INDICATIVE SITE SPECIFIC ENVIRONMENTAL MANAGEMENT PLAN (SSEMP)

Te Puka Stream Focus Area
(from Chainage 3700 - 5000)

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

The aims in producing these documents are to:

- Provide confidence in design;
- Provide an indication as to how works can be staged and programmed;
- Assist in assessing effects;
- Assist in developing mitigation strategies;
- Provide an indication as to how works can be staged and programmed; and
- Assist in consultation with stakeholders regarding construction management issues.

The SSEMP for Te Puka specifically explores the following issues:

- Constructability of a sidling alignment on very steep slopes
- Construction of highway embankments
- Diversion of the Te Puka Stream (approximately 1.2 km)
- Culvert installation and fish passage;
- Erosion and sediment control;
- Stream reconstruction and restoration.

The SSEMPS have been prepared using the best information available and are not intended to be final. They will be refined further during the specimen and detailed design stages and will be to relevant local authority as required by conditions.

July 2011
Version 5. FINAL

1 INTRODUCTION

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

It covers the installation of eight new culverts, formation of a six-lane highway, diversion of the Te Puka Stream and a number of small tributaries, establishment of fifteen sediment control ponds and post construction landscape and ecological mitigation along the Te Puka corridor. This SSEMP covers a length of the Transmission Gully alignment of approximately 1.3 kilometres.

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

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

1.1 Consents

The following consents are relevant to this SSEMP

CONSENT	CONDITION
Greater Wellington Regional Council	
Porirua City Council	

The following activities relevant to this SSEMP are permitted.

ACTIVITY	RULE
Greater Wellington Regional Council	
Porirua City Council	

2 PREPARATION OF DOCUMENT

The draft SSEMP has been prepared by the following people:

NAME	ORGANISATION	ROLE
Peter Ward	NZTA	Project Manager
Mark Edwards	Opus	Civil Engineering design
Lucie Desrosiers	Beca	Urban design inputs
Stephen Chiles	URS	Noise inputs
Mathew Noonan	Beca	Air quality inputs
Craig Martell	SKM	Hydrology, sediment and erosion control

Nic Conland	SKM	Environmental management inputs
Wade Robertson	Isthmus	Landscape Architecture Inputs
Stephen Fuller	BML	Ecology inputs

3 CONTACT DETAILS

NZTA

POSITION	NAME	ORGANISATION	CONTACT DETAILS
Project Engineer			
Project Manager			
Site Supervision			
Environmental Management Auditor			
Project Ecologist			

CONTRACTOR

POSITION	NAME	ORGANISATION	CONTACT DETAILS
Contractors Representative			
Site Supervisor			
Site Safety Supervisor			
xxx			

4 PLANS

Drawings relevant to this SSEMP are contained in volume 5 of the document set. These show :

SSEMP/A1 General Arrangement Plan
SSEMP/A2 Construction Access Plan
SSEMP/A3 Landscape Plan
SSEMP/A4 Stream Diversion Layout
SSEMP/A5 Existing Stream Layout
SSEMP/A6-A7 Stage 1 and 2 Realignment Works
SSEMP/A8 Stages 3-6 Embankment and Culvert Construction
SSEMPA9-11 Typical Details Sheets 1-3

5 ENVIRONMENTAL CONSIDERATIONS

5.1 Wainui Catchment

Te Puka Stream forms the true left branch of Wainui Stream, which discharges to the coast within Queen Elizabeth Regional Park. The lower reaches of Wainui Stream and its small estuary have high ecological value and care is needed in the management of sediment and contaminants.

5.2 Stream Works

Te Puka Stream is not recognised in any statutory documents, but has been identified through the consenting process as having high natural values.

A major diversion of the Te Puka Stream (labelled as TD4 on Plan TP06) is required within the area of this SSEMP. This diversion is considered to be significant and complex and will require a mixture of avoidance, remedy, mitigation and offsetting. The diversion extends for 1.2 km from chainage 3700 to 4900. The design of the new stream channel is based on several performance based, ecological principles to ensure habitat values, fish passage, and to provide a level of mitigation to offset for the reclamation of the original stream channel.

This section of the alignment involves five culvert crossings of very steep tributaries of Te Puka Stream. Good design responses are required for these culverts and associated spillways. One culvert (T10) requires provision of an innovative fish passage solution. The 95m long culvert is located at chainage 4484.

Care is also required in the management of sediment discharge to this stream. Any erosion from the works may result in a sediment-laden discharge to the Te Puka Stream or tributaries. The potential effects from the discharge include the loss of habitat and the interruption of ecosystem function around the point of discharge and downstream. This SSEMP explains how these potential effects can be appropriately managed.

5.3 Terrestrial Flora / At Risk - Threatened plant species

The largest extent of indigenous forest loss from this project is within the Te Puka catchment. Consent conditions require best endeavours to minimise forest loss. There are no rare or threatened plants within the SSEMP.

5.4 Terrestrial Fauna / at risk-threatened fauna species

No rare or threatened terrestrial fauna have been identified within this SSEMP site. However, locally important populations of lizards and indigenous invertebrates are present in boulderfield and scree habitat at several sites within the SSEMP area. These locations require confirmation prior to earthworks. Where this habitat lies beneath the construction footprint consent conditions require a capture and translocation process.

5.5 Indigenous Fish

Te Puka Stream has a number of fish species that are threatened or at risk ((banded kokopu, long finned eel, and red finned bully). During the construction period special attention needs to be paid to the protection of native fish within any section of stream being reclaimed. Proposed consent conditions require capture and translocation of these species as part of diversion works.

In addition measures will be needed to ensure seasonal migration during the period of construction of stream diversions. Consent conditions require that migration passage be provided, either by providing an alternative fish passage path, or through downstream capture and transfer above the site of works.

5.6 Landscape

There are no significant landscape issues within the area covered by this SSEMP.

As for all areas within the Project alignment the final form and landscape treatment of large cut batters and stabilised earth walls will require specific consideration. Primary tools include the design of batter slopes and benches; contouring of fill areas; and re-vegetation of all earth-worked areas.

5.7 Visual

There are no visual issues for this SSEMP, with the exception of retaining key views for road users

5.8 Historical & Cultural Sites

There are no known sites of historical interest or cultural significance within the area covered by the SSEMP. Accidental discovery protocols are contained within the CEMP.

5.9 Dust

Dust control is necessary as part of sediment management and stream protection, and to minimise construction effects on indigenous flora and fauna.

5.10 Noise

There are no residential dwellings existing within 1,250 metres of the construction work and normal construction activities are not expected to create a noise issue. There is a possibility of rock blasting which may need additional management.

5.11 Traffic

Access to this site is from SH and lies over land owned by NZTA. Traffic on SH will be managed according to the Construction Traffic Management Plan.

5.12 Restricted or 'NO GO' Areas

Six sites have been identified within the SSEMP where consent conditions require that these areas be identified as part of enabling works, and require best endeavours to minimise vegetation loss. They are described in section 7.4.

5.13 Forestry

The NZTA is the owner of a large area of plantation forestry on the eastern slopes of Te Puka from chainage 2000 to chainage 4400. This forest is not needed to be cleared as part of this project. Proposed consent conditions require management of these pines and their future extraction and include a requirement to retain a buffer of trees of no less than 40m along Te Puka Stream. This buffer is necessary to protect the stream and stream works from slope failure and erosion.

5.14 Water Abstraction

No water abstraction from streams is currently proposed within this SSEMP. Harvesting of treated water from sediment ponds for dust management may occur.

5.15 Quarrying

No aggregate sourcing has been currently identified outside the road footprint within this SSEMP. Any decision on aggregate winning will be made by the constructor at a future, and any necessary consents applied for at that time.

6 WORK PROGRAMME

6.1 Staging

The exact timing and construction staging is still to be confirmed. However, generally the construction process includes:

- Enabling works including temporary access work, transmission tower relocation, fencing and clearing;
- Site establishment;
- Establishment of Erosion and Sediment Control measures;
- Earthworks, including clearing, stockpiling of topsoil, permanent drainage works;
- Re-vegetation of exposed earthworks areas (to be undertaken as work areas are completed);
- Pavement Works;
- Removal of Erosion and Sediment Control measures after agreement with GWRC.

6.2 Programme

The works will be undertaken in a sequential manner from downstream to up, or sequential in time. Broadly speaking, all stream works will be completed prior to commencement of bulk earth works to form the haul road and main alignment. The haul road will be divided into four one kilometre sections. Two construction teams will be used to construct the haul road and bridges. The programme for the works could be as follows:

A detailed programme for these works will be provided by a contractor based on drawings SSEMP A1-A11 and submitted in the necessary outline plans.

No.	ACTIVITY	ESTIMATED DURATION	PRECEDING ACTIVITY
	ROADWORKS		
1.1	Earthworks (2250-4400) Cut To Fill	8 months	2.5
1.2	Pavement (2250-4400)	6 weeks	1.1
1.3	Finishing Works (2250-4400)	6 weeks	1.2
	TE PUKA STREAM DIVERSION CH 3700 TO 4900		
2.1	construct access track	2 weeks	start
2.2	ch 00 to 190 (rd ch 3700-3880)	1 month	2.1
2.3	ch 190 to 320 (rd ch 3880-4010)	2 weeks	2.2
2.4	ch 320 to 460 (rd ch 4010-4130)	2 weeks	2.3
2.5	ch 460 to 700 (rd ch 4130-4370)	1 month	2.4
2.6	ch 700 to 850 (rd ch 4370-4500)	2 weeks	1.3
2.7	ch 850 to 1080 (rd ch 4500-4750)	1 month	2.6
2.8	ch 1080 to 1250 (rd ch 4750-4900)	1 month	2.7
	ROADWORKS		
3.1	Earthworks (4400-5000) and from Ch 24000	2 months	2.8
3.2	Earthworks (4400-5000) and from Ch 25300	5 months	3.1
3.3	Pavement (4400-5000)	3 weeks	3.2
3.4	Finishing Works (4400-5000)	1 month	3.3

7 ENABLING WORKS

The Contractor's working/establishment areas will involve site clearance, stripping of topsoil (if any), localised contouring and placement of hardfill. The exact locations of the Contractor's working/establishment areas are unknown at this stage. Topsoil will be stockpiled within those establishment areas for later use

7.1 Site Access

A site compound is likely to be established south of MacKays crossing, at CH 2000. A satellite site compound is also likely to be established within the focus area at the Wainui Saddle, at CH 5000.

7.2 Site Clearance / Forestry

Areas of native forest and regenerating scrub and shrub lands will need to be cleared prior to earthworks commencing. Depending upon the nature of the vegetative cover the vegetation clearance method will vary. For pasture no vegetation clearance will be undertaken, the grass will be considered to form part of the top soil. For areas covered in gorse or other shrubby vegetation the vegetation may be treated in the following fashion;

- Bladed off to form a wind row outside of the earthwork area; and then
- Mulched and then treated as top soil; and then either
- Removed with topsoil to be used to revegetate areas; or
- Removed and place in a pile to decompose.

Forestry clearance within this SSEMP will be minimised – see sections 5.3, 5.14 and 7.4).

7.3 Transpower Towers

Within this SSEMP four pylons are to be relocated. They are shown in SSEMP/B01.

