APPENDIX I – EROSION SEDIMENT CONTROL PRINCIPLE AND PRACTICE

SH16 Brigham Creek to Waimauku Safety Improvements – Erosion and Sediment Control Principles and Practices

Curtis Blyth

29.10.2018

VERSION 1 - Final

NZ TRANSPORT AGENCY WAKA KOTAHI
Safe Roads
New Zealand Government

More information

Safe Roads
Published March 2016

If you have further queries, call our contact centre on 0800 699 000 or write to us:

Safe Roads
Level 1
Waitomo House
6 Garden Place
Hamilton 3204

Revision History

Revision No.	Prepared By	Description	Date
1	Curtis Blyth	**Draft for review**	29.05.2018
2	Curtis Blyth	**Final for resource consent application**	20.08.2018
3	Curtis Blyth	**Final for resource consent following design change**	29.10.2018

Document Acceptance

Action	Name	Signed	Date
Prepared by	Curtis Blyth		29.10.2018
Reviewed by	Raymond Chang		29.10.2018
Approved by	Fariz Rahman		29.10.2018

1. INTRODUCTION

1.1 Scope

The Safe Roads Alliance (SRA) has prepared an Erosion and Sediment Control Plan (ESCP) for the SH16 Brigham Creek to Waimauku Project to support a resource consent application for earthworks. This project will provide shoulder widening, barrier improvements, a section of new lane construction and stormwater upgrades of State Highway Sixteen (SH16) between Brigham Street Intersection and Waimauku.

This project is split in to two stages, Huapai to Waimauku Stage 1 and Brigham Creek to Kumeu Stage 2. This ESCP has been prepared to address ESC principles for both stages.

Along with supporting the resource consent application, this document will provide a platform for contractors to develop more detailed erosion and sediment control plans for specific areas once a detailed design and construction methodology is finalised.

1.2 Purpose

This ESCP outlines the effects associated with the land disturbing activities undertaken during this project, and makes recommendations of the principles and practices necessary to mitigate the impact of these activities on receiving environments.

This document has been prepared as supporting documentation for the application for resource consent to perform earthworks along the SH16 alignment. A site specific ESCP will be prepared once detailed design and construction methodology is finalised and a contractor selected. This ESCP does not contain specific plans of where retention or treatment devices may be found along the alignment. Locations of specific devices will be detailed in the site specific ESCP once a contractor is involved and the detailed design has been finalised. This process will allow for the contractor's specific phasing, construction methodology and locations of laydowns/stockpiling to be considered in the plan.

No plans have been provided with this report as it is considered all localised works (bridge abutments etc) are small enough to be protected solely by silt fences and erosion control methods. Site specifc plans to be developed will outline any ESC measures implemented for these areas once designed, including any sediment retention devices (ie. decanting earth bunds (DEBs)) that may be required.

2. PROJECT CONTEXT AND DESCRIPTION

This portion of SH16 has been earmarked as a key location for servicing growth areas and responding to future urban transport demands. The proposed works involve shoulder widening and barrier improvements within the immediate border of the existing road.

The following works are proposed for each section of the corridor (Figure 1). Please note that the proposed works as presented in this ESCP are subject to minor changes through detailed design.

- **Section A** (Brigham Creek roundabout through to Coatesville-Riverhead Highway intersection) – provide two lanes in each direction with median safety barrier and behind the road shoulders;
- **Section B** (Coatesville-Riverhead Highway intersection) – convert the existing priority controlled intersection to a roundabout with consideration to safe accesses to adjoining residential and commercial properties;
- **Section C** (Coatesville-Riverhead Highway intersection through to Taupaki Road / Old North Rd intersection) – provide two lanes in each direction with median safety barriers and behind the road shoulders;
- **Section D** (Taupaki Road / Old North Road intersection through to the posted speed limit change (80km/h and 60km/h) east of Old Railway Road intersection, Kumeu) – provide flush median markings; and
- **Section E** (from Station Road intersection, Huapai to the posted limit change (100 km/h and 70km/h) east of Wintour Road, Waimauku) - provide median safety barrier and behind the road shoulders with safe turnaround facilities

These upgrades will provide safer road infrastructure for the public with the intention of lowering the number of traffic incidents that occur on this stretch of road.

