discipline	CIVIL
Drawing No.	SSEMP-SC1-24-1
Rev	1



CULVERT 24 - STAGE TWO:

- PLUG THE ORIGINAL STREAM CHANNEL AT THE INLET FOLLOWED BY THE OUTLET USING EARTH BUNDS OR A SUITABLE ALTERNATIVE.
- **HOLD POINT:** ECOLOGISTS TO CARRY OUT FISH SALVAGE METHODS.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH.
- CONSTRUCT NECESSARY SEDIMENT CONTROL MEASURES.
- COMMENCE CONSTRUCTION OF CULVERT 24.

DIVERISON BUNDS TO PROTECT THE NEW TEMPORARY DIVERSION (NOTE SPECIFIC HEIGHTS DEPENDING ON 5% AEP STORMWATER REQUIREMENTS)

ACCESS ROUTE TO BE STABILISED WITH AGGREGATE

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

DWD >400MM HIGH

INDICATIVE LOCATION OF TEMPORARY STOCKPILE

ORIGINAL STREAM CHANNEL TO BE DECOMMISSIONED

APPROXIMATE UPSTREAM NTU MONITORING LOCATION

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

CLEAN WATER DIVERSION BUNDS 700MM HIGH

INDICATIVE LOCATION OF TEMPORARY STOCKPILE

DIRTY WATER DIVERSION BUNDS 550MM HIGH

EXISTING RAILWAY CULVERT

APPROXIMATE DOWNSTREAM NTU MONITORING LOCATION

MANGAONE STREAM

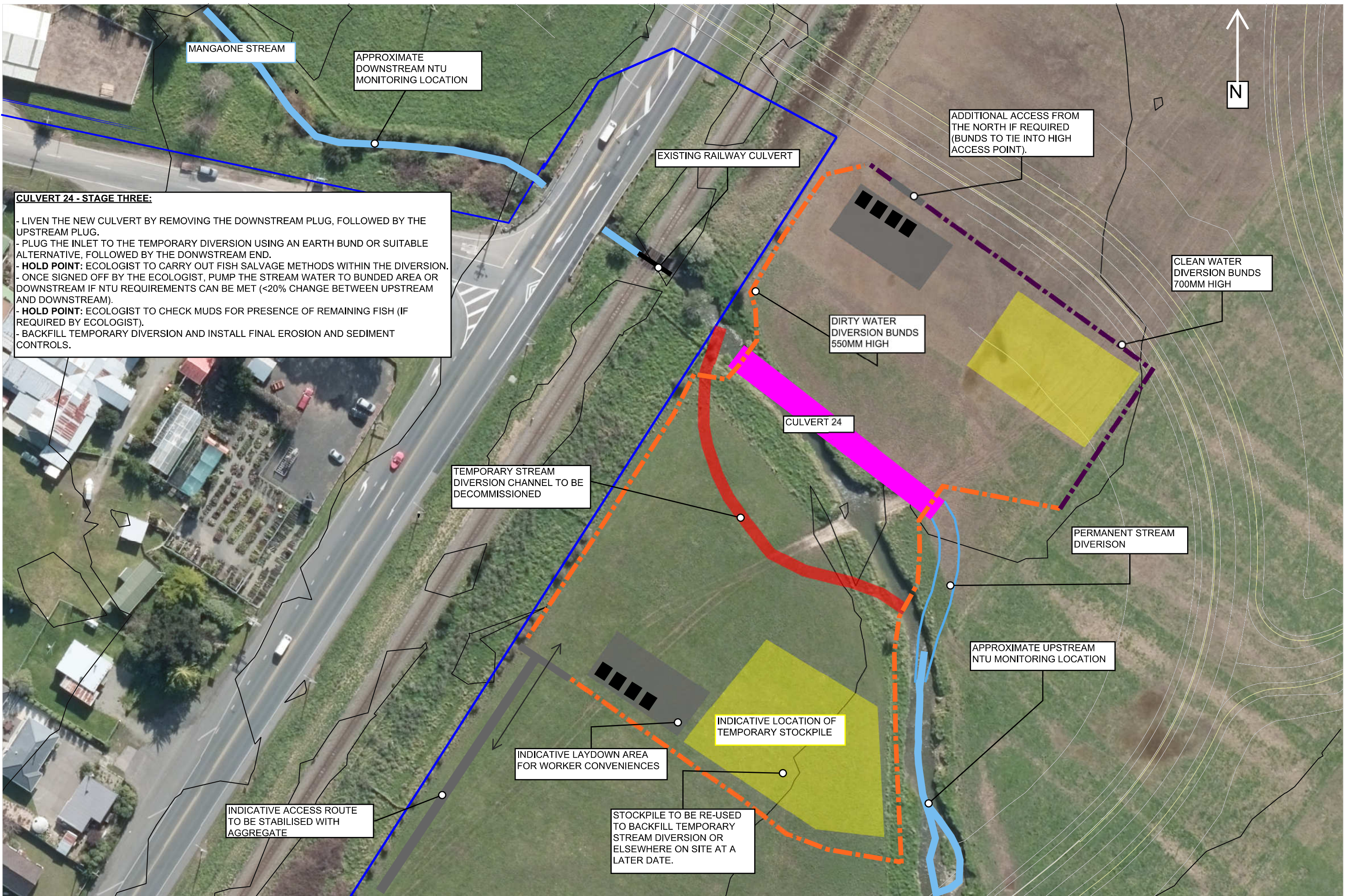


1	FOR CONSTRUCTION	AK	SP	BS	9/23/18
No.	Revision	By	Chk	Appr	Date

Scale (A1)	1:500	Design	S. Perman	15/06/17	Approved For Construction	B. Symons
Scale (A3)		Drawn	A. Kuchar	15/06/17		
		Check	P. Chubbaley	29/03/18		
		Eng Check	G. Down	29/03/18	Date	09/23/18

Project	SSEMP SC1: CULVERT 24 STAGE 2
Discipline	CIVIL
Drawing No.	SSEMP-SC1-24-2
Rev.	1

Discipline	CIVIL
Drawing No.	SSEMP-SC1-24-2
Rev.	1



CULVERT 24 - STAGE THREE:

- LIVE THE NEW CULVERT BY REMOVING THE DOWNSTREAM PLUG, FOLLOWED BY THE UPSTREAM PLUG.
- PLUG THE INLET TO THE TEMPORARY DIVERSION USING AN EARTH BUND OR SUITABLE ALTERNATIVE, FOLLOWED BY THE DOWNSTREAM END.
- **HOLD POINT:** ECOLOGIST TO CARRY OUT FISH SALVAGE METHODS WITHIN THE DIVERSION.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH (IF REQUIRED BY ECOLOGIST).
- BACKFILL TEMPORARY DIVERSION AND INSTALL FINAL EROSION AND SEDIMENT CONTROLS.

1	FOR CONSTRUCTION								
No.	Revision	By	Chk	Appd	Date				

Scale (A1)	1:500	Design	S. Perman	15.08.17	Approved For Construction	B. Symons
Scale (A2)		Drawn	A. Kocher	15.08.17		
		Dep. Verifier	P. Chatterley	09.03.18		
		Dep. Clerk	G. Down	09.03.18	Date	09.03.18

* Refer to Original Hardcopy for Signatures

Peka Peka to Ōtaki Expressway

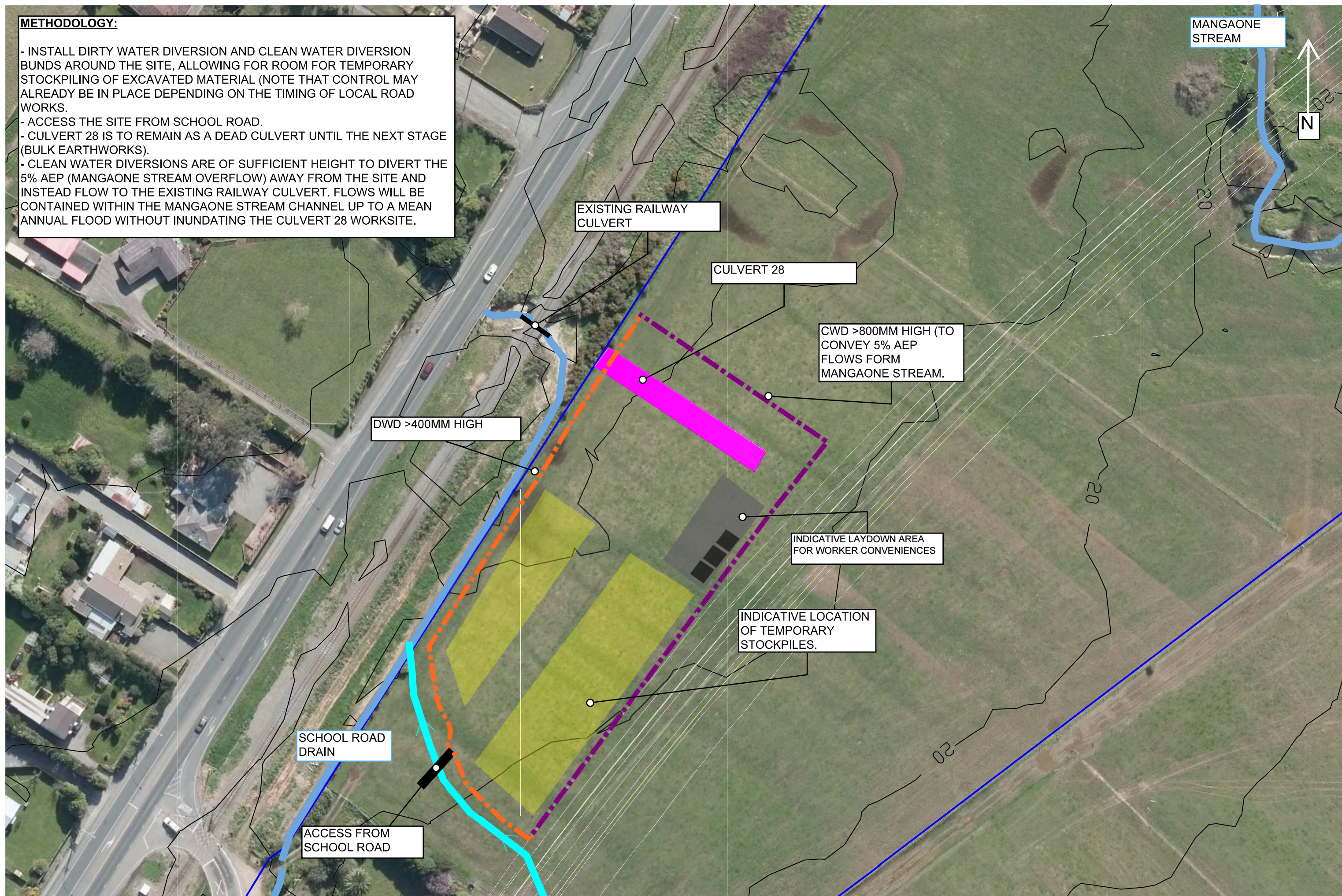
Scale	As per	Discipline	CIVIL
Title	SSEMP SC1: CULVERT 24 STAGE 3		

Drawing No.	SSEMP-SC1-24-3	Rev	1
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Culvert 28:

METHODOLOGY:

- INSTALL DIRTY WATER DIVERSION AND CLEAN WATER DIVERSION BUNDS AROUND THE SITE, ALLOWING FOR ROOM FOR TEMPORARY STOCKPILING OF EXCAVATED MATERIAL (NOTE THAT CONTROL MAY ALREADY BE IN PLACE DEPENDING ON THE TIMING OF LOCAL ROAD WORKS).
- ACCESS THE SITE FROM SCHOOL ROAD.
- CULVERT 28 IS TO REMAIN AS A DEAD CULVERT UNTIL THE NEXT STAGE (BULK EARTHWORKS).
- CLEAN WATER DIVERSIONS ARE OF SUFFICIENT HEIGHT TO DIVERT THE 5% AEP (MANGAONE STREAM OVERFLOW) AWAY FROM THE SITE AND INSTEAD FLOW TO THE EXISTING RAILWAY CULVERT. FLOWS WILL BE CONTAINED WITHIN THE MANGAONE STREAM CHANNEL UP TO A MEAN ANNUAL FLOOD WITHOUT INUNDATING THE CULVERT 28 WORKSITE.



Scale (A1)	1:500	Design	E. Bennett	15.08.17	Approved For Construction	B. Symons
Scale (A2)		Drawn	A. Kocher	15.08.17		
		Day Worker	P. Chatterley	04.03.18		
		Day Check	G. Down	09.03.18	Date	09.03.18

Peka Peka to Ōtaki Expressway

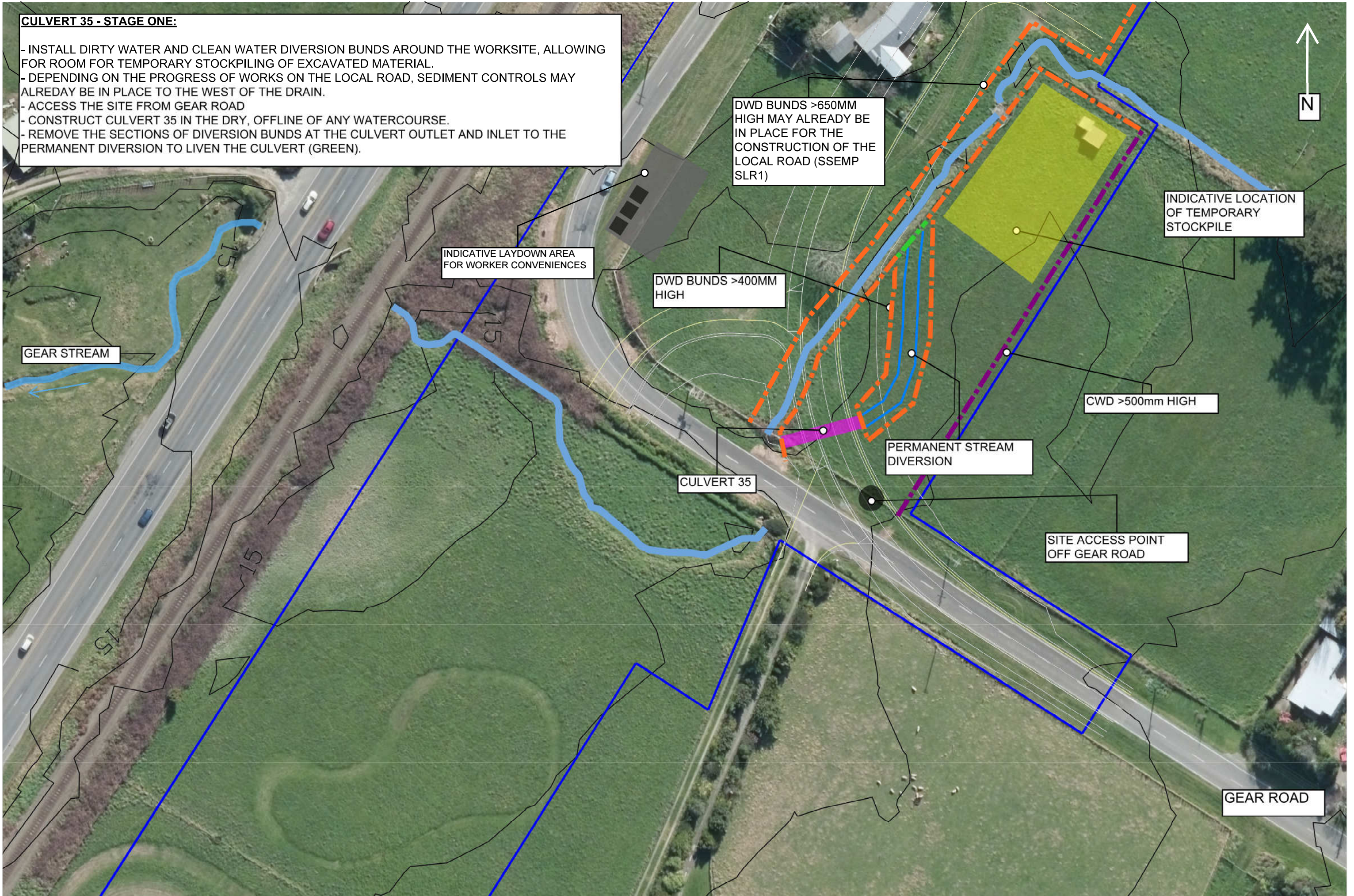
Sheet		Discipline	CIVIL
Title	SSEMP SC1: CULVERT 28	Drawing No.	SSEMP-SC1-28

Rev	1
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Culvert 35:

CULVERT 35 - STAGE ONE:

- INSTALL DIRTY WATER AND CLEAN WATER DIVERSION BUNDS AROUND THE WORKSITE, ALLOWING FOR ROOM FOR TEMPORARY STOCKPILING OF EXCAVATED MATERIAL.
- DEPENDING ON THE PROGRESS OF WORKS ON THE LOCAL ROAD, SEDIMENT CONTROLS MAY ALREADY BE IN PLACE TO THE WEST OF THE DRAIN.
- ACCESS THE SITE FROM GEAR ROAD
- CONSTRUCT CULVERT 35 IN THE DRY, OFFLINE OF ANY WATERCOURSE.
- REMOVE THE SECTIONS OF DIVERSION BUNDS AT THE CULVERT OUTLET AND INLET TO THE PERMANENT DIVERSION TO LIVEN THE CULVERT (GREEN).



1	FOR CONSTRUCTION	AK	SP	BS	9.03.18
No.	Revision	By	Chk	Appr	Date

Scale (A1)	1:500	Design	S. Perman	15.08.17	Approved For Construction	B. Systems
Scale (A2)		Drawn	A. Kitcher	15.08.17		
		Day Worker	P. Chubb	09.03.18		
		Org Check	G. Down	09.03.18	Date	09.03.18

Peka Peka to Ōtaki Expressway

Subject	SSEMP SC1: CULVERT 35 STAGE 1
Discipline	CIVIL

Drawing No.	SSEMP-SC1-35-1	Rev.	1
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Culvert 36:

CULVERT 36 - STAGE ONE:

- INSTALL DIRTY WATER DIVERSION BUNDS TO DELINEATE TEMPORARY DIVERSION FOOTPRINT FROM THE EXISTING STREAM.
- CONSTRUCT TEMPORARY STREAM DIVERSION OFFLINE OF THE STREAM LEAVING PLUGS IN AT EITHER END.
- REMOVE DOWNSTREAM PLUG FOLLOWED BY THE UPSTREAM PLUG TO LIVE THE STREAM DIVERSION.
- ENSURE THAT NTU MONITORING IS CARRIED OUT IN ACCORDANCE WITH THE SSEMP REQUIREMENTS.



APPROXIMATE
DOWNSTREAM NTU
MONITORING LOCATION

GEAR STREAM

TEMPORARY STREAM DIVERSION
(REFER TO STORMWATER
INFORMATION FOR DETAILS).

APPROXIMATE
UPSTREAM NTU
MONITORING LOCATION

DWD BUNDS >500MM
HIGH (<1ha
CATCHMENT)

INDICATIVE LAYDOWN AREA
FOR WORKER CONVENIENCES

INDICATIVE TEMPORARY
STOCKPILE LOCATION

SITE ACCESS POINT
(ALTERNATIVE FROM
THE SOUTH VIA
SUTTON ROAD)

CWD BUNDS >500MM
HIGH (<1ha
CATCHMENT)

GEAR ROAD

1	FOR CONSTRUCTION	Rev	By	Chk	Appr	Date

Scale (A1)	1:500	Design	S. Parnis	15.08.17	Approved For Construction	B. Symons
Scale (A2)		Drawn	A. Kitcher	15.08.17		
		Day Worker	P. Charley	08.03.18		
		Day Check	G. Down	09.03.18	Date	09.03.18



Peka Peka to Ōtaki Expressway

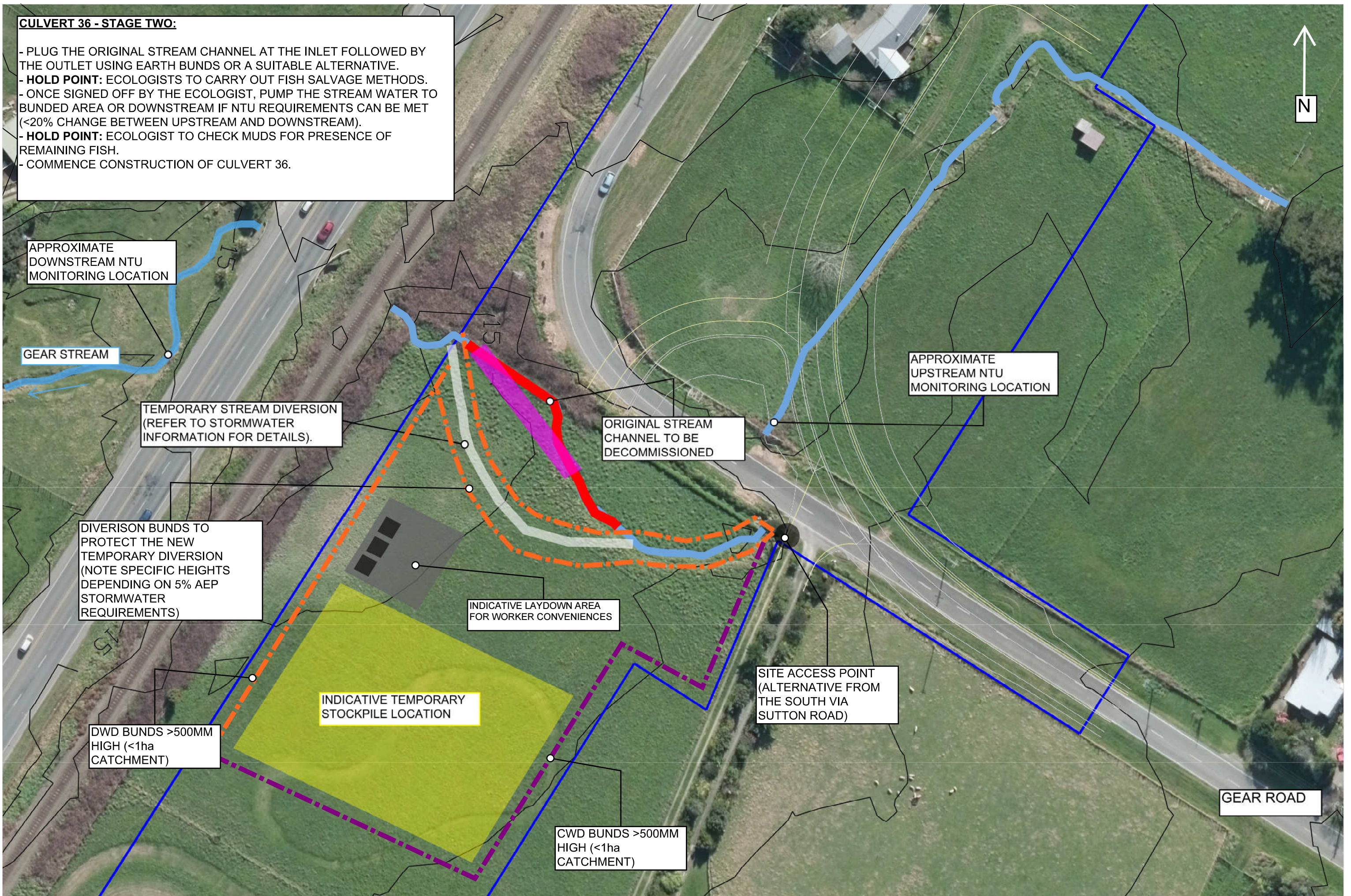


Subject	SSEMP SC1: CULVERT 36 STAGE 1
Discipline	CIVIL
Drawing No.	SSEMP-SC1-36-1
Rev	1

Discipline	CIVIL
Drawing No.	SSEMP-SC1-36-1
Rev	1

CULVERT 36 - STAGE TWO:

- PLUG THE ORIGINAL STREAM CHANNEL AT THE INLET FOLLOWED BY THE OUTLET USING EARTH BUNDS OR A SUITABLE ALTERNATIVE.
- **HOLD POINT:** ECOLOGISTS TO CARRY OUT FISH SALVAGE METHODS.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH.
- COMMENCE CONSTRUCTION OF CULVERT 36.



APPROXIMATE
DOWNSTREAM NTU
MONITORING LOCATION

GEAR STREAM

TEMPORARY STREAM DIVERSION
(REFER TO STORMWATER
INFORMATION FOR DETAILS).

ORIGINAL STREAM
CHANNEL TO BE
DECOMMISSIONED

APPROXIMATE
UPSTREAM NTU
MONITORING LOCATION

DIVERISON BUNDS TO
PROTECT THE NEW
TEMPORARY DIVERSION
(NOTE SPECIFIC HEIGHTS
DEPENDING ON 5% AEP
STORMWATER
REQUIREMENTS)

INDICATIVE LAYDOWN AREA
FOR WORKER CONVENIENCES

INDICATIVE TEMPORARY
STOCKPILE LOCATION

DWD BUNDS >500MM
HIGH (<1ha
CATCHMENT)

SITE ACCESS POINT
(ALTERNATIVE FROM
THE SOUTH VIA
SUTTON ROAD)

GEAR ROAD

CWD BUNDS >500MM
HIGH (<1ha
CATCHMENT)

1	FOR CONSTRUCTION	AK	SP	BS	9/03/18
No.	Revision	By	Chk	Appd	Date

Scale (A1)	1:500	Design	S. Perriman	15/08/17	Approved For Construction	B. Symons
Scale (A2)		Drawn	A. Kocher	15/08/17		
		Day Checker	P. Chalkley	08/03/18		
		Org Check	G. Down	08/03/18	Issue	08/03/18

* Refer to Original Handsets for Signatures

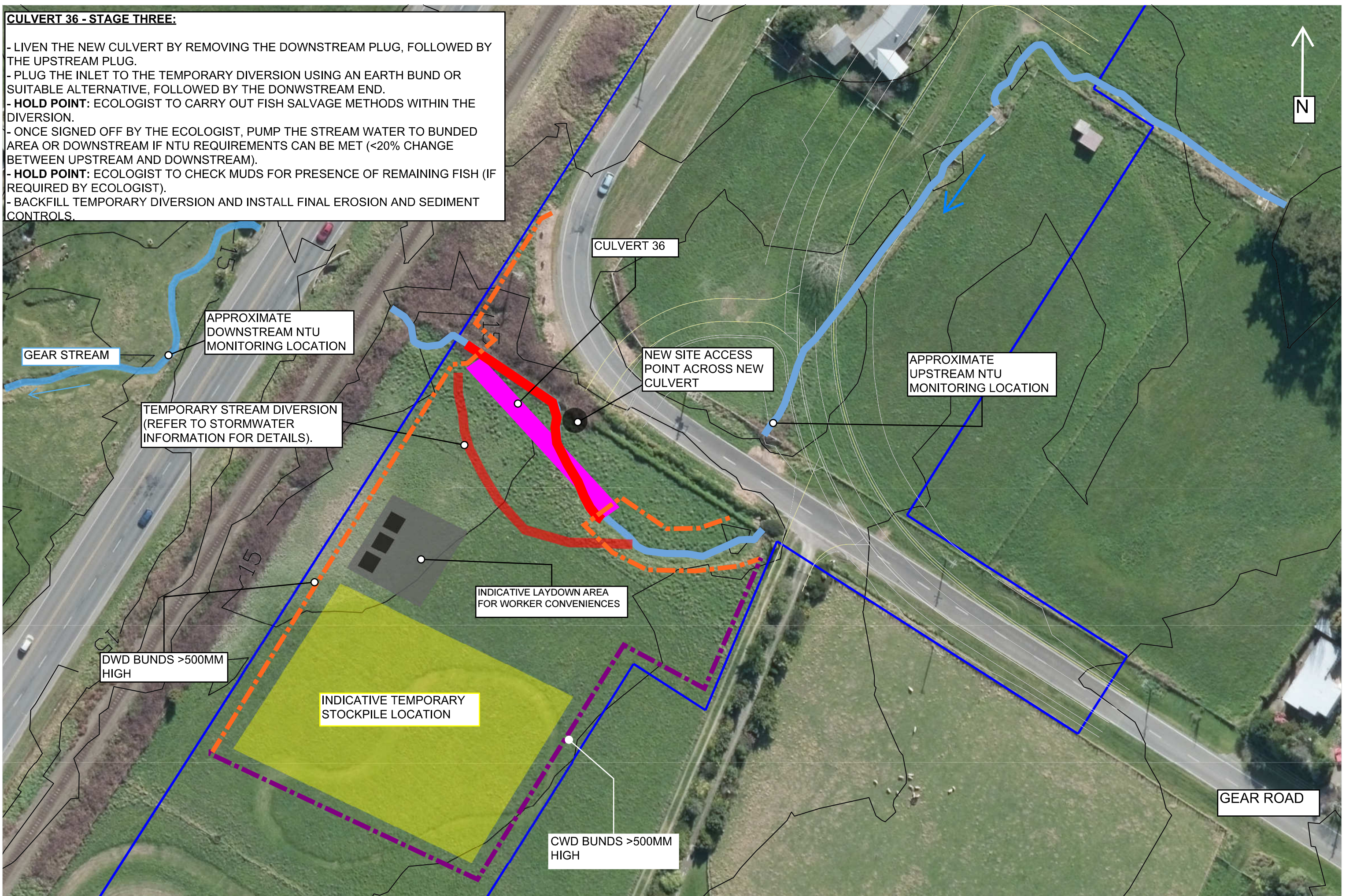
Peka Peka to Ōtaki Expressway

Subject		Discipline	CIVIL
Title	SSEMP SC1: CULVERT 36 STAGE 2	Drawing No.	SSEMP-SC1-36-2

Page	1
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CULVERT 36 - STAGE THREE:

- LIVE THE NEW CULVERT BY REMOVING THE DOWNSTREAM PLUG, FOLLOWED BY THE UPSTREAM PLUG.
- PLUG THE INLET TO THE TEMPORARY DIVERSION USING AN EARTH BUND OR SUITABLE ALTERNATIVE, FOLLOWED BY THE DOWNSTREAM END.
- **HOLD POINT:** ECOLOGIST TO CARRY OUT FISH SALVAGE METHODS WITHIN THE DIVERSION.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH (IF REQUIRED BY ECOLOGIST).
- BACKFILL TEMPORARY DIVERSION AND INSTALL FINAL EROSION AND SEDIMENT CONTROLS.



1	FOR CONSTRUCTION	AK	SP	BS	9/23/15
No.	Revision	By	Chk	App'd	Date

Scale (A1)	1:500
Scale (A3)	
Design	S. Parnes 15/06/17
Drawn	A. Kocher 15/06/17
Supervisor	P. Charbelly 08/03/18
Proj. Check	G. Owen 09/03/18
Date	09/03/18



Peka Peka to Ōtaki Expressway

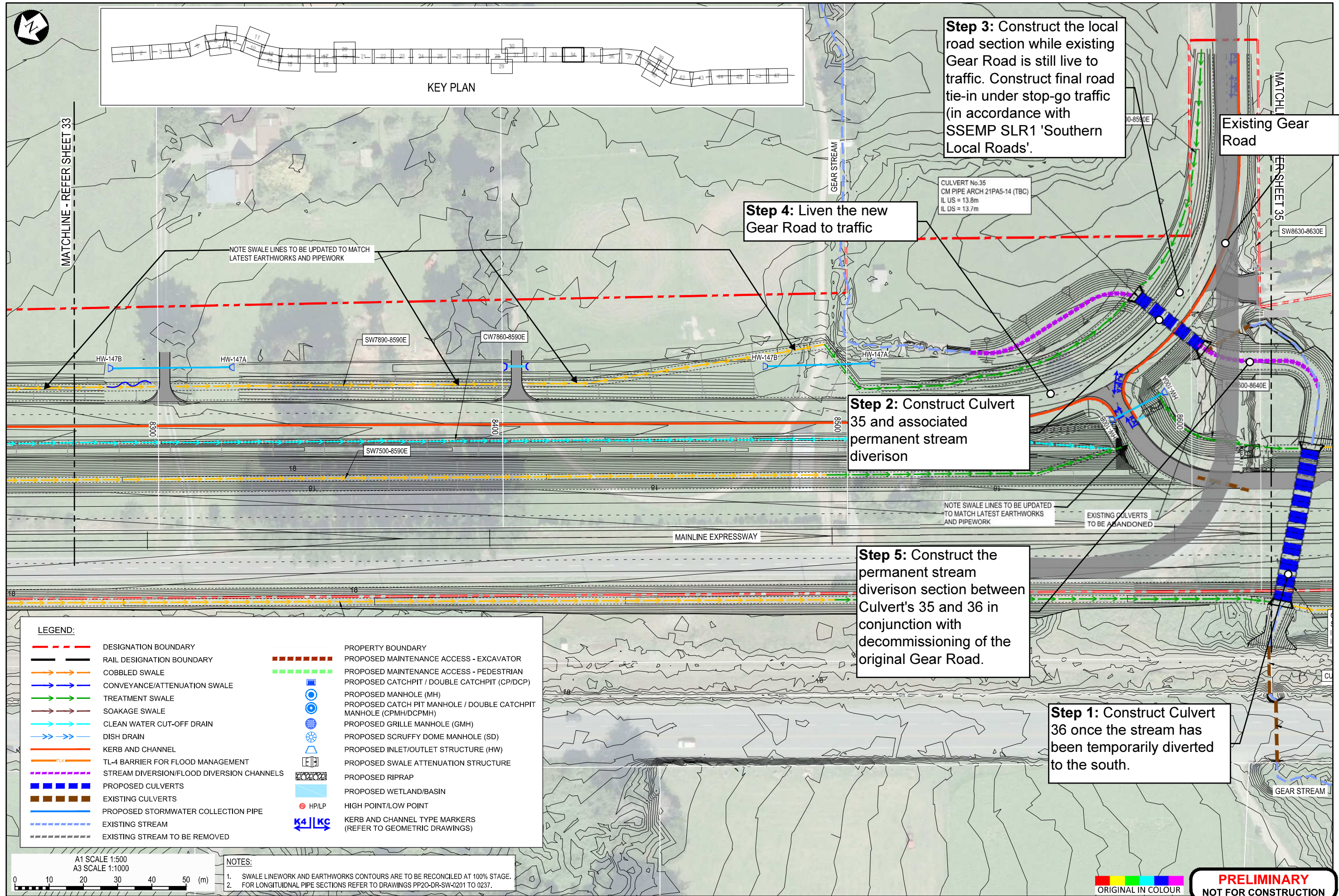


Subject	SSEMP SC1: CULVERT 36 STAGE 3
Discipline	CIVIL
Drawn	SSEMP-SC1-36-3
Rev	1

ORIGINAL SIZE A1 - DO NOT SCALE

IF IN DOUBT ASK

Culvert's 35 and 36 - General sequencing



PRELIMINARY NOT FOR CONSTRUCTION

Scale (A1) 1:500	Design D.Knappstein 29.09.17	Approved For Construction S.Halliday 15.12.17	Date
Scale (A3)	Drawn	Drp Check	Date
* Refer to Original Hardcopy for Signature			

80% DESIGN	GD	MK	BS	15.12.17
Revision	By	Chk	Appd	Date

NZ TRANSPORT AGENCY WAIKAI KOTIAHI

Peka Peka to Otaki Expressway

Fletcher HIGGINS

BECA **Tonkin+Taylor**

Subject:	GENERAL ARRANGEMENTS	Discipline:	STORMWATER
Title:	STORMWATER LAYOUT PLANS	Rev:	A
SHEET 34 OF 47			

Culvert 39:

APPROXIMATE
DOWNSTREAM NTU
MONITORING LOCATION

POTENTIAL ACCESS FROM
THE SOUTH (GEAR ROAD)
ACROSS CULVERT 36



CULVERT 39 - STAGE TWO:

- PLUG THE ORIGINAL STREAM CHANNEL AT THE INLET FOLLOWED BY THE OUTLET USING EARTH BUNDS OR A SUITABLE ALTERNATIVE.
- **HOLD POINT:** ECOLOGISTS TO CARRY OUT FISH SALVAGE METHODS.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH.
- COMMENCE CONSTRUCTION OF CULVERT 39.