Chainage	Pylon Reference	Comments
3800	T8	New tower located 8A
4420	T9	New tower located 9A
4780	T10	New tower located 10A
4990	T11	New tower located 11A

7.4 Other Utilities

- None affected within this SSEMP

7.5 Fencing

Six areas of indigenous forest have been identified that need to be protected in whole or part. Fencing will be installed and these areas of forest clearly marked. The sites are:

Western Slopes of Te Puka Valley: Each of these four sites lie in part within the construction area but is not needed to be removed in order to construct the road. Any vegetation that can be protected will form part of the mitigation planting.

- Kohekohe forest remnant K226 – from chainage 4000 to 4100.
- Kohekohe forest remnant K227 – from chainage 4150 to 4200.
- Kohekohe forest remnant K228 – from chainage 4350 to 4500.
- Kohekohe forest remnant K229 – from chainage 4550 to 5200.

Eastern Slopes of Te Puka Valley: These two forest types are contiguous, lowland forest merging into montane forest, and forming a continuous forest margin along the eastern slopes

immediately above Te Puka Stream. They are potentially affected by creation of the diversion which will may require land that is currently forest (this is not likely to require a significant area of land).

- Akatarawa Regional Forest - Lowland Kohekohe – from chainage 4400 to 4800.
- Akatarawa Regional Forest - Sub-montane – from chainage 4800 to 5450.

These sites are shown in SSEMP/A3. The location of the fence is to be decided by the Site Environmental Manager and fencing contractor. The fencing will be undertaken prior to any earthworks commencing.

7.6 Species translocations

A permit is required together with agreement from the Department of Conservation on appropriate translocations sites, as follows:

7.6.1 INDIGENOUS LIZARDS

Prior to earthworks commencing all debris fields and scree slopes will be searched for lizards following guidelines provided in the Ecological Mitigation and Monitoring Plan. All lizards located will be translocated to appropriate safe habitat, as close to their capture site as possible.

7.6.2 INDIGENOUS INSECTS

Prior to earthworks commencing all debris fields, screen slopes and other likely habitat will be searched for Peripatus following guidelines provided in the Ecological Mitigation and Monitoring Plan. All insects located will be translocated to appropriate safe habitat, as close to their capture site as possible.

7.6.3 FRESHWATER FISH

Prior to stream reclamation associated with culverting or diversion, the sections of stream to be lost will be fished using as a minimum traps and electric fishing machines. Any fish caught will be translocated to appropriate safe habitat as close to their capture site as possible.

7.7 Stream Works

7.7.1 TEMPORARY CULVERTS

There is an existing track that follows the path of the Te Puka Stream adjacent to the proposed corridor. The access track has four stream crossings (natural fords) which will either be replaced with temporary culverts in order to minimise stream disturbance during construction. Following construction if needed for long term maintenance access they will be made into fords.

Chainage	Comments
3780	Stream crossing 1 – Main Channel
3850	Stream crossing 2 – Main Channel
4130	Stream crossing 3 – Main Channel
4880	Stream crossing 4 – Main Channel

The design of these culverts is detailed in the CEMP. Their locations are shown in SSEMP/A2.

The track will be used for initial access from the Wainui Saddle as construction on the reinforced soil embankment begins. As work progresses on filling the stream area at the northern end of the focus area a permanent access track will be constructed, as parts of the existing track will be covered by earthworks (the stream diversion works and earthworks components of the project are inextricably linked). Temporary access will be required from the area of the embankments to connect with the permanent access track.

This permanent access track will run adjacent to the embankment and will be the primary haul road for the section. Both the temporary and permanent access tracks are shown in drawings SSEMP/A2. Access to cut areas will be possible via the access tracks and the haul road as sections of the main alignment are progressively completed.

7.7.2 PERMANENT CULVERTS AND DIVERSIONS

With the exception of temporary culverts described above, all other stream works in the Te Puka will be conducted as part of the construction of the road embankment.

7.8 Laydown Areas

- Currently none proposed within this SSEMP

7.9 Stockpile Areas

- Currently none proposed within this SSEMP

8 CONSTRUCTION WORKS

8.1 Earthworks

Bulk filling will follow the progress of the stream alignment from the southern end. It is proposed the fill begins once stream realignment works have reached road chainage 4485m (approximate location of the second large detention pond). The bulk filling will be coordinated with the progressive installation of the 5 precast unit cascade structures. An overview plan of the bulk filling can be found on SSEMP/8 with typical sediment control details on SSEMP/A9-11.

Four large sediment ponds are proposed along the length of the Te Puka stream works to treat sediment runoff from the highway bulk fill. The access road constructed as part of the stream realignment work will be used to channel "dirty" runoff from the bulk fill operation into the sediment detention pond.

Chemically treated sediment ponds have been proposed along the length of the batter in order to accommodate areas of between 1.5ha and 2.5ha. Where the areas feeding a single pond exceed this, it is proposed that the work be divided into two sections, with earthworks being first completed in the upstream section. Sediment laden runoff is then diverted along the access road, with clean water runoff from the second stage of bulk filling being diverted past the pond directly to the realigned stream channel.

Once this first section is complete and has been stabilised, clean water from the stabilised fill is run directly into the stream. "Dirty" runoff from the second section under construction is then directed into the pond via the access road diversion bund.

As each sections of work are completed and stabilised, the next downstream pond is constructed before the upstream pond is cleaned out and decommissioned and the next stage of bulk filling begins.

8.2 Cut & Fill Treatments

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

- Benches where practical will be spaced evenly except for the first bench which, where practicable, will be a minimum of 15m above finished road level.
- Faces will be left with a rough surface to facilitate vegetation growth.
- Tops and ends of cuts rounded off to reduce hard edges.
- Soil material will be left on benches to aid revegetation.

Both cut and fill batters to receive final revegetation treatment (see 8.6 Revegetation below) at earliest possible time following completion of construction *provided* this timing is conducive to vegetation growth. If the Site Environmental Management Auditor finds that conditions are not acceptable an interim treatment (hydroseeded grass) will be applied prior and the final landscape treatment carried out at an appropriate time within the following year.

8.3 Stream Works

With the exception of temporary culverts required for construction access tracks, all stream works will be coordinated with formation of the road and highway embankments. This staging is shown in SSEMP/A6-A7.

8.3.1 Diversions

Significant diversion of the Te Puka Stream (T5) is required within the area of this SSEMP. This diversion is considered to be the most significant and complex on the alignment, and will require

a mixture of avoidance, remedy, mitigation and offsetting. The design will be discussed with Ngati Toa during the specimen and detailed design stages.

CHAINAGE	ELEMENT	COMMENT
3700	Stream diversion and offline culverts	Eight culverts, constructed offline to provide erosion control. Once complete, streams will be diverted through these culverts to channel water away from the works site during the final stages of construction.
4900	Te Puka Stream diversion	WD1
TBA	Clean water diversion bund	At the north of the site, preventing clean stream water from passing through the works area. Water will then be channelled into a stream diversion.

8.3.2 Diversion Design Guidelines

A series of performance based guidelines have been developed for stream diversions in the Te Puka and Horokiri. These guidelines can be found in the Ecological Mitigation and Monitoring Plan.

The intent of the guidelines is for the new channel (diversion) to mirror, as closely as possible, the existing channels habitat, hydrology and geomorphology including:

- Ideal proportion of habitat types (pool, run, riffle, cascade, chute, waterfall, braid);
- Ideal proportion of substrate types in each habitat type (boulder, cobble, gravel, pebble, sand);
- Ideal water depths in each of the habitat types;
- Ideal total wetted areas in each habitat type; and,
- Maximum allowable water velocities in each of the habitat types.

8.3.3 Side valley flows and culvert structures

Drawings of potential culvert structures are found on SSEMP/A9 to SSEMP/A11.

All culverts in the Te Puka SSEMP area require an alternative design which involves running the culvert at a 1% grade beneath the road with outlet flow being dissipated via a cascade step structure that runs down the fill embankment. This is shown in SSEMP/A9-11.

The following culverts must provide for fish passage and will be built according to specifications contained within the EMP:

CHAINAGE	CULVERT NUMBER	TYPE OF FISH PASSAGE TREATMENT
4475	T10	Sprat Thread / velocity calming

8.3.4 Cascade culvert structure

The construction of cascade culvert outlet structures will be coordinated with placement of the bulk fill, with progressive delivery and placement of precast units keeping pace with filling. This will simplify construction and minimise safety issues associated with construction of the cascade structure down a 40m high, 45° slope. The drawings show the proposed method of construction using precast cascade units.

Culverts will be constructed by overfilling the alignment by 1.5 – 2 metres, then excavating to lay the pipe in “trench” conditions, which will result in a more economic design for the precast concrete pipes. Once laid, the trench will be backfilled prior to recommencing the placement of bulk fill to finished levels.

Details of these cascade structures are shown in SSEMP/A11.

8.3.5 "Splash ford" / access road crossing

The cascade structure for each culvert will both dissipate energy and convey the flow to the base of the embankment. At this point, the service road crosses the discharge over a broad trapezoidal channel with nominal 4 metre wide x 300 mm deep base and 1:10 side slopes for entry and egress through the ford. There is no provision to use the service road during extreme storm events. Protection in the realigned stream channel will be necessary where the side channel enters the stream and typically will include large rocks used as protective riprap to the opposite bank, and if necessary a Reno mattress beneath the rip rap.

Details of these splash fords are shown in SSEMP/A11.

8.3.6 Temporary works for side valley flows

Subsoil drains are to be installed in the bed of the side channels to provide preferential drainage paths under the fill. As the base fill for the RSE wall is completed, a temporary channel lined with geotextile will be constructed across the base fill so that in the event of a storm during construction, the side valley flows can be directed into the main stream channel without causing significant erosion to the base fill.

8.4 Erosion Control Measures

The primary construction methodology for mitigation against sediment release to the environment is targeted erosion control. In the Te Puka SSEMP area this will involved the development of stepped slopes during earthworks, roughing up the soil, importing and laying topsoil, mulch or compost blankets, use of sprayed and bound straw mulch and hydro seeding. On steeper slopes rolled erosion control blankets or netting may be used, and if any particularly steep vulnerable slopes are worked wire blankets or cellular confinement will be used to provide sufficient control.

The locations of erosion control devices are shown in SSEMP/A9-11.

8.5 Sediment Control Measures

The work area is space constrained both in terms of the designation and the availability of flat areas to site sediment treatment devices. Prior to the first phase of construction a number of sediment diversion bunds and channels will be created down-gradient of the earthworks. These will discharge into numerous sediment ponds located along this section of alignment. Chemical treatment (flocculent) will be used within the ponds to provide additional settlement before discharge.

As stream realignment works are to be carried out in relatively short stages, the proposed chemical treatment sediment pond volumes range from $30m^3$ up to a maximum of approximately $150m^3$. The base fill works may result in sections longer than 100m being open at any one time and it is anticipated that sediment pond volumes may be up to twice as large as those used in the stream re-alignment works.

Silt fences will be installed adjacent to the existing watercourses during construction.

Clean water diversion bunds will be formed up-gradient of the earthworks areas prior to the bulk cut and fill required in the Horokiri area for road construction. Silt fences will be installed adjacent to each of the small streams.

Additional erosion control measures for the operation of the project include step structures down gradient of each of the culverts. These are intended to reduce the velocity of flow and therefore the erosion potential.

Once sediment controls are in place, the embankments for the new highway and pavement will be constructed. Once the bulk earthwork and stabilisation are complete sediment controls will be removed.