The majority of works are within the roading designation. The project area of the SH16 upgrades lie on generally flat ground with five watercourses being either bridged or culverted along the alignment. Due to the widening of the road only requiring works that are immediately adjacent to the existing road, sediment runoff will be predominantly controlled with bunds, silt fences and erosion controls (stabilisation) along the road's shoulder.

The turnaround at Foster Road is required due to the construction of a centre barrier restricting some residents' ability to enter their driveways northbound.

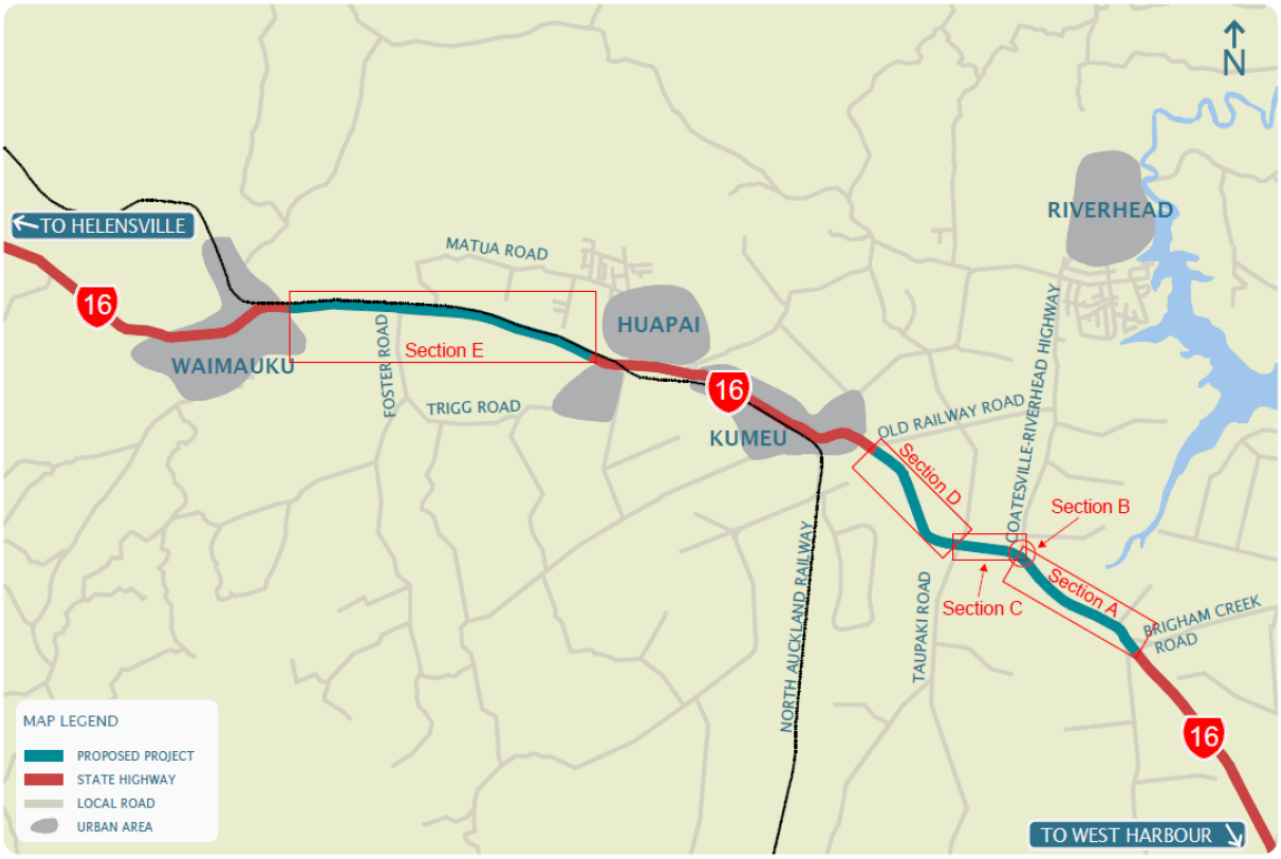


Figure 1. SH16 Improvements – Brigham Creek to Waimauku Project Area

2.1 Proposed design

Overview text of the proposed design is provided in the *SH16 Brigham Creek to Waimauku Safety Improvements Assessment of Environmental Effects.*

Soil disturbance is limited to the existing road surface and shoulder of the road in areas of widening, barrier construction or turnaround development. The total volume of cut for Stage 1 (Section E) is ~6,300m^3 and 9,600m^3 total fill volume. The shortfall of fill will be made up of imported cleanfill and hardfill.