DIVERISON BUND TO BE
INSTALLED IMMEDIATELY
FOLLOWING LIVENING TO
PROTECT THE NEW
TEMPORARY DIVERSION

ORIGINAL STREAM
CHANNEL TO BE
DECOMMISSIONED

INDICATIVE LAYDOWN AREA
FOR WORKER CONVENIENCES

DIVERISON BUNDS TO
PROTECT THE NEW
TEMPORARY DIVERSION
(NOTE SPECIFIC HEIGHTS
DEPENDING ON 5% AEP
STORMWATER
REQUIREMENTS)

APPROXIMATE
UPSTREAM NTU
MONITORING LOCATION

DIVERSION BUNDS TO TIE
INTO THE HIGH POINT (RAIL
EMBANKMENT 1-2M HIGHER)

INDICATIVE ACCESS ROUTE
ACROSS EXISTING STREAM
CROSSING. TO BE STABILISED
WITH CLEAN AGGREGATE

POTENTIAL ACCESS FROM
THE SOUTH (BUNDS TO TIE-
INTO HIGH ACCESS POINT)

1	FOR CONSTRUCTION	AK	SP	BS	9.03.18																				
<table border="0"> <tr> <td>Design:</td> <td>S. Perman</td> <td>15.08.17</td> <td>Approved For Construction:</td> <td>B. Symons</td> </tr> <tr> <td>Drawn:</td> <td>A. Kocher</td> <td>15.08.17</td> <td></td> <td></td> </tr> <tr> <td>Day Worker:</td> <td>P. Chubbaley</td> <td>09.03.18</td> <td></td> <td></td> </tr> <tr> <td>Day Check:</td> <td>G. Down</td> <td>09.03.18</td> <td>Date:</td> <td>09.03.18</td> </tr> </table>						Design:	S. Perman	15.08.17	Approved For Construction:	B. Symons	Drawn:	A. Kocher	15.08.17			Day Worker:	P. Chubbaley	09.03.18			Day Check:	G. Down	09.03.18	Date:	09.03.18
Design:	S. Perman	15.08.17	Approved For Construction:	B. Symons																					
Drawn:	A. Kocher	15.08.17																							
Day Worker:	P. Chubbaley	09.03.18																							
Day Check:	G. Down	09.03.18	Date:	09.03.18																					

Peka Peka to Otaki Expressway

Subject:	SSEMP SC1: CULVERT 39 STAGE 2	Discipline:	CIVIL
File:		Drawing No.:	SSEMP-SC1-39-2
		Rev:	1

APPROXIMATE
DOWNSTREAM NTU
MONITORING LOCATION

STOCKPILE TO BE RE-USED
TO BACKFILL TEMPORARY
STREAM DIVERSION OR
ELSEWHERE ON SITE AT A
LATER DATE.

CULVERT 39 - STAGE THREE:

- LIVE IN THE NEW CULVERT BY REMOVING THE DOWNSTREAM PLUG, FOLLOWED BY THE UPSTREAM PLUG.
- PLUG THE INLET TO THE TEMPORARY DIVERSION USING AN EARTH BUND OR SUITABLE ALTERNATIVE, FOLLOWED BY THE DOWNSTREAM END.
- **HOLD POINT:** ECOLOGIST TO CARRY OUT FISH SALVAGE METHODS WITHIN THE DIVERSION.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH (IF REQUIRED BY ECOLOGIST).
- BACKFILL TEMPORARY DIVERSION AND INSTALL FINAL EROSION AND SEDIMENT CONTROLS.

CULVERT 39

TEMPORARY STREAM
DIVERSION CHANNEL
TO BE
DECOMMISSIONED

APPROXIMATE
UPSTREAM NTU
MONITORING LOCATION

DIVERSION BUNDS TO TIE
INTO THE HIGH POINT (RAIL
EMBANKMENT 1-2M HIGHER)

POTENTIAL ACCESS FROM
THE SOUTH (BUNDS TO TIE-
INTO HIGH ACCESS POINT)

INDICATIVE ACCESS ROUTE
ACROSS EXISTING STREAM
CROSSING. TO BE
STABILISED UNLESS
CONTAINED WITHIN
SEDIMENT CONTROLS

1	FOR CONSTRUCTION	AA	BP	BS	9/03/18
No.	Revision	By	Chk	Appd	Date

Scale (A1): 1:500
 Design: G. Perrin 15/08/17
 Drawn: A. Kocher 15/08/17
 Checked: P. Chatterley 09/03/18
 Date: 09/03/18

Scale (A2):
 Design: G. Down 09/03/18
 Date: 09/03/18

* Refer to Original Drawings for Signatures

NZ TRANSPORT AGENCY Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
MBCA **TFT** Tonkin+Taylor

Subject	CIVIL
Title	SSEMP SC1: CULVERT 39 STAGE 3

Drawn	SSEMP-SC1-39-3
Rev	1

School Road Drain Diversion:

METHODOLOGY: STAGE ONE

- CONSTRUCT PERMANENT SCHOOL ROAD DRAIN DIVERSION ALONG THE EASTERN EDGE OF THE NEW SCHOOL ROAD ALIGNMENT.
- EXTEND THE DIVERSION TO THE NORTH TEMPORARILY.
- LEAVE EXISTING EARTH PLUGS AT THE INLET AND OUTLET OF THE DIVERSION DURING CONSTRUCTION.

DOWNSTREAM MONITORING LOCATION

TEMPORARY CROSSING MAY BE REQUIRED. CULVERT TO BE SIZED TO CONVEY 50% AEP

TEMPORARY STOCKPILES FOR DIVERSION DIG-OUT AND LOCAL ROAD WORKS (REFER TO SSEMP SLR1 FOR DETAILS)

INITIAL ACCESS ACROSS EXISTING CULVERT (SAP-6)

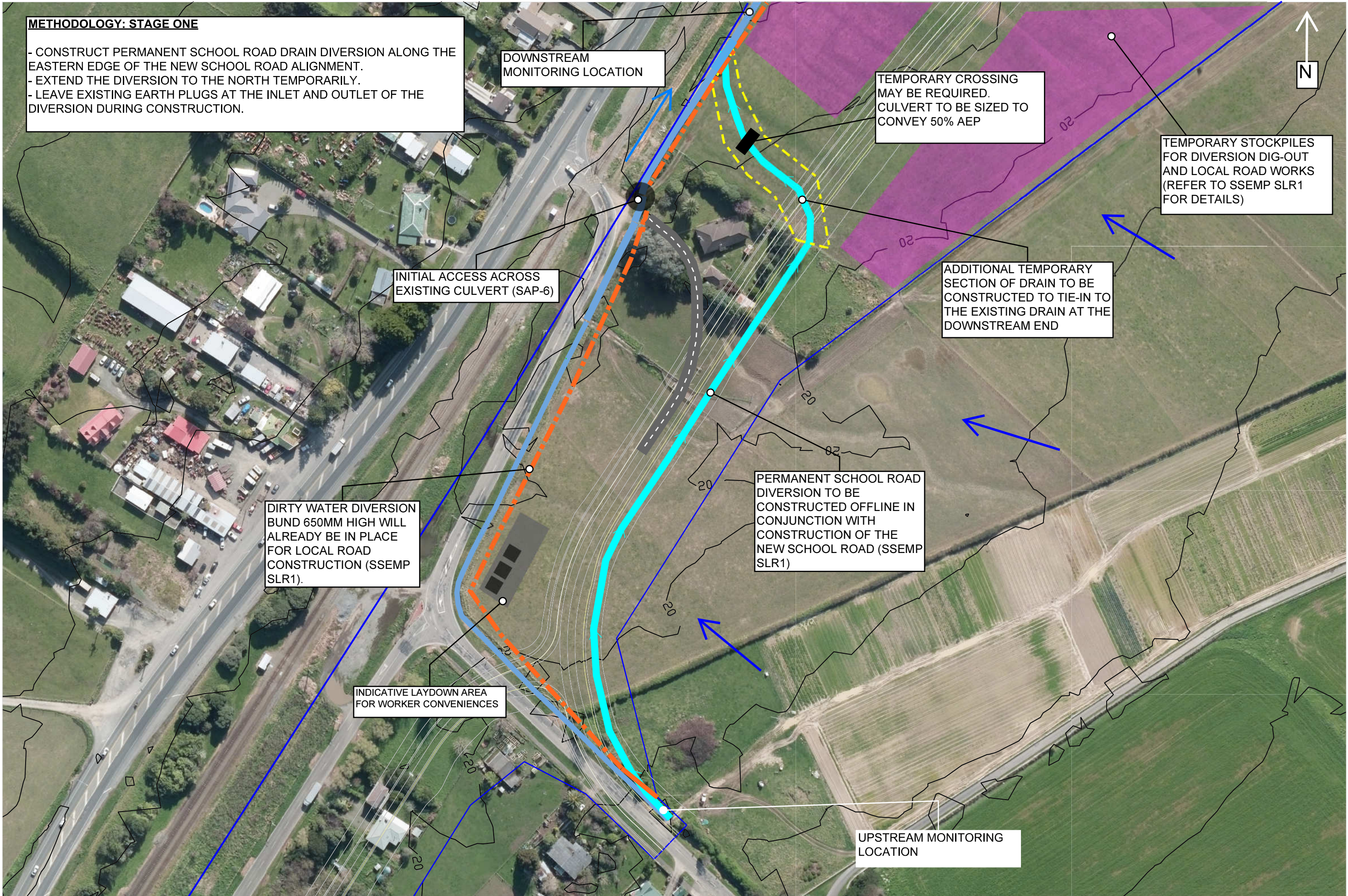
ADDITIONAL TEMPORARY SECTION OF DRAIN TO BE CONSTRUCTED TO TIE-IN TO THE EXISTING DRAIN AT THE DOWNSTREAM END

DIRTY WATER DIVERSION BUND 650MM HIGH WILL ALREADY BE IN PLACE FOR LOCAL ROAD CONSTRUCTION (SSEMP SLR1).

PERMANENT SCHOOL ROAD DIVERSION TO BE CONSTRUCTED OFFLINE IN CONJUNCTION WITH CONSTRUCTION OF THE NEW SCHOOL ROAD (SSEMP SLR1)

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

UPSTREAM MONITORING LOCATION



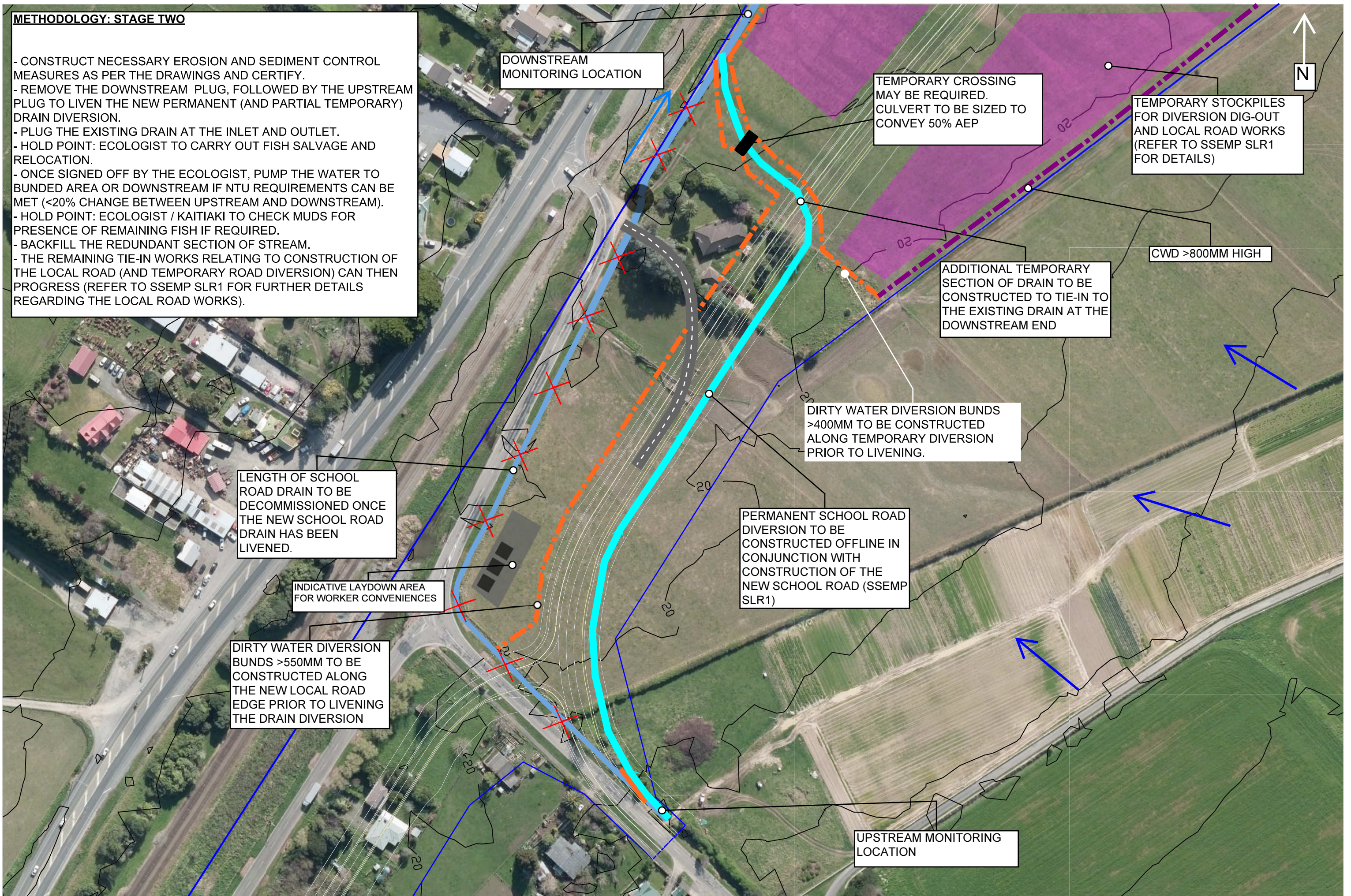
Scale (A1)	1:500	Design	S. Perman	15.06.17	Approved For Construction	B. Szymanski
Scale (A2)		Drawn	A. Kitcher	15.06.17		
		Design Checker	P. Chatterley	08.03.18		
		Drawn	G. Dowd	08.03.18		
		Design Checker				

Peka Peka to Ōtaki Expressway

Subject	SSEMP SC1: SCHOOL ROAD DRAIN STAGE 1	Discipline	CIVIL
Drawn	SSEMP-SC1-SRD1	Rev	1

METHODOLOGY: STAGE TWO

- CONSTRUCT NECESSARY EROSION AND SEDIMENT CONTROL MEASURES AS PER THE DRAWINGS AND CERTIFY.
- REMOVE THE DOWNSTREAM PLUG, FOLLOWED BY THE UPSTREAM PLUG TO LIVEN THE NEW PERMANENT (AND PARTIAL TEMPORARY) DRAIN DIVERSION.
- PLUG THE EXISTING DRAIN AT THE INLET AND OUTLET.
- HOLD POINT: ECOLOGIST TO CARRY OUT FISH SALVAGE AND RELOCATION.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- HOLD POINT: ECOLOGIST / KAITIAKI TO CHECK MUDS FOR PRESENCE OF REMAINING FISH IF REQUIRED.
- BACKFILL THE REDUNDANT SECTION OF STREAM.
- THE REMAINING TIE-IN WORKS RELATING TO CONSTRUCTION OF THE LOCAL ROAD (AND TEMPORARY ROAD DIVERSION) CAN THEN PROGRESS (REFER TO SSEMP SLR1 FOR FURTHER DETAILS REGARDING THE LOCAL ROAD WORKS).



1	FOR CONSTRUCTION	Rev	By	Chk	Date

Scale (A1)	1:500	Design	S. Perman	15.06.17	Approved For Construction	B. Szymanski
Drawn	A. Kitcher	15.06.17				
Checked	P. Chatterley	08.03.18				
Scale (A2)		Drawn	G. Dwan	08.03.18		
		Checked				

Refer to Original Hardcopy for Signatures

NZ TRANSPORT AGENCY Peka Peka to Ōtaki Expressway

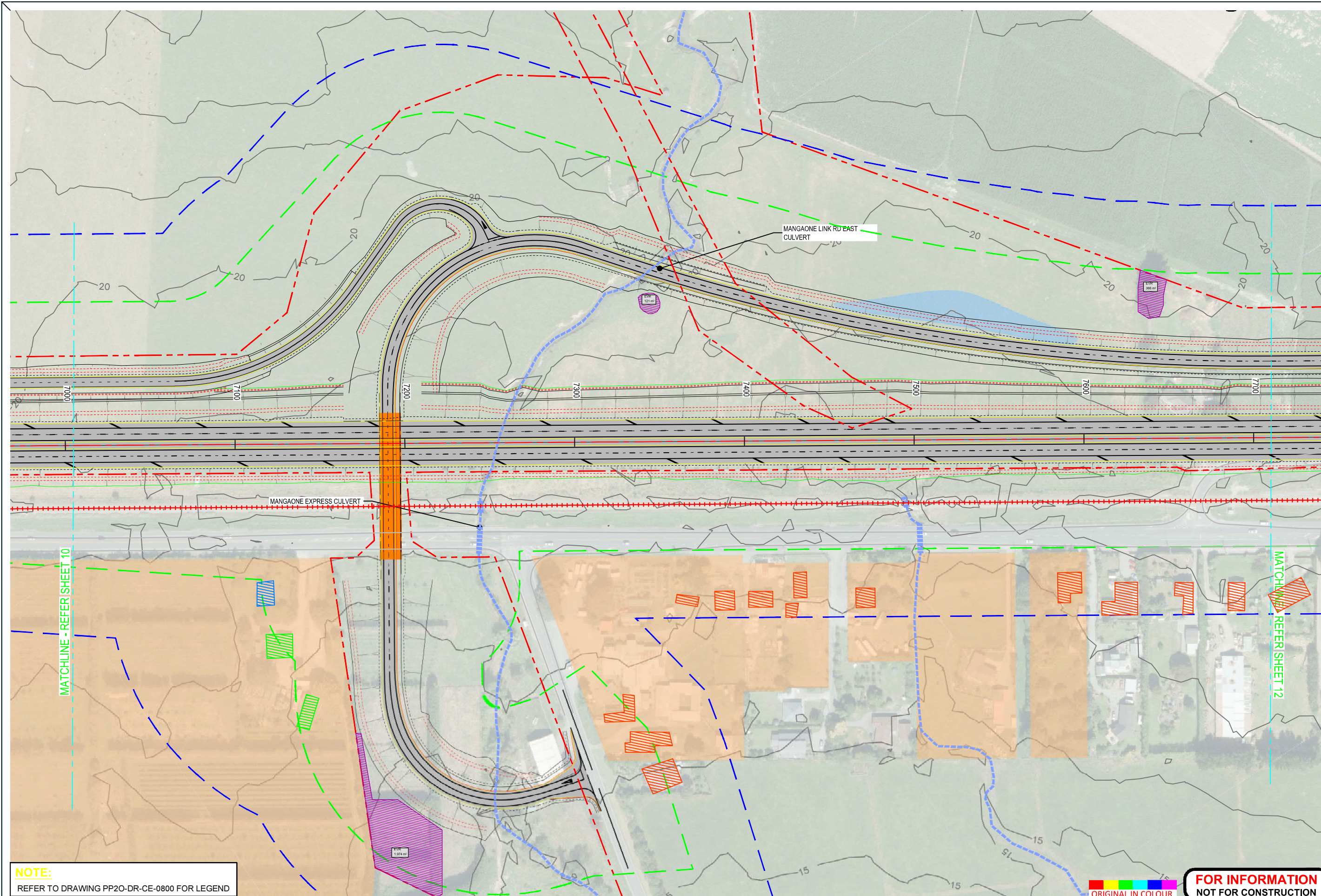
Fletcher HIGGINS

MBCA **TIT** Tonkin+Taylor

Project	SSEMP SC1: SCHOOL ROAD DRAIN STAGE 2
Discipline	CIVIL
Drawing No.	SSEMP-SC1-SRD2
Rev	1

Discipline	CIVIL
Drawing No.	SSEMP-SC1-SRD2
Rev	1

Environmental Constraints Drawings



NOTE:
REFER TO DRAWING PP20-DR-CE-0800 FOR LEGEND

ORIGINAL IN COLOUR

**FOR INFORMATION
NOT FOR CONSTRUCTION**

No.	Revision	By	CHK	Appt.	Date
B	SSEMP FOR INFORMATION	AK	GD	AN	14.09.17
A	SSEMP FOR INFORMATION	AK	GD	AN	30.07.17

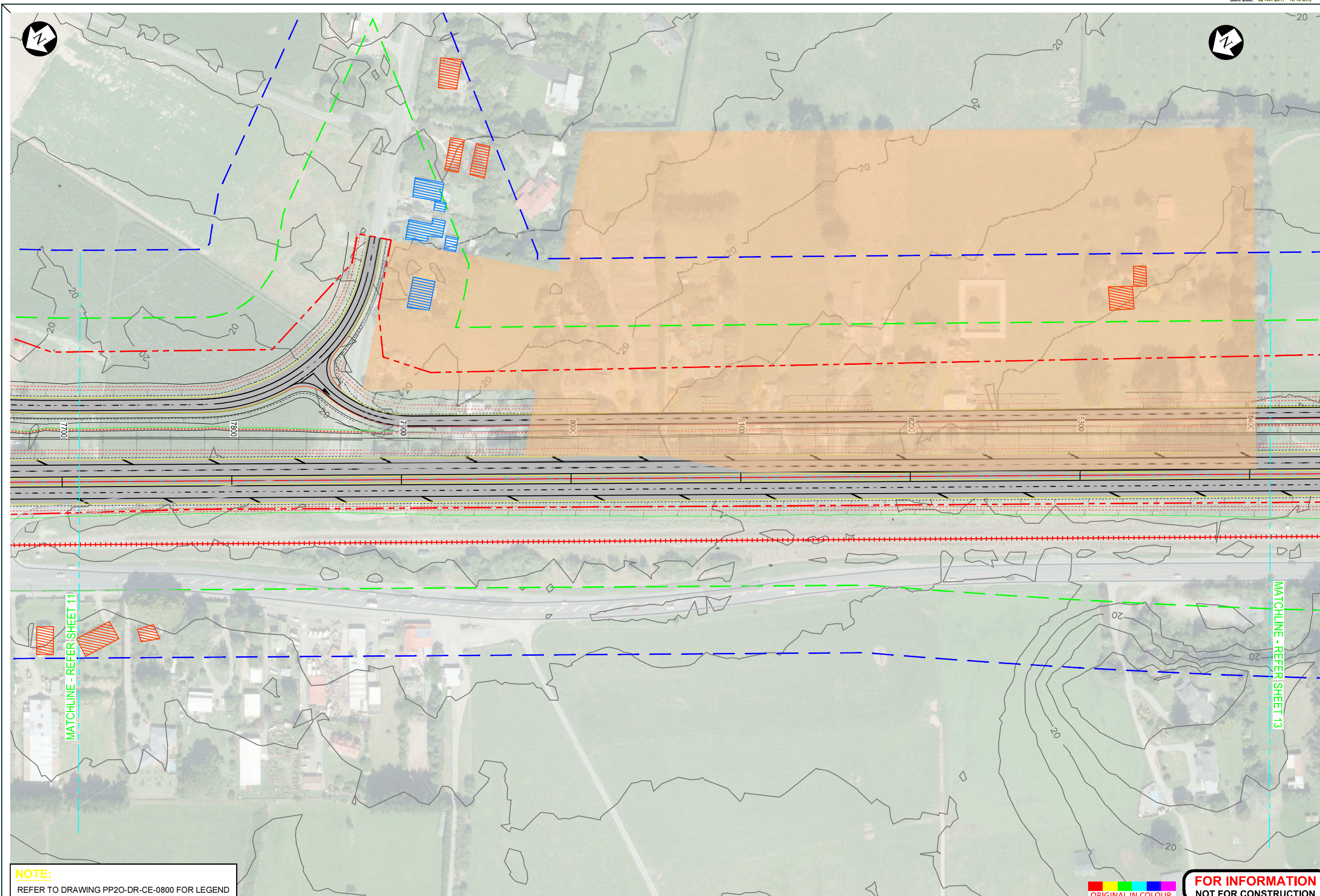
Design	AN	13.07.17	Approved For Construction
Drawn	AK	13.07.17	
Design Checker			
Scale (A1)			
Scale (A3)			

* Refer to Original Handcopy for Signatures

Subject	ENVIRO	Discipline	CIVIL
Title	SHEET 1		

Rev.	B
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Document No. \\MPPSP\FCC\INTERNAL\DAV\WORK\2017\270 SECTOR GENERAL\PRECAS\WORKING SHIP DRAWINGS\PP20-DR-CE-0800-0818-10-26-26-STANDARD\PP20-DR-CE-0800-0818-26-06-SET.DWG



NOTE:
REFER TO DRAWING PP20-DR-CE-0800 FOR LEGEND

ORIGINAL IN COLOUR

**FOR INFORMATION
NOT FOR CONSTRUCTION**

No.	Revision	By	CHK	Appd.	Date
B	SSEMP FOR INFORMATION	WW			14.09.17
A	SSEMP FOR INFORMATION	AK	GD	AN	30.07.17

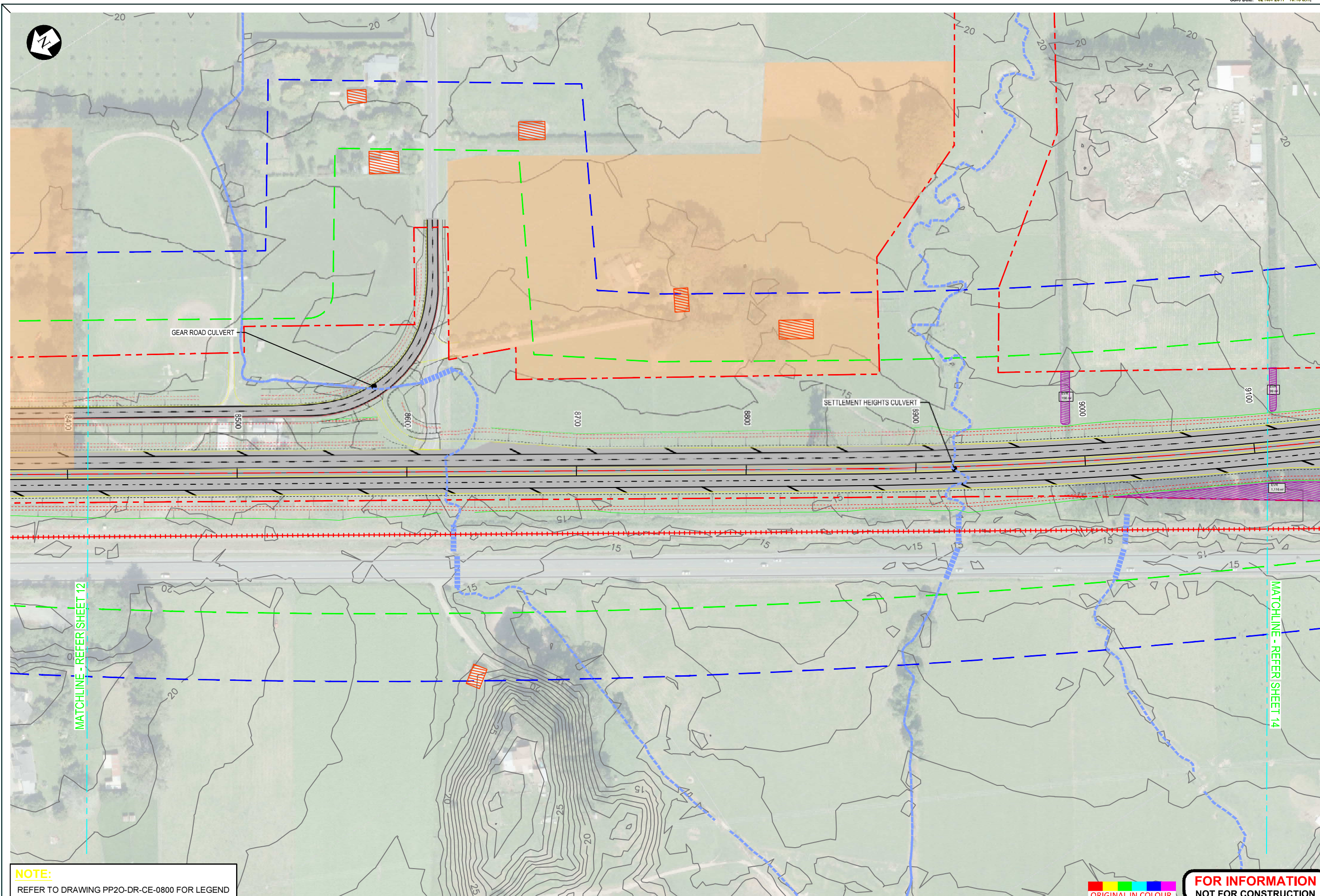
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Drawn	AK	13.07.17	
Dwg Verifier			
Dwg Check			
Date			

* Refer to Original Handcopy for Signature

Peka Peka to Otaki Expressway

Subject	ENVIRO	Discipline	CIVIL
Title	SHEET 2	Rev	B

Document No. \M2PPSP\FCC\INTERNAL\DAV\WORK\02020270\SECTOR GENERAL\PRECAST WORKING SHIP DRAWINGS\PP20-DR-CE-0800-0818-08-26-STANDARD\PP20-DR-CE-0800-0818-26-08-SET.DWG



NOTE:
REFER TO DRAWING PP20-DR-CE-0800 FOR LEGEND

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

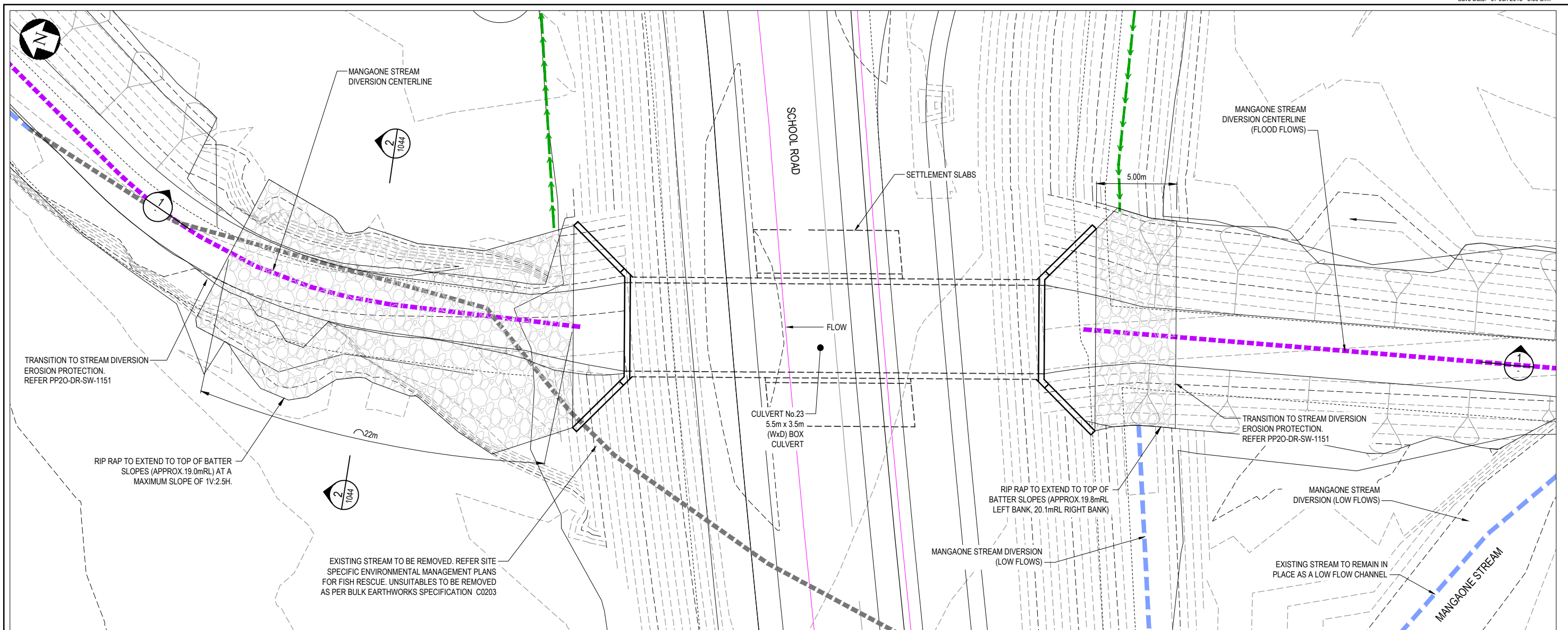
No.	Revision	By	CHK	Appd.	Date
B	SSEMP FOR INFORMATION	WW			14.09.17
A	SSEMP FOR INFORMATION	AK	GD	AN	30.07.17

Design	AN	13.07.17	Approved For Construction
Drawn	AK	13.07.17	
Design Verifier			
Dwg Check			
* Refer to Original Handcopy for Signature			

Subject	ENVIRO	Discipline	CIVIL
Title	SHEET 3	Rev	B

Document No. \M2PPSP\FCC\INTERNAL\DAV\WORK\02027270\SECTOR GENERAL\PRECAST WORKING SHIP DRAWINGS\PP20-DR-CE-0800-0818-25-09-SETZDWG

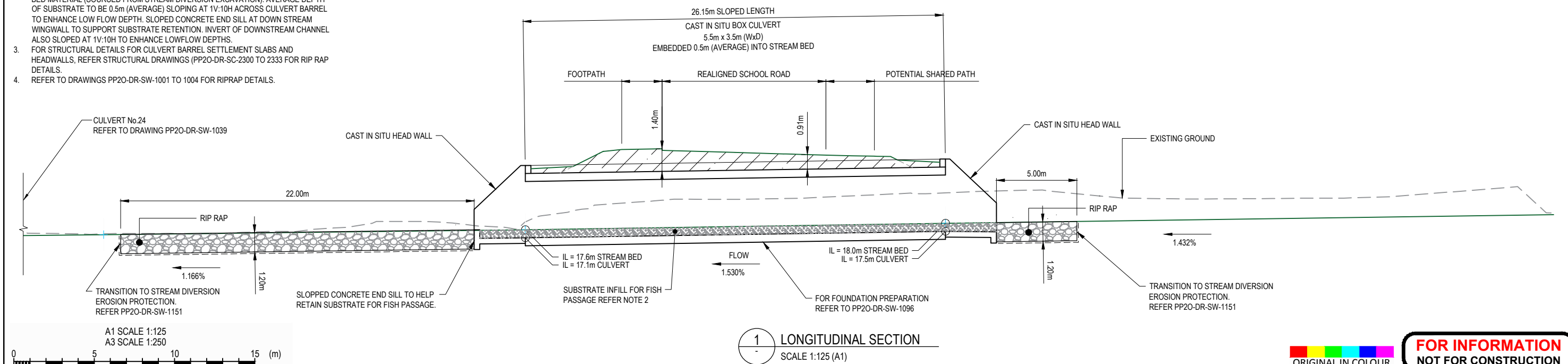
Construction Drawings



PLAN - LAYOUT
SCALE 1:125 (A1)

NOTES:

- COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
- FISH PASSAGE PROVIDED BY EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAM BED MATERIAL (SOURCED FROM STREAM DIVERSION EXCAVATION). AVERAGE DEPTH OF SUBSTRATE TO BE 0.5m (AVERAGE) SLOPING AT 1V:10H ACROSS CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWN STREAM WINGWALL TO SUPPORT SUBSTRATE RETENTION. INVERT OF DOWNSTREAM CHANNEL ALSO SLOPED AT 1V:10H TO ENHANCE LOWFLOW DEPTHS.
- FOR STRUCTURAL DETAILS FOR CULVERT BARREL SETTLEMENT SLABS AND HEADWALLS, REFER STRUCTURAL DRAWINGS (PP20-DR-SC-2300 TO 2333 FOR RIP RAP DETAILS.
- REFER TO DRAWINGS PP20-DR-SW-1001 TO 1004 FOR RIPRAP DETAILS.