The following table identifies erosion control techniques that will be applied to key areas.

CHAINAGE	ELEMENT	COMMENT
3700 to 5000	Sediment diversion bunds and channels	Down-gradient of all earthworks
3700 to 5000	Te Puka Stream diversion	
3700 to 5000	Silt fencing	Along the boundary of existing streams during earthworks
TBA	Sediment ponds and chemical treatment sheds	In the early construction phase, sediment ponds and chemical treatment sheds will be constructed at the downstream of sediment diversion bunds. These will discharge to existing small watercourses or the Te Puka Stream.
TBA	Sediment tanks	Where space is constrained and the catchment is small sediment tanks may be used instead of ponds.

The locations of sediment control measures are shown in SSEMP/A4 and A11.

8.6 Revegetation

Following completion of bulk earthworks restoration planting will be carried out as per plan SSEMP/A3. The treatments are likely to be as follows:

Site	Current Vegetation	Method
TP1	Pasture on slopes	Revegetation
TP2	Pasture adjacent to streams	Riparian Planting
TP3	Shrublands and open scrub	Enrichment planting (interplanting)
TP4	Advanced regeneration	Retirement (no planting proposed)

8.7 Dust

A selection of the following controls will be deployed on the construction sites as required:

- Water (water cart irrigation), provides a good short term solution. Caution is required to avoid a discharge from over application of water. All areas identified as dust sources including roads are to be kept dampened during dry weather periods to minimise public nuisance from windborne dust.
- Chemical Adhesive Sprays, provide longer term solutions to small areas which aren't able to be treated by water such as hill slopes or long term stock piles. Resource consents may be needed for this activity (depending on chemicals used) and any over spray risks will be managed.
- Wind fences, are good for small areas and may be appropriate to be used in this location.
- Mechanical treatment, such as slopes rolled with mulch or aggregate provide effective control for wind erosion. However these can't be used in active work areas, so require careful planning for installation.
- Cover Blankets for stock piles.

Should the potential for dust generation be identified, an investigation by the Construction Supervisor into likely sources shall be undertaken and specific controls can be applied to the problem area(s).

8.8 Transporting of Materials

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

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

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

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

9 RE-INSTATEMENT

The re-instatement works will entail the removal of temporary culverts placed along the construction access track. The stream channel will be reinstated to a form that reflects the existing characteristics of the stream on either side of the culvert.

10 TRAINING

Within this SSEMP site, all contractors will receive a full briefing on the environmental considerations including avoidance of NO-GO sites, recognition of habitats of significant species, and timing of ecological and water quality monitoring.

11 MONITORING

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

11.1 Erosion & Sediment Control (ESC) Devices

Performance monitoring of the proposed ESC devices is intended to ensure that they operate as designed and that their performance is maintained over the lifespan of their use on the project. The discharges from the site works and the proposed treatment devices will enter watercourses throughout the catchments. The following monitoring of the receiving environment is proposed to check whether the effects of the discharges are as anticipated.

Monitoring of erosion and sediment control measures will be selected from the following table as appropriate:

Control Measure	Routine Inspection	Wet Weather And Incident Inspections	Inspect For	Performance Measures	Management Action	Reporting
Control and retention of disturbed soil at earthwork sites (Improve Soil Health)	Weekly	During heavy rain (Q10 event) and after all rain	Soil loss Rill erosion Surface water flow pathways	Retention of soil	Rectify any erosion or channel formation Re-grade surface as required	Inspection, outcomes and management action in site log
Provide	Weekly	When rainfall	Surface water	Design	Undertake	Inspection,

Control Measure	Routine Inspection	Wet Weather And Incident Inspections	Inspect For	Performance Measures	Management Action	Reporting
Short Term Soil Cover		predicted through weather monitoring. After all rain	pathways / erosion	specifications	straw mulching Hydro seeding	outcomes and management action in site log
Provide Long Term Soil Cover	Weekly	During heavy rain (Q10 event) and after heavy rain (Q10 event)	Damage / erosion Growth of plantings (including gaps)	90% cover or stabilised	Rectify and repair damage to blankets/netting Replant gaps/dieback	Inspection, outcomes and management action in site log
Steep Slope Techniques	Weekly till 90% stabilised (i.e. 90% gassed or equivalent)	During heavy rain (Q10 event) and after heavy rain (Q10 event)	Damage / erosion Growth of plantings (including gaps)	Design specifications	Rectify and repair damage to blankets/netting Replant gaps/dieback	Inspection, outcomes and management action in site log
Clean water diversion bund	Weekly	During heavy rain (Q10 event) and after all rain	Damage / erosion Blockages Sediment build-up	Design specifications	Rectify any damage / erosion or blockages Remove accumulated sediment in diversion channel.	Inspection, outcomes and management action in site log
Rock check dam	Weekly	After all rain	Damage / erosion Blockages Sediment build-up	Design specifications	Rectify any damage / erosion or blockages Remove accumulated sediment behind dams when 50% full	Inspection, outcomes and management action in site log
Pipe drop structure/ flume	Weekly	After all rain	Damage / erosion Blockages	Design specifications	Rectify any damage / erosion or blockages	Inspection, outcomes and management action in site log
'Pinned' Silt socks or gravel check dams	Weekly	During heavy rain (Q10 event) and after heavy rain (Q10 event)	Damage / erosion Sediment build-up	Design specifications	Rectify and damage / erosion or blockages Replace/ repair gaps	Inspection, outcomes and management action in site log
Sediment Retention Pond	Daily	After all rain. During heavy rain (Q10)	Sediment build up	Measure depth of sediment versus pond volume	Remove sediment when 20% full	Inspection, outcomes and management action in site log

Control Measure	Routine Inspection	Wet Weather And Incident Inspections	Inspect For	Performance Measures	Management Action	Reporting
			Damage/ Function of the decants/ Level Spreaders / Fore bay	Design Specifications	Rectify any damage / blockages to fore bay	Inspection, outcomes and management action in site log Advise GWRC within 24hrs of significant damage and management actions
Chemical treatment System	Weekly	After all rain. During heavy rain (Q10)	Damage, low dosing supply	Design Specifications	Rectify any damage or blockages. Replace flocculent	Inspection, outcomes and management action in site log
Sediment Fence / Silt Socks	Weekly	After all storm events (Q2-Q10)	Sediment build-up	Measure depth of sediment versus fence height	Remove sediment when 20% of height occupied	Inspection, outcomes and management action in site log
			Damage/ erosion/ water bypass	Design Specifications	Rectify any damage / erosion. Relocate devices to deal with bypass	Inspection, outcomes and management action in site log
Decanting Earth Bund	Weekly	After all rain events During heavy rain (Q10)	Sediment build-up	Measure depth of sediment versus pond volume	Remove sediment when 20% full	Inspection, outcomes and management action in site log
			Damage/ erosion Blockages	Design Specifications	Rectify any damage / erosion or blockages	Inspection, outcomes and management action in site log Advise GWRC within 24hrs of significant damage and management actions
Stormwater Inlet Protection	Weekly	After all rain	Damage/ erosion Blockages	Design Specifications	Rectify any damage / erosion or blockages	Inspection, outcomes and management action in site log
Works in watercourses	Weekly	After all rain	Visual release of sediment into the water above that envisaged for works	Documented method for works	Investigate source of sediment and rectify works/modify method	Inspection, outcomes and management action in site log

12 REPORTING (AS ABOVE)

No reporting above and beyond the requirements of the CEMP is required for this SSEMP section.

13 APPENDIX - CALCULATIONS

13.1 Quantities

All works and Erosion and Sediment Control measures will be contained within the designation. The indicative earthworks quantities for the Te Puka SEMP are summarised in the table below.

EARTHWORKS CATEGORY	AREA (m^2)	QUANTITY (m^3)
Earthworks cut CH 3500 - 5000	35,948	359,000
Earthworks fill CH 3500 - 5000	84,175	843,000

13.2 Chemically Treated Sediment Retention Ponds

CHAINAGE	CATCHMENT AREA (m^2)	POND SIZE m^3 (main pond / forebay)	POND NUMBER	COMMENTS
x	1658	50	259	
x	6464	195	260	
x	7661	230	262	
x	7631	230	263	
x	5902	180	264	
x	1361	45	265	
x	2258	70	266	
x	8906	270	267	
x	2354	75	268	
x	8218	250	269	
x	4765	145	270	
x	10104	305	271	
x	6062	185	272	
x	10744	325	273	
x	8724	265	274	
x	9551	290	275	

The sediment retention pond size has been calculated on the basis of 3% of the contributing catchment.

13.3 Culverts

Calculation summary for culverts are as follows:

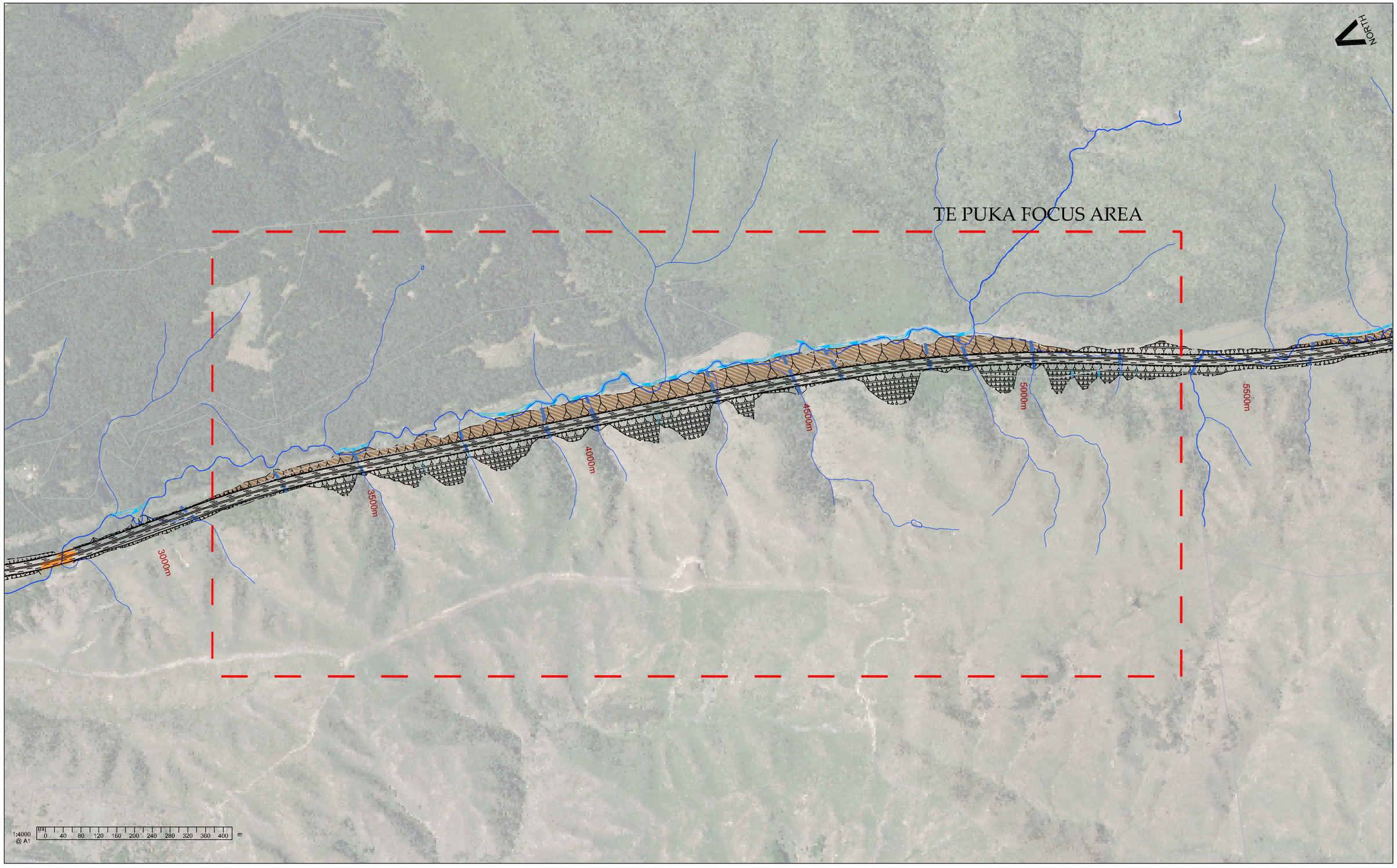
Chainage	Pipe reference	Pipe diameter (mm)	Indicative gradient (m/m)	Catchment (ha)	Q10 Design Flow (m3/s)	Height below pipe soffit in Q10 (m)	Q100 Design Flow (m3/s)	Height below road level in Q100 (m)
3900	T7	900	1 to 50	2	0.50	0.2	0.84	1.1
4025	T8	1050	1 to 50	5	0.80	0.25	1.32	6.4
4300	T9	1050	1 to 50	8	0.79	0.25	1.29	3.4
4475	T10	1200	1 to 50	8	1.49	0.1	2.50	17