2.2 Project overview

The project overview will be provided in the *SH16 Brigham Creek to Waimauku Safety Improvements Assessment of Environmental Effects.*

2.3 Site Description

The 10.2km length of safety improvements are predominantly within the designation of SH16, Auckland Unitary Plan. Minor works outside of the designation are associated with newly constructed turn-around points, minor cut of neighbouring banks and newly constructed driveway entrances where applicable. Only one Conservation Zone lies adjacent to the road corridor as detailed in the Auckland Unitary Plan (AUP). This zone runs alongside Brigham Creek with no works occurring within it.

2.4 Receiving Environment Values

Several freshwater streams are bridged or culverted under the alignment of SH16 including Ngongetepara Stream (Brigham Creek), Ahukuramu Stream, and two tributaries of the Kumeu River. The extent of works surrounding these areas are yet to be confirmed, however indicatively are well removed from the stream banks and flow paths.

A small section of the banks of the Ngongetepara Stream is overlain by an AUP Conservation Zone which appears to hold a grove of developed native bush.

The Kumeu River runs through predominantly agricultural and horticultural land and does not have a high recreational value. Land, Air and Water Aotearoa has repeatedly recorded the macroinvertebrate community index (MCI) of the Kumeu River to be poor.

3. PRINCIPLES OF EROSION AND SEDIMENT CONTROL

The key principles to be employed for an ESCP are to undertake land disturbing activities in a manner that reduces the potential for erosion of bare soils to occur (erosion control) and, to employ treatment devices to treat all sediment laden water prior to discharging from the site (sediment control). The 10 basic principles of erosion and sediment control taken from *Auckland Council Guidance Document: Erosion and Sediment Control* (GD05, 2016) will be applied to each of the defined scenarios (as applicable) and are outlined for completeness as follows:

Minimise Disturbance: Only work those areas required for construction to take place.
Stage Construction: Carefully plan works to minimise the area of disturbance at any one time.
Protect steep slopes: Where steep slopes exist within the works area, ensure that these are protected throughout the duration of works.
Protect Watercourses: Map all water bodies and nearby stormwater outflows before works commence.
Stabilise exposed areas rapidly: Sewing new seed or mulch cover where design does not include a finished hard surface (concrete or hard fill).
Install perimeter controls: Divert clean water away from areas of disturbance and divert runoff from areas disturbed to sediment control measures.
Employ detention devices: Treat runoff by methods that allow sediment to settle out.
Make sure the ESCP evolves: As construction progresses and the nature of land disturbing activities change, the ESCP needs to be modified to reflect the changing conditions on the site.
Assess and adjust: Inspect, monitor and maintain control measures.
Use trained and experienced contractors

The following sections outline aspects of ESC that will be implemented by the contractor. While no specific plans can be produced at this stage, it is envisioned that the contractor will prepare a site specific ESCP once construction methodology and detailed design are finalised. The following sections are therefore based on the proposed construction methodology of removing the existing road shoulder and obtaining the desired grade for the widened road corridor followed by hard fill placement and stabilisation. Works are programmed to be completed section by section. This staging allows for safer control of the roadway and stabilisation of each road section as the works progress.

4. EROSION CONTROLS

A number of considerations around control of erosion within areas of disturbance are outlined below which will be applied to all areas of construction.

4.1 Timing of Earthworks

The contractor shall endeavour to complete earthworks during the Auckland Council's earthwork season (1st October – 30th April). Should earthworks be required outside this period the contractor may be required to apply to the Auckland Council for permission to complete works through winter (this will be stipulated in a resource condition if determined applicable by Council).

Staging of earthworks will allow for the duration of exposed soils to be minimised and also allows for planning around the construction of the roadway and stabilisation to follow. It is likely works will occur on a section by section basis, excavating in front of the construction activities and allowing the hard fill placement to continually stabilise exposed areas as works progress. It is anticipated that turnaround areas constructed outside of the alignment will be operated as independent sites with appropriate devices scaled to their specific open area.