1 LONGITUDINAL SECTION
SCALE 1:125 (A1)

A1 SCALE 1:125
A3 SCALE 1:250

FOR INFORMATION NOT FOR CONSTRUCTION
ORIGINAL IN COLOUR

Scale (A1) AS SHOWN	Design	A.Houldsworth	15.12.17	Approved For Construction
Scale (A3)	Drawn	S.Halliday	24.07.17	Date
	Dwg Verifier			
	Dwg Check			
	*Refer to Original Hardcopy for Signature			

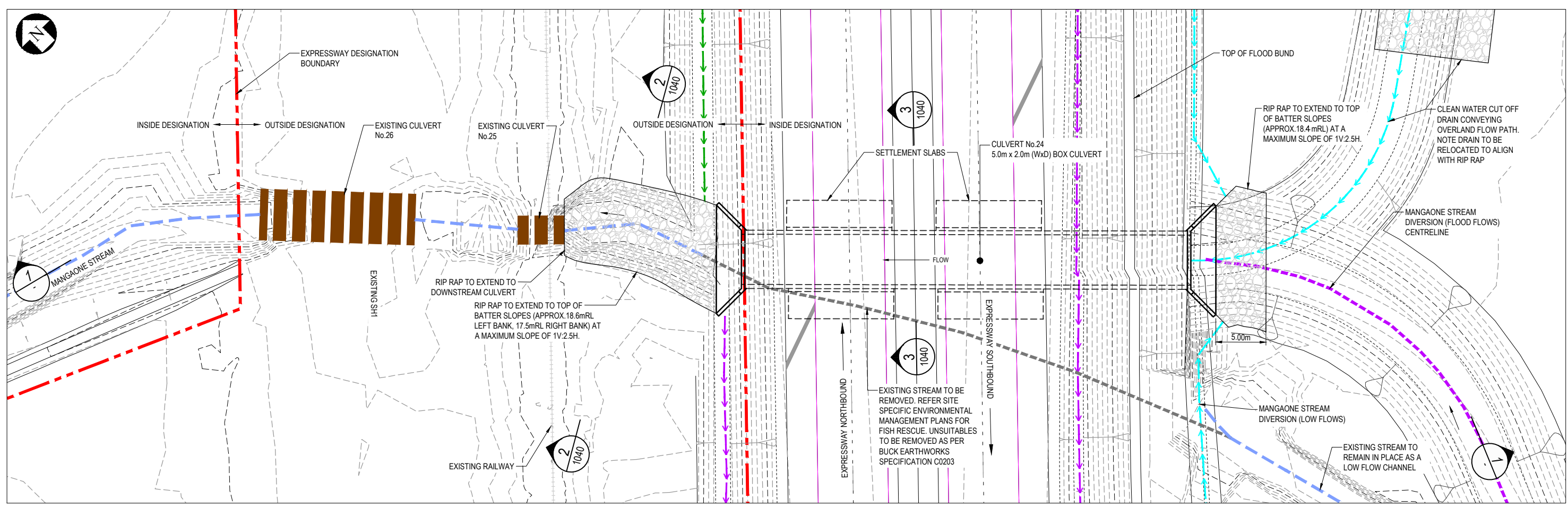
NZ TRANSPORT AGENCY Peka Peka to Otaki Expressway

Fletcher HIGGINS

BECA **TFT** **Tonkin+Taylor**

Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.23 (CH 7,350, MANGAONE STREAM EAST)	Drawing No.:	PP20-DR-SW-1043
	PLAN AND LONGITUDINAL SECTION	Rev.:	B

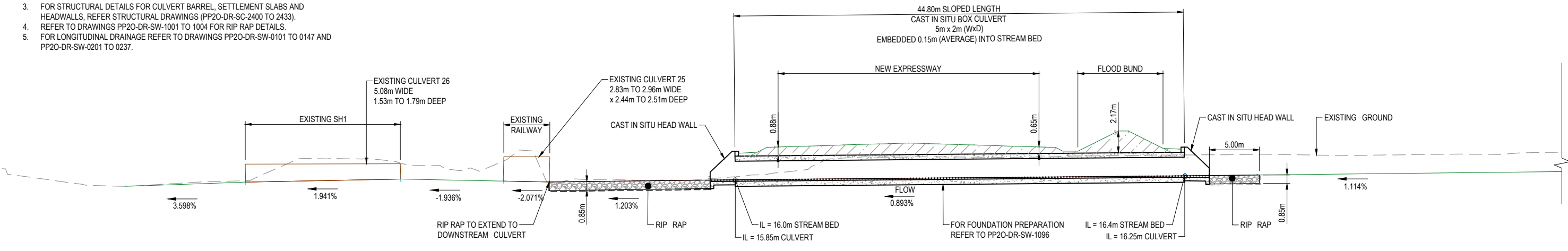
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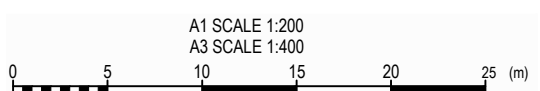
PLAN - LAYOUT
SCALE: 1:200 (A1) 1:400 (A3)

NOTES:

- COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
- FISH PASSAGE TO BE PROVIDED BY EMBEDDING CULVERT 0.15m (AVERAGE) IN STREAM BED. SUBSTRATE TO BE CONCRETED IN PLACE AS THROUGH CULVERT BARREL AND ACROSS WING WALL APRON PER DETAILS SHOWN IN PP20-DR-SW-1040.
- FOR STRUCTURAL DETAILS FOR CULVERT BARREL, SETTLEMENT SLABS AND HEADWALLS, REFER STRUCTURAL DRAWINGS (PP20-DR-SC-2400 TO 2433).
- REFER TO DRAWINGS PP20-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
- FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP20-DR-SW-0101 TO 0147 AND PP20-DR-SW-0201 TO 0237.



1 LONGITUDINAL SECTION
SCALE: 1:200 (A1) 1:400 (A3)



FOR INFORMATION NOT FOR CONSTRUCTION
ORIGINAL IN COLOUR

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	GD	DK	BS	18.05.18
B	80% DESIGN ALL CULVERTS	GD	DK	BS	2.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Scale	Design	Drawn	Design	Date	Approved For
Scale (A1) 1:200	A.Houldsworth	S.Halliday	24.07.17	24.07.17	Approved For Construction
Scale (A3) 1:400					

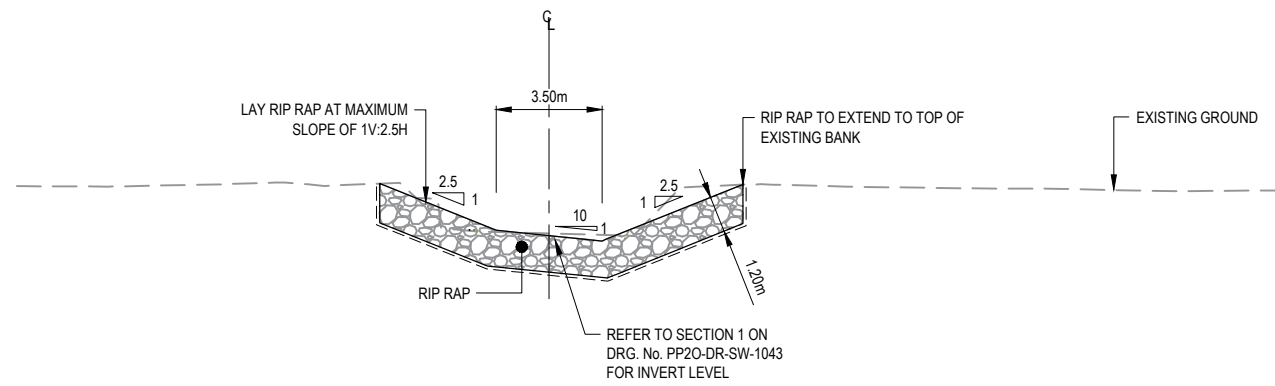
NZ TRANSPORT AGENCY Peka Peka to Otaki Expressway

Fletcher HIGGINS **BECA** **Tonkin+Taylor**

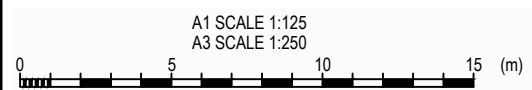
Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.24 (CH 7,250, MANGAONE STREAM CENTRAL)	Drawing No.:	PP20-DR-SW-1039
PLAN AND LONGITUDINAL SECTION		Rev.:	C

NOTES:

1. REFER TO DRAWING PP20-DR-SW-1001-1004 FOR RIPRAP SCHEDULE.



2 SECTION
1043 SCALE 1:125 (A1)



**FOR INFORMATION
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
A	100% DESIGN	GD	DK	BS	30.05.18

Scale (A1) AS SHOWN	Design Drawn	Date	Approved For Construction
Scale (A3)	S.Halliday	24.07.17	
	Dwg Verifier		Date
	Dwg Check		

* Refer to Original Hardcopy for Signature

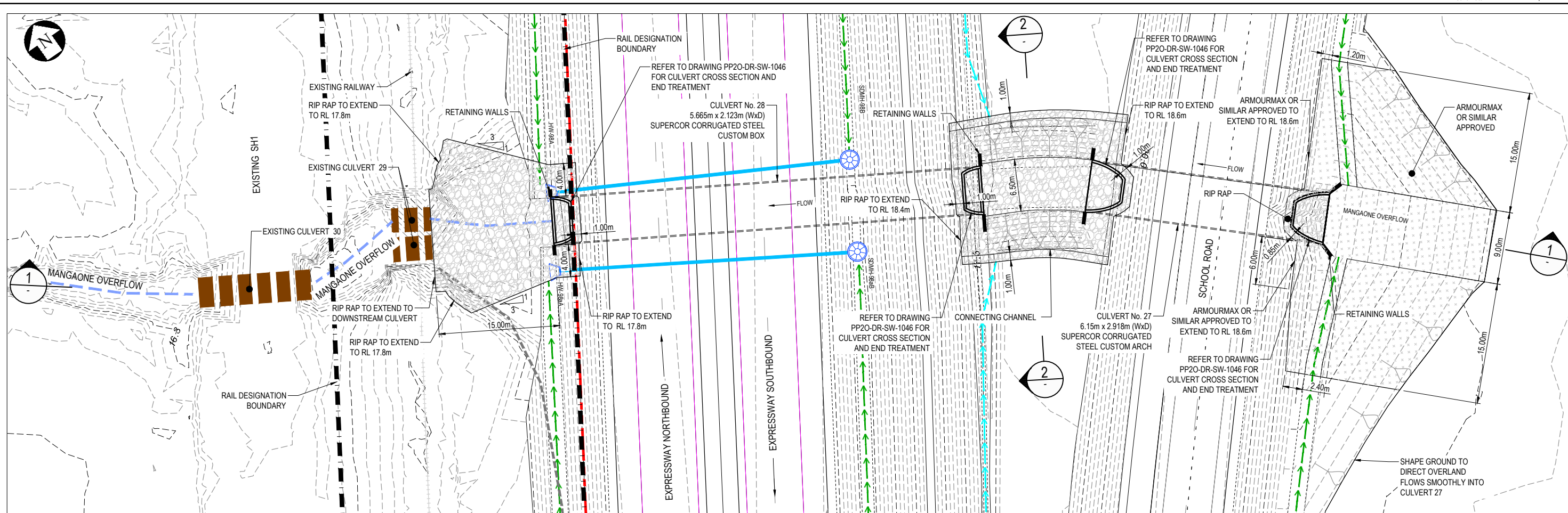


Peka Peka to Ōtaki Expressway



Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.23 (CH 7350, MANGAONE STREAM EAST) DETAILS	Drawing No.:	PP20-DR-SW-1044

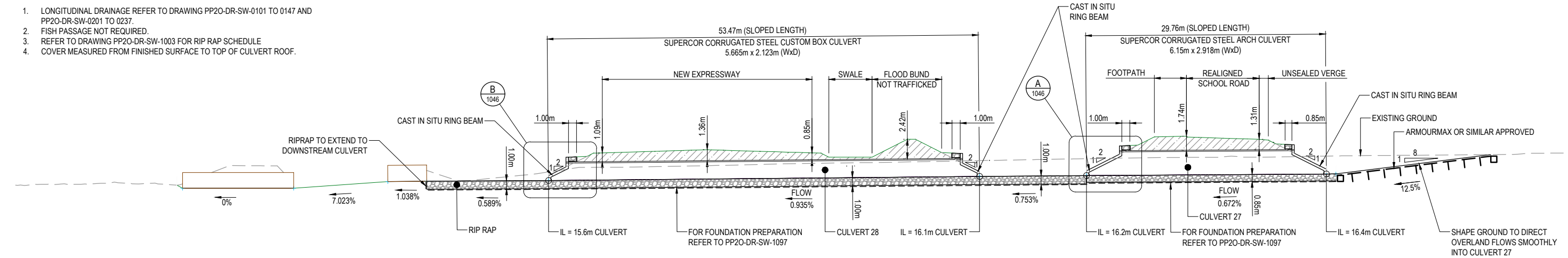
Rev.:	A
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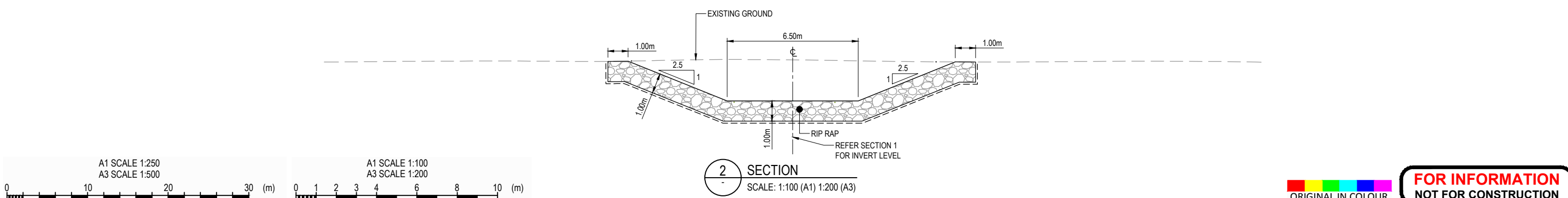
PLAN - LAYOUT
SCALE: 1:250 (A1) 1:500 (A3)

NOTES:

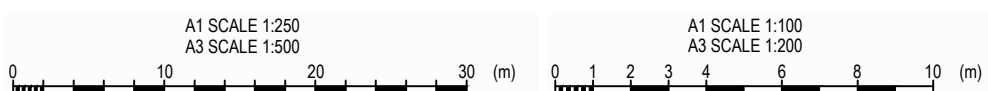
- LONGITUDINAL DRAINAGE REFER TO DRAWING PP20-DR-SW-0101 TO 0147 AND PP20-DR-SW-0201 TO 0237.
- FISH PASSAGE NOT REQUIRED.
- REFER TO DRAWING PP20-DR-SW-1003 FOR RIP RAP SCHEDULE
- COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.



1 LONGITUDINAL SECTION
SCALE: 1:250 (A1) 1:500 (A3)



2 SECTION
SCALE: 1:100 (A1) 1:200 (A3)



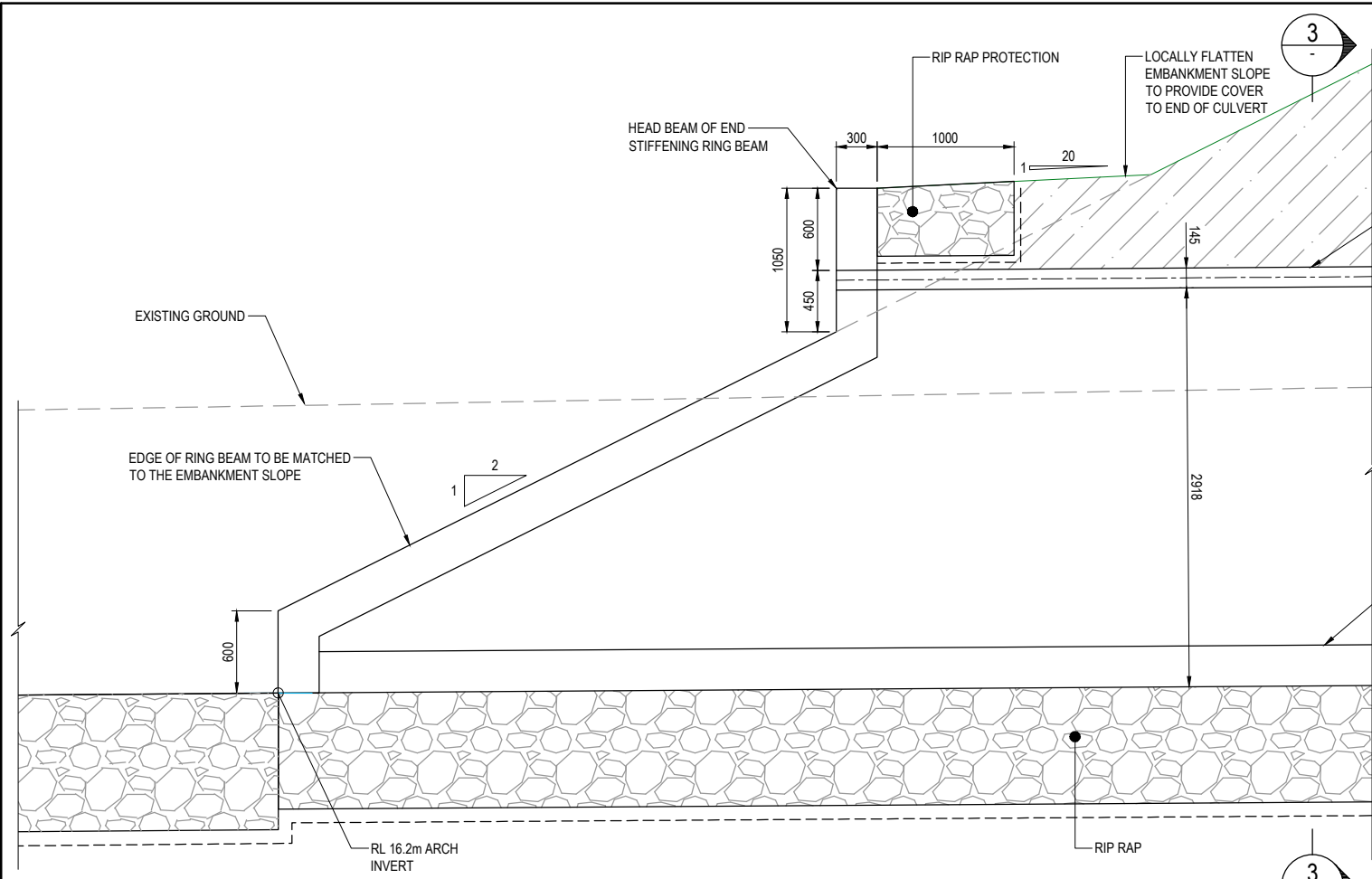
C	100% DESIGN	RMT	DK	BS	28.05.18	Scale (A1) AS SHOWN	Design Drawn	A.Houldsworth A.Kochar	15.12.17 29.01.18	Approved For Construction
B	80% DESIGN ALL CULVERTS	AK	AH	BS	02.02.18	Scale (A3) 1/2 SHOWN	Design Checked			
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17		Design Checked			
No.	Revision	By	Chk	Appd	Date					

Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERTS No.27 & 28 (CH7470, MANGAONE OVERFLOW) PLAN AND LONGITUDINAL SECTION	Drawing No.:	PP20-DR-SW-1045
		Rev.:	C

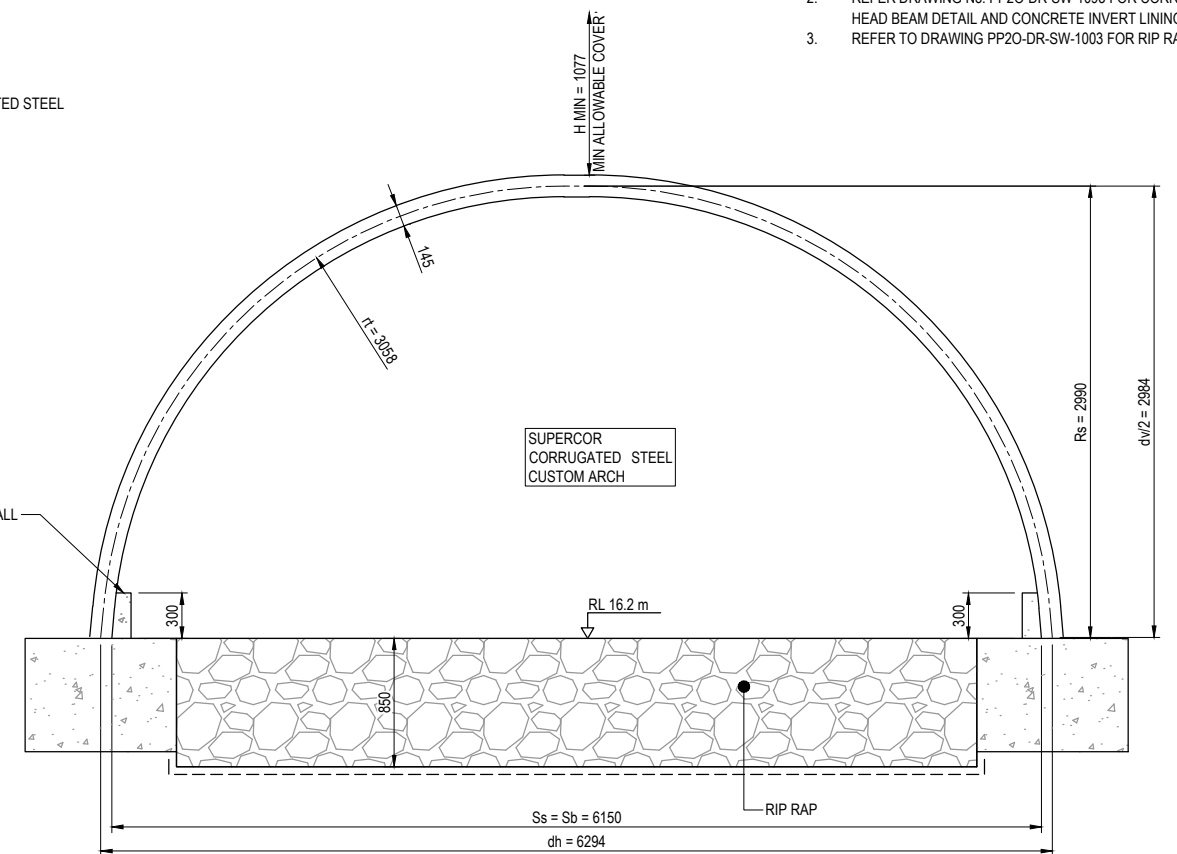
ORIGINAL IN COLOUR
FOR INFORMATION NOT FOR CONSTRUCTION

NOTES:

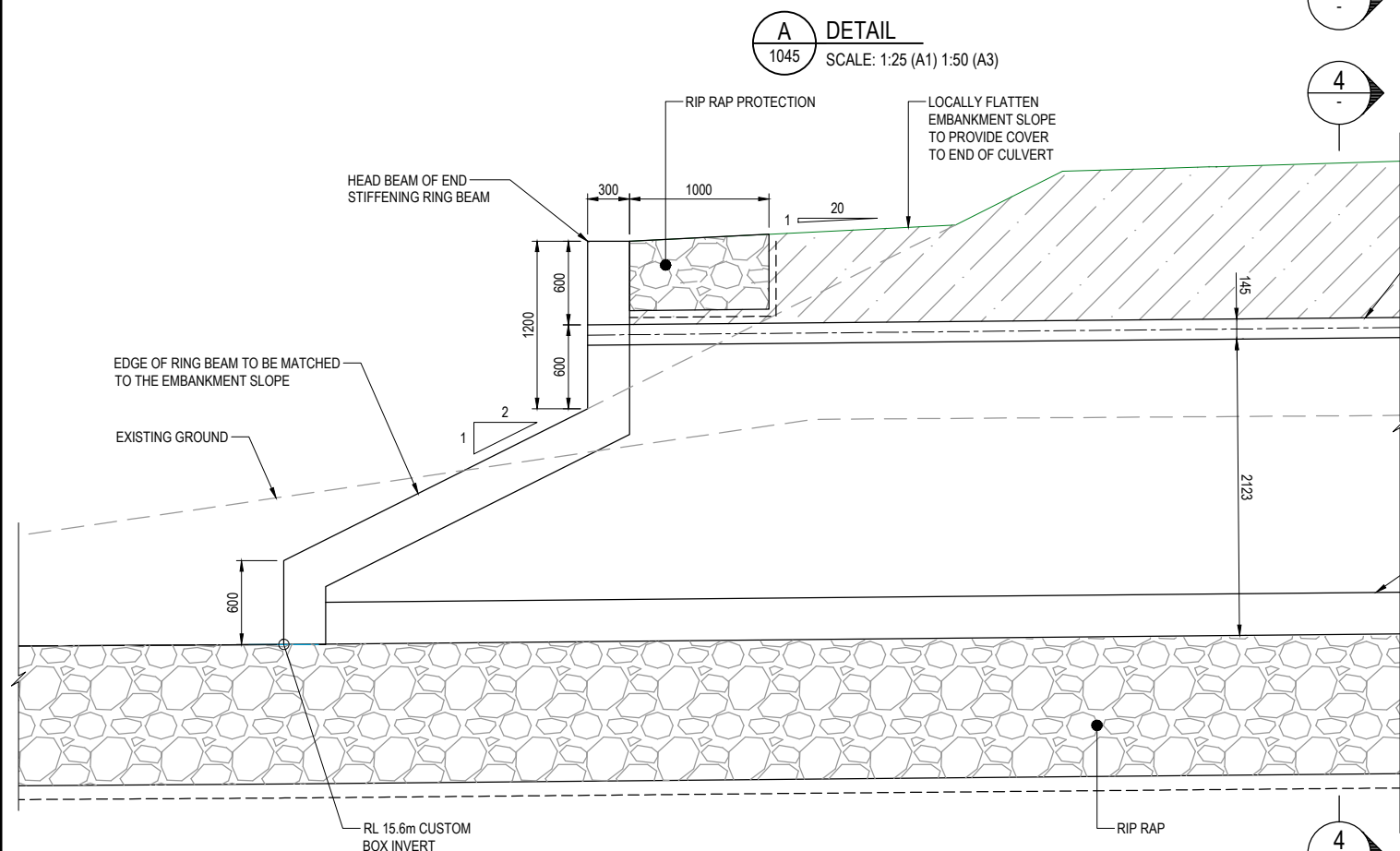
1. FOR CULVERTS 27 AND 28 PLAN AND LONGSECTION REFER TO DRAWING PP20-DR-SW-1045.
2. REFER DRAWING No. PP20-DR-SW-1093 FOR CORRUGATION DETAIL, HEAD BEAM DETAIL AND CONCRETE INVERT LINING DETAIL.
3. REFER TO DRAWING PP20-DR-SW-1003 FOR RIP RAP SCHEDULE.



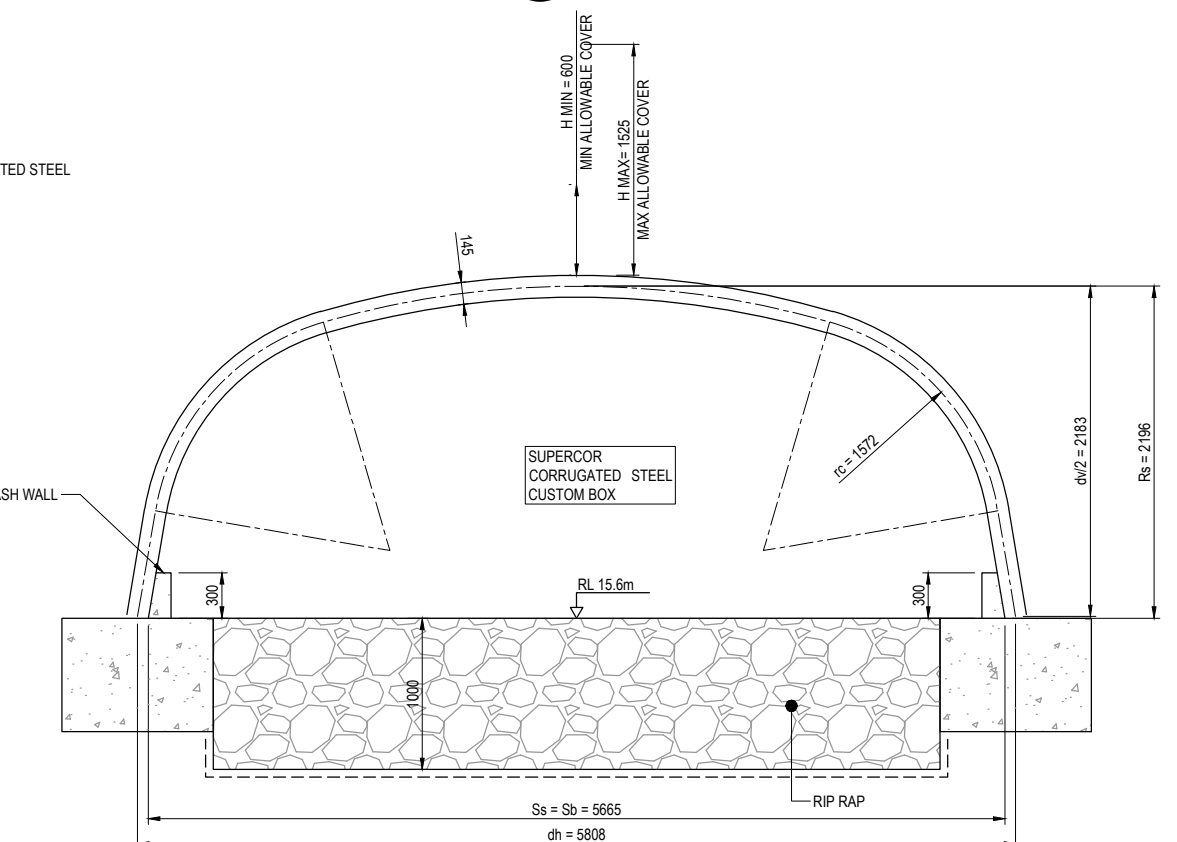
A DETAIL
1045 SCALE: 1:25 (A1) 1:50 (A3)



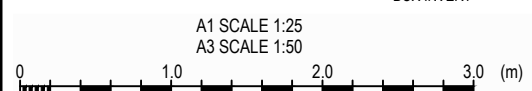
3 SECTION
SCALE: 1:25 (A1) 1:50 (A3)



B DETAIL
1045 SCALE: 1:25 (A1) 1:50 (A3)



4 SECTION
SCALE: 1:25 (A1) 1:50 (A3)

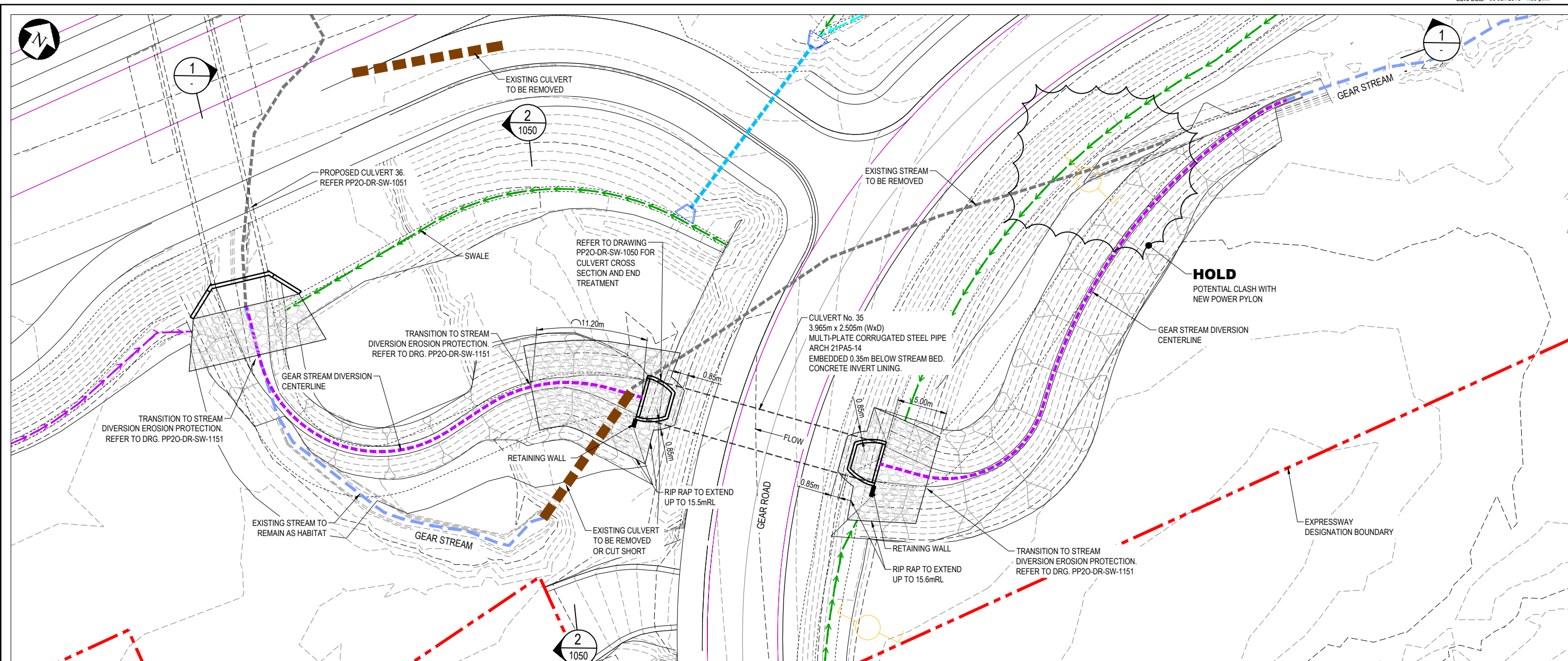


A1 SCALE 1:25		A3 SCALE 1:50	
B	100% DESIGN	LW	DK
A	80% DESIGN ALL CULVERTS	SJH	AH
No.	Revision	By	Chk
		Appd	Date

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	S.Halliday	24.07.17	Date
Dwg Verifier			
Dwg Check			
*Refer to Original Hardcopy for Signature			

Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERTS No.27 & 28 (CH7,470, MANGAONE OVERFLOW)	Drawing No.:	PP20-DR-SW-1046
DETAILS		Rev.:	B

FOR INFORMATION NOT FOR CONSTRUCTION

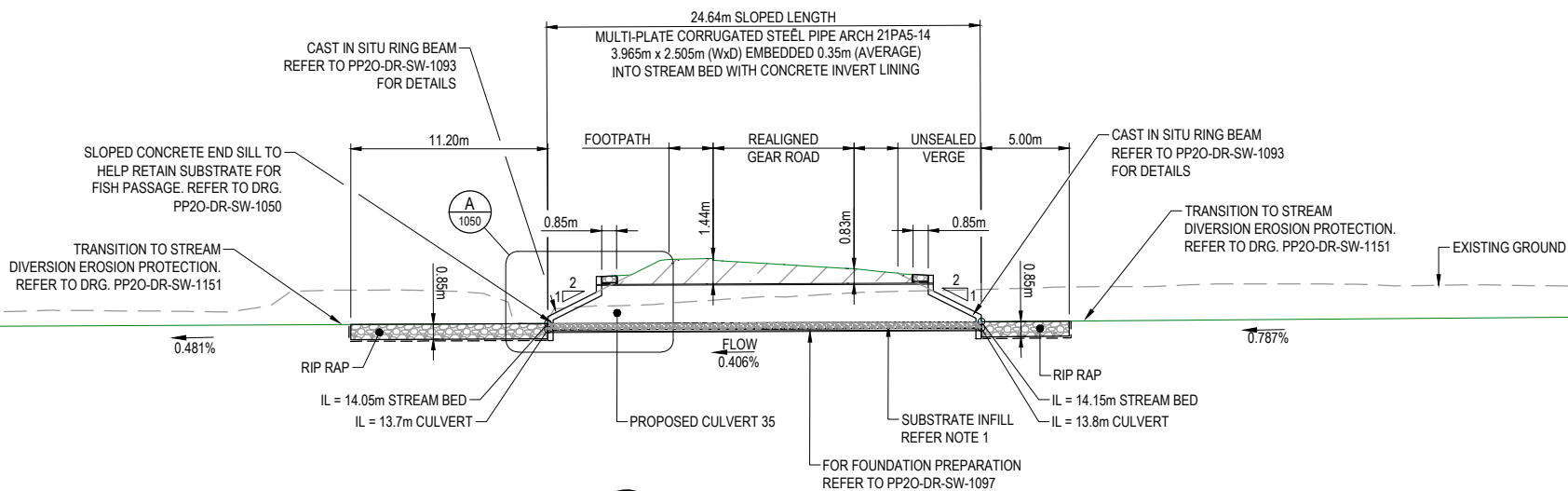
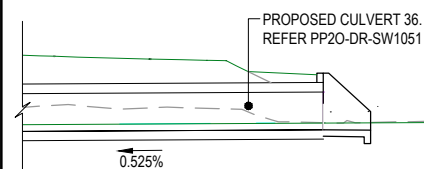


PLAN - LAYOUT

SCALE: 1:200 (A1) 1:400 (A3)

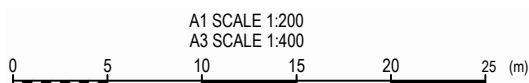
NOTES:

- FISH PASSAGE PROVIDED BY EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAM BED MATERIAL (SOURCED FROM STREAM DIVERSION EXCAVATION). AVERAGE DEPTH OF SUBSTRATE TO BE 0.35m, SLOPING AT 1V:10H ACROSS THE CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM RING BEAM TO SUPPORT SUBSTRATE RETENTION. INVERT OF DOWNSTREAM CHANNEL ALSO SLOPED AT 1V:10H TO ENHANCE LOW FLOW DEPTHS.
- REFER TO DRAWINGS PP20-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
- COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
- FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP20-DR-SW-0101 TO 0147 AND PP20-DR-SW-0201 TO 0237.