4600	T15	600	1 to 50	15	0.21	0.1	0.36	0.5
4800	T11	600	1 to 50	4	0.39	0.15	0.64	1.2
4900	T12	1050	1 to 50	7	0.64	0.35	1.04	6.6

13.4 Stormwater Treatment Devices

There are three proprietary devices proposed for the capture and treatment of road runoff. The catchment size and size of proposed stormwater treatment devises are as follows:

CHAINAGE	CATCHMENT AREA (ha)	TYPE OF TREATMENT	DESIGN WATER QUALITY VOLUME (m3)	COMMENTS
P2	1.2	Proprietary device	300	-
P3	1.8	Proprietary device	450	-
P4	1.7	Proprietary device	419	-



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
General Arrangement Plan

Status. For Consenting

Sheet. No. SSEMP/A1

Version No. A

Plot Date 03.03.2011

NORTH

3500m

4000m

4500m

5000m

8A

9A

10A

11A

EXISTING ACCESS TRACK

TEMPORARY TRACK FOR CONSTRUCTION

PROPOSED TRACK AFTER CONSTRUCTION

TEMPORARY CULVERTS

1:2500 @ A1

0 40 80 120 160 200 240 m

Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Construction Access Plan

Status. For Consenting

Sheet. No. SSEMP/A2

Version No. A

Plot Date 03.03.2011

NORTH

3500m

4000m

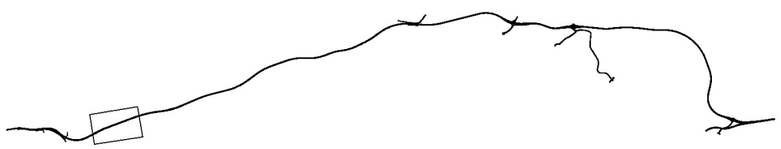
4500m

5000m

PLANTING KEY

- AMENITY PLANTING
- TREE GRID - KAHIKATEA
- KANUKA CORRIDOR
- STREAM RESTORATION
- CUT / FILL FACE + FILL SITE VEGETATED
- CUT / FILL FACE + FILL SITE GRASSED
- ENRICHMENT
- RETIREMENT/PROTECTION
- EXISTING DESIGNATION MITIGATION PLANTING
- VISUAL MITIGATION PLANTING

1:2500 @ A1 — 0 40 80 120 160 200 240 m



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

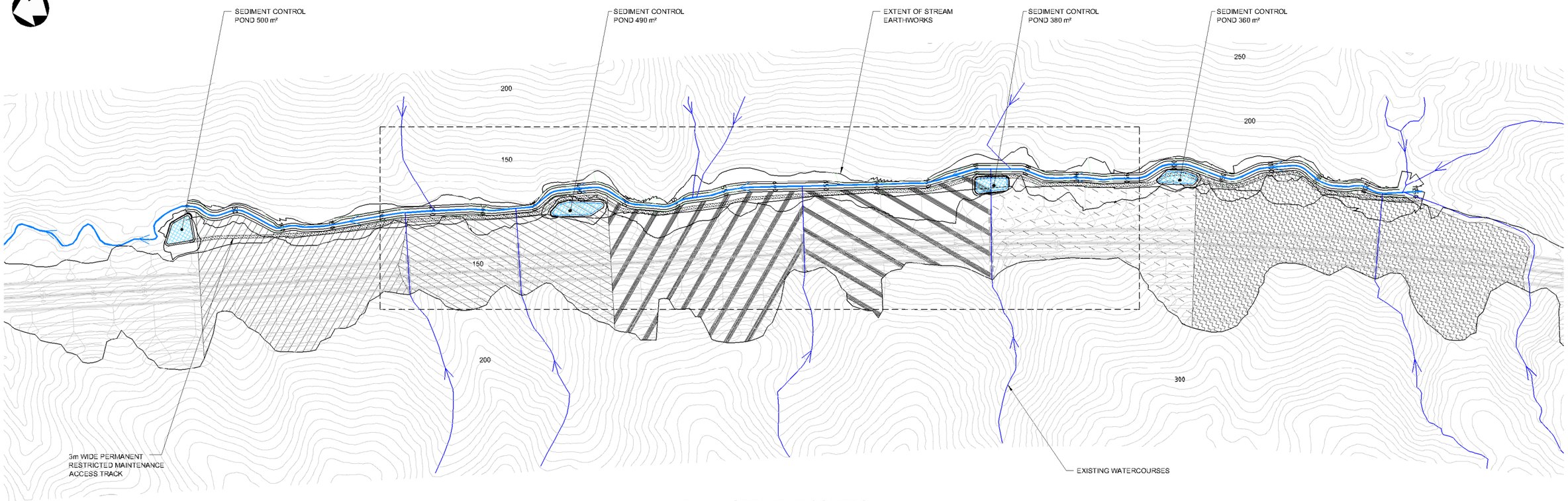
Title.
Site Environmental Management Plan
Te Puka
Landscape Plan

Status. For Consenting

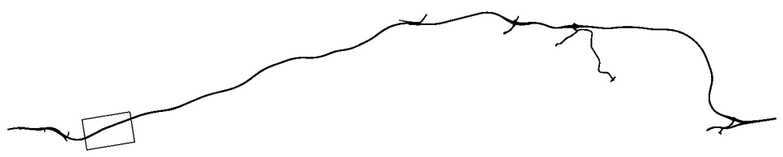
Sheet. No. SSEMP/A3

Version No. A

Plot Date 03.03.2011



PLAN - SEDIMENT CONTROL
SCALE 1:2000 (A1)



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Stream Diversion Layout

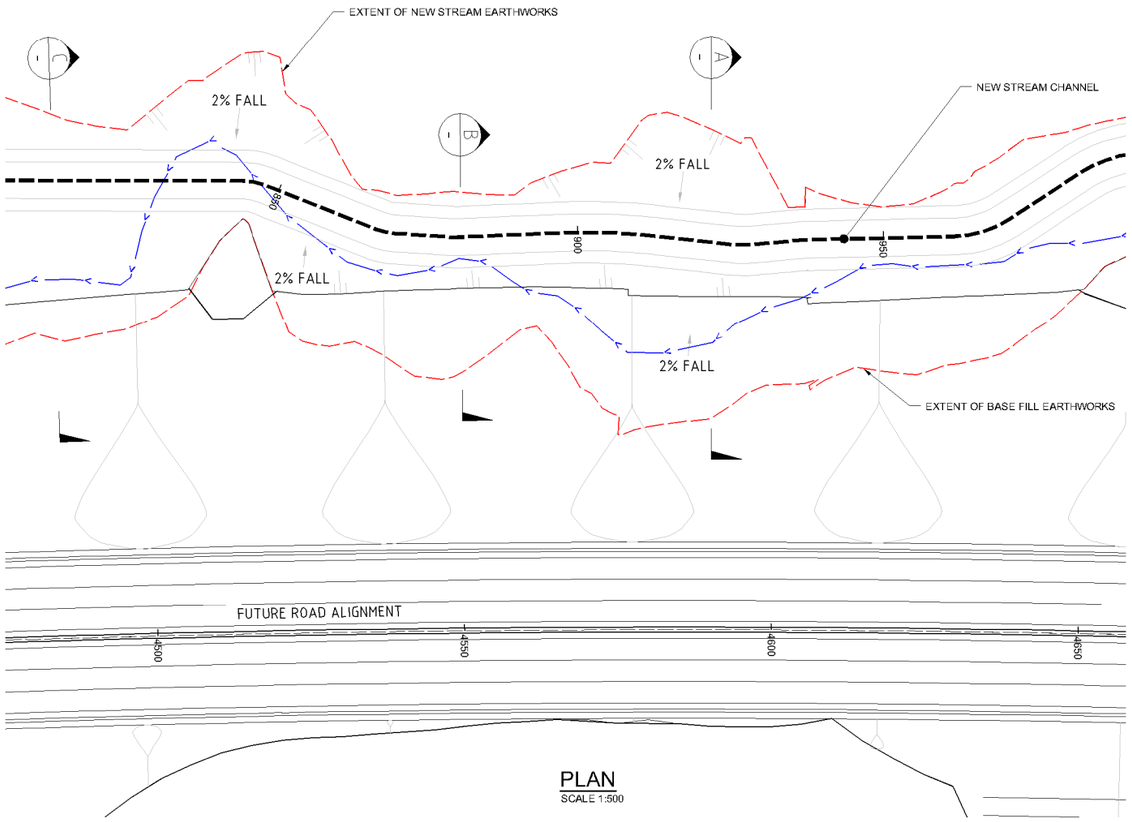
Status. For Consenting

Sheet. No. SSEMP/A4

Version No. A

Plot Date 19.10.2010 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

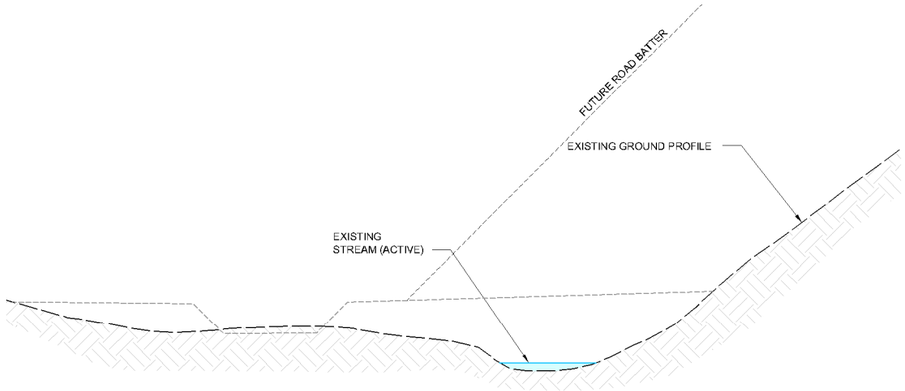
1:2000 @ A1 0 20 40 60 80 100 120 140 160 180 200 m