4.2 Site Access Points

Entranceways into the worked areas will be directly off SH16. Several laydown areas will also be accessible of SH16 that will be on existing gravel pits or off neighbouring roads. All entranceways will be required to be stabilised at points where site access is off public roads. This stabilised entrance will be built in accordance with GD05. The purpose of stabilised entranceways is to prevent the exit points of the site becoming a source of sediment and reduce the tracking of sediment onto SH16.

4.3 Minimise Exposed Areas

A number of best practice measures will be employed to minimise the area of land exposed to erosive forces at any one time. Vegetation clearance will be limited to those areas where soil disturbance/road construction will be undertaken, with as much existing ground cover being retained as possible. Staging of earthworks will also be implemented where practicable in order to stabilise areas after construction has been completed.

Very little soil will be exposed given the site works will be confined to the road shoulder directly adjacent to the existing road. The works will therefore be confined to a long narrow stretch of earthworks of either side of the road. This narrow design allows for easier control of sediment runoff and erosion protection as the majority of works are within the berm of the road, channelling stormwater flow.

4.4 Limiting Site Length

Exposure of long slopes increases the potential for water traveling over the site to cause erosion and generate increases in sediment loss. Contour bunds or check dams will be required along the length of the excavation should sustained heavy rainfall be forecast while an excavation over a long section of the pathway is open. Alternatively, excavations could be temporarily stabilised with geofabric or hay mulch.

4.5 Stabilisation and Reinstatement

A large portion of the worked area will be stabilised with hard fill systematically given the road design involves the widening of the road surface.

Exposed soil surrounding these finished surfaces will be progressively stabilised when earthworks are completed to reduce erosion on these surfaces. Stabilisation will be in accordance with GD05 guidelines, and be dependent on the slope and surface. This progressive stabilisation will include top soiling and grass seeding for all areas within two weeks of having earthworks and pathway construction completed on them. Cut banks can be stabilised temporarily with geofabric where practical.

4.6 Dust Control

Dust will be controlled by water spray as required. Water for dust control purposes will be sourced from public supply or local boreholes applied for at the time of construction. Dust management will need to comply with Permitted Activity conditions.

4.7 Stockpiling

Stockpiling of soil will be kept to a minimum where possible. Stockpiled soils will be covered by appropriate material or stabilised to prevent ingress of rainfall and the generation of dust. Management of stockpiles will be detailed in the contractor's site specific ESCP.

4.8 Watercourse Protection

No machinery is to enter watercourses, except for authorised works in watercourses. These works will need to be authorised prior to the mobilisation of machinery in this area. Erosion and sediment control plans will be updated upon the confirmation of earthworks plans in the vicinity of the watercourses. These practices will be in accordance with GD05 guidelines. Watercourse works may be required for a number of existing culverts and the construction of a new bridge near Foster Road (Berry's Bridge). ESC measures for these areas will be on a case-by-case situation, to be detailed in site specific plans. Use of coffer dams, sheet piling or silt curtains may be required pending detailed design in the vicinity of nearby watercourses.

5. SEDIMENT CONTROLS

Not all sediment retention devices will be present throughout the entire development works. Instead, sediment control devices will be installed based on the staging of earthworks and anticipated earthworks catchments. Erosion control measures and silt fences will be used prior to the construction of certain sediment retention devices as required.

5.1 Clean Water Diversion

A key measure applied in these works will be to ensure clean water is diverted away from exposed soils with perimeter controls. Clean water diversions will be constructed upgradient of all earthworks to ensure clean water does not mix with sediment laden water. Clean water is likely to be diverted onto neighbouring land, waterways or to stormwater catch pits.

The contractor will be required to assess each specific works area for clean water flowing into the works area, particularly where surface water may be discharging from uphill road surfaces.

5.2 Slope Protection

Slopes have the potential to generate significant sediment discharges, and must be protected from excessive erosion. There will be several steep cut surfaces along the length of construction where the road shoulder requires cut of a nearby bank to widen the corridor. These areas that require soil exposure of steep surfaces will require temporary stabilisation via soil stabilisers or geotextile if the final desired stabilisation cannot be obtained during works. Several retaining walls are required along the length of the alignment which will require slope protection during their construction.