1 LONGITUDINAL SECTION

SCALE 1:200 (A1) 1:400 (A3)



A1 SCALE 1:200
A3 SCALE 1:400

ORIGINAL IN COLOUR

**FOR INFORMATION
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	RMT	DK	BS	18.05.18
B	80% DESIGN ALL CULVERTS	JL	AH	BS	02.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

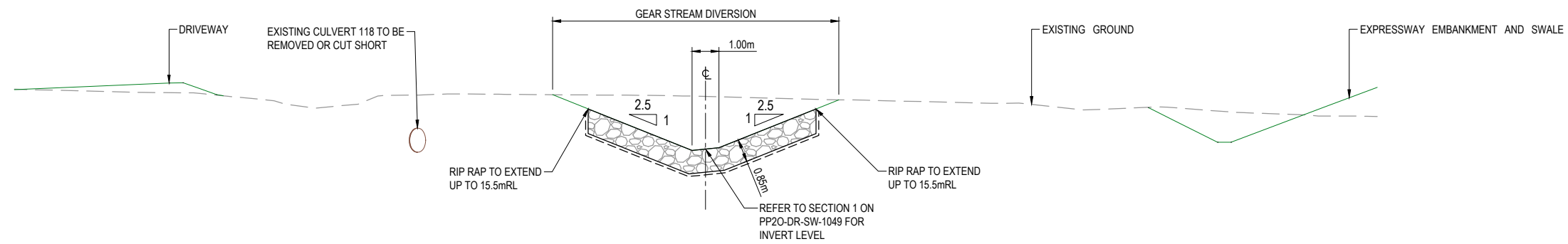
Scale	Design	Drawn	Checked	Date	Approved For Construction
Scale (A1) 1:200	A.Houldsworth	15.12.17	A.Kochar	29.01.18	
Scale (A3) 1:400					

Subject:	CULVERTS
Title:	CULVERT No.35 (CH 8600, GEAR STREAM EAST) PLAN AND LONGITUDINAL SECTION

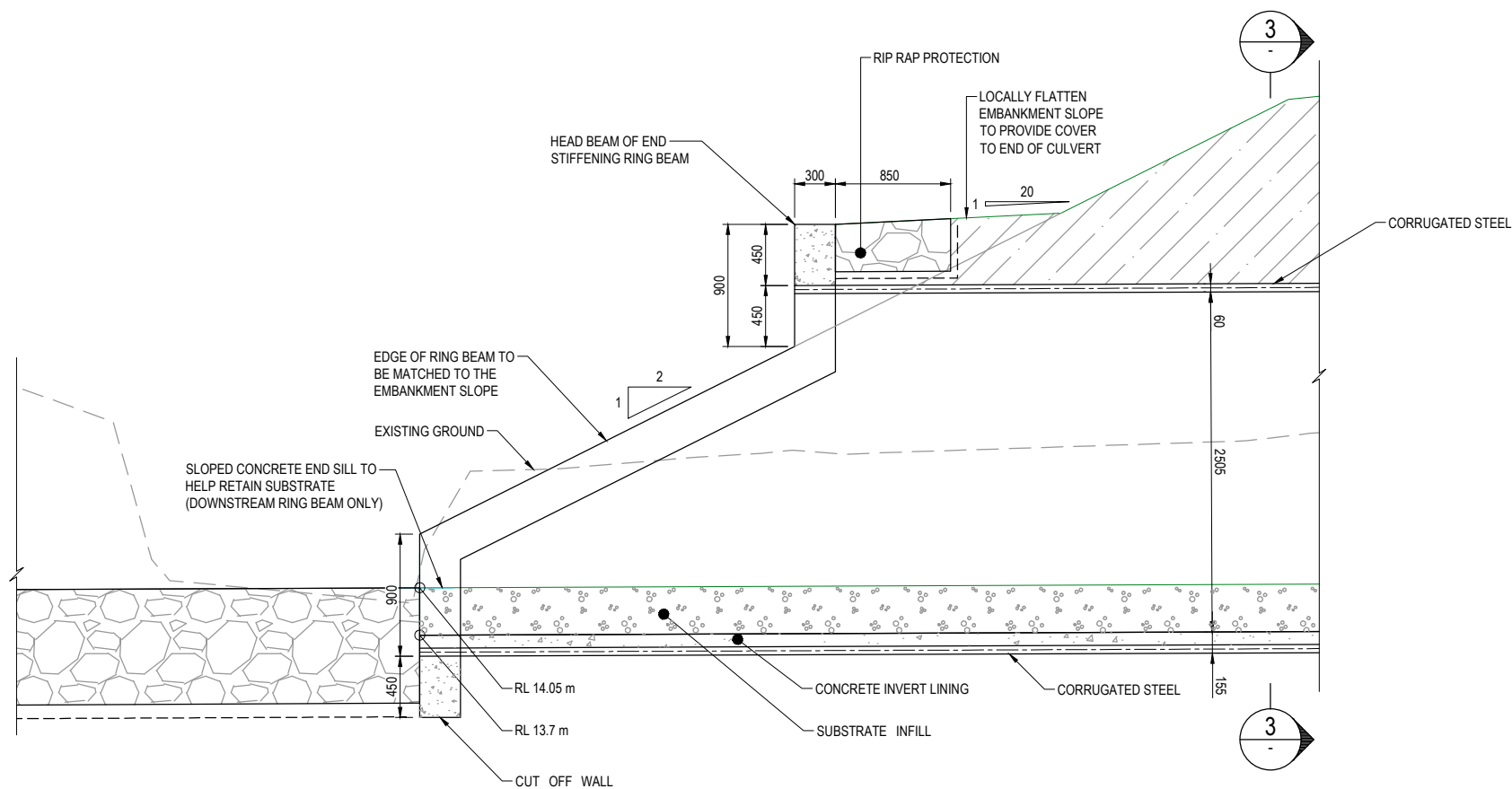
Discipline:	STORMWATER
Drawing No.:	PP20-DR-SW-1049
Rev.:	C

NOTES:

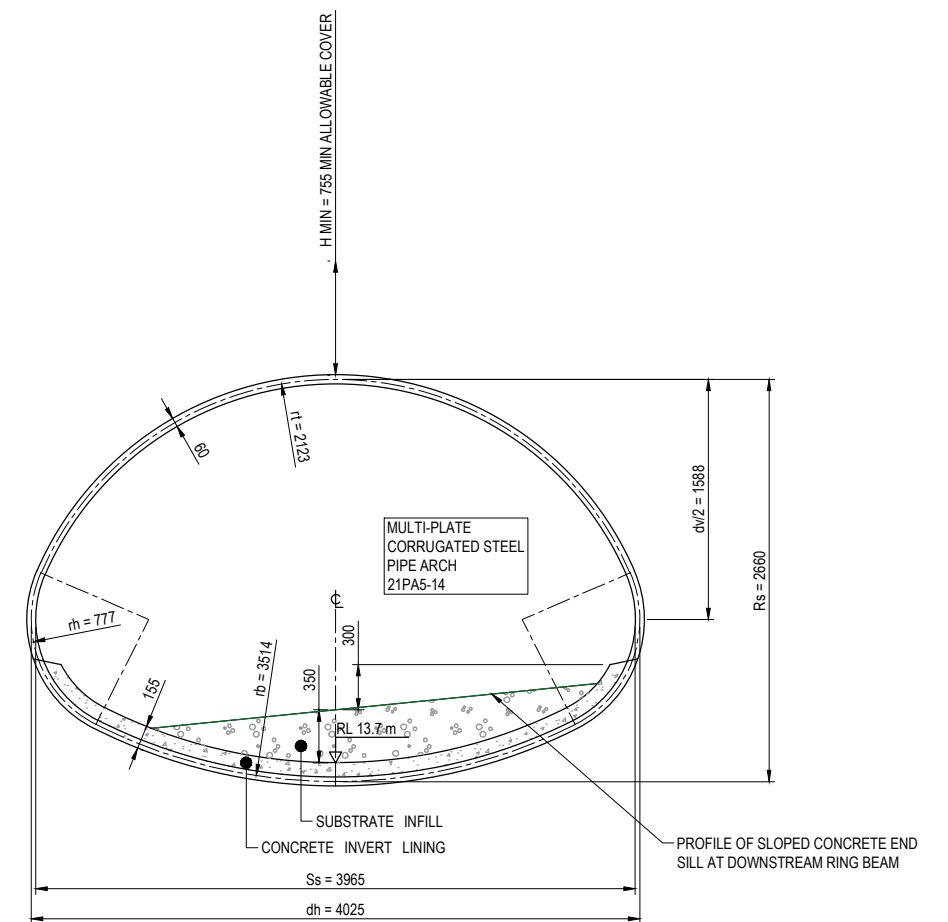
1. FOR CULVERT 35 PLAN AND LONGSECTION REFER TO DRAWING PP20-DR-SW-1049.
2. REFER DRAWING PP20-DR-SW-1093 FOR CORRUGATION DETAIL, HEAD BEAM DETAIL AND CONCRETE INVERT LINING DETAIL.
3. REFER TO DRAWING PP20-DR-SW-1003 FOR RIP RAP SCHEDULE.



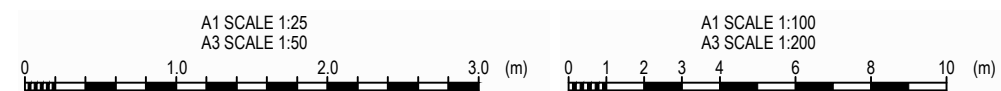
2 SECTION
1049 SCALE: 1:100 (A1) 1:200 (A3)



A DETAIL
1049 SCALE: 1:25 (A1) 1:50 (A3)



3 SECTION
SCALE: 1:25 (A1) 1:50 (A3)

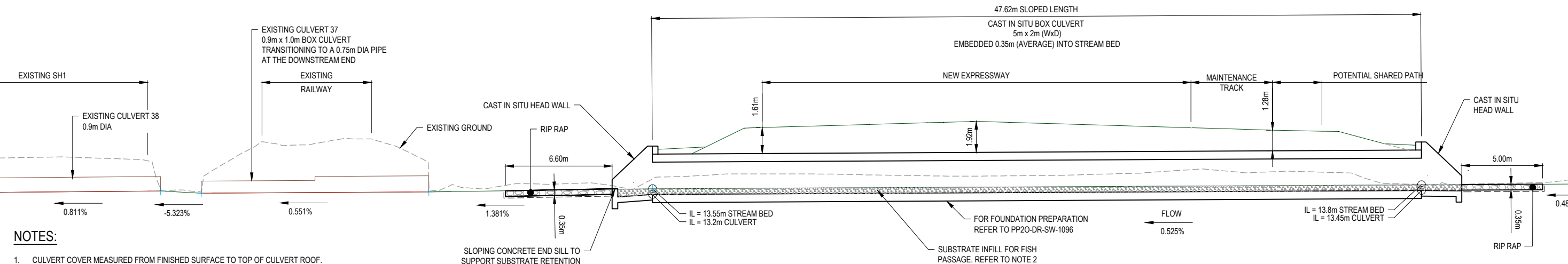
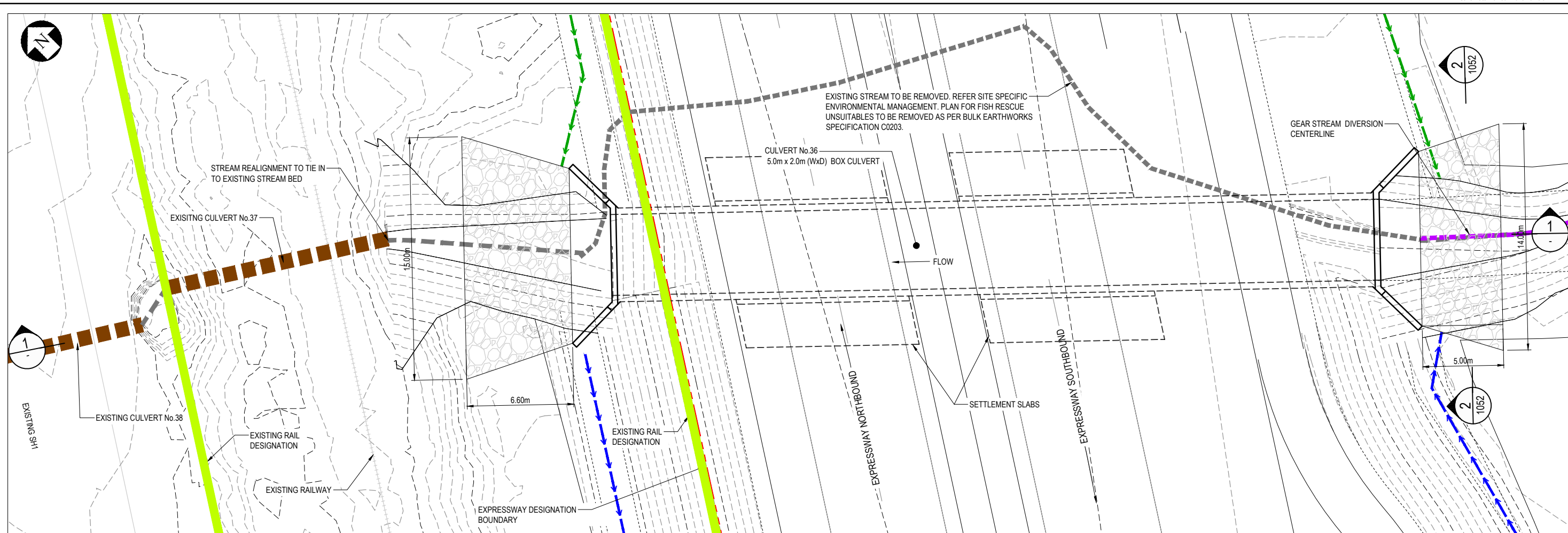


FOR INFORMATION NOT FOR CONSTRUCTION

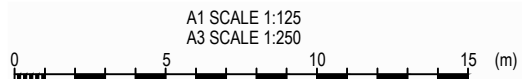
Scale (A1) AS SHOWN		Design	A.Houldsworth	15.12.17	Approved For Construction
Scale (A3) 1/2 SHOWN		Drawn	A.Kochar	29.01.18	Date
		Design Verifier			
		Design Check			
		* Refer to Original Hardcopy for Signature			

NZ TRANSPORT AGENCY **Peka Peka to Otaki Expressway** **Fletcher HIGGINS** **BECA** **Tonkin+Taylor**

Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.35 (CH 8,600, GEAR STREAM EAST) DETAILS	Drawing No.:	PP20-DR-SW-1050
		Rev.:	B



- NOTES:**
- CULVERT COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
 - FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP20-DR-SW-0101 TO 0147 AND PP20-DR-SW-0201 TO 023.
 - FISH PASSAGE PROVIDED BY EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAM BED MATERIAL (SOURCED FROM STREAM DIVERSION EXCAVATION). AVERAGE DEPTH OF SUBSTRATE TO BE 0.35m. SLOPING 1T 1V:10H ACROSS THE CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM WING WALL TO SUPPORT SUBSTRATE RETENTION.
 - FOR STRUCTURAL DETAILS FOR CULVERT BARREL, SETTLEMENT SLABS AND HEADWALLS REFER STRUCTURAL DRAWINGS (PP20-DR-SC-3600 TO 3633).
 - REFER TO DRAWINGS PP20-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.



C	100% DESIGN	GD	DK	BS	18.05.18
B	80% DESIGN ALL CULVERTS	JL	AH	BS	2.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17
No.	Revision	By	Chk	Appd	Date

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	S.Halliday	24.07.17	
Dig Verifier			
Dig Check			
Date			

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY Peka Peka to Ōtaki Expressway

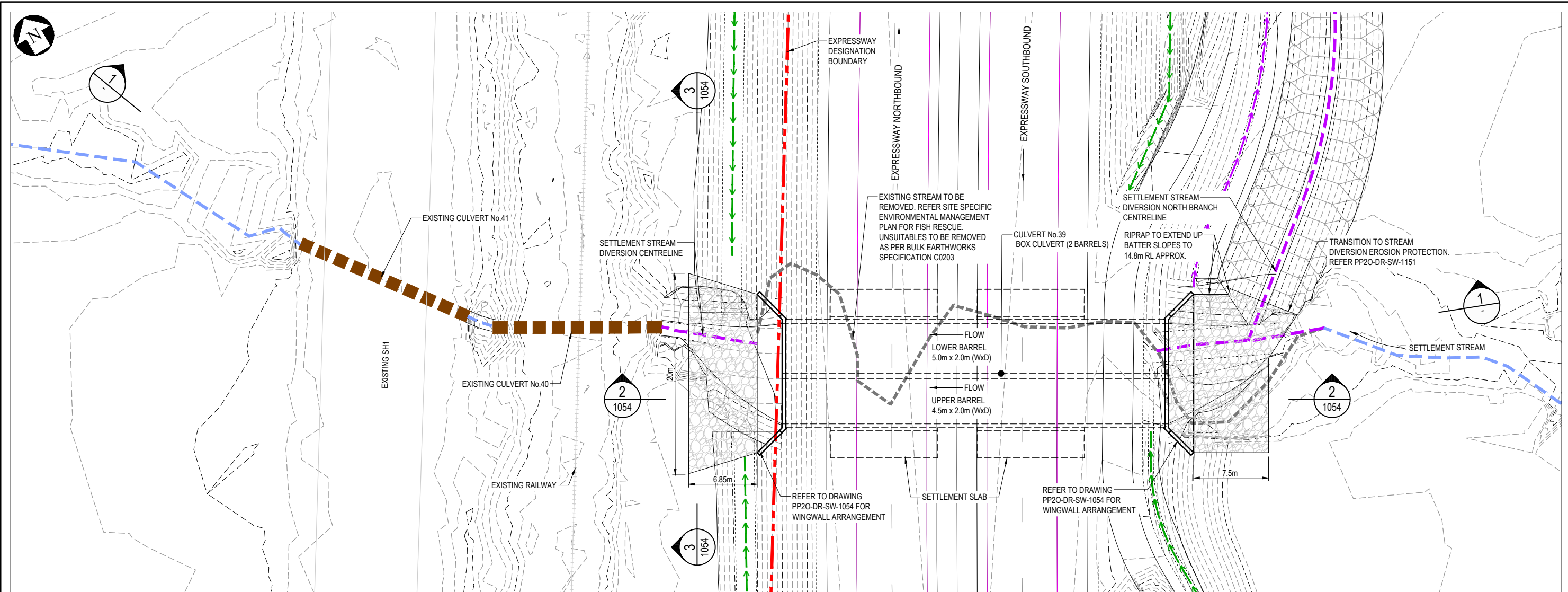
Fletcher HIGGINS

BECA **Tonkin+Taylor**

Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.36 (CH8620, GEAR STREAM WEST) PLAN AND LONGITUDINAL SECTION	Drawing No.:	PP20-DR-SW-1051
		Rev.:	C

FOR INFORMATION NOT FOR CONSTRUCTION

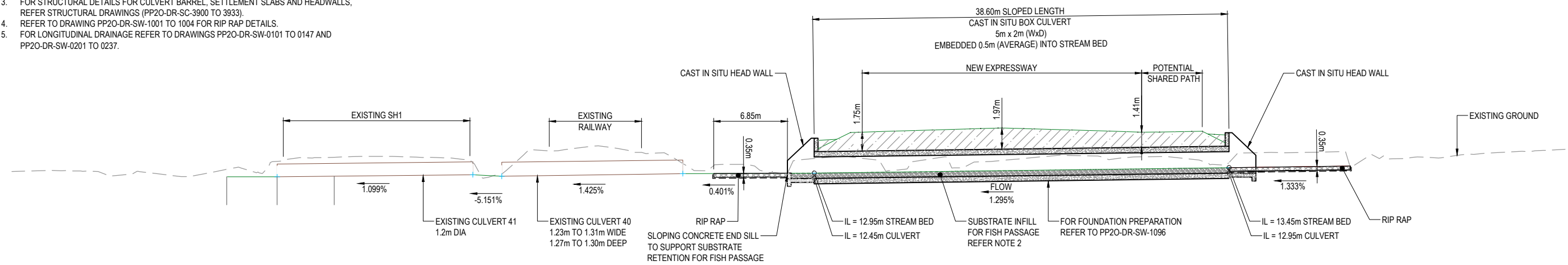
Document No. R3800 - DESIGN DEVELOPMENT GENERAL 08 CAD/DRAWINGS/PP20-DR-SW-1051-1052.DWG



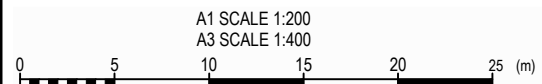
PLAN - LAYOUT
SCALE 1:200 (A1) 1:400 (A3)

NOTES:

1. CULVERT COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
2. FISH PASSAGE TO BE PROVIDED BY CONSTRUCTING ONE BARREL OF CULVERT LOWER, AND EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAMBED MATERIAL. AVERAGE DEPTH OF SUBSTRATE TO BE 0.285m AVERAGE IN UPPER BARREL AND 0.5m AVERAGE IN LOWER BARREL. SLOPING AT 1V:10H ACROSS CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM WING WALL TO SUPPORT SUBSTRATE RETENTION. REFER PP20-DR-SW-1054.
3. FOR STRUCTURAL DETAILS FOR CULVERT BARREL, SETTLEMENT SLABS AND HEADWALLS, REFER STRUCTURAL DRAWINGS (PP20-DR-SC-3900 TO 3933).
4. REFER TO DRAWING PP20-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
5. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP20-DR-SW-0101 TO 0147 AND PP20-DR-SW-0201 TO 0237.



1 LONGITUDINAL SECTION
SCALE 1:200 (A1) 1:400 (A3)



FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	RMT	DK	BS	30.05.18
B	80% DESIGN ALL CULVERTS	LW	AH	BS	2.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Scale (A1)	Design	Drawn	Checked	Approved For Construction
1:200	A.Houldsworth	S.Halliday		24.07.17
1:400				24.07.17

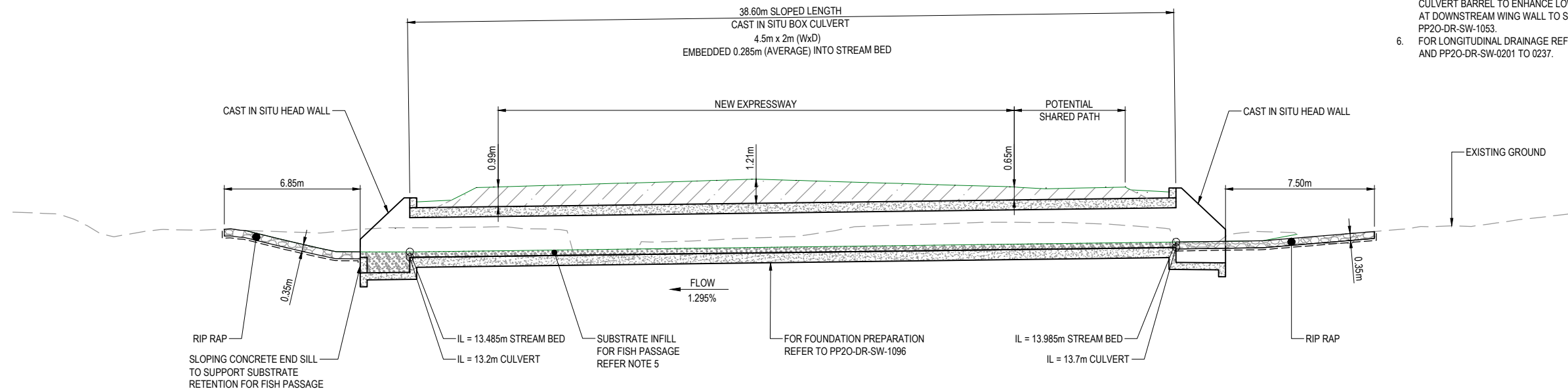
NZ TRANSPORT AGENCY
Peka Peka to Otaki Expressway

Fletcher HIGGINS
BECA
Tonkin+Taylor

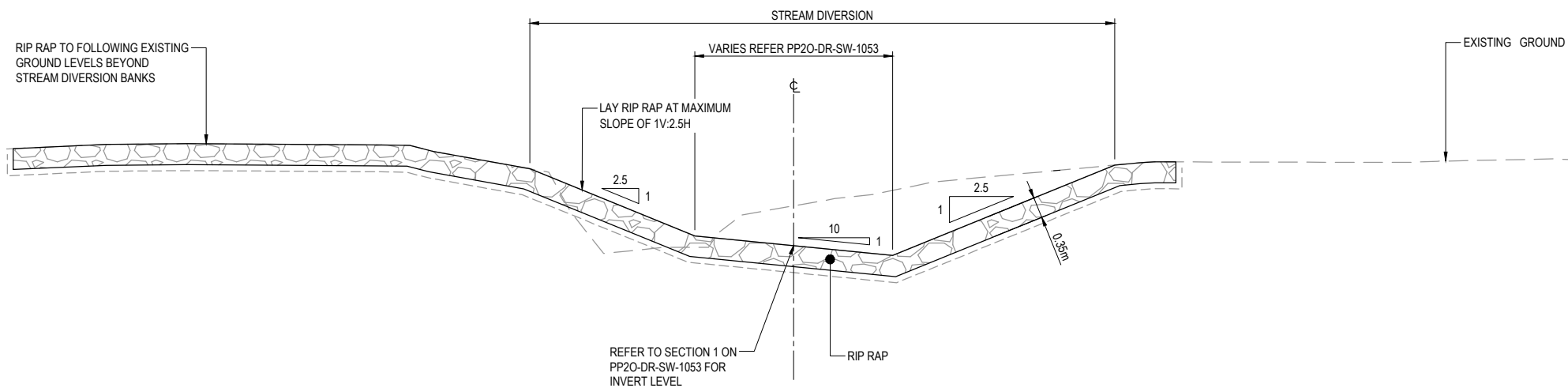
Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.39 (CH 8,920 SETTLEMENT STREAM) PLAN AND LONGITUDINAL SECTION	Drawing No.:	PP20-DR-SW-1053
		Rev.:	C

NOTES:

1. LONGSECTION AND PLAN REFER TO DRAWING PP20-DR-SW-1053.
2. REFER TO DRAWING PP20-DR-SW-1002 FOR HEADWALL AND RIP RAP SCHEDULE.
3. CULVERT COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
4. FOR STRUCTURAL DETAILS FOR CULVERT BARREL AND HEADWALLS, REFER STRUCTURAL DRAWINGS PP20-DR-SC-3900-3933.
5. FISH PASSAGE TO BE PROVIDED BY CONSTRUCTING ONE BARREL OF CULVERT LOWER, AND EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAMBED MATERIAL. AVERAGE DEPTH OF SUBSTRATE TO BE 0.285m AVERAGE IN UPPER BARREL AND 0.5m AVERAGE IN LOWER BARREL. SLOPING AT 1V:10H ACROSS CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM WING WALL TO SUPPORT SUBSTRATE RETENTION. REFER PP20-DR-SW-1053.
6. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP20-DR-SW-0101 TO 0147 AND PP20-DR-SW-0201 TO 0237.



2 LONGITUDINAL SECTION
1053 SCALE: 1:125 (A1) 1:250 (A3)



3 SECTION
1053 SCALE: 1:50 (A1) 1:100 (A3)



FOR INFORMATION NOT FOR CONSTRUCTION

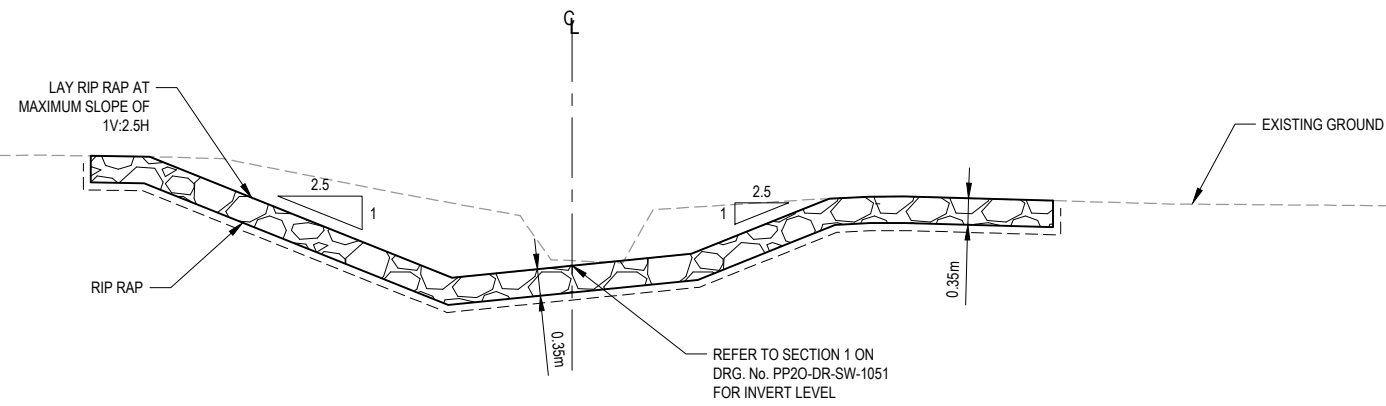
C	100% DESIGN	RMT	DK	BS	30.05.18	Scale (A1) AS SHOWN	Design	A.Houldsworth	24.07.17	Approved For Construction
B	80% DESIGN ALL CULVERTS	G.G.	D.K.	B.S.	02.02.18	Scale (A3) 1/2 SHOWN	Drawn	S.Halliday	24.07.17	Date
A	80% P1 CULVERT DESIGN	S.J.H.	A.H.	B.S.	12.09.17		Eng Verifier	-	-	
No.	Revision	By	Chk	Appd	Date		Eng Check	-	-	

NZ TRANSPORT AGENCY **Peka Peka to Otaki Expressway** **Fletcher HIGGINS** **BECA** **TFT Tonkin+Taylor**

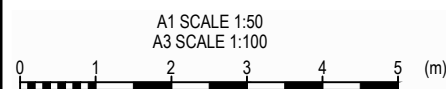
Subject:	CULVERTS	Discipline:	STORMWATER
Title:	CULVERT No.39 (CH 8,920 SETTLEMENT STREAM) SECTIONS AND DETAILS	Drawing No.:	PP20-DR-SW-1054
		Rev.:	C

NOTES:

1. REFER TO DRAWINGS PP20-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
2. FOR CULVERT 36 PLAN AND LONG SECTION REFER TO DRG. No. PP20-DR-SW-1051



2 SECTION
1051 SCALE 1:50 (A1)



**FOR INFORMATION
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
A	100% DESIGN	GD	DK	BS	18.05.18

Scale (A1)	Design	Drawn	Date	Approved For Construction
AS SHOWN	D.Knappstein	G.Down	16.05.18	18.05.18
Scale (A3)	Dwg Verifier	Dwg Check	Date	

* Refer to Original Hardcopy for Signature

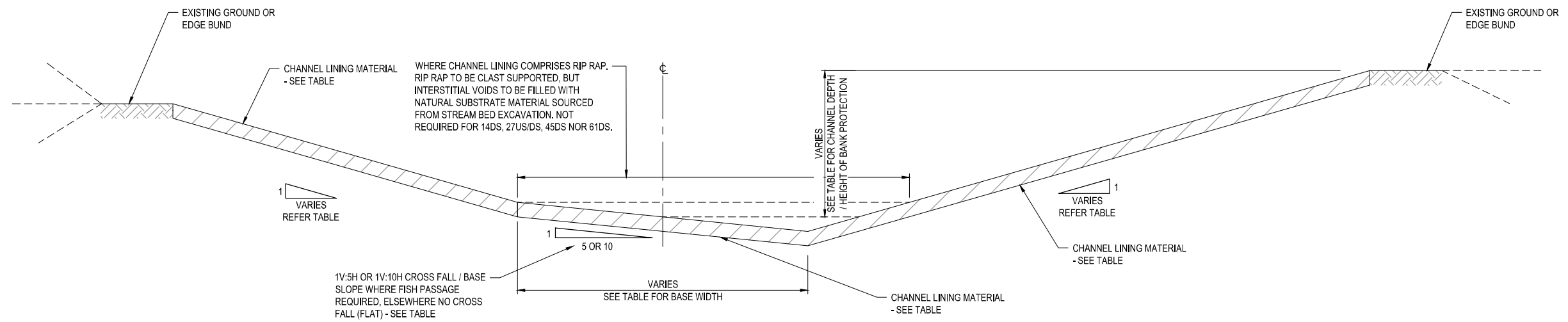
Peka Peka to Ōtaki Expressway

Subject:	CULVERTS
Title:	CULVERT No.36 (CH 8,620, GEAR STREAM WEST) DETAILS

Discipline:	STORMWATER
Drawing No.:	PP20-DR-SW-1052
Rev.:	A

NOTES:

- REFER TO PP20-DR-SW-1001 FOR ROCK CLASS GRADING.
- REFER PP20-DR-SW-1002 TO 1004 FOR DETAILS ON THE CULVERT INLET AND OUTLET PROTECTION IMMEDIATELY UPSTREAM AND DOWNSTREAM OF EACH CULVERT.

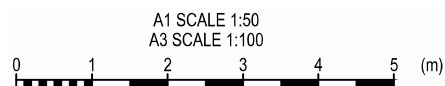


PERMANENT STREAM DIVERSION CHANNEL TYPICAL SECTION

SCALE: 1:50 (A1) 1:100 (A3)

Permanent Stream Diversion ID = Culvert Number, US for Upstream, DS for Downstream	Base width (m)	Base Slope (H/V)	Side slopes (1V:)	Slope (%)	Channel Depth (m)	Total Stream Diversion Channel Length (m)	Height of bank protection (m)	Design Velocity (m/s)	Channel Lining Material	Length of channel lining material required (upstream/downstream of culvert inlet/outlet protection) (m)	Rip Rap Class	Rip Rap Layer Thickness (m)
1 US	0.50	10	2.5	1.86	1.00	16	1.00	2.5	Rock rip rap - class 2 on channel base and banks	11	2	0.60
3 DS	3.00	10	2.5	0.30	1.00	55	1.00	1.4	No special requirements (grass only) until the 3 DS final section.	30		
3 DS final section	2.00	10	2.5	5.00	1.00		1.00	3.5	Rock rip rap chute - class 4 on channel base and banks	9	4	0.85
9-10 US	2.50	10	2.5	1.89	1.25	30	1.25	2.2	Rock rip rap - class 1 on channel banks and class 2 on channel base*	0*	1	0.35
9-10 DS	2.50	10	2.5	-0.80	1.60	14	1.60	1.6	Rock rip rap - class 1 on channel base and banks	3	2	0.60
14 DS	3.00	Flat	2.5	0.34	2.20	83	N/A	1.2	No special protection requirements (grass only)	62	1	0.35
23 US	3.50	10	2.5	1.43	1.80	42	1.80	3.2	Rock rip rap - class 3 on channel base and banks	37	3	0.70
23 DS	3.50	10	2.5	1.17	1.80	100	1.80	3.0	Rock rip rap - class 2 on channel banks and class 3 rip rap on channel base	73	2	0.60
27 US	9.00	Flat	8.0	12.50	1.30	20	1.30	6.0	ArmorMax (or similar approved) reinforced turf protection upstream of culvert inlet	0*	3	0.70
27 DS	6.50	Flat	2.5	0.75	1.85	13	1.85	2.5	Rock rip rap - class 5 rip rap*	0*	5	1.00
35 US	0.50	10	2.5	0.79	1.60	55	1.60	2.0	Rock rip rap - class 1 on channel base and banks	50	1	0.35
35 DS	1.00	10	2.5	0.48	1.40	50	1.40	1.6	Rock rip rap - class 1 on channel base and banks	33	1	0.35
39 US North Trib	1.00	10	2.5	0.83	0.50	60	N/A	1.4	No special protection requirements (grass only)	60		
42 US	0.50	10	2.5	0.99	0.65	42	N/A	1.4	No special protection requirements (grass only)	37		
42 DS	0.50	10	2.5	1.19	0.65	15	N/A	1.5	No special protection requirements (grass only)	10		
45 DS	0.50	Flat	2.5	5.33	0.75	42	0.75	3.0	Rock rip rap - class 3 on channel base and banks	35	3	0.70
50a US	0.50	10	2.5	1.56	2.10	37	N/A	1.1	No special protection requirements (grass only)	32		
50 US	0.50	10	2.5	1.29	1.25	19	1.25	1.9	Enkamat A20, or similar approved - on channel base and banks	9		
50 DS	1.00	10	2.5	1.26	0.60	80	0.60	1.8	Enkamat A20, or similar approved - on channel base and banks	65		
53 US	0.50	10	2.5	2.25	1.25	52	1.25	3.1	Rock rip rap - class 3 on channel base and banks	47	3	0.70
53 DS	2.00	10	2.5	1.97	0.60	60	0.60	2.2	Rock rip rap - class 2 on channel base and banks	45	2	0.60
59 US	1.50	10	2.5	0.22	0.70	21	N/A	0.8	No special protection requirements (grass only)	17		
59 DS	1.50	10	2.5	0.20	0.60	150	N/A	0.8	No special protection requirements (grass only)	146		
61 DS	0.75	Flat	2.5	0.63	0.54	23	N/A	0.8	No special protection requirements (grass only)	20		

* Channel lining for stream diversion is the same type and length as proposed for the culvert inlet/outlet protection, refer PP20-DR-SW-1002 to 1004



ORIGINAL IN COLOUR

For Information

No.	Revision	By	Chk	Appd	Date
1	ISSUED FOR CONSTRUCTION (CULVERTS)	LW	DK	SW	29.06.18

Design	D. K	31.01.18	Approved For Construction
Drawn	L. Wang	31.01.18	
Dwg Verifier			
Dwg Check			
* Refer to Original Handcopy for Signature			

Subject:	STREAM DIVERSIONS	Discipline:	STORMWATER
Title:	STREAM DIVERSION STANDARD DETAILS	Drawing No.:	PP20-DR-SW-1151
	SHEET 1	Rev.:	1

Landscape Plans

Planting Key

MP-XX Mass Planting	RVP-XX River Planting
MP-D-XX Mass Planting Dune	TP-XX Terrestrial Revegetation Planting
MPT-XX Mass Planting with Tree Enrichment	TPM-XX Terrestrial Mitigation Planting Makahuri/Mary Crest
MPT-D-XX Mass Planting Dune with Tree Enrichment	LSW-XX Low Stature Wetland Planting
MPS-XX Mass Planting Steep Sites	SWF-XX Swamp Forest Mitigation Planting
LP-XX Low Planting	RPMA-XX Riparian Mitigation Planting - Standing Water
LP-D-XX Low Planting Dune	RPMB-XX Riparian Mitigation Planting - Lower Bank
SC-XX Swale - Cobbled	RPMC-XX Riparian Mitigation Planting - Upper Bank
SG-XX Swale - Grassed	G-XX Grass
SP-XX Swale - Planted	SHB-XX Shelter Belt Planting
RPA-XX Riparian Planting - Standing Water	EVR Existing Vegetation Retained
RPB-XX Riparian Planting - Lower Bank	- - - - - Bottom/Base of Channel
RPC-XX Riparian Planting - Upper Bank	- - - - - Designation Boundary
WPA-XX Wetland Planting - Land Edge	- - - - - Existing Road/Rail
WPB-XX Wetland Planting - Periodically Inundated	- - - - - Back of Verge
WPC-XX Wetland Planting - Wet Margin (0.0-0.3m depth)	- - - - - Embankment Ground Interface
WPD-XX Wetland Planting - Shallow Zone (0.3+m depth)	- - - - - Kerb Face
	TOP Slope/Embankment
	BOTTOM Slope/Embankment
	Rip-Rap

Notes:

1. Read plans in conjunction with relevant Specifications
2. Read plans in conjunction with relevant Planting Schedules (refer PP20-SC-LA-XXXX for schedules)
3. Read plans in conjunction with relevant Planting Details (Planting Details TBC)
4. Final boundary configuration to be confirmed between: Land owners / Transport Agency / Kiwi Rail / KCDC
5. Difference between SC-01 (cobbled swale) areas in plan vs schedules due to only sides being planted. Ratio of 50% of plan area has been applied for schedules. IFC will show an exact area in drawings and schedules.