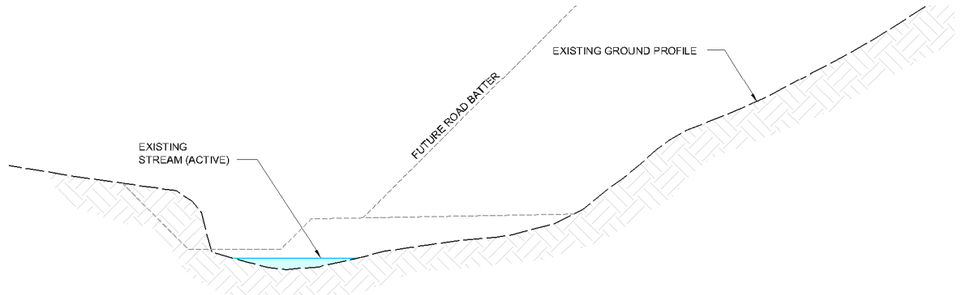
PLAN
SCALE 1:500

KEY

EXISTING STREAMS



SECTION A
SCALE 1:200



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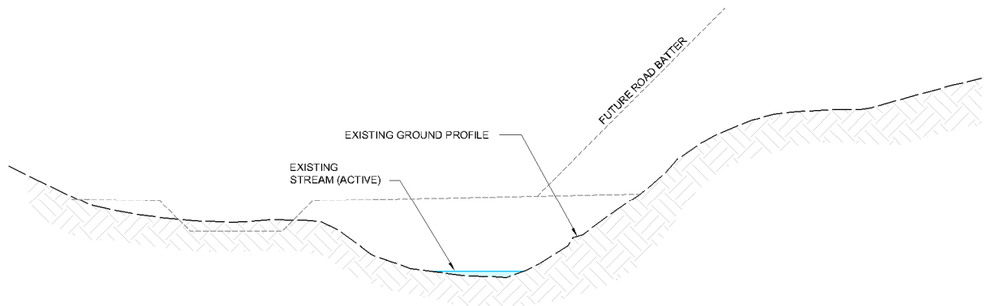
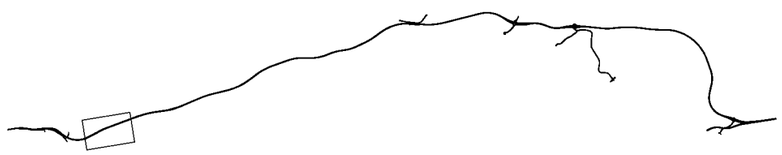


SECTION C
SCALE 1:200



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Existing Stream Layout

Status. For Consenting

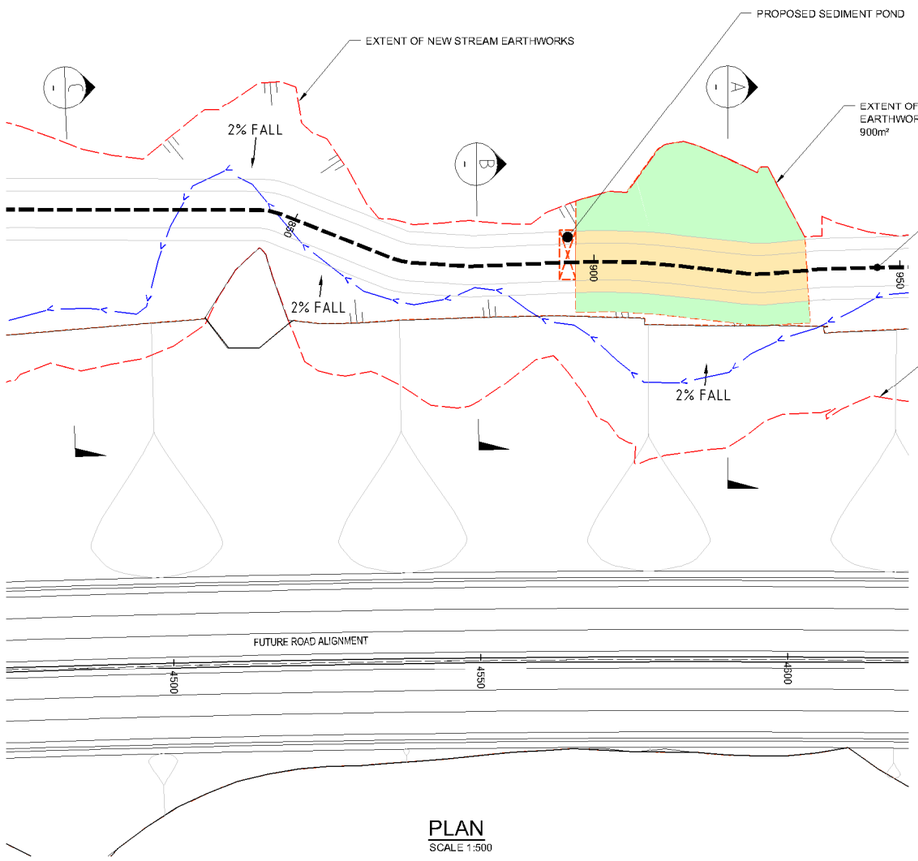
Sheet. No. SSEMP/A5

Version No. A

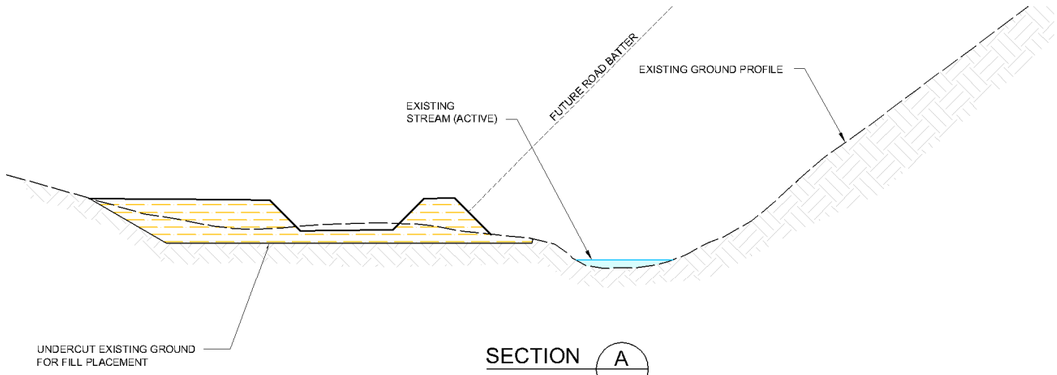
Plot Date 09.06.2011 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

1:500 @ A1 0 5 10 15 20 25 30 35 40 45 50 m

1:200 @ A1 0 2 4 6 8 10 12 14 16 18 20 m



PLAN
SCALE 1:500



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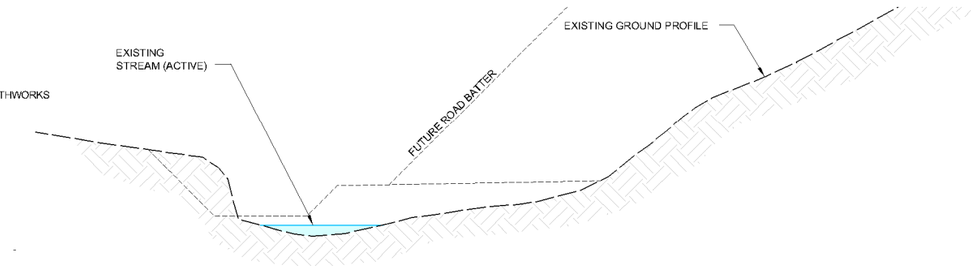

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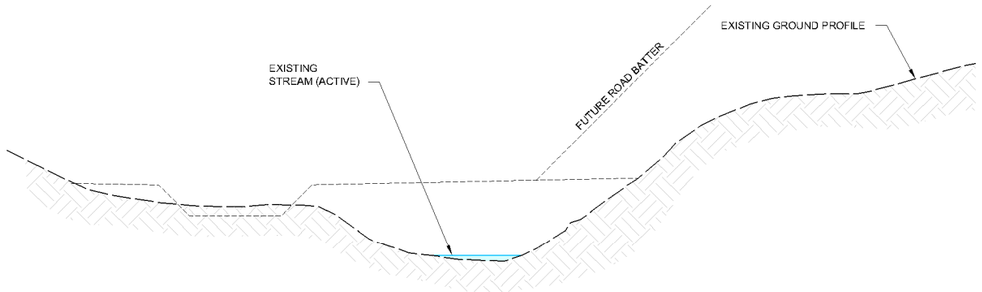
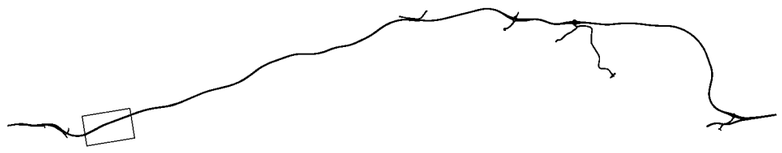


SECTION C
SCALE 1:200

KEY

EXISTING STREAMS



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Stage 1 Realignment Works

Status. For Consenting

Sheet. No. SSEMP/A6

Version No. A

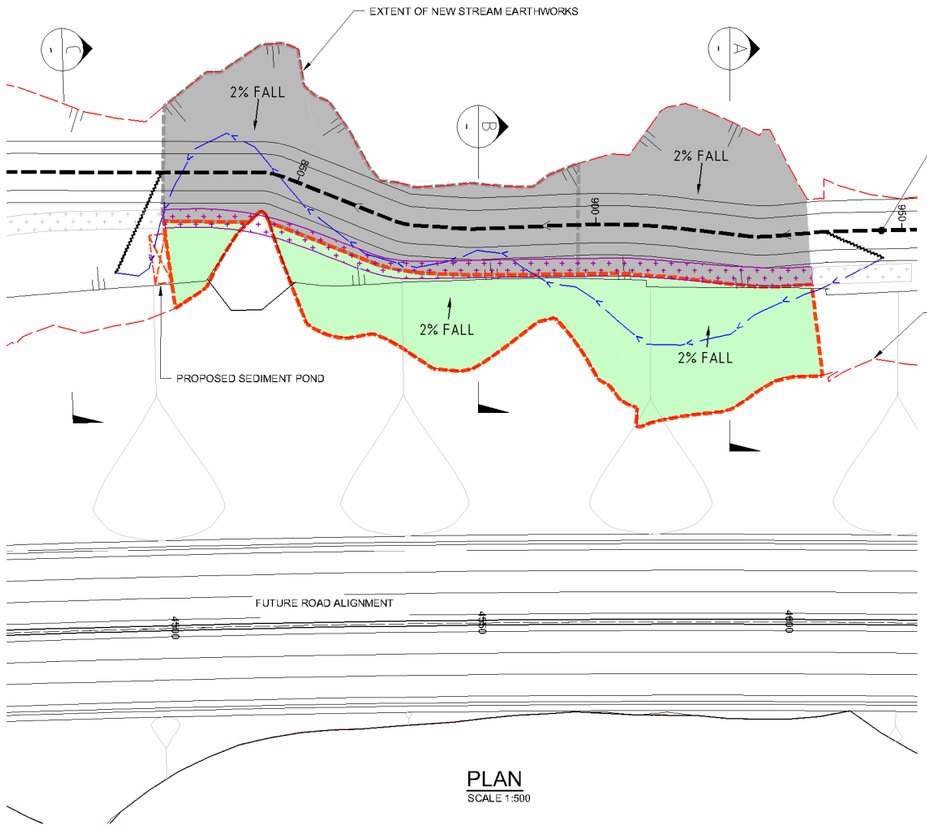
Plot Date 09.06.2011 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