5.3 Decanting Earth Bunds or Sediment Retention Ponds

Decanting earth bunds (DEBs) or sediment retention ponds (SRPs) will be installed to provide retention and treatment of sediment laden water dependent on the size of the earthworks catchment. Given the narrow earthwork areas and construction methodology of the roadway widening it is unlikely SRPs will be required. DEBs will be installed in large earthwork catchments that cannot be treated by silt fences and where site constraints do not restrict their construction.

These retention devices will be installed at the base of a long slope by the contractor in a position such that they are treating the greatest volume of sediment laden water. All DEBs will be designed and sized according to the GD05 guidelines with a minimum 2% volume of the earthworks and installed with a floating T-bar dewatering device.

Given the site is retricted to the shoulder of the road, DEBs will only be required at larger areas of cut or fill that are not suitable for silt fences. DEB placement will be adjacent to the road, collecting discharge from soil disturbance areas along the worked shoulder, where required.

5.4 Dewatering

Dewatering of excavations may need to occur after rainfall events.

Dewatering can occur from excavations to either a retention device onsite or a temporary silt trap (e.g. turkeys nest, baffled skip bin or dewatering silt bag). The use of flocculation in batch doses could be employed for dewatering devices to obtain faster settlement of suspended sediment. Specifics on the chosen dewatering device, if required, will be detailed in the contractor's site specific ESCP.

5.5 Silt Fences and Super Silt Fences

Silt fences or super silt fences will be installed across the contour to slow sheet flow and impound sediment from small catchment areas. Silt fences will be used where it is not practical to collect runoff and divert it to a SRP or DEB. It is likely silt fences and super silt fences will be the primary treatment device implemented along the length of the road construction where required due to the constraints of the alignment and limited earthworks area on the shoulder of each side of the road. The contractor will detail areas of site that require silt fence construction in the site specific ESCP.

Silt fences and super silt fences will be installed in accordance with GD05, following the design criteria outlined in **Table 1 and 2** respectively. Silt fences and super silt fences will remain in place until at least 80% stabilisation is achieved at the completion of works.

Table 1: GD05 sizing guidelines for **silt fences**.

Slope Steepness (%)	Slope Length (m) (Maximum)	Spacing of Returns (m)	Silt Fence Length (m) (Maximum)
Flatter than 2%	Unlimited	N/A	Unlimited
2 – 10%	40	60	300
10 – 20%	30	50	230
20 – 33%	20	40	150
33 – 50%	15	30	75
> 50%	6	20	40

Table 2: GD05 sizing guidelines for **super silt fences**.

Slope Steepness (%)	Slope Length (m) (Maximum)	Spacing of Returns (m)	Silt Fence Length (m) (Maximum)
0 – 10%	Unlimited	60	Unlimited
10 – 20%	60	50	450
20 – 33%	30	40	300
33 – 50%	30	30	150
> 50%	NA	20	NA

5.6 Stormwater Protection

All stormwater catch pits in the immediate area of earthworks will be protected by geotextile filter cloth, silt socks or silt fences (if in grassed areas). These must be installed correctly following the GD05 guidelines. These should be assessed regularly and replaced when significant volumes of sediment have accumulated. Catch pit protection will be necessary for this project along the entire length of upgrade works where stormwater outlets are identified near or within the worked area.

6. SPECIFIC AREAS OF CONSTRUCTION

6.1 Foster Road Turnaround

The Foster Road Turnaround is an approximate 1300m^2 area of flat agricultural land. This area is required for a safe turnaround point due to the construction of a centre barrier preventing some residents being able to cross the centre of the road to access their properties.

This turnaround is to be built up to the same level as Foster Road, requiring fill placement and compaction to obtain the designed height. Soil disturbance and fill placement will be required prior to stabilisation with hard fill for the roads construction. The entire area will therefore be required to be protected during these works.

Appendix A details the ESC measures that will be required for the Foster Road Turnaround. These measures include the construction of a bund and DEB which encompass the entire area and discharge to a nearby drain which runs parallel to the road alignment. The bund will have its outside face stabilised to act as a clean water divert from any water discharging over the neighbouring farmland. This bund and DEB will stay in place until the turnaround and its batter slopes are stabilised in accordance with GD05. A short silt fence is also required along the farm drain edge where the dirty water bund will not encompass.