Drawing Numbering and Linking Plans with Schedules

Planting Plan:

Subject: PLANTING PLANS	Discipline: LANDSCAPE
Title: GENERAL ARRANGEMENT SHEET 17 OF 47	Drawing No. PP20-DR-LA-0217 Rev. A

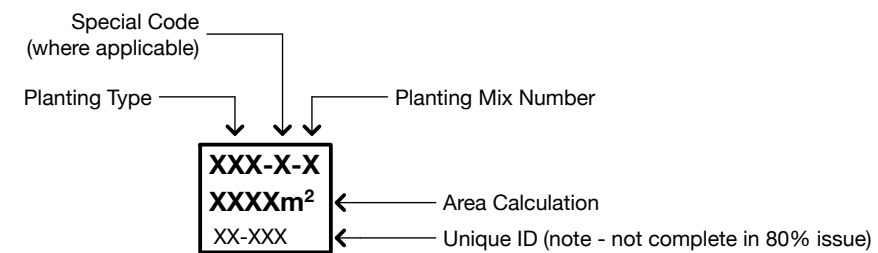
First two digits indicate planting plans drawing set
Last two digits indicate sheet number

Planting Schedule:

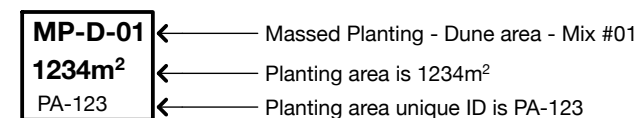
Subject: PLANTING SCHEDULES	Discipline: LANDSCAPE
Title: PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 17	Drawing No. PP20-SC-LA-1701 Rev. A

First two digits indicate the schedules corresponding drawing sheet number
Last two digits indicate the schedule number/partial number (eg. 1/3, 2/3..)

Planting Label Key



EG.



No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

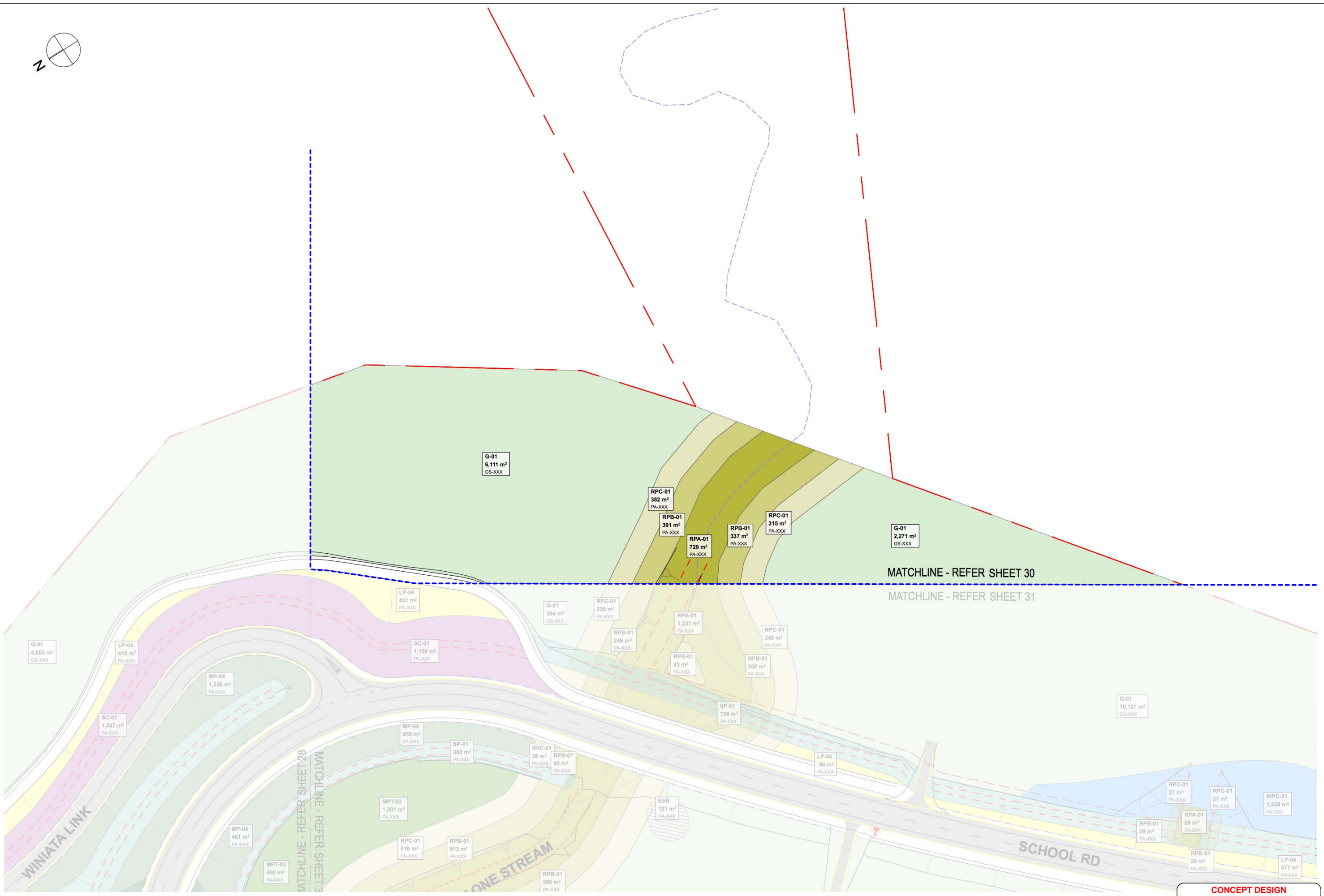
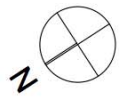
Scale (A1) 1:500	Design Drawn	SD/SH MB	23/03/18	Approved For Construction
Scale (A3) 1:1000	Design Checked			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
BECA
Tonkin+Taylor

Subject: PLANTING PLANS	Discipline: LANDSCAPE
Title: KEY / GENERAL INFORMATION	Drawing No. PP20-DR-LA-0000 Rev. A

CONCEPT DESIGN
NOT FOR CONSTRUCTION



No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

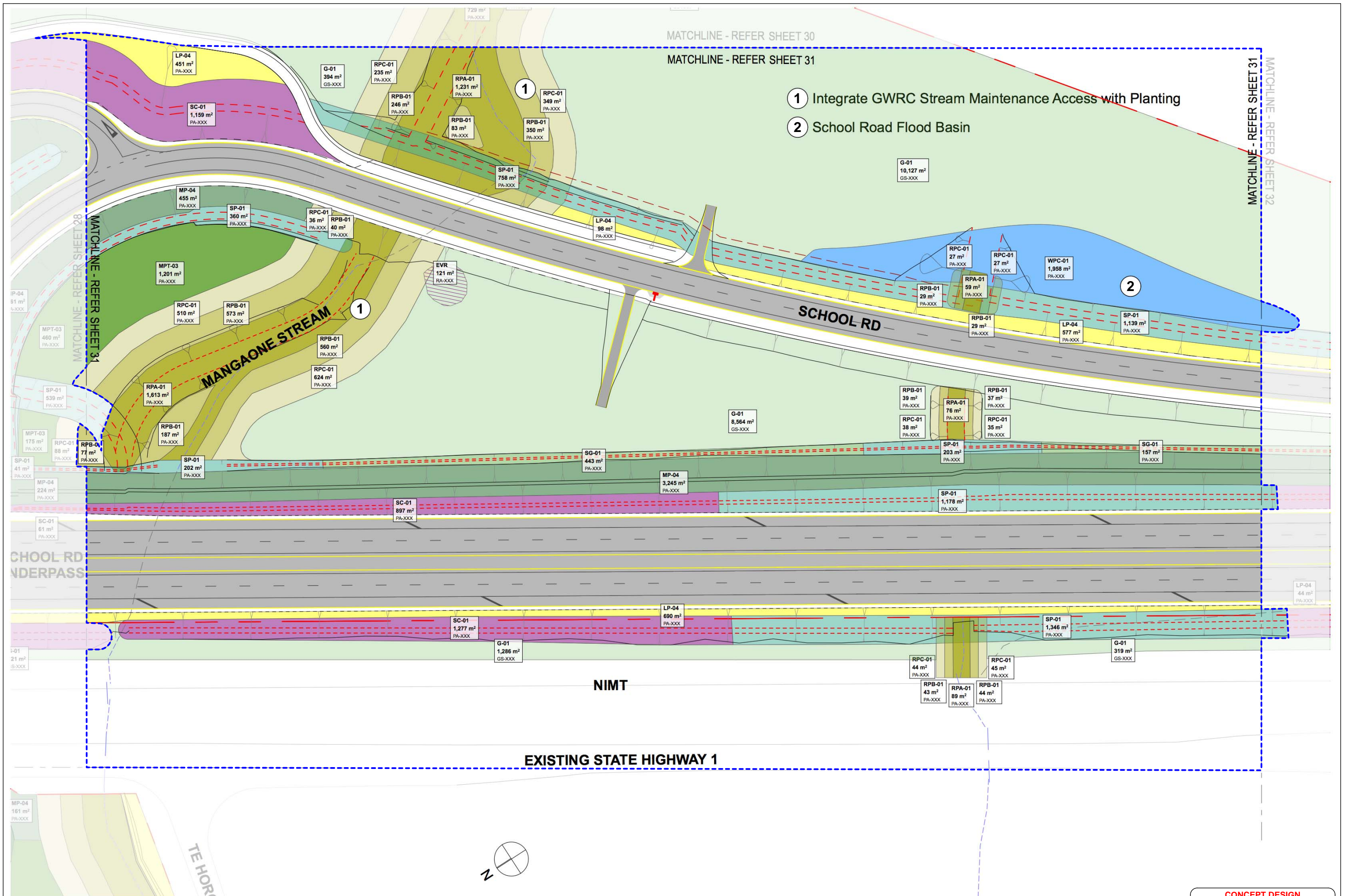
Scale (A1)	1:500	Design	SD/SH	23/03/18	Approved For Construction
Scale (A3)	1:1000	Drawn	MB		Date
		Design Verifier			
		Dwg Check			
		* Refer to Original Hardcopy for Signature			

Peka Peka to Ōtaki Expressway

Subject:	PLANTING PLANS
Title:	GENERAL ARRANGEMENT SHEET 30 OF 47

**CONCEPT DESIGN
NOT FOR CONSTRUCTION**

Discipline:	LANDSCAPE
Drawing No.:	PP20-DR-LA-0230
Rev.:	A



- ① Integrate GWRC Stream Maintenance Access with Planting
- ② School Road Flood Basin

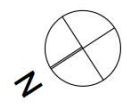
No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	Design	SD/SH	23/03/18	Approved For Construction
1:500	Drawn	MB		
Scale (A3)	Design Checker			Date
1:1000	Dtg Check			
	* Refer to Original Hardcopy for Signature			

Peka Peka to Ōtaki Expressway

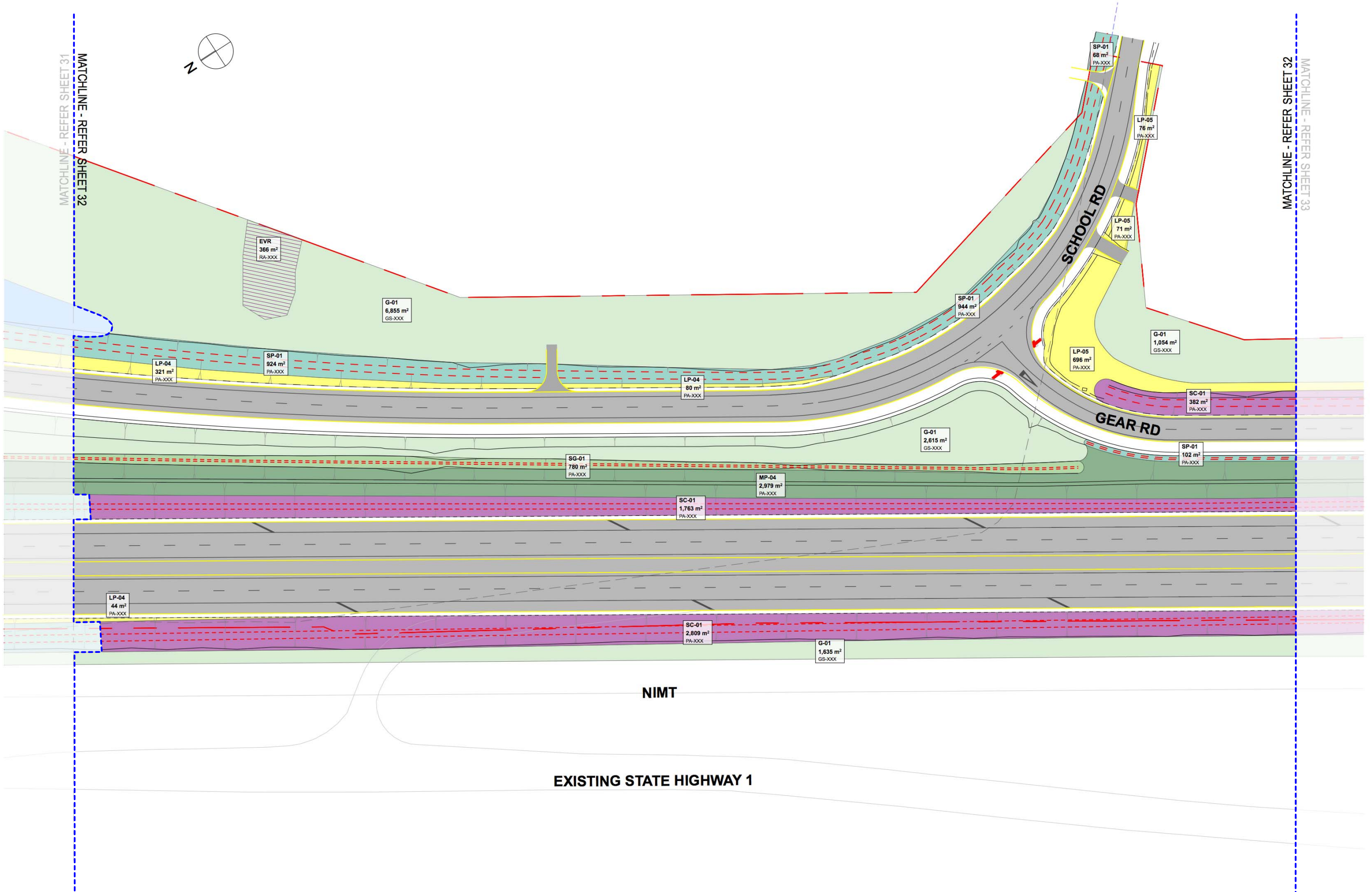
Subject:	PLANTING PLANS
Title:	GENERAL ARRANGEMENT SHEET 31 OF 47

CONCEPT DESIGN NOT FOR CONSTRUCTION	
Discipline:	LANDSCAPE
Drawing No.:	PP20-DR-LA-0231
Rev.:	A



MATCHLINE - REFER SHEET 31
MATCHLINE - REFER SHEET 32

MATCHLINE - REFER SHEET 32
MATCHLINE - REFER SHEET 33



NIMT

EXISTING STATE HIGHWAY 1

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

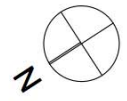
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Scale (A1) 1:500	Drawn	MB	23/03/18	
Scale (A3) 1:1000	Design Verifier			
	Design Check			

* Refer to Original Hardcopy for Signature

Peka Peka to Ōtaki Expressway

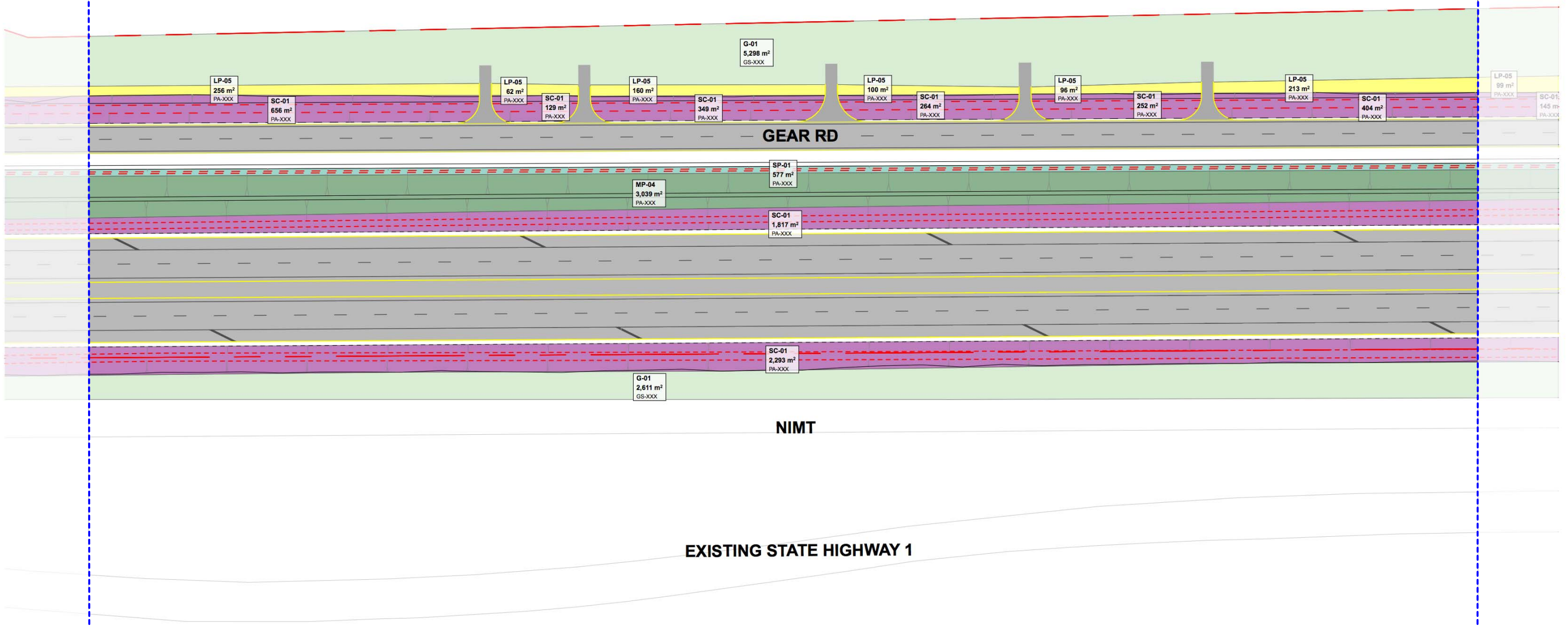
Subject:	PLANTING PLANS
Title:	GENERAL ARRANGEMENT SHEET 32 OF 47

Discipline:	LANDSCAPE
Drawing No.:	PP20-DR-LA-0232
Rev.:	A



MATCHLINE - REFER SHEET 32
MATCHLINE - REFER SHEET 33

MATCHLINE - REFER SHEET 33
MATCHLINE - REFER SHEET 34



EXISTING STATE HIGHWAY 1

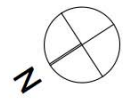
No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	1:500	Design	SD/SH	23/03/18	Approved For Construction
Scale (A3)	1:1000	Drawn	MB		Date
		Design Verifier			
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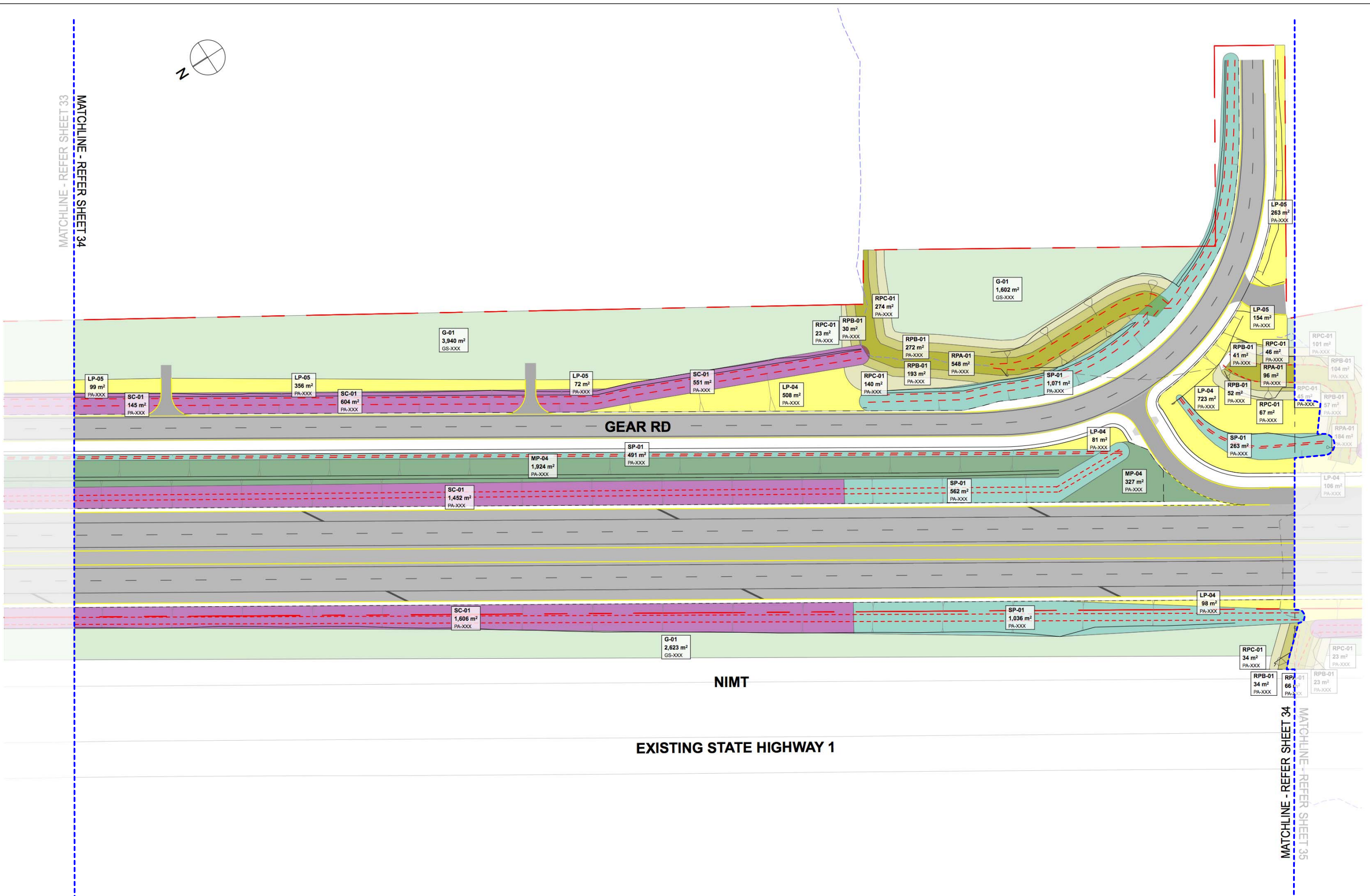
Subject:	PLANTING PLANS
Title:	GENERAL ARRANGEMENT SHEET 33 OF 47

CONCEPT DESIGN
NOT FOR CONSTRUCTION

Discipline:	LANDSCAPE
Drawing No.:	PP20-DR-LA-0233
Rev.:	A



MATCHLINE - REFER SHEET 33
MATCHLINE - REFER SHEET 34



MATCHLINE - REFER SHEET 34
MATCHLINE - REFER SHEET 35

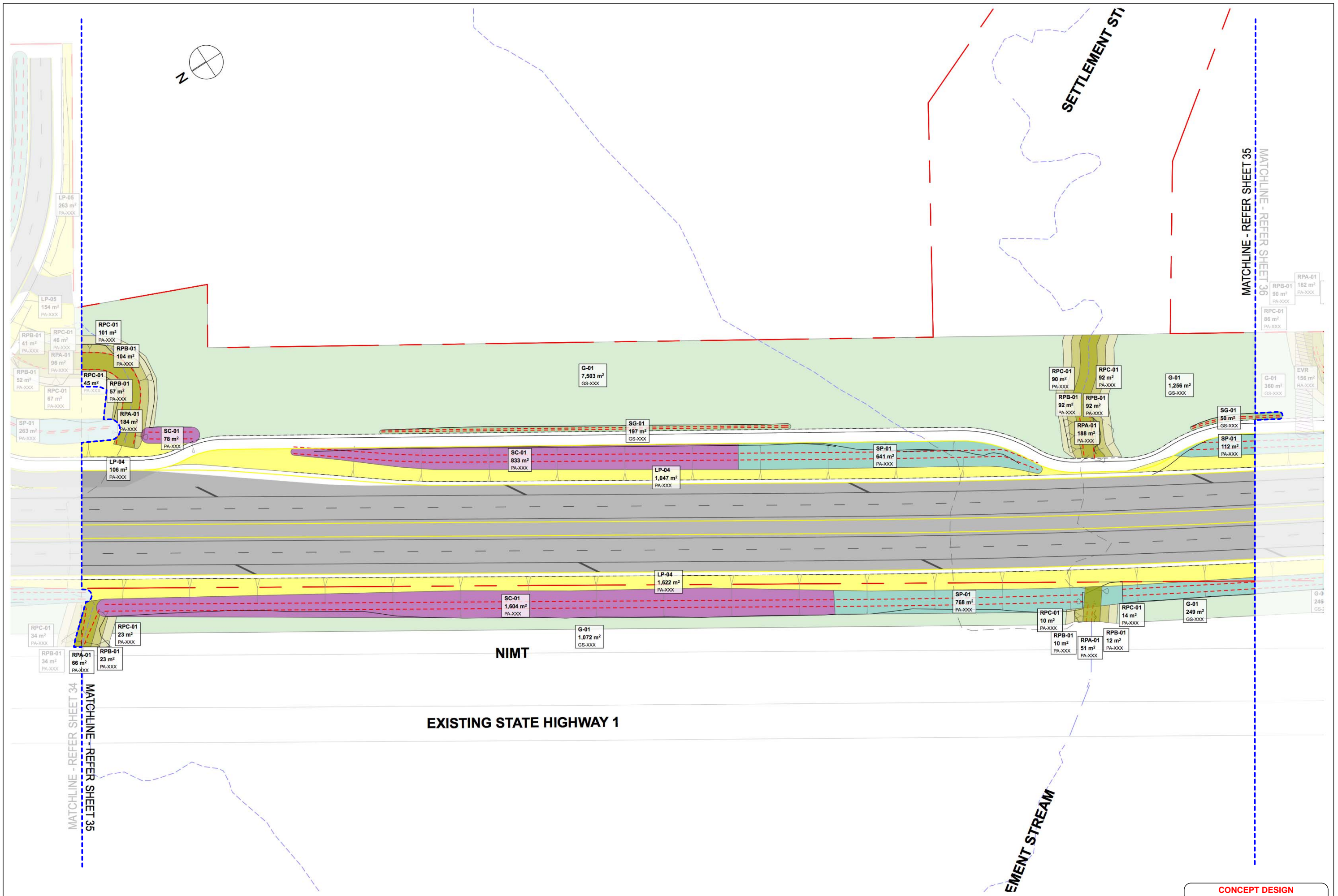
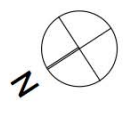
No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	1:500	Design	SD/SH	23/03/18	Approved For Construction
Scale (A3)	1:1000	Drawn	MB		Date
		Design Verifier			
		Design Check			
		* Refer to Original Hardcopy for Signature			

Subject:	PLANTING PLANS
Title:	GENERAL ARRANGEMENT SHEET 34 OF 47

CONCEPT DESIGN
NOT FOR CONSTRUCTION

Discipline:	LANDSCAPE
Drawing No.:	PP20-DR-LA-0234
Rev.:	A



EXISTING STATE HIGHWAY 1

NIMT

SETTLEMENT ST

EMENT STREAM

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	1:500	Design	SD/SH	23/03/18	Approved For Construction
Scale (A3)	1:1000	Drawn	MB		Date
		Design Verifier			
		Design Checker			
* Refer to Original Hardcopy for Signature					

Peka Peka to Ōtaki Expressway

Subject:	PLANTING PLANS
Title:	GENERAL ARRANGEMENT SHEET 35 OF 47

CONCEPT DESIGN NOT FOR CONSTRUCTION	
Discipline:	LANDSCAPE
Drawing No.:	PP20-DR-LA-0235
Rev.:	A

Swale Planting (SP-01)						Area (m2)	6477
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	50%	0.5L	1.8	Base	5,829	
<i>Ficinia nodosa</i>	Knobby Club Rush	50%	0.5L	1.8	Sides	5,829	
Total %		100%	Total			11,658	

Cobbled Swale (SC-01)						Area (m2)	2562
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Ficinia nodosa</i>	Knobby Club Rush	100%	0.5L	1.8	Sides	4,612	
Total %		100%	Total			4,612	

Riparian Planting - C (RPC-01): Upper Bank						Area (m2)	88
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	5%	PB2	1.8	Front	8	
<i>Carex geminata</i>	Rautahi	5%	0.5L	1.8	Mid	8	
<i>Coprosma propinqua</i>	Mingimingi	5%	PB2	1	Mid	4	
<i>Cordyline australis</i>	Cabbage Tree	3%	PB2	1	Mid	3	
<i>Cortaderia fulvida</i>	Toetoe	15%	PB2	1	Front/mid	13	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Mid	9	
<i>Olearia paniculata</i>	Akiraho	12%	PB2	1	Mid	11	
<i>Phormium tenax</i>	NZ Swamp Flax	25%	PB2	1	Mid	22	
<i>Pittosporum tenuifolium</i>	Kohuhu	15%	PB2	1	Mid/Back	13	
<i>Plagianthus regius</i>	Ribbonwood	5%	PB2	1	Back	4	
Total %		100%	Total			95	

Low Planting - Hautere Plains/Te Horo (LP-04)						Area (m2)	1008
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Acaena novae-zelandiae</i>	Piripiri	10%	PB2	1.8	Front	181	
<i>Carex dipsacea</i>	Autumn Sedge	15%	PB2	1.8	Front	272	
<i>Carex solandri</i>	Forest Sedge	15%	PB2	1.8	Front	272	
<i>Coprosma propinqua</i>	Mingimingi	10%	PB2	1	Mid/Back	101	
<i>Cortaderia fulvida</i>	Toetoe	5%	PB2	1	Back	50	
<i>Hebe stricta</i>	Koromiko	15%	PB2	1	Mid	151	
<i>Melicope simplex</i>	Poataniwha	10%	PB2	1	Mid/Back	101	
<i>Olearia paniculata</i>	Akiraho	15%	PB2	1	Mid/Back	151	
<i>Phormium tenax</i>	NZ Swamp Flax	5%	PB2	1	Back	50	
Total %		100%	Total			1,329	

Massed Planting Steep Sites (MPS-01)						Area (m2)	1435
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	5%	PB2	1.8	Front	129	
<i>Carex solandri</i>	Forest Sedge	5%	PB2	1.8	Front	129	
<i>Coprosma rhamnoides</i>	Twiggy Coprosma	10%	PB2	1	Mid/Back	144	
<i>Cortaderia fulvida</i>	Toetoe	20%	PB2	1	Back	287	
<i>Muehlenbeckia complexa</i>	Pohuehue	10%	PB2	1	Mid	144	
<i>Phormium tenax</i>	NZ Swamp Flax	50%	PB2	1	Front/Mid	718	
Total %		100%	Total			1,551	

Massed Planting - Hautere Plains (MP-03)						Area (m2)	2640
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	2%	PB2	1.8	Front	95	
<i>Carex solandri</i>	Forest Sedge	2%	PB2	1.8	Front	95	
<i>Carpodetus Serratus</i>	Marble leaf	10%	PB2	1	Mid	264	
<i>Coprosma propinqua</i>	Mingimingi	3%	PB2	1	Mid/Back	79	
<i>Coprosma robusta</i>	Karamu	8%	PB2	1	Mid/Back	211	
<i>Cortaderia fulvida</i>	Toetoe	6%	PB2	1	Back	158	
<i>Dodonea viscosa</i>	Ake Ake (Green Only)	4%	PB2	1	Back	106	
<i>Griselenia littoralis</i>	Kapuka	8%	PB2	1	Mid	211	
<i>Hebe stricta</i>	Koromiko	8%	PB2	1	Front/Mid	211	
<i>Kunzea robusta</i>	Kanuka	2%	PB2	1	Back	53	
<i>Leptospermum scoparium</i>	Manuka	2%	PB2	1	Back	53	
<i>Myoporum laetum</i>	Ngiao	4%	PB2	1	Mid/Back	106	
<i>Myrsine australis</i>	Red Matipo	7%	PB2	1	Mid/Back	185	
<i>Olearia paniculata</i>	Akiraho	4%	PB2	1	Front/Mid	106	
<i>Phormium tenax</i>	NZ Swamp Flax	10%	PB2	1	Front/Mid	264	
<i>Pittosporum eugenioides</i>	Lemonwood	10%	PB2	1	Mid/Back	264	
<i>Pittosporum tenuifolium</i>	Kohuhu	10%	PB2	1	Mid/Back	264	
Total %		100%	Total			2,725	

Massed Planting - Te Horo (MP-04)						Area (m2)	2021
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	2%	PB2	1.8	Front	73	
<i>Carex solandri</i>	Forest Sedge	2%	PB2	1.8	Front	73	
<i>Carpodetus Serratus</i>	Marble leaf	10%	PB2	1	Mid	202	
<i>Coprosma propinqua</i>	Mingimingi	3%	PB2	1	Mid/Back	61	
<i>Coprosma rhamnoides</i>	Twiggy Coprosma	3%	PB2	1	Mid/Back	61	
<i>Dodonea viscosa</i>	Ake Ake (Green Only)	4%	PB2	1	Back	81	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Front/Mid	202	
<i>Kunzea robusta</i>	Kanuka	2%	PB2	1	Back	40	
<i>Leptospermum scoparium</i>	Manuka	2%	PB2	1	Back	40	
<i>Melicytus ramiflorus</i>	Mahoe	8%	PB2	1	Back	162	
<i>Myoporum laetum</i>	Ngiao	4%	PB2	1	Mid/Back	81	
<i>Myrsine australis</i>	Red Matipo	10%	PB2	1	Mid/Back	202	
<i>Olearia paniculata</i>	Akiraho	10%	PB2	1	Front/Mid	202	
<i>Phormium tenax</i>	NZ Swamp Flax	10%	PB2	1	Front/Mid	202	
<i>Pittosporum eugenioides</i>	Lemonwood	10%	PB2	1	Mid/Back	202	
<i>Pittosporum tenuifolium</i>	Kohuhu	10%	PB2	1	Mid/Back	202	
Total %		100%	Total			2,086	

Massed Planting Tree Enrichment - Pioneer Species - Te Horo (MPT-03)						Area (m2)	635
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	2%	PB2	1.8	Front	23	
<i>Carex solandri</i>	Forest Sedge	2%	PB2	1.8	Front	23	
<i>Carpodetus Serratus</i>	Marble leaf	10%	PB2	1	Mid	64	
<i>Coprosma propinqua</i>	Mingimingi	3%	PB2	1	Mid/Back	19	
<i>Coprosma rhamnoides</i>	Twiggy Coprosma	3%	PB2	1	Mid/Back	19	
<i>Dodonea viscosa</i>	Ake Ake (Green Only)	4%	PB2	1	Back	25	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Front/Mid	64	
<i>Kunzea robusta</i>	Kanuka	2%	PB2	1	Back	13	
<i>Leptospermum scoparium</i>	Manuka	2%	PB2	1	Back	13	
<i>Melicytus ramiflorus</i>	Mahoe	8%	PB2	1	Back	51	
<i>Myoporum laetum</i>	Ngiao	4%	PB2	1	Mid/Back	25	
<i>Myrsine australis</i>	Red Matipo	10%	PB2	1	Mid/Back	64	
<i>Olearia paniculata</i>	Akiraho	10%	PB2	1	Front/Mid	64	
<i>Phormium tenax</i>	NZ Swamp Flax	10%	PB2	1	Front/Mid	64	
<i>Pittosporum eugenioides</i>	Lemonwood	10%	PB2	1	Mid/Back	64	
<i>Pittosporum tenuifolium</i>	Kohuhu	10%	PB2	1	Mid/Back	64	
Total %		100%	Total			659	