1:200 @ A1 0 2 4 6 8 10 12 14 16 18 20 m

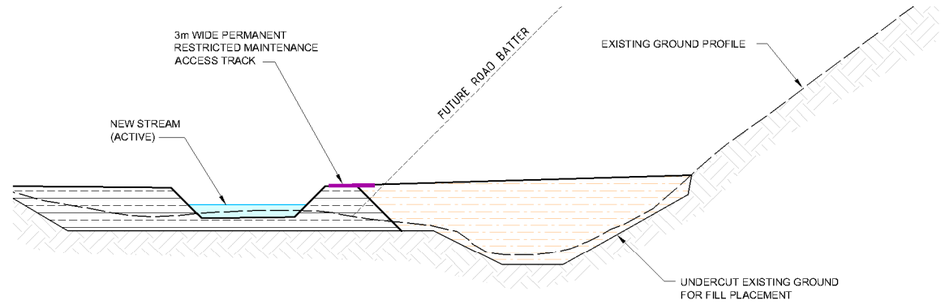
1:500 @ A1 0 5 10 15 20 25 30 35 40 45 50 m

KEY

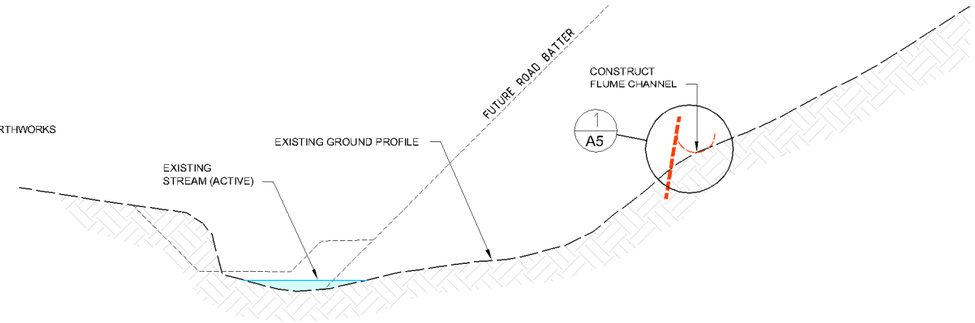
EXISTING STREAMS



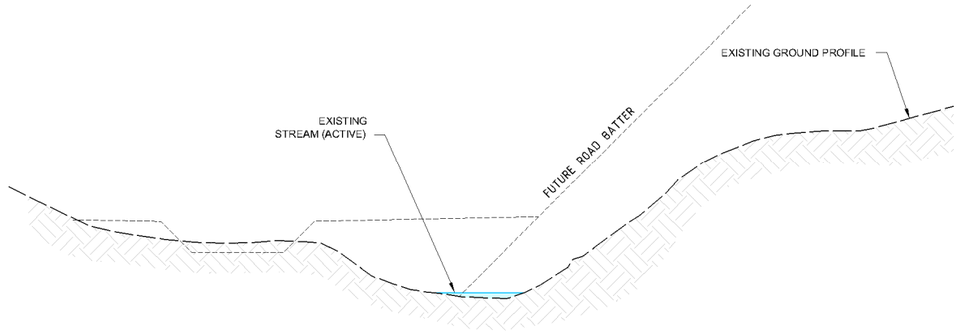
PLAN
SCALE 1:500



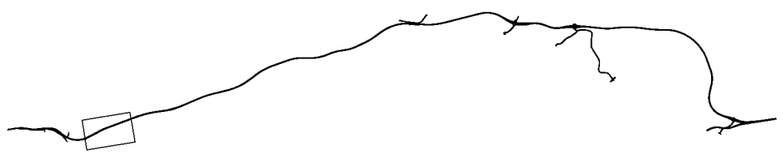
SECTION A
SCALE 1:200



SECTION B
SCALE 1:200



SECTION C
SCALE 1:200



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Stage 2 Realignment Works

Status. For Consenting

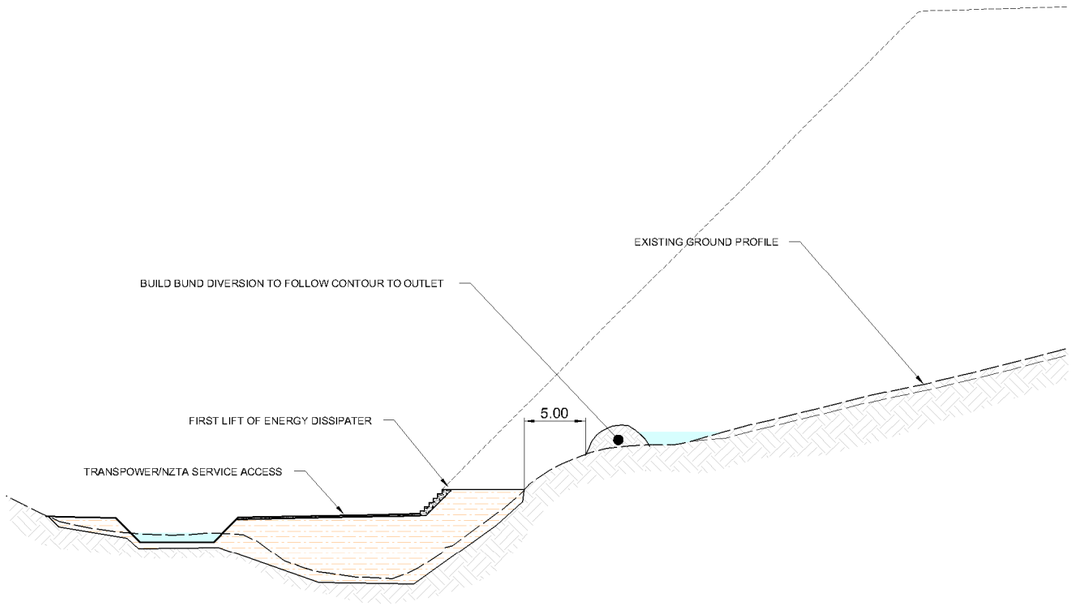
Sheet. No. SSEMP/A7

Version No. A

Plot Date 19.10.2010 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

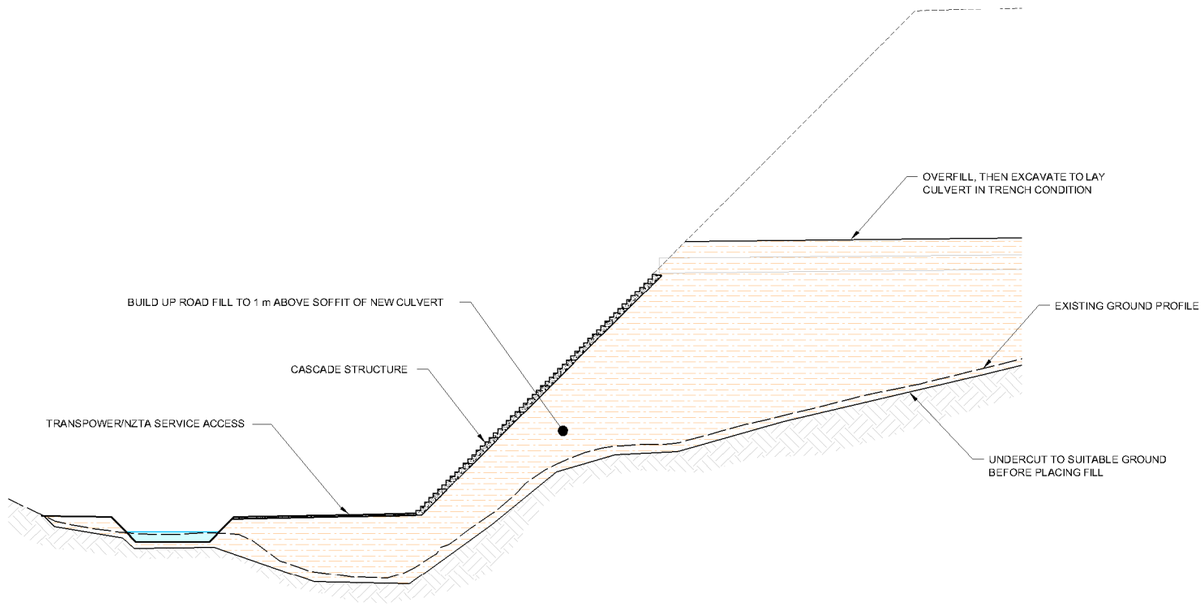
1:200 @ A1 0 2 4 6 8 10 12 14 16 18 20 m

1:500 @ A1 0 5 10 15 20 25 30 35 40 45 50 m



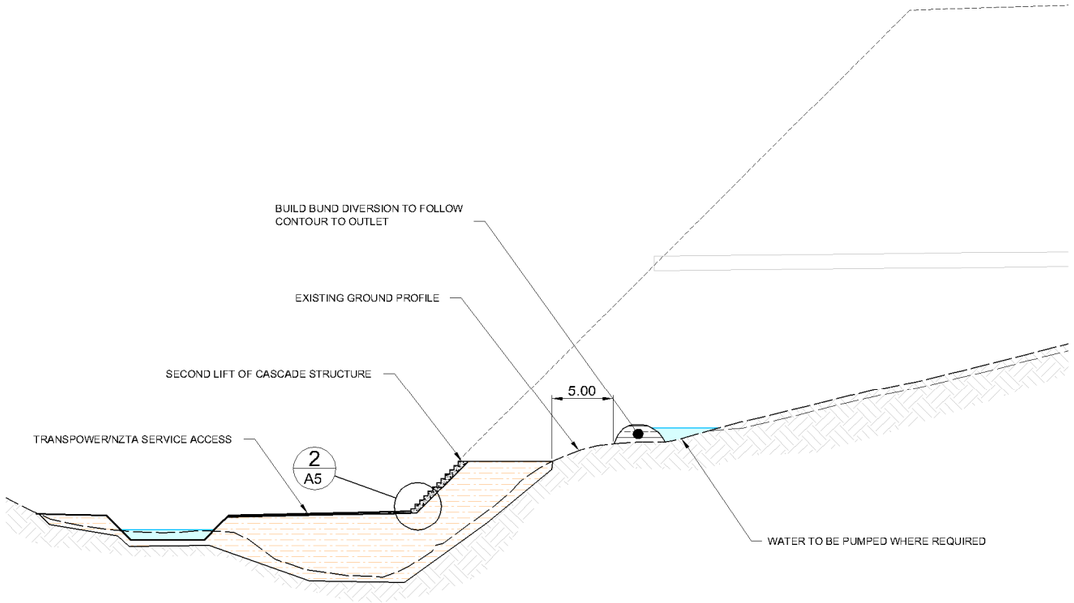
TYPICAL CULVERT CONSTRUCTION STAGE 3 - FIRST LIFT