All sediment discharge from the remaining turnarounds will be appropriately managed via use of silt fences and erosion control due to their smaller size.

7. ESCP MONITORING AND MAINTENANCE

7.1 General Monitoring and Maintenance activities

The following monitoring and maintenance activities shown in **Table 3** are recommended to be reviewed and finalised in the contractor's site specific ESCP. This table provides several aspects of ESC that the site manager or site foreman will assess regularly to ensure ESC measures are optimised.

Table 3: Monitoring and maintenance activities

Control Type	*Inspection and Maintenance Requirements*	*Frequency*
Weather Forecast	Check Metservice New Zealand for rainfall forecasts	**Daily**
Silt fence and super silt fence	Check that silt fences are toed in correctly. Check for tears and other damage. Any areas of collapse, decomposition or ineffectiveness are to be replaced immediately. Remove silt build ups when bulges develop or when deposition reaches 50% of the silt fence height.	**Daily** **Daily** **As required** **As required**
Decanting Earth Bunds (where required)	Inspect the bund and clean out if excess material has accumulated. Check the embankment for signs of erosion. Check the inlet structure. Check the outlet structure and pipe (e.g. signs of seeping, blockages).	**Daily**
Sediment Retention Ponds (where required)	Inspect the pond and clean out if excess material has accumulated. Check the embankment for signs of erosion. Check the inlet structure. Check the outlet structure and pipe (e.g. signs of seeping, blockages) Check flocculent levels and that the flocculation system is working correctly. Check pH of SRP water with litmus paper to assess the effects of flocculation if being undertaken.	**Daily**
Monitoring of Sediment Discharge	Check whether erosion and sediment devices are operating as designed. Inspect areas of earthworks and identify whether additional erosion and sediment control measures are necessary. Determine whether excessive sediment is discharging to roadways, land, or watercourses.	**During rainfall events**
Stabilised Entranceways	Inspect any structure used to trap sediment from the stabilised entranceways.	**After each rainfall.**
Stabilising Areas	Check that all stabilised areas have 80% cover. Identify areas that require stabilisation.	**As works progress (a minimum of once per week).**
Stormwater Catch pits	Check for build-up of sediment and ensure all dirty water will be filtered through geotextile	**Weekly and after major rain events**

8. CONCLUSION

The SH16 improvements involve standard road construction methodology of excavating areas to be widened, laying basecourse (hard fill) and paving. Works will be staged to avoid having an excess area of exposed soil open at one given time. The sequencing of works will allow for the stabilisation and subsequent erosion protection of soils with the placement of hard fill following the excavation of soils or existing roadway. Once hardfill is placed, the erosion potential of the worked areas will be minimal.

Emphasis on erosion and sediment control along the alignment will be placed on stormwater inlet protection, diverting clean water flows away from works, managing sediment on impervious surfaces and protection of laydown areas. Silt fences will be the primary treatment device along the side of the works where required, particularly where any upgrade works are to occur for stormwater infrastructure. DEBs may be required at the base of long lengths of exposed soil if planned to remain open for a period of time.

ESC measures for the Foster Road Turnaround take in to consideration the site's contour and catchment size to provide the most effective treatment with the construction of a DEB (Appendix A).

Site specific plans will be required for works in the vicinity of watercourses on a case-by-case basis as this detail was not ready at the time of preapring this plan. These sites are limited and any potential discharge effects will likely be mitigated with the implementation of silt fences to prevent discharge to the nearby waterways. Oher considerations will be necessary should works need to occur within the watercourse.

The measures outlined in this ESCP aim to mitigate any potential effect on the nearby receiving environment from sediment discharge. All devices detailed in this ESCP will be constructed to GD05 recommended criteria.