Massed Planting Tree Enrichment - Enrichment Species - Te Horo (MPT-03)						Area (m2)	64
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Alectryon excelsus</i>	Titoki	15%	PB15	0.1	Enrich	10	
<i>Nestegis lanceolata</i>	White Maire	5%	PB15	0.1	Enrich	3	
<i>Nestegis montana</i>	Narrow-Leaved Maire	5%	PB15	0.1	Enrich	3	
<i>Podocarpus totara</i>	Totara	60%	PB15	0.1	Enrich	38	
<i>Prumnopitys taxifolia</i>	Matai	15%	PB15	0.1	Enrich	10	
Total %		100%	Total			64	

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	Design	SD/SH	23/03/18	Approved For Construction
1:500	Drawn	MB		
Scale (A3)	Design	SD/SH	23/03/18	Approved For Construction
1:1000	Dwg Verifier			
	Dwg Check			

Subject:	PLANTING SCHEDULES
Title:	PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 28

CONCEPT DESIGN
NOT FOR CONSTRUCTION

Discipline:	LANDSCAPE
Drawing No.:	PP20-SC-LA-2801
Rev.:	A

Swale Planting (SP-01)						Area (m2)	5186
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	50%	0.5L	1.8	Base	4,667	
<i>Ficinia nodosa</i>	Knobby Club Rush	50%	0.5L	1.8	Sides	4,667	
Total %		100%			Total	9,334	

Cobbled Swale (SC-01)						Area (m2)	1667
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Ficinia nodosa</i>	Knobby Club Rush	100%	0.5L	1.8	Sides	3,001	
Total %		100%			Total	3,001	

Grassed Swales (SG)						Area (m2)	600
Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
Perennial Ryegrass		50%					
Fescue Grass		50%					
Total %		100%			Total	-	

Riparian Planting - A (RPA-01): Standing Water/Waters Edge						Area (m2)	3068
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	10%	0.5L	1.8	Front/Mid	552	
<i>Carex secta</i>	Pukio	10%	0.5L	1.8	Front	552	
<i>Carex virgata</i>	Pukio	10%	0.5L	1.8	Front	552	
<i>Coprosma tenuicaulis</i>	Swamp Coprosma	8%	PB2	1	Back	245	
<i>Cyperus ustulatus</i>	Giant Umbrella Sedge	20%	0.5L	1	Front/Mid	614	
<i>Ficinia nodosa</i>	Knobby Club Rush	10%	0.5L	1.8	Front/Mid	552	
<i>Phormium tenax</i>	NZ Swamp Flax	30%	PB2	1	Mid	920	
<i>Typha orientalis</i>	Raupo	2%	PB2	1		61	
Total %		100%			Total	4,048	

Riparian Planting - B (RPB-01): Lower Bank						Area (m2)	2337
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	3%	0.5L	1.8	Front/Mid	126	
<i>Carex dipsacea</i>	Autumn Sedge	4%	PB2	1.8	Front	168	
<i>Carex secta</i>	Pukio	4%	0.5L	1.8	Front	168	
<i>Carex virgata</i>	Pukio	4%	0.5L	1.8	Front	168	
<i>Coprosma tenuicaulis</i>	Swamp Coprosma	8%	PB2	1	Mid	187	
<i>Cordyline australis</i>	Cabbage Tree	6%	PB2	1	Mid	140	
<i>Cortaderia fulvida</i>	Toetoe	20%	PB2	1	Front/mid	467	
<i>Cyperus ustulatus</i>	Giant Umbrella Sedge	8%	0.5L	1	Front/Mid	187	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Mid	234	
<i>Ficinia nodosa</i>	Knobby Club Rush	3%	0.5L	1.8	Front/Mid	126	
<i>Phormium tenax</i>	NZ Swamp Flax	30%	PB2	1	Mid	701	
Total %		100%			Total	2,672	

Riparian Planting - C (RPC-01): Upper Bank						Area (m2)	1970
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	5%	PB2	1.8	Front	177	
<i>Carex geminata</i>	Rautahi	5%	0.5L	1.8	Mid	177	
<i>Coprosma propinqua</i>	Mingimingi	5%	PB2	1	Mid	99	
<i>Cordyline australis</i>	Cabbage Tree	3%	PB2	1	Mid	59	
<i>Cortaderia fulvida</i>	Toetoe	15%	PB2	1	Front/mid	296	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Mid	197	
<i>Olearia paniculata</i>	Akiraho	12%	PB2	1	Mid	236	
<i>Phormium tenax</i>	NZ Swamp Flax	25%	PB2	1	Mid	493	
<i>Pittosporum tenuifolium</i>	Kohuhu	15%	PB2	1	Mid/Back	296	
<i>Plagianthus regius</i>	Ribbonwood	5%	PB2	1	Back	99	
Total %		100%			Total	2,129	

Low Planting - Hautere Plains/Te Horo (LP-04)						Area (m2)	1816
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Acaena novae-zelandiae</i>	Piripiri	10%	PB2	1.8	Front	327	
<i>Carex dipsacea</i>	Autumn Sedge	15%	PB2	1.8	Front	490	
<i>Carex solandri</i>	Forest Sedge	15%	PB2	1.8	Front	490	
<i>Coprosma propinqua</i>	Mingimingi	10%	PB2	1	Mid/Back	182	
<i>Cortaderia fulvida</i>	Toetoe	5%	PB2	1	Back	91	
<i>Hebe stricta</i>	Koromiko	15%	PB2	1	Mid	272	
<i>Melicope simplex</i>	Poataniwha	10%	PB2	1	Mid/Back	182	
<i>Olearia paniculata</i>	Akiraho	15%	PB2	1	Mid/Back	272	
<i>Phormium tenax</i>	NZ Swamp Flax	5%	PB2	1	Back	91	
Total %		100%			Total	2,397	

Massed Planting - Te Horo (MP-04)						Area (m2)	3860
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	2%	PB2	1.8	Front	139	
<i>Carex solandri</i>	Forest Sedge	2%	PB2	1.8	Front	139	
<i>Carpodetus Serratus</i>	Marble leaf	10%	PB2	1	Mid	386	
<i>Coprosma propinqua</i>	Mingimingi	3%	PB2	1	Mid/Back	116	
<i>Coprosma rhamnoides</i>	Twiggy Coprosma	3%	PB2	1	Mid/Back	116	
<i>Dodonea viscosa</i>	Ake Ake (Green Only)	4%	PB2	1	Back	154	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Front/Mid	386	
<i>Kunzea robusta</i>	Manuka	2%	PB2	1	Back	77	
<i>Leptospermum scoparium</i>	Manuka	2%	PB2	1	Back	77	
<i>Melicytus ramiflorus</i>	Mahoe	8%	PB2	1	Back	309	
<i>Myoporum laetum</i>	Ngiao	4%	PB2	1	Mid/Back	154	
<i>Myrsine australis</i>	Red Matipo	10%	PB2	1	Mid/Back	386	
<i>Olearia paniculata</i>	Akiraho	10%	PB2	1	Front/Mid	386	
<i>Phormium tenax</i>	NZ Swamp Flax	10%	PB2	1	Front/Mid	386	
<i>Pittosporum eugenioides</i>	Lemonwood	10%	PB2	1	Mid/Back	386	
<i>Pittosporum tenuifolium</i>	Kohuhu	10%	PB2	1	Mid/Back	386	
Total %		100%			Total	3,983	

Massed Planting Tree Enrichment - Pioneer Species - Te Horo (MPT-03)						Area (m2)	1201
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	2%	PB2	1.8	Front	43	
<i>Carex solandri</i>	Forest Sedge	2%	PB2	1.8	Front	43	
<i>Carpodetus Serratus</i>	Marble leaf	10%	PB2	1	Mid	120	
<i>Coprosma propinqua</i>	Mingimingi	3%	PB2	1	Mid/Back	36	
<i>Coprosma rhamnoides</i>	Twiggy Coprosma	3%	PB2	1	Mid/Back	36	
<i>Dodonea viscosa</i>	Ake Ake (Green Only)	4%	PB2	1	Back	48	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Front/Mid	120	
<i>Kunzea robusta</i>	Manuka	2%	PB2	1	Back	24	
<i>Leptospermum scoparium</i>	Manuka	2%	PB2	1	Back	24	
<i>Melicytus ramiflorus</i>	Mahoe	8%	PB2	1	Back	96	
<i>Myoporum laetum</i>	Ngiao	4%	PB2	1	Mid/Back	48	
<i>Myrsine australis</i>	Red Matipo	10%	PB2	1	Mid/Back	120	
<i>Olearia paniculata</i>	Akiraho	10%	PB2	1	Front/Mid	120	
<i>Phormium tenax</i>	NZ Swamp Flax	10%	PB2	1	Front/Mid	120	
<i>Pittosporum eugenioides</i>	Lemonwood	10%	PB2	1	Mid/Back	120	
<i>Pittosporum tenuifolium</i>	Kohuhu	10%	PB2	1	Mid/Back	120	
Total %		100%			Total	1,238	

Massed Planting Tree Enrichment - Enrichment Species - Te Horo (MPT-03)						Area (m2)	120
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Alectryon excelsus</i>	Titoki	15%	PB15	0.1	Enrich	18	
<i>Nestegis lanceolata</i>	White Maire	5%	PB15	0.1	Enrich	6	
<i>Nestegis montana</i>	Narrow-Leaved Maire	5%	PB15	0.1	Enrich	6	
<i>Podocarpus totara</i>	Totara	60%	PB15	0.1	Enrich	72	
<i>Prumnopitys taxifolia</i>	Matai	15%	PB15	0.1	Enrich	18	
Total %		100%			Total	120	

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	Design	SD/SH	23/03/18	Approved For Construction
1:500	Drawn	MB		
Scale (A3)	Design	SD/SH	23/03/18	Approved For Construction
1:1000	Dwg Verifier			
	Dwg Check			
	Date			



Subject:	PLANTING SCHEDULES	Discipline:	LANDSCAPE
Title:	PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 31	Drawing No.:	PP20-SC-LA-3101
		Rev.:	A

CONCEPT DESIGN
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Swale Planting (SP-01)						Area (m2)	3423
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	50%	0.5L	1.8	Base	3,081	
<i>Ficinia nodosa</i>	Knobby Club Rush	50%	0.5L	1.8	Sides	3,081	
Total %		100%	Total			6,162	

Cobbled Swale (SC-01)						Area (m2)	2179
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Ficinia nodosa</i>	Knobby Club Rush	100%	0.5L	1.8	Sides	3,922	
Total %		100%	Total			3,922	

Riparian Planting - A (RPA-01): Standing Water/Waters Edge						Area (m2)	644
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	10%	0.5L	1.8	Front/Mid	116	
<i>Carex secta</i>	Pukio	10%	0.5L	1.8	Front	116	
<i>Carex virgata</i>	Pukio	10%	0.5L	1.8	Front	116	
<i>Coprosma tenuicaulis</i>	Swamp Coprosma	8%	PB2	1	Back	52	
<i>Cyperus ustulatus</i>	Giant Umbrella Sedge	20%	0.5L	1	Front/Mid	129	
<i>Ficinia nodosa</i>	Knobby Club Rush	10%	0.5L	1.8	Front/Mid	116	
<i>Phormium tenax</i>	NZ Swamp Flax	30%	PB2	1	Mid	193	
<i>Typha orientalis</i>	Raupo	2%	PB2	1		13	
Total %		100%	Total			851	

Riparian Planting - B (RPB-01): Lower Bank						Area (m2)	622
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Apodasmia similis</i>	Oioi / Jointed Wire Rush	3%	0.5L	1.8	Front/Mid	34	
<i>Carex dipsacea</i>	Autumn Sedge	4%	PB2	1.8	Front	45	
<i>Carex secta</i>	Pukio	4%	0.5L	1.8	Front	45	
<i>Carex virgata</i>	Pukio	4%	0.5L	1.8	Front	45	
<i>Coprosma tenuicaulis</i>	Swamp Coprosma	8%	PB2	1	Mid	50	
<i>Cordyline australis</i>	Cabbage Tree	6%	PB2	1	Mid	37	
<i>Cortaderia fulvida</i>	Toetoe	20%	PB2	1	Front/mid	124	
<i>Cyperus ustulatus</i>	Giant Umbrella Sedge	8%	0.5L	1	Front/Mid	50	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Mid	62	
<i>Ficinia nodosa</i>	Knobby Club Rush	3%	0.5L	1.8	Front/Mid	34	
<i>Phormium tenax</i>	NZ Swamp Flax	30%	PB2	1	Mid	187	
Total %		100%	Total			713	

Riparian Planting - C (RPC-01): Upper Bank						Area (m2)	584
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	5%	PB2	1.8	Front	53	
<i>Carex geminata</i>	Rautahi	5%	0.5L	1.8	Mid	53	
<i>Coprosma propinqua</i>	Mingimingi	5%	PB2	1	Mid	29	
<i>Cordyline australis</i>	Cabbage Tree	3%	PB2	1	Mid	18	
<i>Cortaderia fulvida</i>	Toetoe	15%	PB2	1	Front/mid	88	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Mid	58	
<i>Olearia paniculata</i>	Akiraho	12%	PB2	1	Mid	70	
<i>Phormium tenax</i>	NZ Swamp Flax	25%	PB2	1	Mid	146	
<i>Pittosporum tenuifolium</i>	Kohuhu	15%	PB2	1	Mid/Back	88	
<i>Plagianthus regius</i>	Ribbonwood	5%	PB2	1	Back	29	
Total %		100%	Total			632	

Low Planting - Hautere Plains/Te Horo (LP-04)						Area (m2)	1410
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Acaena novae-zelandiae</i>	Piripiri	10%	PB2	1.8	Front	254	
<i>Carex dipsacea</i>	Autumn Sedge	15%	PB2	1.8	Front	381	
<i>Carex solandri</i>	Forest Sedge	15%	PB2	1.8	Front	381	
<i>Coprosma propinqua</i>	Mingimingi	10%	PB2	1	Mid/Back	141	
<i>Cortaderia fulvida</i>	Toetoe	5%	PB2	1	Back	71	
<i>Hebe stricta</i>	Koromiko	15%	PB2	1	Mid	212	
<i>Melicope simplex</i>	Poataniwha	10%	PB2	1	Mid/Back	141	
<i>Olearia paniculata</i>	Akiraho	15%	PB2	1	Mid/Back	212	
<i>Phormium tenax</i>	NZ Swamp Flax	5%	PB2	1	Back	71	
Total %		100%	Total			1,864	

Low Planting - Driveways (LP-05)						Area (m2)	944
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Acaena novae-zelandiae</i>	Piripiri	15%	PB2	1.8	Front	255	
<i>Carex dipsacea</i>	Autumn Sedge	15%	PB2	1.8	Front	255	
<i>Carex solandri</i>	Forest Sedge	15%	PB2	1.8	Front	255	
<i>Coprosma propinqua</i>	Mingimingi	15%	PB2	1	Mid/Back	142	
<i>Hebe stricta</i>	Koromiko	25%	PB2	1	Mid	236	
<i>Olearia paniculata</i>	Akiraho	15%	PB2	1	Mid/Back	142	
Total %		100%	Total			1,285	

Massed Planting - Te Horo (MP-04)						Area (m2)	2251
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants	
<i>Carex dipsacea</i>	Autumn Sedge	2%	PB2	1.8	Front	81	
<i>Carex solandri</i>	Forest Sedge	2%	PB2	1.8	Front	81	
<i>Carpodetus Serratus</i>	Marble leaf	10%	PB2	1	Mid	225	
<i>Coprosma propinqua</i>	Mingimingi	3%	PB2	1	Mid/Back	68	
<i>Coprosma rhamnoides</i>	Twiggy Coprosma	3%	PB2	1	Mid/Back	68	
<i>Dodonea viscosa</i>	Ake Ake (Green Only)	4%	PB2	1	Back	90	
<i>Hebe stricta</i>	Koromiko	10%	PB2	1	Front/Mid	225	
<i>Kunzea robusta</i>	Kanuka	2%	PB2	1	Back	45	
<i>Leptospermum scoparium</i>	Manuka	2%	PB2	1	Back	45	
<i>Melicytus ramiflorus</i>	Mahoe	8%	PB2	1	Back	180	
<i>Myoporum laetum</i>	Ngiao	4%	PB2	1	Mid/Back	90	
<i>Myrsine australis</i>	Red Matipo	10%	PB2	1	Mid/Back	225	
<i>Olearia paniculata</i>	Akiraho	10%	PB2	1	Front/Mid	225	
<i>Phormium tenax</i>	NZ Swamp Flax	10%	PB2	1	Front/Mid	225	
<i>Pittosporum eugenioides</i>	Lemonwood	10%	PB2	1	Mid/Back	225	
<i>Pittosporum tenuifolium</i>	Kohuhu	10%	PB2	1	Mid/Back	225	
Total %		100%	Total			2,323	

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1)	Design	SD/SH	23/03/18	Approved For Construction
1:500	Drawn	MB		
Scale (A3)	Dwg Verifier			
1:1000	Dwg Check			
	* Refer to Original Hardcopy for Signature			

Peka Peka to Otaki Expressway

Subject:	PLANTING SCHEDULES
Title:	PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 34

CONCEPT DESIGN
NOT FOR CONSTRUCTION

Discipline:	LANDSCAPE
Drawing No.:	PP20-SC-LA-3401
Rev.:	A

APPENDIX D – STORMWATER INFORMATION

Culvert 24:

Culvert 24 Temporary Diversion Works

Name	Signed	Date
Tyler Campbell		09/03/2018
Bruce Symmans		09/03/2018

Comments

Option 1: Full Diversion

- 72 m long diversion channel
- US invert 16.28mRL, DS invert 15.9mRL (NZVD 2009)
- Sized to convey a 2.3 year ARI without climate change flow (mean annual flood event) of 24.1 m³/s (as per flood frequency analysis for Mangaone Stream, previously presented in the Stormwater Design Philosophy Report Rev 2 (PP20 August 2017))
- Note that temporary diversion ties into permanent Mangaone Stream diversion at upstream end
- Channel plan, dimensions and calcs as below

Roughness Coefficient:	0.035	...	Flow Area:	11.20	m ²
Channel Slope:	0.00530	m/m	Wetted Perimeter:	10.61	m
Normal Depth:	1.88	m	Hydraulic Radius:	1.06	m
Left Side Slope:	2.00	m/m (H:V)	Top Width:	9.72	m
Right Side Slope:	2.00	m/m (H:V)	Critical Depth:	1.51	m
Bottom Width:	2.20	m	Critical Slope:	0.01362	m/m
Discharge:	24.17	m ³ /s	Velocity:	2.16	m/s
			Velocity Head:	0.24	m
			Specific Energy:	2.12	m
			Froude Number:	0.64	
			Flow Type:	Subcritical	

Option 2: Partial Diversion

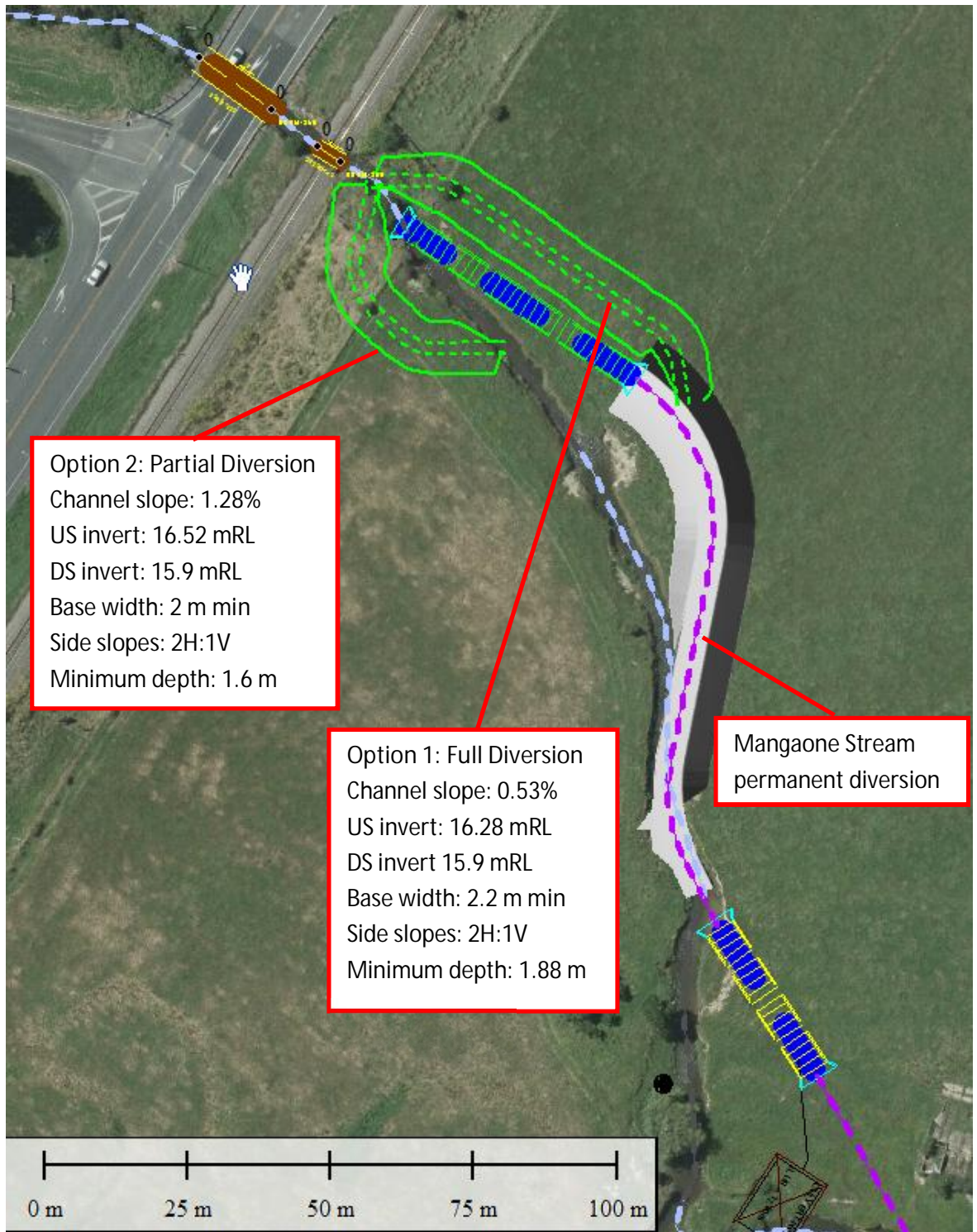
- 48 m long diversion channel
- US invert 16.52mRL, DS invert 15.9mRL (NZVD 2009)
- Sized to convey a 2.3 year ARI without climate change flow (mean annual flood event) of 24.1 m³/s (as per flood frequency analysis for Mangaone Stream, previously presented in the Stormwater Design Philosophy Report Rev 2 (PP20 August 2017))
- Channel plan, dimensions and calcs as below

Roughness Coefficient:	<input type="text" value="0.035"/>	<input type="button" value="..."/>	Flow Area:	<input type="text" value="8.32"/>	m ²
Channel Slope:	<input type="text" value="0.01280"/>	m/m	Wetted Perimeter:	<input type="text" value="9.16"/>	m
Normal Depth:	<input type="text" value="1.60"/>	m	Hydraulic Radius:	<input type="text" value="0.91"/>	m
Left Side Slope:	<input type="text" value="2.00"/>	m/m (H:V)	Top Width:	<input type="text" value="8.40"/>	m
Right Side Slope:	<input type="text" value="2.00"/>	m/m (H:V)	Critical Depth:	<input type="text" value="1.58"/>	m
Bottom Width:	<input type="text" value="2.00"/>	m	Critical Slope:	<input type="text" value="0.01356"/>	m/m
Discharge:	<input type="text" value="25.23"/>	m ³ /s	Velocity:	<input type="text" value="3.03"/>	m/s
			Velocity Head:	<input type="text" value="0.47"/>	m
			Specific Energy:	<input type="text" value="2.07"/>	m
			Froude Number:	<input type="text" value="0.97"/>	
			Flow Type:	<input type="text" value="Subcritical"/>	

Channel Lining:

The channel will require scour protection from velocities of up to 2.2 m/s and 3.0 m/s for option 1 & 2 respectively in the 2 year ARI event. Possible solutions are outlined below, similar solutions could also be used as approved:

- Rock rip rap
- Erosion Control Blankets
- Turf reinforcement mats





Levels in terms of NZVD 2009

Culvert 28:

Stormwater Review

Culvert 28 Temporary Works

Name	Signed	Date
Tyler Campbell		9/03/2018
Bruce Symmans		9/03/2018

Comments

A permanent Culvert 28 is proposed on the Mangaone floodplain, noting that it will not be within a defined stream channel. In large floods, flows break out of the Mangaone Stream and spread across this flood plain. A portion of the flood plain flows are diverted through an existing rail and SH1 culvert on what is known as the "Mangaone Overflow". A drain alongside School Road also enters these existing culverts from the south. The figure following illustrates the flood pattern in the 10 yr ARI CC event in the pre project situation (of similar magnitude to the 20 yr ARI present climate event).

The existing culverts are located close to the downstream end of proposed Culvert 28. In the post project situation, Culvert 28 will convey the School Road drain and Mangaone Overflow under the expressway embankment. An embankment for a School Road realignment and further permanent Culvert 27 are proposed upstream of the expressway embankment and Culvert 28. The construction of the expressway embankment and Culvert 28 are expected to be complete prior to construction of the School Road embankment and Culvert 27 in this area (as advised by the construction team).

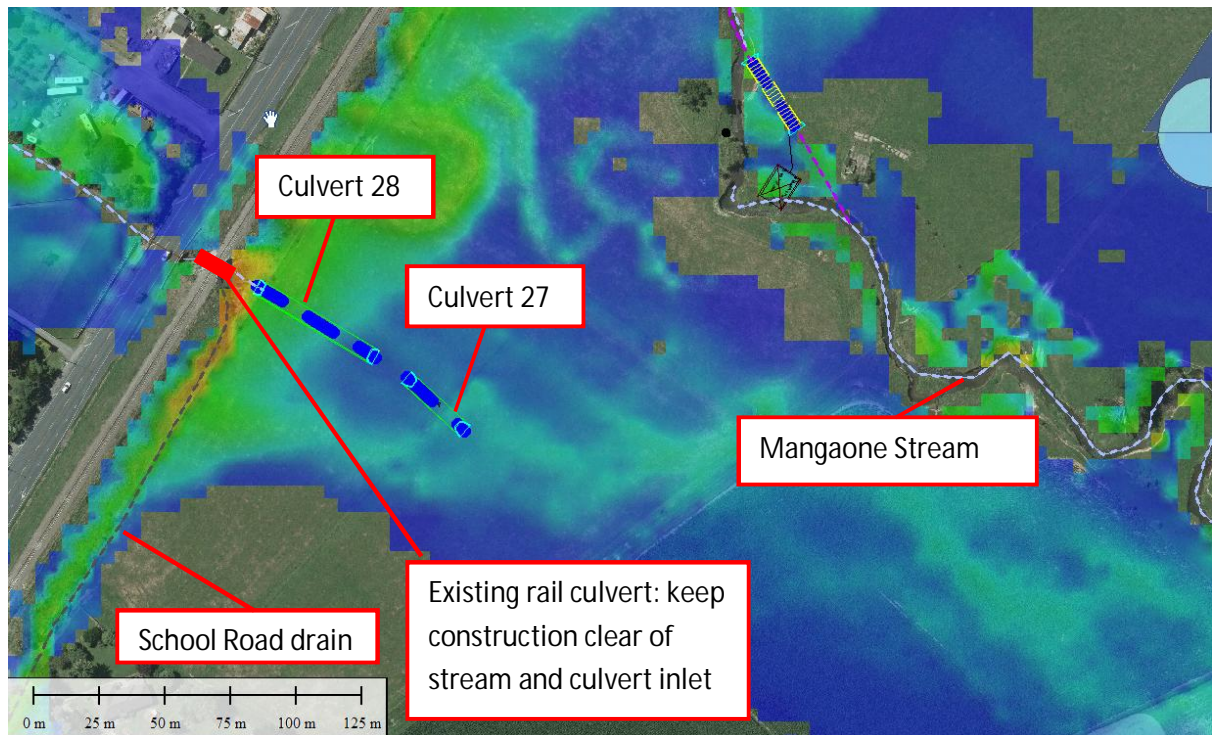
Our findings are as follows:

- Culvert 28 is located within a flood plain but not within a defined existing stream channel.
- The mean annual flood on the Mangaone Stream is estimated to be 24.1 m³/s as per flood frequency analysis for Mangaone Stream, previously presented in the Stormwater Design Philosophy Report Rev 2 (PP20 August 2017).
- In the mean annual flood, which would typically be the design flood event for a temporary stream diversion of less than 30 days, flood flows are expected to be contained within the existing Mangaone Stream channel, without breaking out and inundating the Culvert 28 construction site.
- The existing rail and SH1 culverts located downstream of Culvert 28 will still convey the School Road drain flows in the mean annual flood.
- The pre-project 10 year ARI flood event with the effects of climate change (approx. equal to present day 20 year ARI event) is expected to cause inundation of the Culvert 28 works site with water depths of up to 0.8 m.

Our recommendations are as follows:

- No temporary stream diversion is necessarily required for construction of Culvert 28 as it is not located within a defined existing stream channel.
- Construction of Culvert 28 should be complete before the expressway embankment causes any significant obstruction of the flood plain to avoid adverse impacts on flood plain capacity. If this is not practicable, further assessment and specific measures will likely be required.
- Provision should be made for the continuity of the School Road drain flows during construction.

- Construction works for Culvert 28 should be kept clear of inlet to the existing rail culvert downstream of Culvert 28, so as not to obstruct flow from the School Road drain in smaller events, and also breakout flows from the Mangaone Stream in larger events.



Inundation of works site during pre-project 10 yr CC2130 flood event

Culvert 36:

TEMPORARY STREAM DIVERSION FOR CONSTRUCTION OF CULVERT 36

Introduction

A temporary partial stream diversion is proposed to enable the construction of proposed permanent culvert 36 for the Peka Peka to Qtaki Expressway.

A specific works methodology has been developed for this diversion to minimise adverse water quality and fish passage effects during construction as per the PP2Q Environmental Management Plan (EMP). Sizing of the channel and construction methodology is set out as per the NZTA Erosion and Sediment Control Guidelines.

Diversion sizing

- The diversion will consist of a temporary coffer dam and channel diversion. x The temporary diversion channel has been designed to convey a 2 year ARI flow (present climate). This is consistent with NZTA guidelines for stream diversions of less than 30 days (15 day construction period anticipated for Culvert 36).
- HEC HMS software with the SCS method has been used to estimate design flow, applied in accordance with Appendix 1 of “Subdivision and Development Principles and Requirements” (KCDC 2012) as described in Section 3.3.4 of the PP2Q Stormwater Design Philosophy Report Rev 2 (PP2Q August 2017).
- Manning’s equation has been used to estimate channel capacity, flow depths and velocities.
- Existing stream levels have been based on KCDC LiDAR collected in 2010, supplemented by conventional survey collected for the purposes of the PP2Q project.
- All vertical levels are in terms of NZVD 2009.

Diversion channel requirements:

Trapezoidal channel:

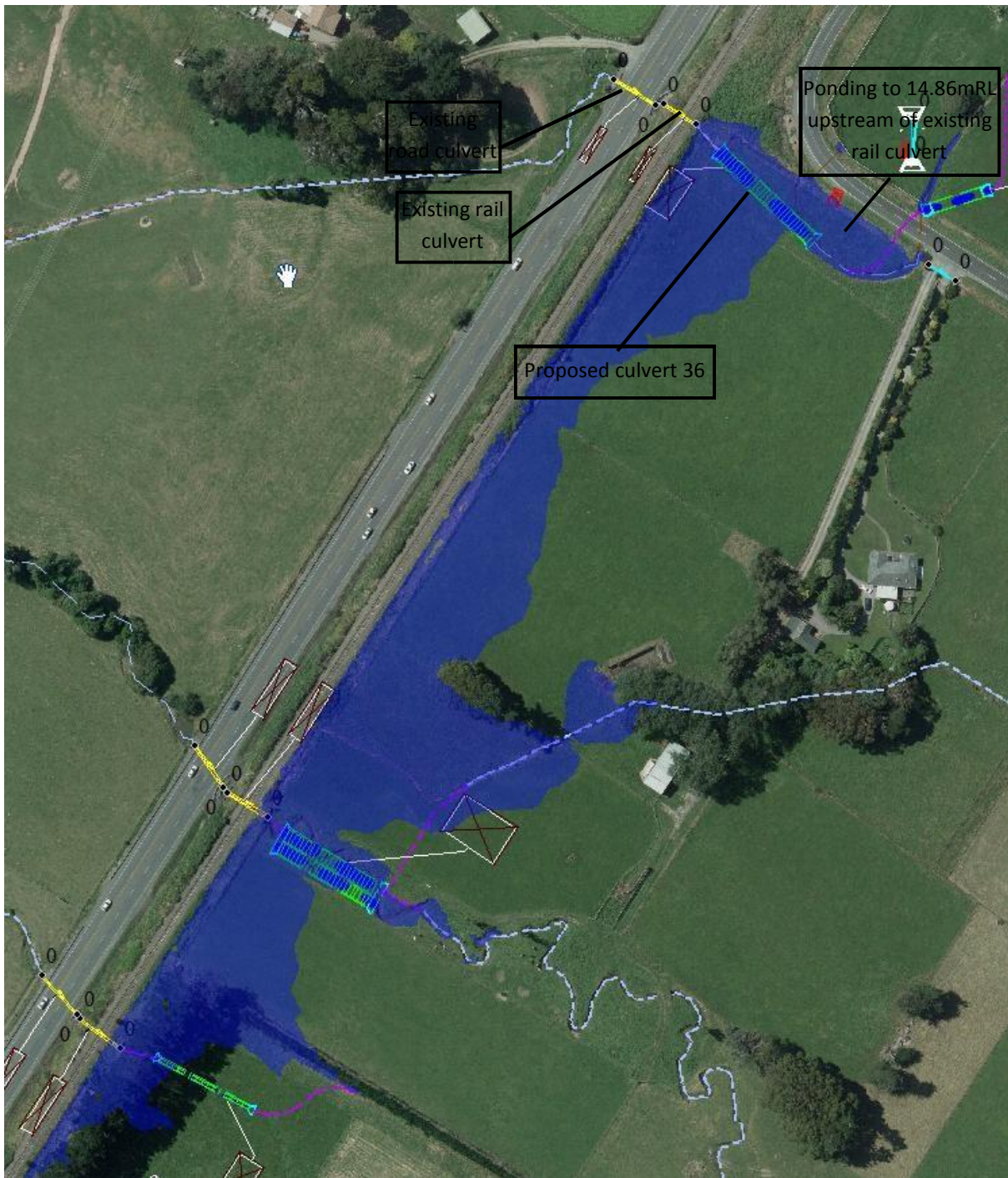
- 0.53% grade (minimum)
- Trapezoidal cross section
- 2.5 m base width
- 2:1 H:V side slopes
- 0.55 m depth (minimum)
- 0.035 manning’s roughness, n value.
- Assuming a grassed or gravel/cobble substrate.
- 2.2 m³/s, 2 year ARI flow (present climate)
- 1.12 m/s assuming above parameters

Plan and cross sections are attached showing two indicative locations of the temporary stream diversion for a trapezoidal channel with a 2.5 m base width.

Construction of the upstream Culvert 35 with permanent stream diversion is anticipated to have been completed at the time of construction of Culvert 36.

Although the channel has been sized to convey the 2 year ARI flow, we note that there is likely to be some ponding into the proposed Culvert 36 works area in relatively small flood events due to the limited capacity of the downstream rail and road culverts.

Ponding up to 14.86 mRL is anticipated in the vicinity of the Culvert 36 works area in the 2 year ARI (present climate) flow as shown in figure below. This is based on a calculation in HY-8 assuming flows are shared between the road and rail culverts for the Gear, Settlement and Coolen catchments (2 year ARI flow $5.88\text{m}^3/\text{s}$ for these three catchments combined). The tail water conditions for the road culvert capacity calculation were based on the downstream channel geometry. The tail water conditions for the rail culvert capacity calculation were based in turn on the headwater conditions from the road culvert capacity calculation.



Plan view showing ponding to 14.86mRL upstream of existing rail culvert in 2 year ARI flood

Reinstatement

Unless otherwise agreed in writing with GWRC, upon the completion of any temporary in-stream works, the stream bed and margins will, as far as practicable, be restored to a state that closely matches the upstream and downstream riparian and in-stream habitats and visual appearance.