SCALE 1:250



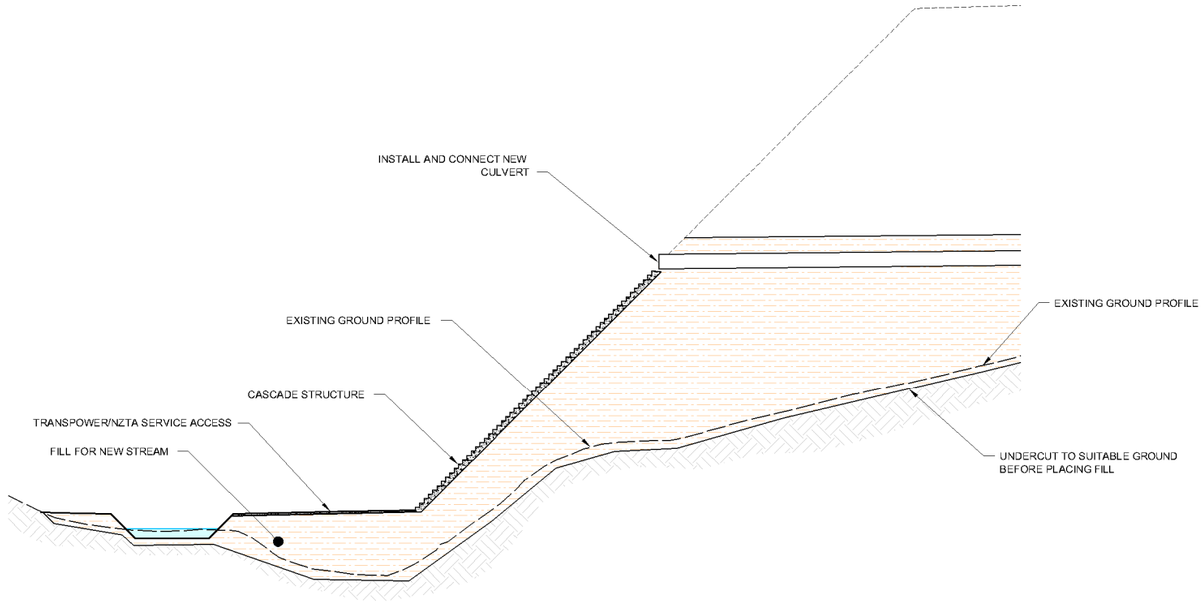
TYPICAL CULVERT CONSTRUCTION STAGE 5 - ONGOING LIFTS, OVERFILL

SCALE 1:250



TYPICAL CULVERT CONSTRUCTION STAGE 4 - SECOND LIFT

SCALE 1:500



TYPICAL CULVERT CONSTRUCTION STAGE 6 - CULVERT INSTALLATION

SCALE 1:250

Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka - Stages 3 to 6
Embankment and Culvert Construction