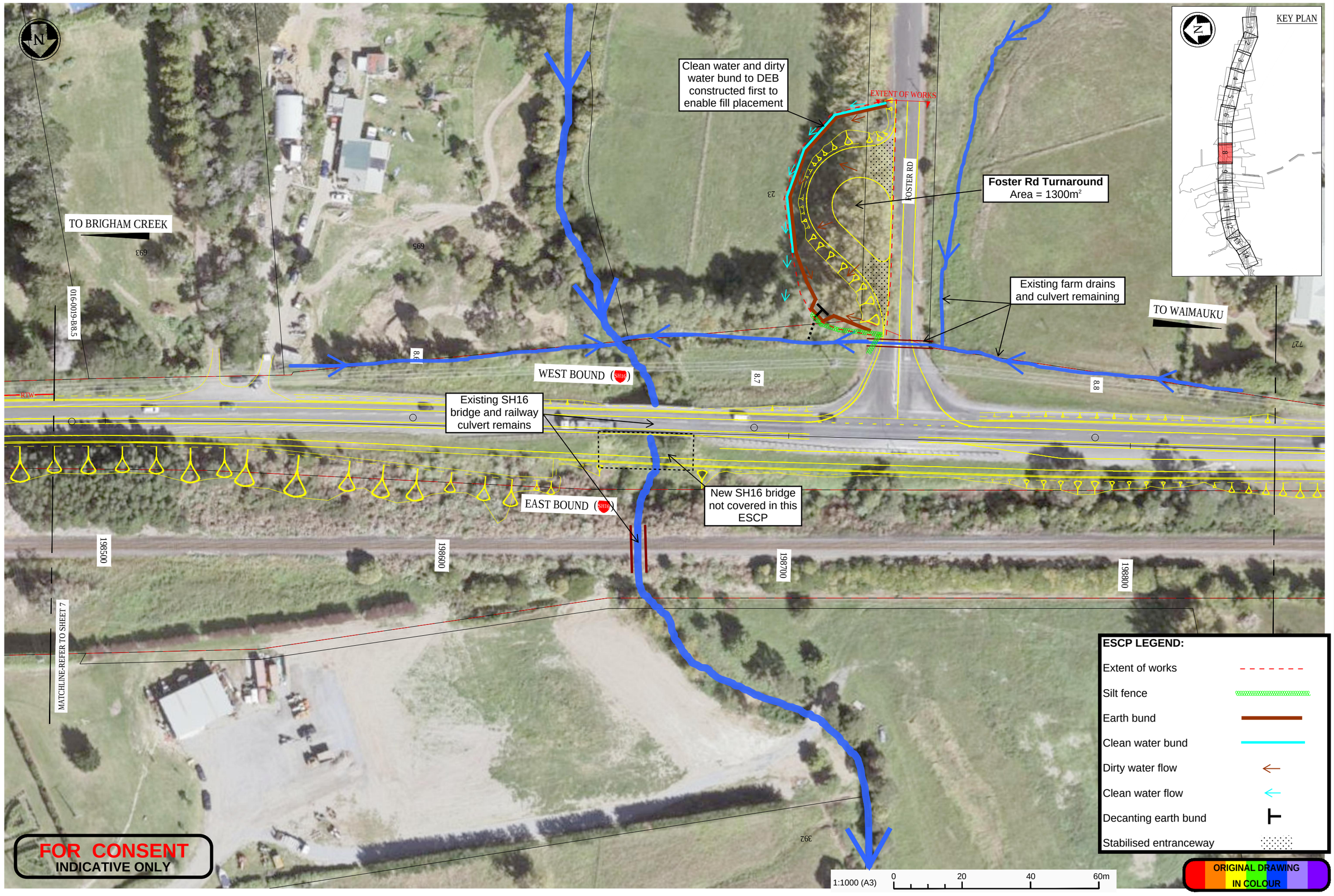
APPENDIX A
EROSION AND SEDIMENT CONTROL PLAN – Foster Road Turnaround

Drawing Plotted: 17 May 2018 2:30 p.m.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0



ESCP LEGEND:

- Extent of works
- Silt fence
- Earth bund
- Clean water bund
- Dirty water flow
- Clean water flow
- Decanting earth bund
- Stabilised entranceway

FOR CONSENT
INDICATIVE ONLY

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
A			-	-	-

Original Scale (A3) 1:1000

Design	-	-	Approved For Construction* -
Drawn			
Dsg Verifier	-	-	
Dwg Check	-	-	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: FOSTER ROAD EROSION AND SEDIMENT CONTROL PLAN - OVERLAIN ON DWG-CE-1208

Status.

Drawing No. | Rev.

Document No. S:\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD\SR1003-01-CE-1201-1214.dwg

DO NOT SCALE

IF IN DOUBT ASK.