Applicability

This report has been prepared for the exclusive use of our client, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:



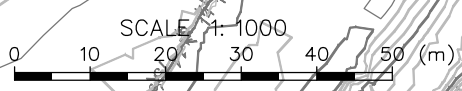
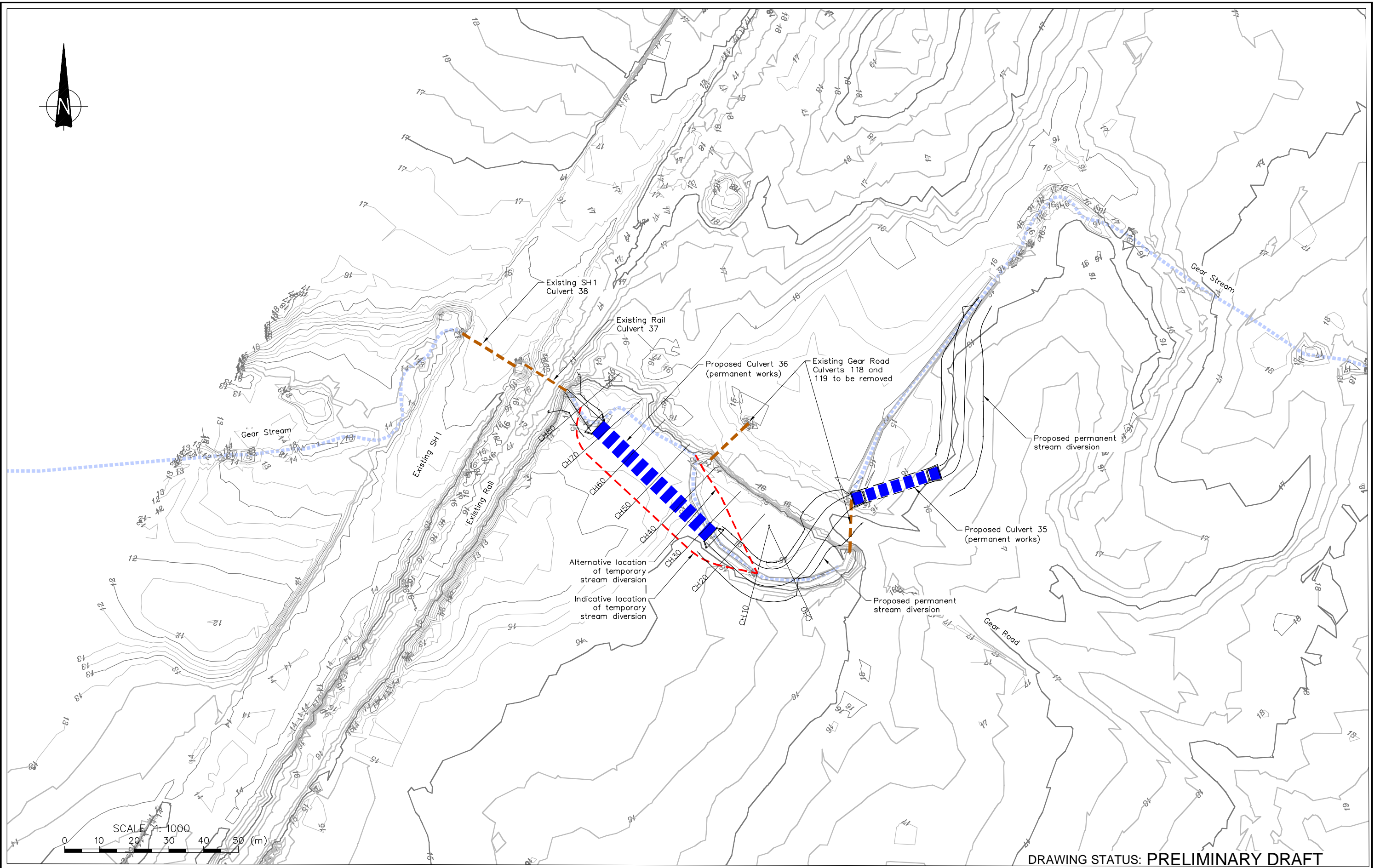
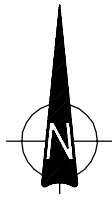
.....
Tyler Campbell

.....
Bruce Symmans

Civil Engineer, Water Engineering

Design Manager

Reviewed by Dean Miller, Environmental Lead, and Dewi Knapstein, Stormwater Lead.



DRAWING STATUS: PRELIMINARY DRAFT

DESIGNED :	TJAC	Mar. 18
DRAWN :	DMK	Mar. 18
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CADFILE :	\\Culv 36 & 35 Temp Works_plan.dwg	
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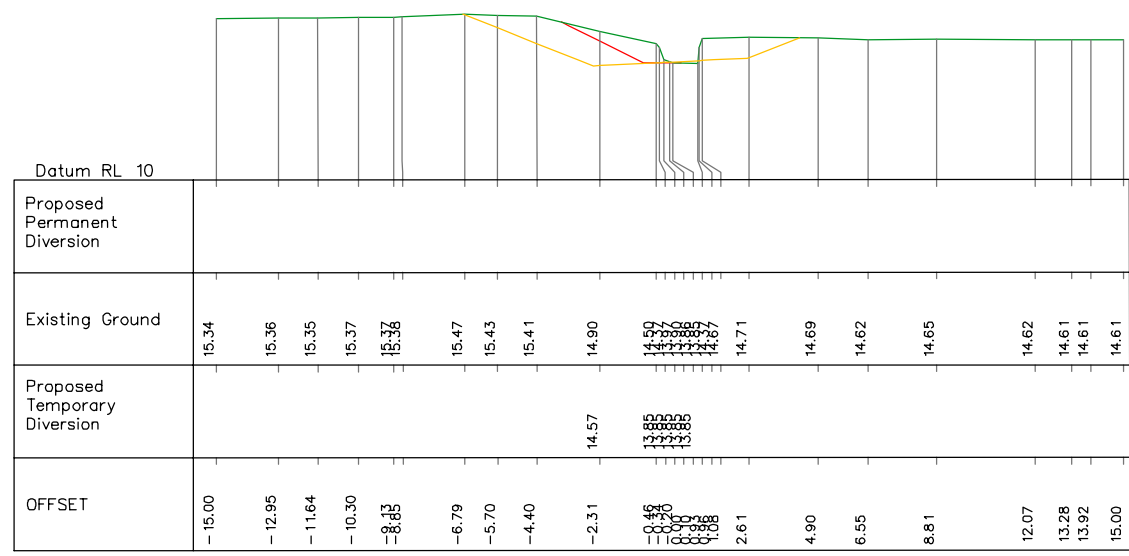
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Peka Peka to Ōtaki Expressway

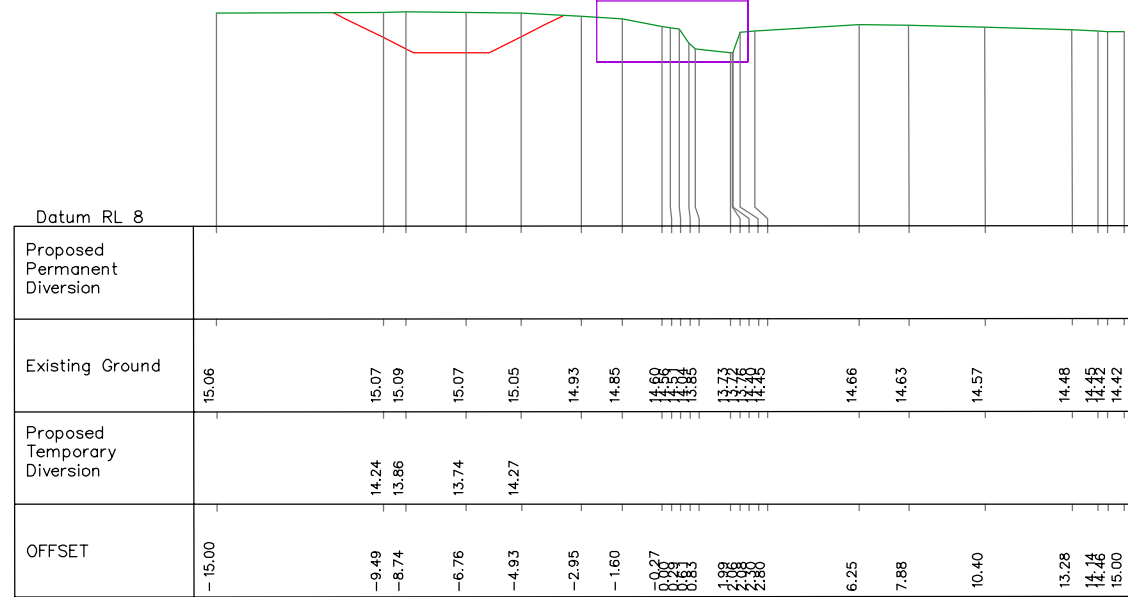
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CLIENT, PROJECT	NZ TRANSPORT AGENCY PEKA PEKA TO OTAKI EXPRESSWAY	
TITLE	TEMPORARY WORKS Culvert 36 Stream Diversion	
SCALES (AT A3 SIZE)	DWG. No.	REV.
1: 1000	Figure 1	0

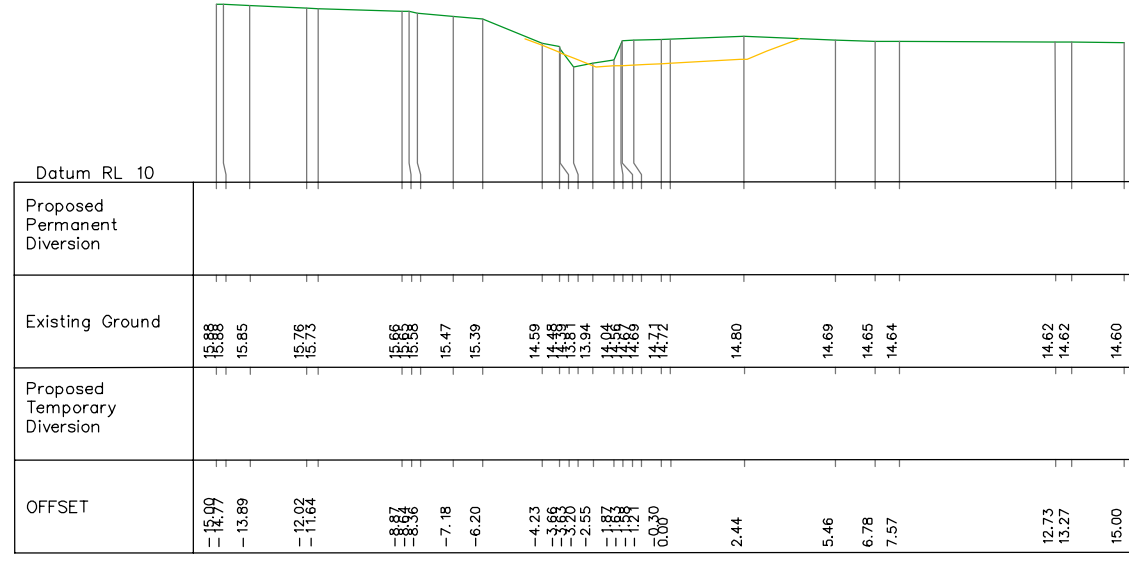
LEGEND	
	Existing ground
	Temporary diversion
	Permanent diversion
	Permanent culvert



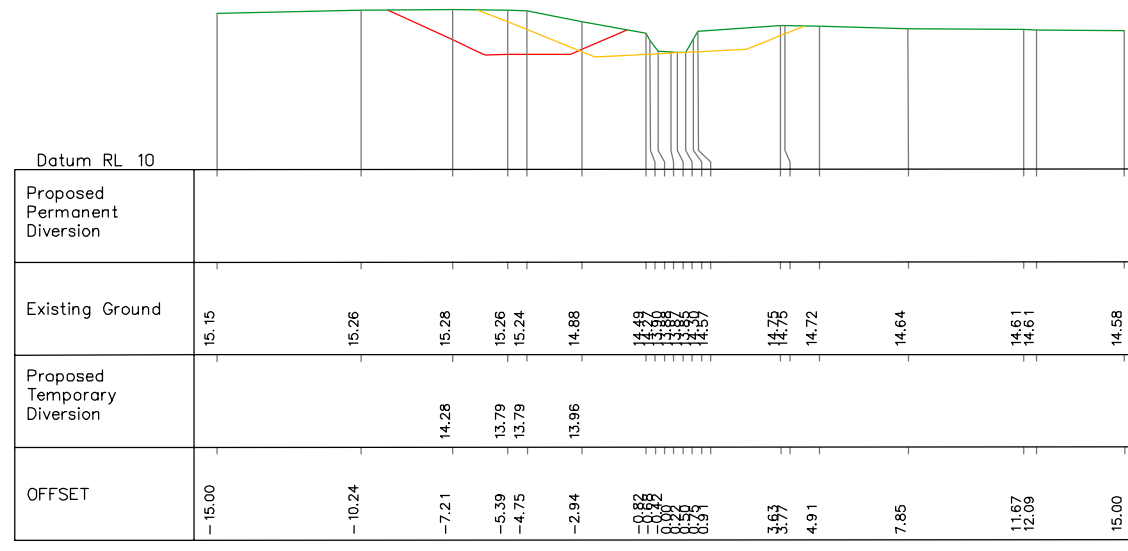
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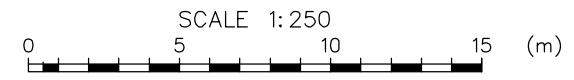
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SECTION 0



SECTION 20



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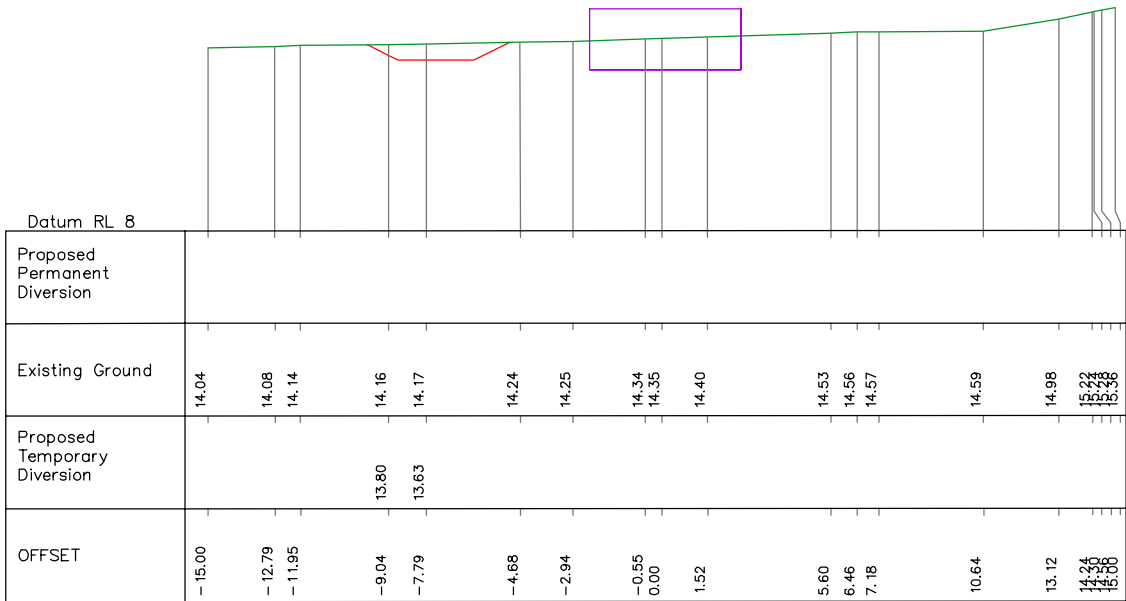
Peka Peka to Ōtaki Expressway

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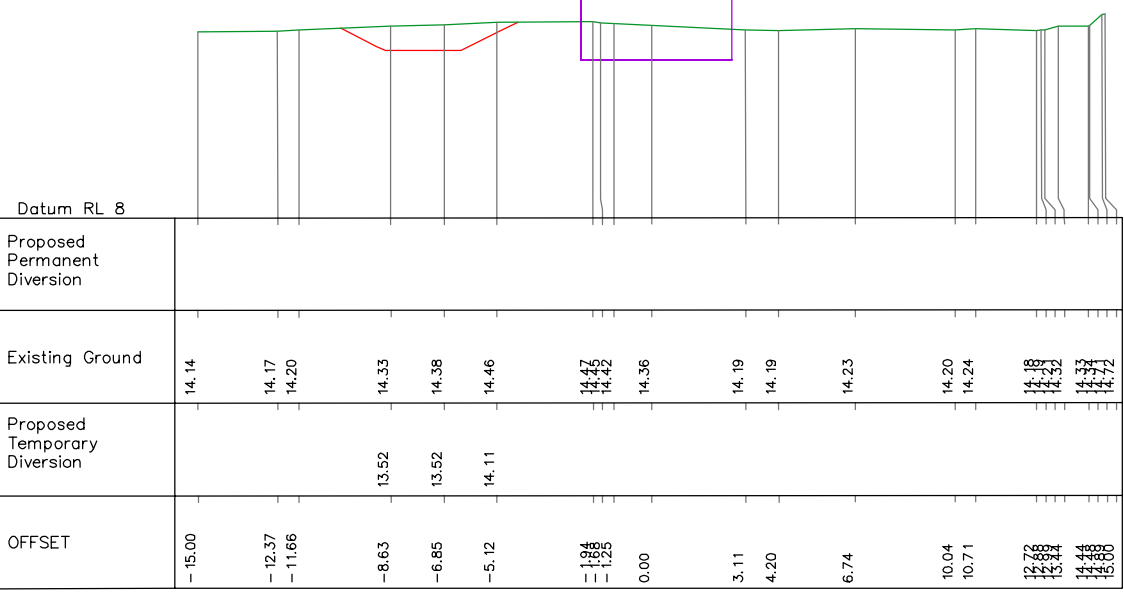
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TITLE	TEMPORARY WORKS Culvert 36 Stream Diversion	
SCALES (AT A3 SIZE)	DWG. No.	REV.
1:250	Figure 2	0

LEGEND

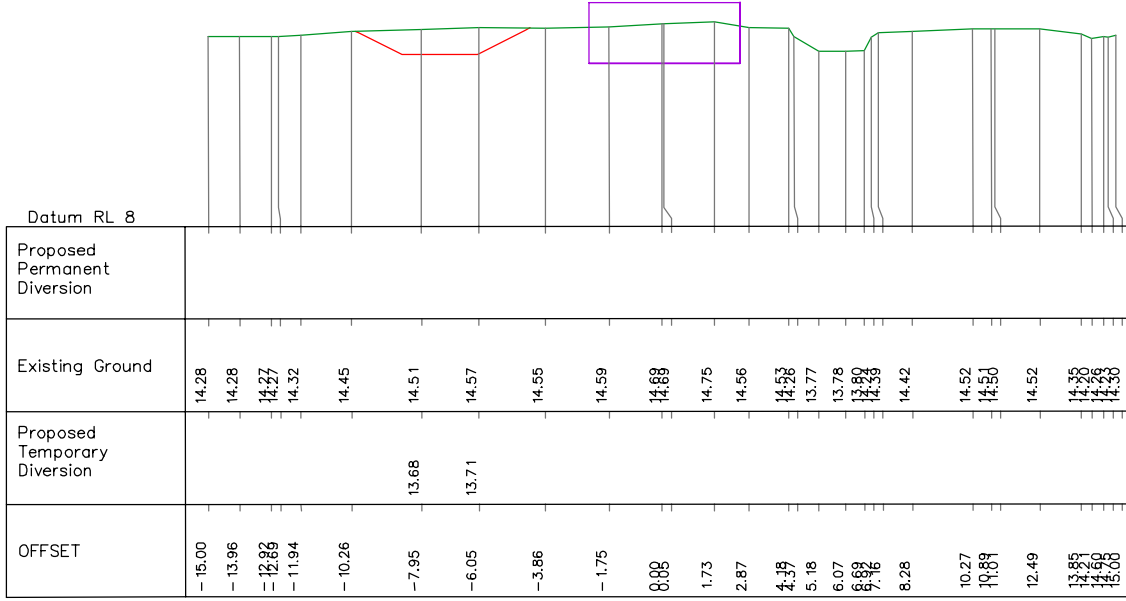
- Existing ground
- Temporary diversion
- Permanent diversion
- Permanent culvert



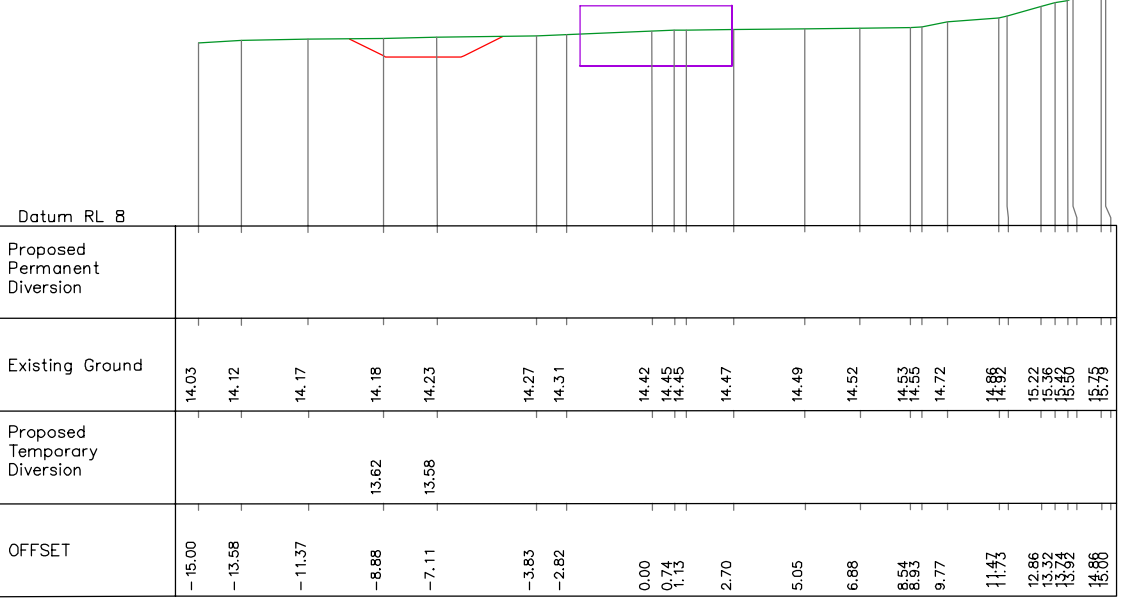
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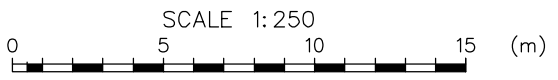
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SECTION 40



SECTION 60



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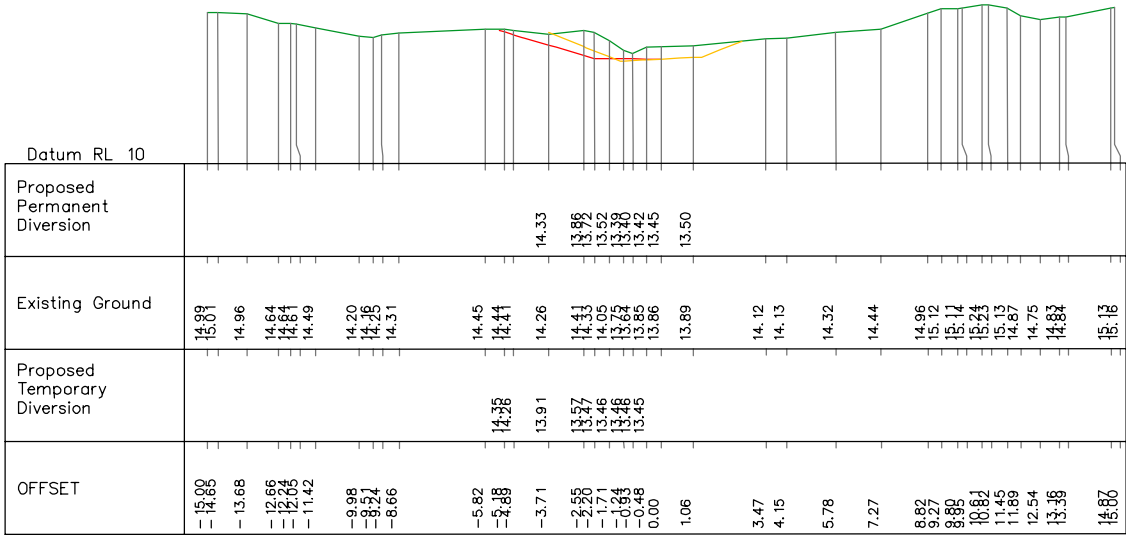
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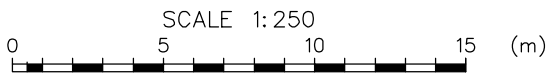
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CLIENT, PROJECT	NZ TRANSPORT AGENCY PEKA PEKA TO OTAKI EXPRESSWAY	
TITLE	TEMPORARY WORKS Culvert 36 Stream Diversion	
SCALES (AT A3 SIZE)	DWG. No.	REV.
1:250	Figure 3	0

LEGEND	
	Existing ground
	Temporary diversion
	Permanent diversion
	Permanent culvert



SECTION 80



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CLIENT, PROJECT	NZ TRANSPORT AGENCY PEKA PEKA TO OTAKI EXPRESSWAY	
TITLE	TEMPORARY WORKS Culvert 36 Stream Diversion	
SCALES (AT A3 SIZE)	DWG. No.	REV.
1:250	Figure 4	0

Culvert 39:

TEMPORARY STREAM DIVERSION FOR CONSTRUCTION OF CULVERT 39

Introduction

A temporary stream diversion is proposed to enable the construction of proposed permanent culvert 39 for the Peka Peka to Qtaki Expressway.

A specific works methodology has been developed for this diversion to minimise adverse water quality and fish passage effects during construction as per the PP2Q Environmental Management Plan (EMP). Sizing of the channel and construction methodology is set out as per the NZTA Erosion and Sediment Control Guidelines.

Diversion sizing

- The diversion will consist of a temporary coffer dam and channel diversion.
- The temporary diversion channel has been designed to convey a 2 year ARI flow. This is consistent with NZTA guidelines for stream diversions of less than 30 days (2-3 week construction period anticipated for Culvert 39).
- HEC HMS software with the SCS method has been used to estimate design flow, applied in accordance with Appendix 1 of “Subdivision and Development Principles and Requirements” (KCDC 2012) as also described in Section 3.3.4 of the PP2Q Stormwater Design Philosophy Report Rev 2 (PP2Q August 2017)
- Manning’s equation has been used to estimate channel capacity, flow depths and velocities
- Existing stream levels have been based on KCDC LiDAR collected in 2010, supplemented by conventional survey collected for the purposes of the PP2Q project
- All vertical levels are in terms of NZVD 2009 Diversion

Channel requirements:

Option A – Trapezoidal channel:

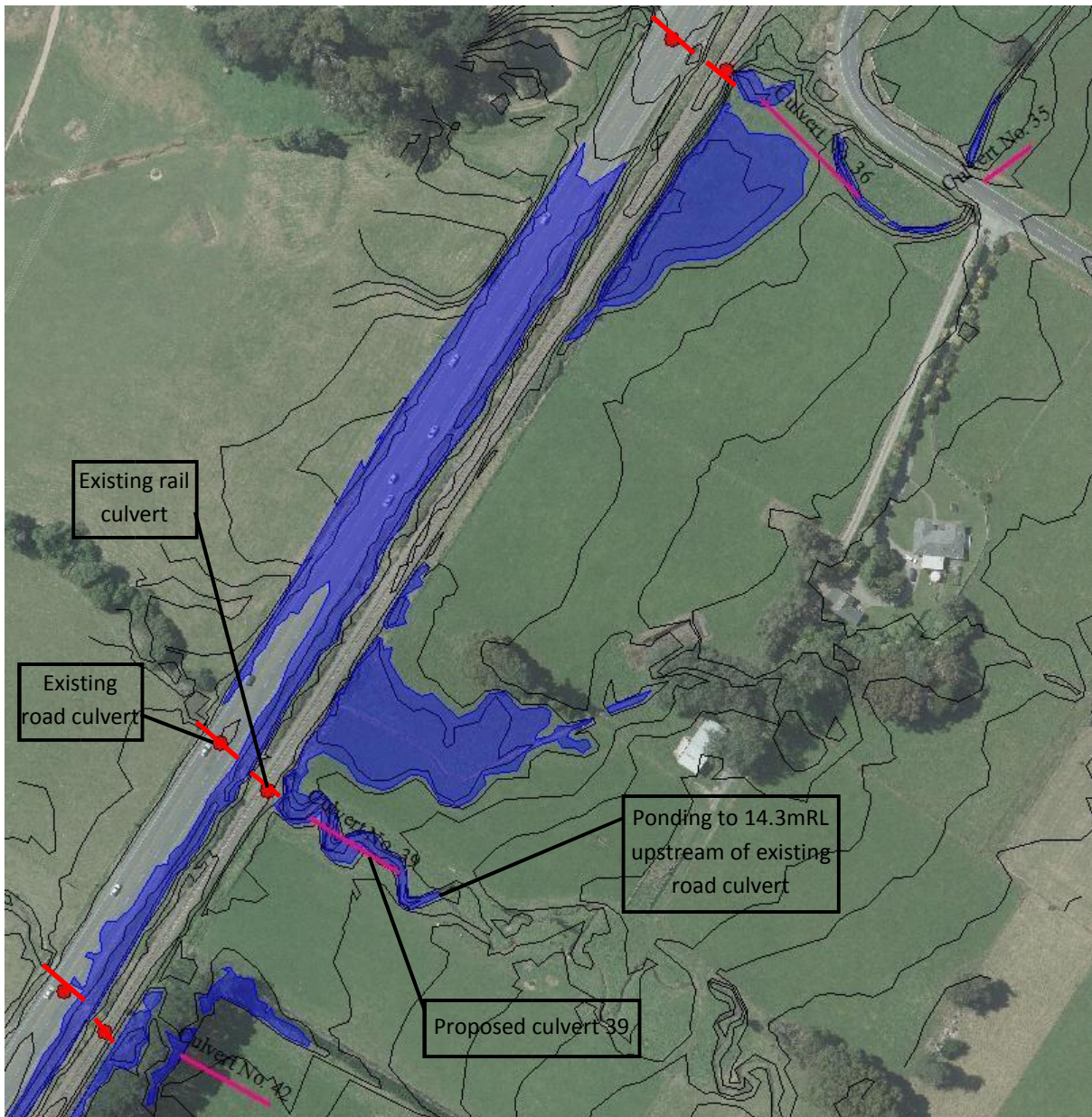
- 2% grade (1.5% minimum)
- Trapezoidal cross section
- 0.5 - 2 m base width
- 1:2.5 V/H
- 0.5 m (2 m base width)
- 0.7 m (0.5 m base width)
- 0.03 manning’s roughness
n value
- 3.4 m³/s 2 year ARI flow
(present climate)
- 2.3 m/s assuming above
parameters

Option B – V channel:

- 2% grade (1.5% minimum)
- V cross section
- 1:2.5 V/H
- 0.8 m minimum depth
- 0.03 manning's roughness, n value
- 3.4 m³/s 2 year ARI flow (present climate)
- 2.4 m/s assuming above parameters

Plan and cross sections are attached showing an indicative location of the stream diversion for a trapezoidal channel with a 2 m base width.

Although the channel has been sized to convey the 2 year ARI flow, we note that there is likely to be some ponding into the proposed Culvert 39 works area in relatively small flood events due to the limited capacity of the downstream rail and road culverts. Ponding up to 14.3 mRL (NZVD 2009) is anticipated for flows > 2.6 m³/s through the existing road culvert (threshold at which road starts to overtop), and up to 15.65 mRL (NZVD 2009) with flows > 6.1 m³/s through the existing rail culvert (threshold at which significant flows over rail start to occur).



Plan view showing ponding to 14.3mRL upstream of existing road culvert (threshold at which road starts to overtop, 2.6m³/s approx)

Channel lining

The channel will require scour protection from the high velocities of up to 2.3 m/s in the 2 year ARI event. Possible solutions are outlined below, similar solutions could also be used as approved;

- Rock rip rap
- Erosion Control Blankets
- Turf Reinforcement Mats

Reinstatement

Unless otherwise agreed in writing with GWRC, upon the completion of any temporary in-stream works, the stream bed and margins will, as far as practicable, be restored to a state that closely matches the upstream and downstream riparian and in-stream habitats and visual appearance.

Applicability

This report has been prepared for the exclusive use of our client, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:



.....
Tyler Campbell

Civil Engineer, Water Engineering

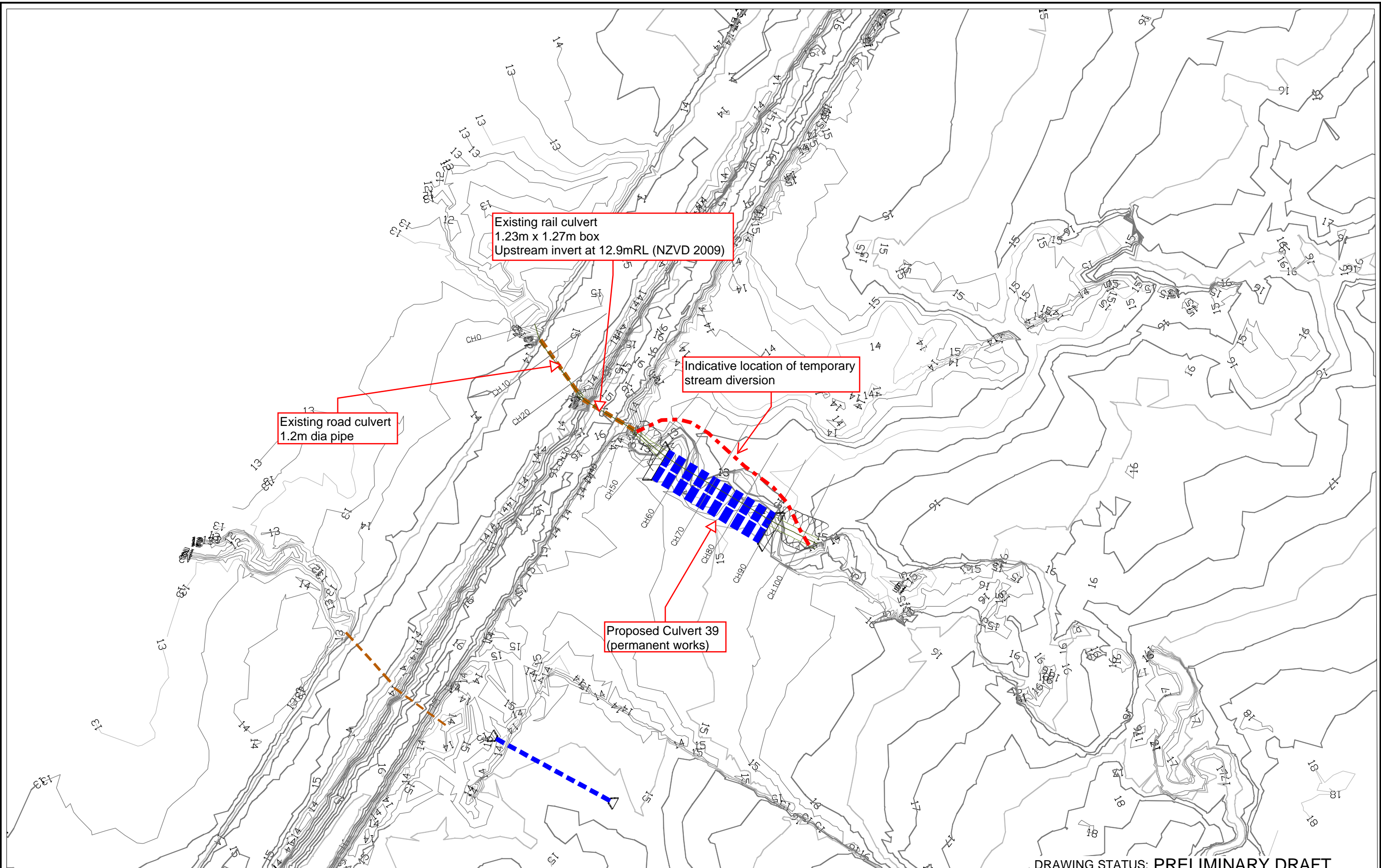
Authorised for Tonkin & Taylor Ltd by:



.....
Bruce Symmans

Design Manager

Reviewed by Dean Miller, Environmental Lead, and Dewi Knapstein, Stormwater Lead.