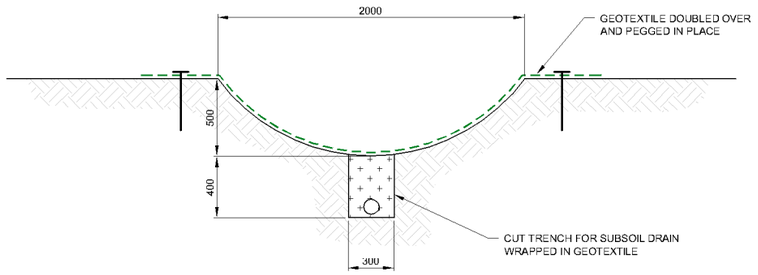
Status. For Consenting

Sheet. No. SSEMP/A8

Version No. A

Plot Date 09.06.2011 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

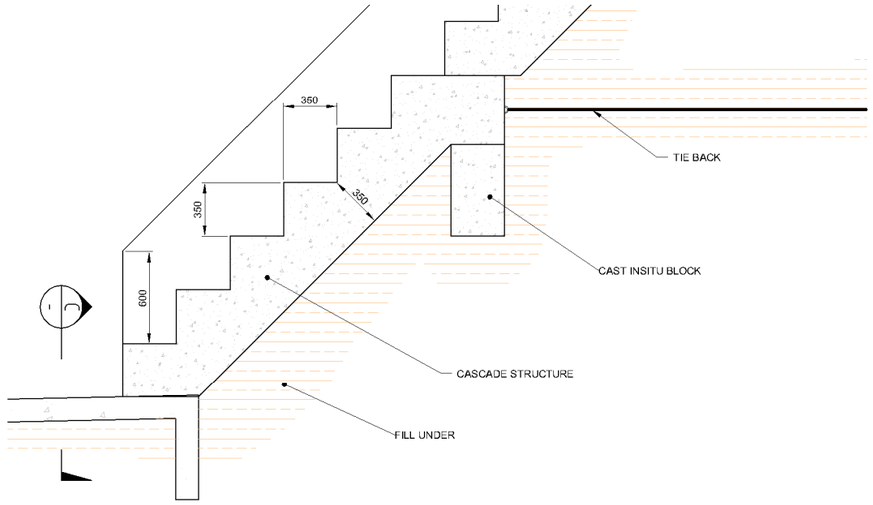
1:250 @ A1 0 4 8 12 16 20 24 m



TYPICAL TEMPORARY FLUME CHANNEL

DETAIL 1 / A3

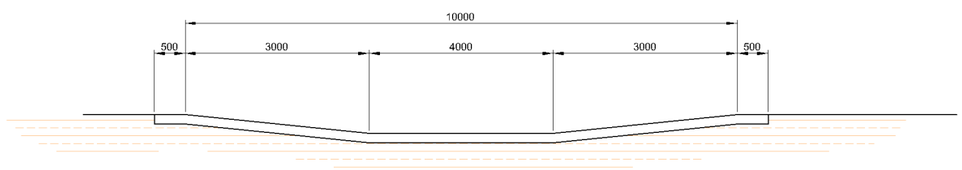
SCALE 1:20



TYPICAL CASCADE STRUCTURE SECTIONAL DETAIL

DETAIL 2 / A4

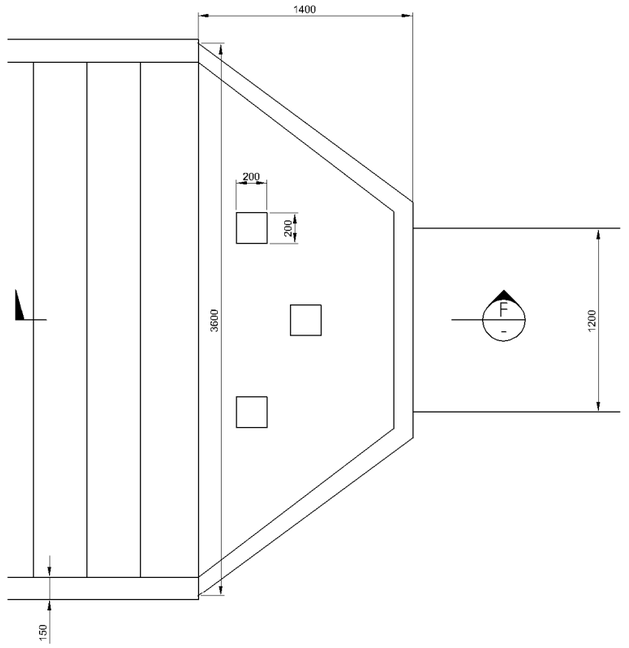
SCALE 1:20



TYPICAL SERVICE ROAD CULVERT DISCHARGE CROSSING

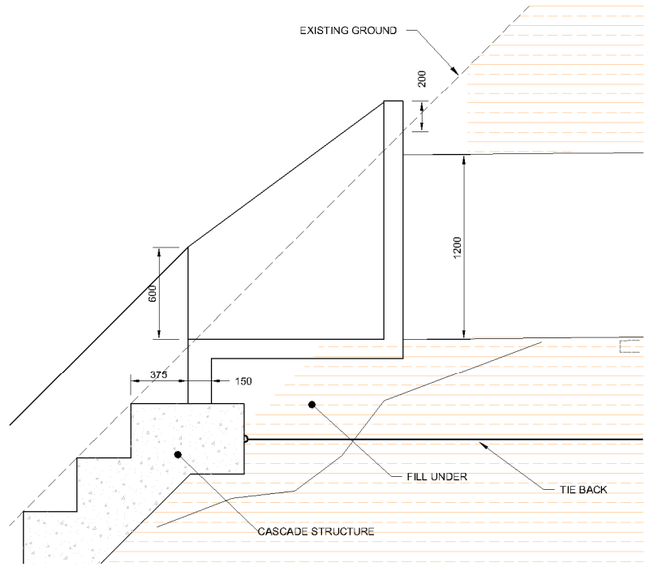
SECTION C / -

SCALE 1:50



TYPICAL CASCADE STRUCTURE PLAN VIEW

SCALE 1:20



SECTION F / -

SCALE 1:20

Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Typical Details Sheet 1

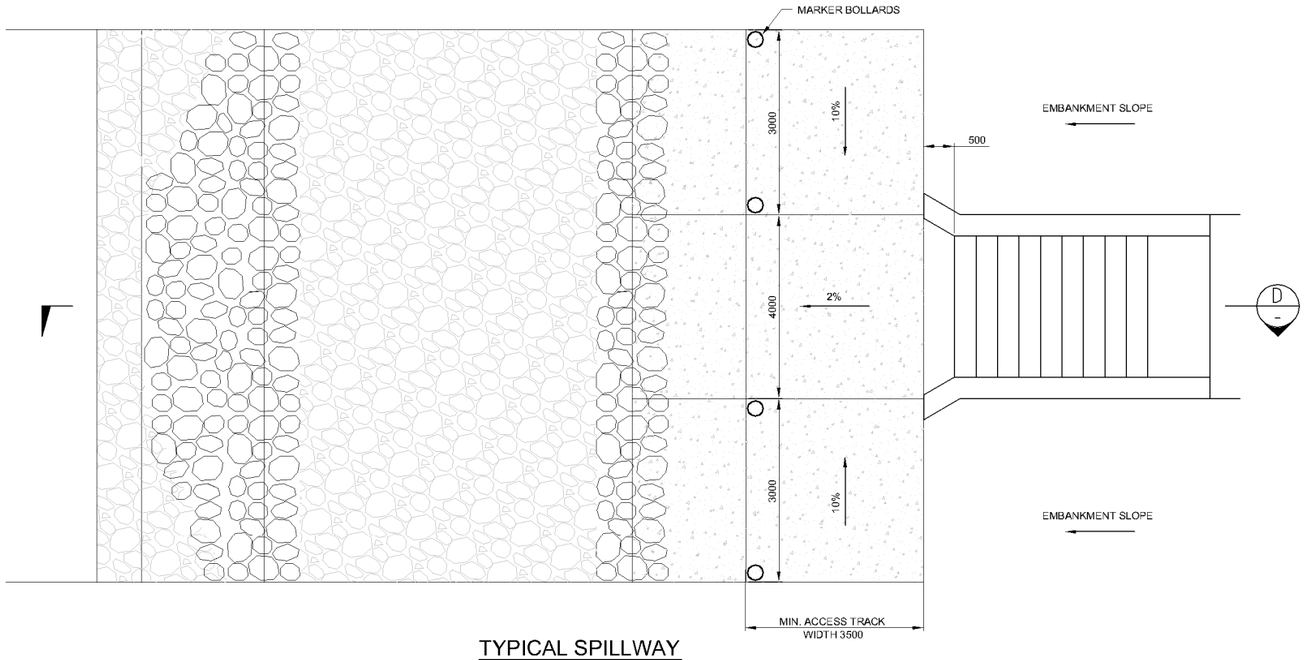
Status. For Consenting

Sheet. No. SSEMP/A9

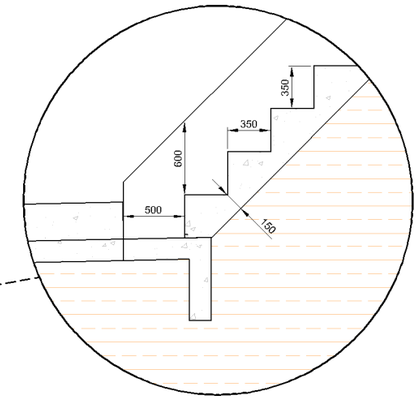
Version No. A

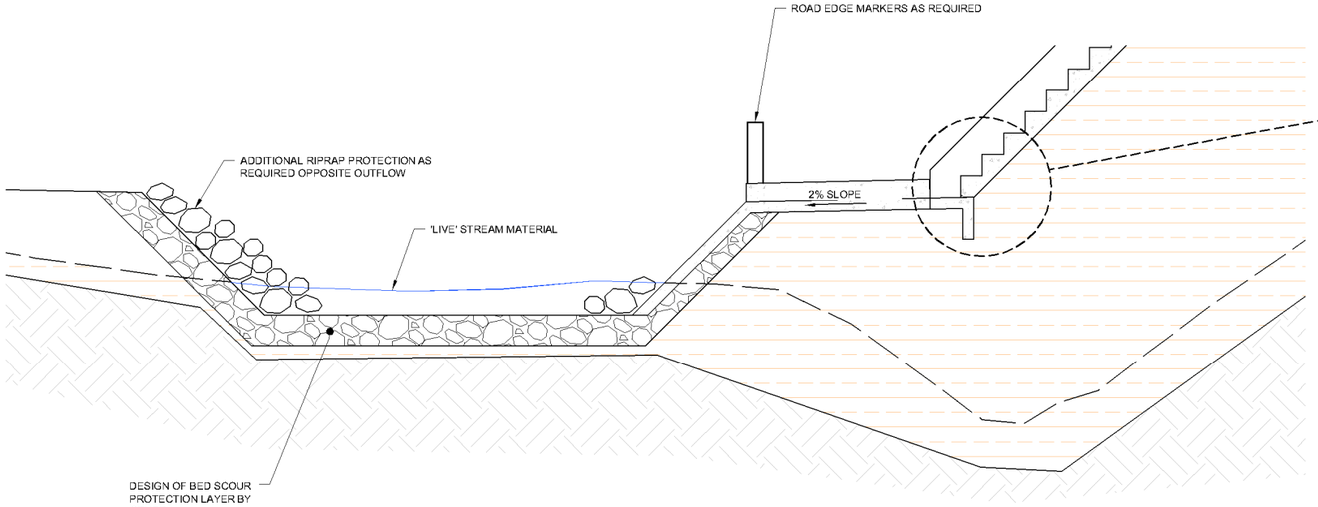
Plot Date 19.10.2010 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

1:20 @ A1 0 200 400 600 800 1000 1200 1400 1600 1800 2000 mm

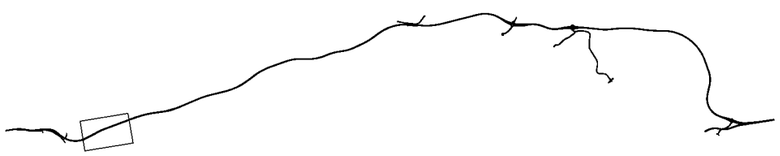


TYPICAL SPILLWAY
SCALE 1:50





SECTION D
SCALE 1:50



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project.
TRANSMISSION GULLY PROJECT

Title.
Site Environmental Management Plan
Te Puka
Typical Details Sheet 2

Status. For Consenting

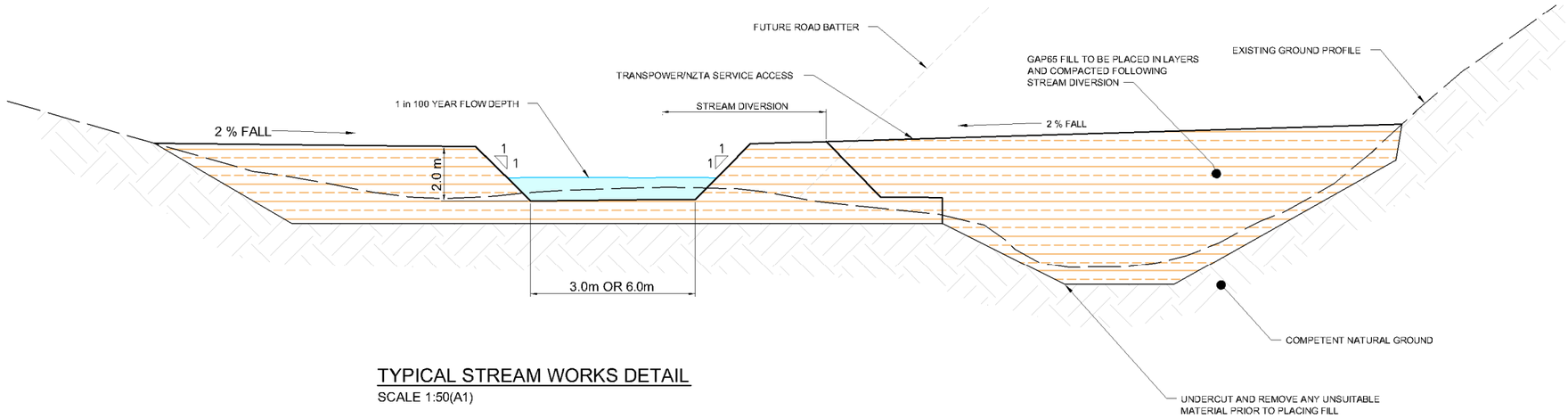
Sheet. No. SSEMP/A10

Version No. A

Plot Date 19.10.2010 P:\projects\5-C1591.00 Transmission Gully Phase2\600 Deliverables\Data Produced\2010 10 15 EMP Workshop\D_Linden\Linden_Sheet11.dwg

1:50 @ A1

0 1 2 3 4 5 m

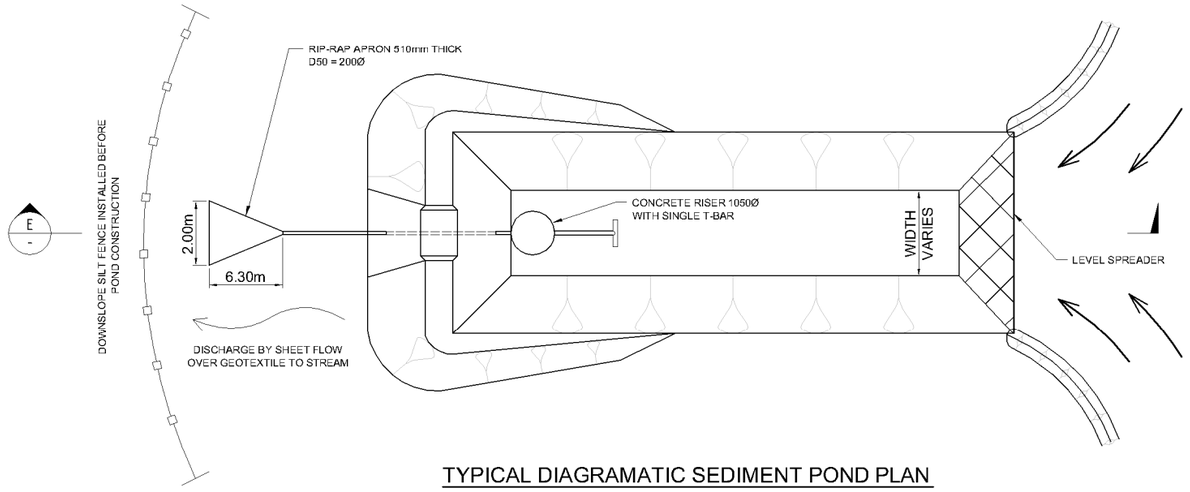


TYPICAL STREAM WORKS DETAIL

SCALE 1:50(A1)

NOTES

1. EXTENT OF UNDERCUT DETERMINED BY OTHERS.
2. STREAM DIVERSION AND BASE FILL CARRIED OUT AS SEQUENTIAL OPERATIONS.



TYPICAL DIAGRAMATIC SEDIMENT POND PLAN

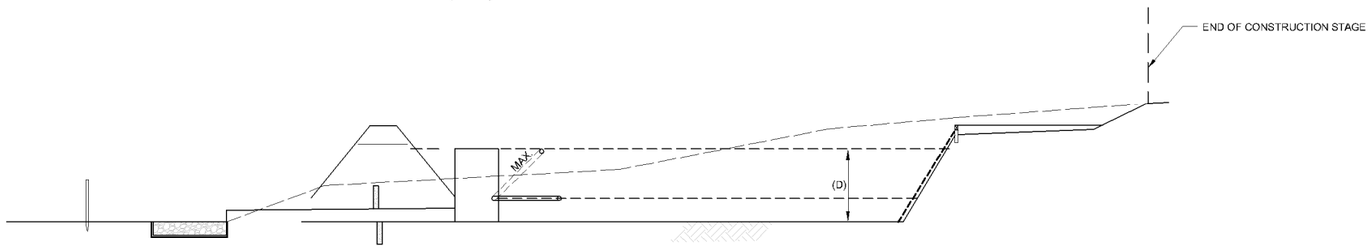
SCALE: (N.T.S)

TYPICAL SEDIMENT POND SIZING FOR STREAM REALINGMENT AND BASE FILL WORKS

(RANGE 900-5000m² WORK AREA)

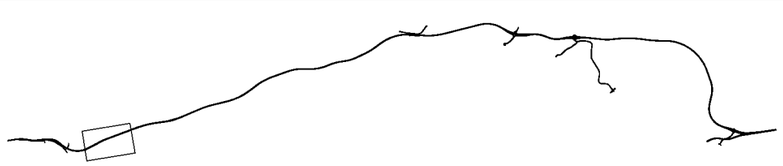
- POND AREA BASED ON 3% SIZING
- LENGTH TO WIDTH RATIO OF 3.1m
- STANDARD DEPTH OF 1.5m

POND AREA	WIDTH	LENGTH	DEPTH (D)	AREA SERVED
APPROX. MIIN. SIZE : 18m ²	2.5m	7.5m	1.5m	900m²
APPROX. MIAX. SIZE : 100m ²	6m	18m	1.5m	5000m²



TYPICAL DIAGRAMATIC SEDIMENT POND SECTION

SECTION E - SCALE: (N.T.S)



Revision	Amendment	Approved	Date

NZ TRANSPORT AGENCY WAKA KOTAHI

Project. TRANSMISSION GULLY PROJECT

Title. Site Environmental Management Plan
Te Puka
Typical Details Sheet 3

Status. For Consenting

Sheet. No. SSEMP/A11

Version No. A

Plot Date 09.06.2011 P:\projects\5-C1591.00 Transmission Gully Phase2\500 Technical\CEMP\2011 01 27 SEMP plans\Te Puka

1:100 @ A1 0 1 2 3 4 5 6 7 8 9 10 m