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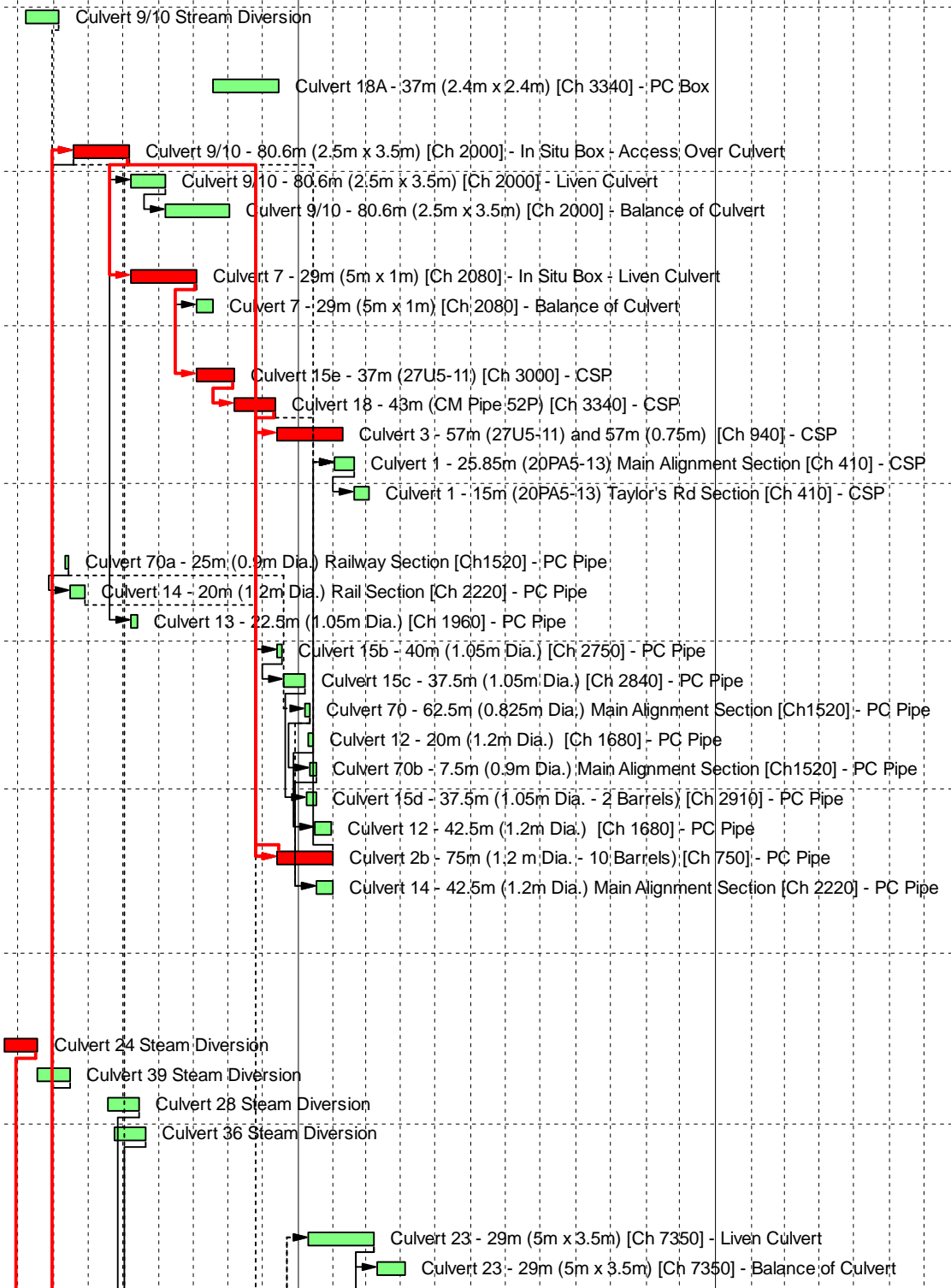
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NZ TRANSPORT AGENCY PEKA PEKA TO ŌTAKI EXPRESSWAY	
Temporary Works Culvert 39 Stream Diversion	
SCALES (AT A3 SIZE) 1: 1000	Figure 1
REV. 0	

APPENDIX E – PROGRAMME

Activity Name	Orig Dur	Rem Dur	Start	Finish	2018												2019												2020												2021
					M	Apr	M	J	Jul	A	S	Oct	N	D	Jan	F	M	Apr	M	J	Jul	A	S	Oct	N	D	Jan	F	M	Apr	M	J	Jul	A	S	Oct	N	D	Jan		
Peka Peka to Otaki Expressway - Master	408d	408d	19-Apr-18	09-Dec-19																																					
Construction	408d	408d	19-Apr-18	09-Dec-19																																					
Zone 1 (North): Ch 0 - 3800	201d	201d	08-May-18	04-Mar-19																																					
Drainage	201d	201d	08-May-18	04-Mar-19																																					
Stream Diversions	20d	20d	08-May-18	05-Jun-18																																					
Culvert 9/10 Stream Diversion	20d	20d	08-May-18	05-Jun-18																																					
Box Culverts	129d	129d	18-Jun-18	14-Dec-18																																					
Culvert 18A - 37m (2.4m x 2.4m) [Ch 3340] - PC Box	40d	40d	19-Oct-18	14-Dec-18																																					
Culvert 9/10	99d	99d	18-Jun-18	02-Nov-18																																					
Culvert 9/10 - 80.6m (2.5m x 3.5m) [Ch 2000] - In Situ Box - Access Over Culvert	36d	36d	18-Jun-18	06-Aug-18																																					
Culvert 9/10 - 80.6m (2.5m x 3.5m) [Ch 2000] - Liven Culvert	23d	23d	07-Aug-18	06-Sep-18																																					
Culvert 9/10 - 80.6m (2.5m x 3.5m) [Ch 2000] - Balance of Culvert	40d	40d	07-Sep-18	02-Nov-18																																					
Culvert 7	53d	53d	07-Aug-18	18-Oct-18																																					
Culvert 7 - 29m (5m x 1m) [Ch 2080] - In Situ Box - Liven Culvert	42d	42d	07-Aug-18	03-Oct-18																																					
Culvert 7 - 29m (5m x 1m) [Ch 2080] - Balance of Culvert	11d	11d	04-Oct-18	18-Oct-18																																					
CSP Culverts	95d	95d	04-Oct-18	04-Mar-19																																					
Culvert 15e - 37m (27U5-11) [Ch 3000] - CSP	22d	22d	04-Oct-18	05-Nov-18																																					
Culvert 18 - 43m (CM Pipe 52P) [Ch 3340] - CSP	27d	27d	06-Nov-18	12-Dec-18																																					
Culvert 3 - 57m (27U5-11) and 57m (0.75m) [Ch 940] - CSP	30d	30d	13-Dec-18	08-Feb-19																																					
Culvert 1 - 25.85m (20PA5-13) Main Alignment Section [Ch 410] - CSP	11d	11d	01-Feb-19	18-Feb-19																																					
Culvert 1 - 15m (20PA5-13) Taylor's Rd Section [Ch 410] - CSP	10d	10d	19-Feb-19	04-Mar-19																																					
Circular Culverts	157d	157d	11-Jun-18	31-Jan-19																																					
Culvert 70a - 25m (0.9m Dia.) Railway Section [Ch1520] - PC Pipe	4d	4d	11-Jun-18	14-Jun-18																																					
Culvert 14 - 20m (1.2m Dia.) Rail Section [Ch 2220] - PC Pipe	10d	10d	15-Jun-18	28-Jun-18																																					
Culvert 13 - 22.5m (1.05m Dia.) [Ch 1960] - PC Pipe	5d	5d	07-Aug-18	13-Aug-18																																					
Culvert 15b - 40m (1.05m Dia.) [Ch 2750] - PC Pipe	4d	4d	13-Dec-18	18-Dec-18																																					
Culvert 15c - 37.5m (1.05m Dia.) [Ch 2840] - PC Pipe	4d	4d	19-Dec-18	07-Jan-19																																					
Culvert 70 - 62.5m (0.825m Dia.) Main Alignment Section [Ch1520] - PC Pipe	4d	4d	07-Jan-19	10-Jan-19																																					
Culvert 12 - 20m (1.2m Dia.) [Ch 1680] - PC Pipe	4d	4d	09-Jan-19	14-Jan-19																																					
Culvert 70b - 7.5m (0.9m Dia.) Main Alignment Section [Ch1520] - PC Pipe	4d	4d	11-Jan-19	16-Jan-19																																					
Culvert 15d - 37.5m (1.05m Dia. - 2 Barrels) [Ch 2910] - PC Pipe	8d	8d	08-Jan-19	17-Jan-19																																					
Culvert 12 - 42.5m (1.2m Dia.) [Ch 1680] - PC Pipe	10d	10d	15-Jan-19	29-Jan-19																																					
Culvert 2b - 75m (1.2 m Dia. - 10 Barrels) [Ch 750] - PC Pipe	25d	25d	13-Dec-18	31-Jan-19																																					
Culvert 14 - 42.5m (1.2m Dia.) Main Alignment Section [Ch 2220] - PC Pipe	10d	10d	17-Jan-19	31-Jan-19																																					
Zone 2 (South): 3800 - 12200	408d	408d	19-Apr-18	09-Dec-19																																					
Drainage	408d	408d	19-Apr-18	09-Dec-19																																					
Stream Diversions	86d	86d	19-Apr-18	20-Aug-18																																					
Culvert 24 Steam Diversion	20d	20d	19-Apr-18	17-May-18																																					
Culvert 39 Steam Diversion	20d	20d	18-May-18	15-Jun-18																																					
Culvert 28 Steam Diversion	20d	20d	18-Jul-18	14-Aug-18																																					
Culvert 36 Steam Diversion	20d	20d	24-Jul-18	20-Aug-18																																					
Box Culverts	315d	315d	18-May-18	27-Aug-19																																					
Culvert 23	59d	59d	10-Jan-19	04-Apr-19																																					
Culvert 23 - 29m (5m x 3.5m) [Ch 7350] - Liven Culvert	40d	40d	10-Jan-19*	08-Mar-19																																					
Culvert 23 - 29m (5m x 3.5m) [Ch 7350] - Balance of Culvert	19d	19d	11-Mar-19*	04-Apr-19																																					



Peka Peka to Otaki Culvert Programme

- █ Remaining Level of Effort
- █ Actual Level of Effort
- █ Actual Work
- █ Remaining...
- ▼ Milestones
- █ Critical Re...



Activity Name	Orig Dur	Rem Dur	Start	Finish	2018												2019												2020												2021
					M	Apr	M	J	Jul	A	S	Oct	N	D	Jan	F	M	Apr	M	J	Jul	A	S	Oct	N	D	Jan	F	M	Apr	M	J	Jul	A	S	Oct	N	D	Jan		
Culvert 24	62d	62d	18-May-18	14-Aug-18																																					
Culvert 24 - 46.5m (4m x 2m) [Ch 7250] - In Situ Box - Access Over Culvert	35d	35d	18-May-18	06-Jul-18																																					
Culvert 24 - 46.5m (4m x 2m) [Ch 7250] - Liven Culvert	8d	8d	09-Jul-18*	18-Jul-18																																					
Culvert 24 - 46.5m (4m x 2m) [Ch 7250] - Balance of Culvert	19d	19d	19-Jul-18*	14-Aug-18																																					
Culvert 34	56d	56d	11-Jun-19	27-Aug-19																																					
Culvert 34 - 23.3m (4m x 3.6m) Te Horo Bridge Approach West [Ch 7250] - Liven	39d	39d	11-Jun-19	02-Aug-19																																					
Culvert 34 - 23.3m (4m x 3.6m) Te Horo Bridge Approach West [Ch 7250] - Balance	17d	17d	05-Aug-19	27-Aug-19																																					
Culvert 36	70d	70d	21-Aug-18	27-Nov-18																																					
Culvert 36 - 45m (5m x 2m) [Ch 8620] - Access Over Culvert	32d	32d	21-Aug-18	03-Oct-18																																					
Culvert 36 - 45m (5m x 2m) [Ch 8620] - Liven Culvert	17d	17d	04-Oct-18	29-Oct-18																																					
Culvert 36 - 45m (5m x 2m) [Ch 8620] - Balance of Culvert	21d	21d	30-Oct-18	27-Nov-18																																					
Culvert 39	99d	99d	18-Jun-18	02-Nov-18																																					
Culvert 39 - 35.65m (4.5m x 2m and 5m x 2m) [Ch 8920] - Access Over Culvert	46d	46d	18-Jun-18	20-Aug-18																																					
Culvert 39 - 35.65m (4.5m x 2m and 5m x 2m) [Ch 8920] - Liven Culvert	30d	30d	21-Aug-18	01-Oct-18																																					
Culvert 39 - 35.65m (4.5m x 2m and 5m x 2m) [Ch 8920] - Balance of Culvert	23d	23d	02-Oct-18	02-Nov-18																																					
CSP Culverts	215d	215d	20-Jul-18	10-Jun-19																																					
Culvert 35 - 23.25m (21PA5-14) Gear Rd [Ch 8600] -CSP	18d	18d	20-Jul-18*	14-Aug-18																																					
Culvert 53 - 30m (18PA5-7) Local Rd Section (MC and TH) [Ch 10,050] - CSP	22d	22d	24-Jul-18	22-Aug-18																																					
Culvert 28 - 51.5m (CM Supercor box 10m2) [Ch 7500] - CSP	32d	32d	15-Aug-18	27-Sep-18																																					
Culvert 53 - 58m (18PA5-7) Main Alignment Section (MC and TH) [Ch 10,050] - CSP	45d	45d	23-Aug-18	25-Oct-18																																					
Culvert 27 - 28m (CM supercor arch 12m2) [Ch 7520] - CSP	26d	26d	11-Mar-19	15-Apr-19																																					
Culvert 23a - 37.2m (CM Arch 39AB) Te Horo Bridge Approach East Side [Ch 7200] - CSP	36d	36d	16-Apr-19	10-Jun-19																																					
Circular Culverts	333d	333d	06-Aug-18	09-Dec-19																																					
Culvert 50 - 20 m (1.2m Dia.) Local Rd Section (MC and TH) [Ch 9950]	5d	5d	06-Aug-18	10-Aug-18																																					
Culvert 59 - 25m (1.6m Dia.) Local Rd Section (MC and TH) [Ch 10,800]	5d	5d	13-Aug-18	17-Aug-18																																					
Culvert 61 - 30m (0.75m Dia.) Local Rd Section (MC and TH) [Ch 10,970]	4d	4d	20-Aug-18	23-Aug-18																																					
Culvert 45 - 46.5m (1.5m Dia.) [Ch 9400]	5d	5d	04-Oct-18	10-Oct-18																																					
Culvert 42 - 37.2m (1.35m Dia.) [Ch 9020]	5d	5d	11-Oct-18	17-Oct-18																																					
Culvert 64 - 30m (5 Barrel 1.5m Dia.) Local Rd Section (TH and PP) [Ch 11,380] - PC Pipe	10d	10d	04-Oct-18	17-Oct-18																																					
Culvert 66 - 23.55m (Twin 1.6m Dia.) Local Rd Section (TH and PP) [Ch 11,660]	10d	10d	21-Nov-18	04-Dec-18																																					
Culvert 59 - 45m (1.6m Dia.) Main Alignment Section (MC and TH) [Ch 10,800]	10d	10d	29-Jan-19	12-Feb-19																																					
Culvert 61 - 34.5m (0.75m Dia.) Main Alignment Section (MC and TH) [Ch 10,970]	5d	5d	13-Feb-19	19-Feb-19																																					
Culvert 50 - 82.5m (1.2m Dia.) Main Alignment Section (MC and TH) [Ch 9950]	5d	5d	01-Mar-19	07-Mar-19																																					
Culvert 50a - 17.5m (1.2m Dia.) Mary Crest Culvert Underpass [Ch 9950]	5d	5d	08-Mar-19	14-Mar-19																																					
Culvert 64 - 40m (5 Barrel 1.5m Dia.) Main Alignment Section (TH and PP) [Ch 11,380]	20d	20d	14-Oct-19	11-Nov-19																																					
Culvert 66 - 40m (Twin 1.6m Dia.) Main Alignment Section (MC and TH) [Ch 11,660]	20d	20d	12-Nov-19	09-Dec-19																																					



Peka Peka to Otaki
Culvert Programme

- Remaining Level of Effort
- Actual Level of Effort
- Actual Work
- Remaining...
- Milestones
- Critical Re...



APPENDIX F – ACCIDENTAL DISCOVERY PROTOCOLS

Accidental Discovery Protocols

The protocols for accidental archaeological discovery set out below will be followed if subsurface archaeological remains, koiwi tangata (human remains) or taonga are exposed during construction in areas that are not being monitored by an archaeologist or when archaeologists are not present on site.

Information provided below outlines procedures to be followed in the case of suspected unrecorded archaeological sites being located during the course of work.

Discovery of Suspected Archaeological Features or Deposits

If suspected archaeological remains are exposed in the course of works, the following procedure will be implemented:

1. Contractors shall cease all work within the vicinity of the suspected archaeological site, and immediately notify the Site Project Manager.
2. The area of the suspected archaeological deposit or feature is to be made secure, ensuring that the area (and any objects contained within) remains undisturbed and meets health and safety requirements.
3. The Project Manager will arrange for the Project Archaeologist to visit the site, to confirm the nature of the archaeological site, and to define the extent of the deposit or feature.
4. Following confirmation of the site as archaeological, the Project Manager will notify the Regional Archaeologist HNZPT, The Transport Agency, Nga Hapū o Ōtaki and M.T.A representatives and, if appropriate, district and city council representatives.
5. The archaeological remains will be investigated and recorded in accordance with archaeological best practice, and in line with the legal conditions of any authority granted by HNZPT.
6. Works can resume once the Project Archaeologist confirms that the required investigation and recording are complete and Nga Hapū o Ōtaki and M.T.A representatives and HNZPT give their agreement.

Discovery of Koiwi Tangata (Human Remains)

If suspected human remains are identified, the following protocol will be adopted:

1. Earthworks shall cease within **20 meters** of the find while an appropriately qualified archaeologist is consulted to establish whether the bone is human.
2. The area of the site containing koiwi will be secured, ensuring that the area (and any objects contained within) remains undisturbed and meets health and safety requirements.

3. If it is determined that bone is human, earthworks will not resume in the immediate vicinity (as determined by the Project Archaeologist) until HNZPT, Nga Hapū o Ōtaki and M.T.A representatives, the New Zealand Police and district council representatives have been notified.
4. Nga Hapū o Ōtaki and M.T.A representatives will be given the opportunity to conduct karakia in association with appropriate tikanga Māori prior to the removal of koiwi for reburial.
5. If Nga Hapū o Ōtaki and M.T.A representatives so request, koiwi may be further analysed by a specialist osteo-archaeologist prior to reburial.
6. Work within the area can recommence as soon as the remains have been removed from site, and with the agreement of all relevant agencies.

Discovery of Taonga

Maori artefacts such as carvings, stone adzes, and greenstone are considered to be taonga (treasures). These objects are identified as taonga tuturu in the Protected Objects Act 1975. Taonga may be discovered in isolated contexts, but are generally found within archaeological sites, modification of which is subject to the provisions of the HNZPT Act.

If taonga are discovered, the procedure established for the discovery of archaeological sites (as detailed above) must be followed, and the following procedure will apply to the taonga itself:

1. The area of the site containing the taonga will be secured in such a way that protects the taonga from further disturbance or damage.
2. The archaeologist will inform HNZPT and Nga Hapū o Ōtaki and M.T.A representatives so that appropriate actions can be determined, and appropriate tikanga protocols to be undertaken.
3. If the object is identified as taonga tuturu the Project Archaeologist will notify the Ministry for Culture and Heritage of the finding, as required under the Protected Objects Act 1975.
4. The Ministry for Culture and Heritage, in consultation with Nga Hapū o Ōtaki and M.T.A representatives, will decide on custodianship of the taonga. If the taonga requires conservation treatment this can be carried out by the Archaeological Conservation Laboratory, University of Auckland.

Specific Tikanga Maori Protocols

1. Nga Hapū o Ōtaki and M.T.A shall be informed **48 hours** before the start and finish of the archaeological work.
2. Any alterations to the Archaeological Site Management Plan will be discussed with Nga Hapū o Ōtaki and M.T.A.
3. Access for Nga Hapū o Ōtaki and M.T.A shall be enabled in order to undertake tikanga Maori protocols consistent with any requirements of site safety.

4. Nga Hapū o Ōtaki and M.T.A shall be provided with a copy of all reports completed as a result of the archaeological work associated with this authority(s) and be given an opportunity to discuss it with the archaeologist if required.
5. Nga Hapū o Ōtaki will notify other iwi parties of any archaeological finds (e.g. taonga or kōiwi tangata) and subsequent ceremonies as deemed appropriate by Nga Hapū o Ōtaki and M.T.A.

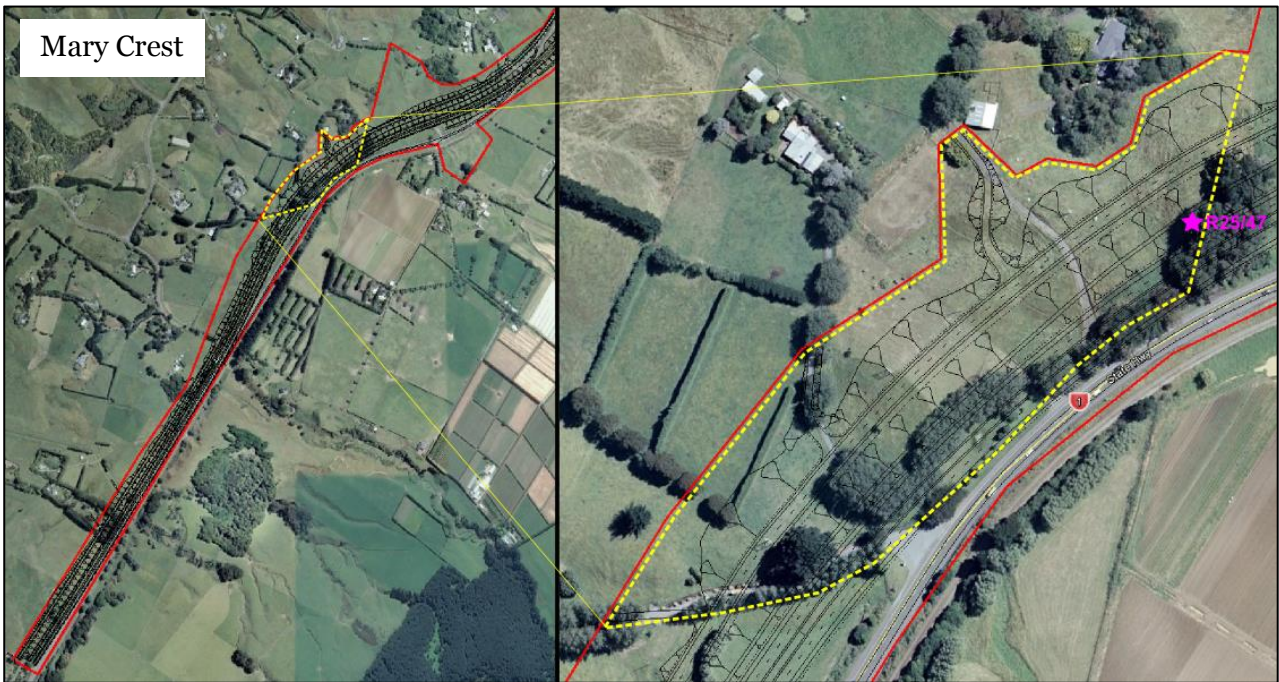


Figure 1: Area of pre-construction investigation (outlined in yellow) at the Mary Crest dunes, showing the location of recorded site R25/47 (in pink).

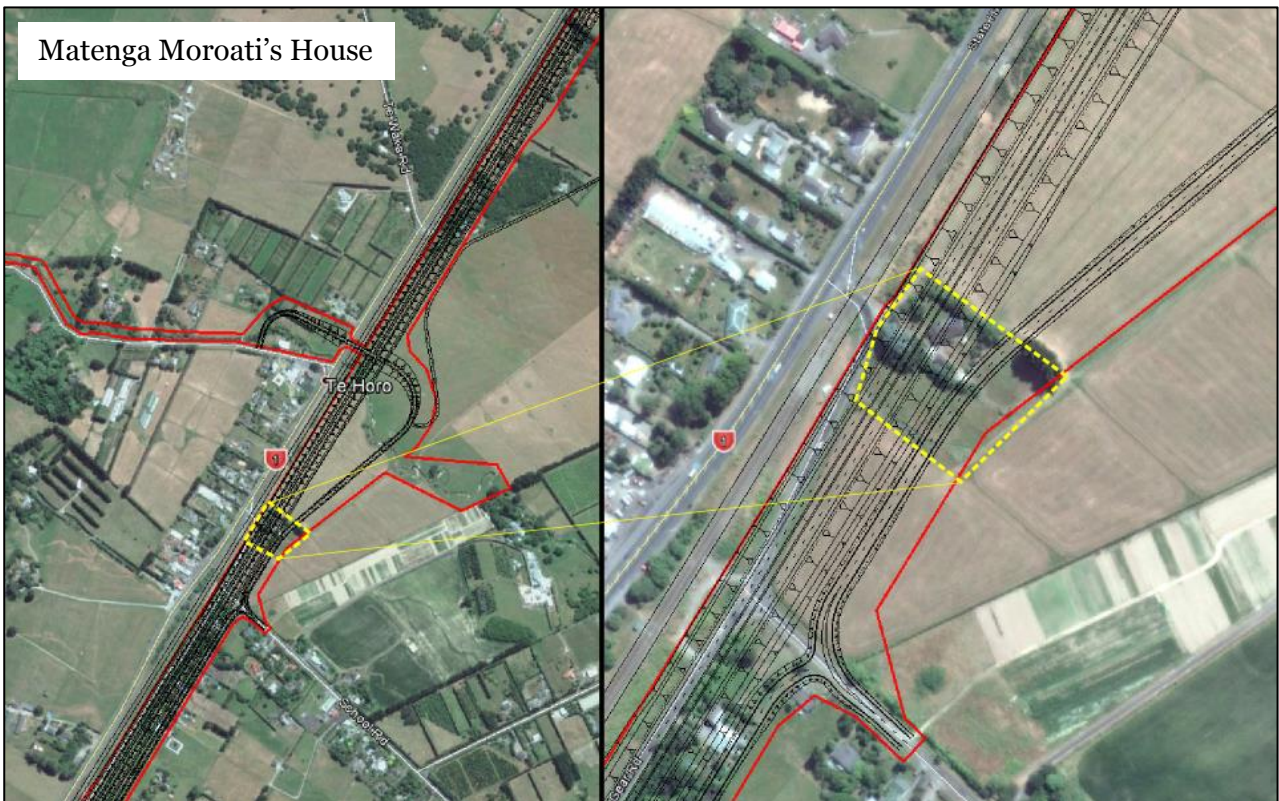


Figure 2: Area of pre-construction investigation (outlined in yellow) at Matenga Moroati's House.

APPENDIX G – SITE SPECIFIC TRAFFIC MANAGEMENT PLAN

Site Specific Traffic Management Plan

– Peka to Ōtaki Project

Southern Culverts

March 2018

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1 INTRODUCTION

This Site Specific Traffic Management Plan (SSTMP) provides the necessary information to demonstrate how the project team plan to avoid or mitigate potential construction traffic effects from activities associated with construction of five transverse culverts in the southern zone of the project as follows:

- Culvert 24 (chainage 7260)
- Culvert 28 (chainage 7500)
- Culvert 35 (chainage 8600)
- Culvert 36 (chainage 8640)
- Culvert 39 (chainage 8920)

This SSTMP reflects the requirements of the Construction Traffic Management Plan (CTMP) including sections 1.3 (Performance Standards) and section 3.2.1 - specifically the need to interface with TTM on other networks. This plan is also consistent with the requirements set out in the over-arching Construction Environmental Management Plan (CEMP).

This document is intended to be utilised by the construction team to clearly identify any site specific traffic management requirements that must be adhered to prior to, and during works in any given area.

Specific Traffic Management methodologies will be finalised and submitted to the relevant Road Controlling Authority as the construction programme is finalised and becomes more detailed. These more specific Traffic Management Plans (TMPs) will cover specific mitigation for each individual temporary traffic management requirement. This document will be a living document that will have multiple stages and traffic layouts that will be amended as and when required to suit varying construction stages and required traffic management.

1.1 The SSTMP and TMP Process

This SSTMP provides the necessary information from a project level on how the effects of construction traffic related to the site activities will be avoided or mitigated across the two roading networks in the location of the expressway works i.e. the State Highway Network (NZTA) and the local road network (KCDC)

Each of the two Road Controlling Authorities (RCA's) has its own processes and procedures for the approvals (TMP's) and implementation of temporary Traffic management within their respective networks which is separate to the SSTMP process.

It is recognised that approval / implementation of TMPs associated with this SSTMP will be staged and implemented at differing times over the course of the works. In addition, it is recognised that the TMP's themselves may alter due to both project and surrounding community requirements.

The purpose of this SSTMP is to provide the base (minimum) standard of service / maximum practical level of mitigation to be incorporated into the development of the respective TMP's all the while ensuring that the BOI consent conditions and subsequent CTMP requirements are met during the construction process.

2 SSTMP CONSENT CONSIDERATIONS

Reference should also be made to section 3.2 of the CTMP.

2.1 Proposed Temporary Traffic Management Measures - BOI condition 34 b (i)

Each of the work areas will have the required (CoPTTM) signage and early warning delineation provided by a combination of cones and line marking – all in accordance with the respective RCA TMP requirements. Each Traffic Management Plan will be submitted to the relevant RCA and Approved prior to implementation. Until site specific construction plans are finalised a location specific Traffic Management Plan cannot be prepared. Once methodologies are finalised location specific Traffic Management plans will be prepared and submitted to KCDC for approval.

2.2 Assessment of delays - BOI condition 34 b (ii)

Each Traffic Management plan will incorporate an assessment of expected delays and will also provide delay calculations where any are expected to occur. It is not envisaged that any significant delays will occur at any time.

Any oversized loads will be escorted with Pilot Vehicles again with no anticipated delays with their operations covered by Oversized Vehicle Permits. These oversized movements will be of an occasional nature only to move large plant in and off site.

2.3 Detour Routes - BOI condition 34 b (iii)

There are no expected detours associated with the Temporary Traffic Management measures included within this SSTMP. Should a Detour Route be identified a Site Specific Traffic Management Plan will be subject to review by the relevant RCA before implementation. It is expected that should any Detour be required this will be for short term activities only and Approved on a case by case basis by the RCA.

2.4 Existing Accesses - BOI condition 34 b (iv)

The proposed Temporary Traffic Management measures do not knowingly affect existing accesses to private or commercial properties. Should this occur consultation will be undertaken with affected parties to ensure they retain access at all times.

2.5 Pedestrian and Cyclist Access - BOI condition 34 b (v)

The work area does not affect any dedicated cycle paths or lanes though their set out and operation will be mindful of cyclists in accordance with CoPTTM and applicable RCA requirements.

2.6 Maintaining Existing Transport Services - BOI condition 34 b (vi)

The proposed Temporary Traffic Management measures for implementation of the work areas will not affect any existing public transport services and facilities such as bus stops.

2.7 Temporary Speed Limits (TSL) - BOI condition 34 b (vii)

The use of TSL's will be kept to a minimum and will be identified as and when required in Site Specific Traffic Management Plans submitted to and approved by the relevant RCA. It is expected that a Temporary Speed Limit of 30km/h will only be used during Stop Go operations or should an unsealed surface be required to be left trafficked.

2.8 Access to & From the Construction Site - BOI condition 34 b (viii)

The primary objective of this SSTMP is the planning (TMP's), approvals (RCA's) and incorporation of Site Access Points (SAP's) as outlined in this SSTMP appended to **SSEMP SLR1** to ensure the safe and efficient access to and from site of construction related traffic.

The operating hours of the SAP's will be in accordance with the proposed hours of work included within the **CNVMP** i.e.

- Monday to Friday 6.30am to 8pm
- Saturday 7.30am to 6pm

Operation outside those hours will be at the approval of the Engineer and in accordance with the provisions of the **CNVMP**.

2.9 Communications and Stakeholders - BOI condition 34 b (ix)

As the effects of the proposed measures are as yet unknown, implementation and operation of the SSTMP's will be communicated to stakeholders, road users and the community via the methods and processes as included within the project Stake Holder and Communications Management Plan, with particular emphasis on the key groups identified in Section 3.1 of the CTMP as required.

3 ADDITIONAL CTMP CONSIDERATIONS

3.1 Kiwirail NIMTR - CTMP section 2.1.2

The implementation and operation of some SSTMP's may involve the need to collaborate with Kiwirail as sites may cross the NIMT Railway or existing at grade carriageway crossings. Traffic Management strategies will include having no delays created for Kiwirail and the NIMT.

3.2 Emergency Action Plan(s) – CTMP section 3.2.3.8

All emergency services shall have unimpeded access along all State Highway and local roads 24 hrs. per day. Should any roads be affected by temporary traffic management any likely delays will be communicated prior to works to all Emergency Service Providers by way of weekly Road Works Reporting procedures as required by both RCA's. All major works that impact the roading network will have SSTMP's developed with consultation of Emergency Services.

3.3 Access to KCDC Owned and Operated Water and Waste Water Assets – CTMP section 3.2.1.1.7

Access to existing KCDC water and waste water assets will not be impeded by any SSTMP's.

3.4 Monitoring, Auditing & Reporting – CTMP sections 3.3 & 3.4

Monitoring, Auditing and Reporting of the Traffic Management Measure (once implemented) shall be in accordance with the CTMP and CoPTTM guidelines.

3.5 Complaints – CTMP sections 3.5

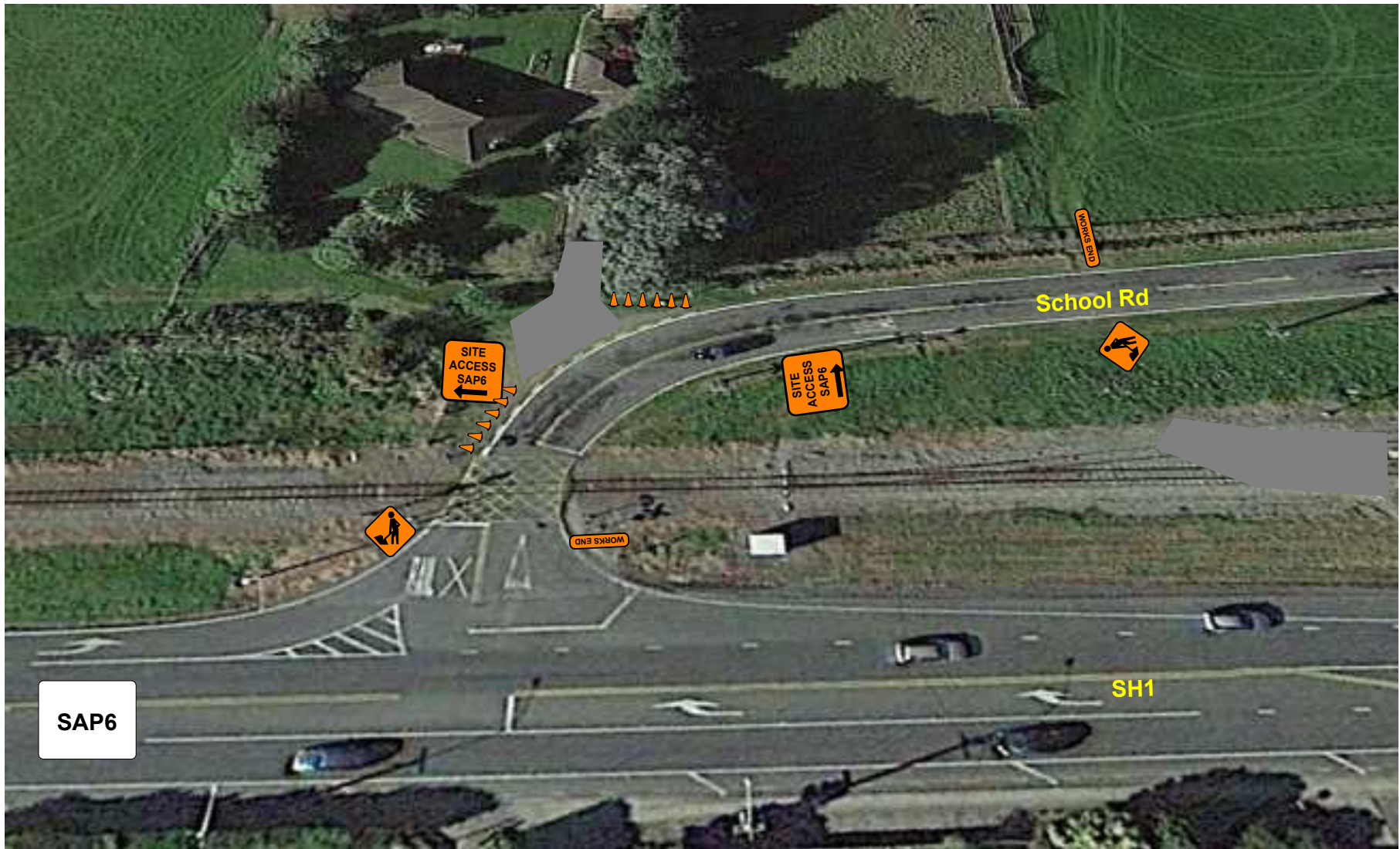
Feedback including complaints received related to the implementation of Temporary Traffic Management measures covered within this SSTMP shall be recorded and processed in line with the CTMP.



SAP5

Situation: Site Access Point 5 - Gear Rd	Drawing No: SAP 5	Revision: 1
		Drawing By: Chris Harmer
Drawing Title:		Checked:
		Date: 17/07/17
		TMC Approval:





Situation: Site Access Point 6 - School Rd	Drawing No: SAP 6	Revision: 1
		Drawing By: Chris Harmer
Drawing Title:		Checked:
		Date: 17/07/17
		TMC Approval:

