NZ TRANSPORT AGENCY
WAKA KOTAHI

TE ARA HAUĀURU
NORTHWEST RAPID TRANSIT

ASSESSMENT OF CONSTRUCTION STORMWATER EFFECTS

CAMPBELL STEWART

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New Zealand Government

Qualifications and experience of the author

My full name is Campbell Stewart. I am a Director at Southern Skies Environmental Limited. I hold a Bachelor of Resource Studies from Lincoln University (1994).

I have 30 years of experience providing specialist Erosion and Sediment Control (ESC) management services including assessing and monitoring significant earthworks projects. I have extensive experience in earthworks, stream works and construction activities. This includes involvement with policy development and implementation, education and training, and regulation covering all aspects of the ESC process. Since 2008, I have been involved in designing and working with construction teams to implement, monitor and maintain ESC and environmental devices and methodologies for a number of large infrastructure projects across New Zealand.

I am a Certified Professional in Erosion and Sediment Control, a qualification that is achieved through Envirocert International and the International Erosion Control Association.

I am a past director of the Australasian Chapter of the International Erosion Control Association and a past member of the Certified Professional in Erosion and Sediment Control Ethics Committee Australasia.

My relevant experience includes:

- I have specific experience in both preparing technical assessments to support Resource Management Act 1991 (RMA) applications as well as on-site experience with a number of New Zealand Transport Agency Waka Kotahi (NZTA) and Auckland Transport (AT) roading projects including, but not limited to, Te Ahu a Turanga (Manawatū Gorge), Huntly Bypass, East Taupō Arterial, Tauranga Eastern Link, Auckland North Western Motorway upgrade projects including the Causeway Upgrade, Royal Road to Westgate, Lincoln Road Interchange, Te Atatū Interchange, St Lukes Interchange, the Waikato Expressway Te Rapa section and the Northern Motorway Albany to Pūhoi Sections B1 and B2. Having been directly involved with all ESC aspects of these projects, I am aware of the issues, opportunities and practicalities that can arise between the planning phase and on-site implementation.
- I was the lead technical author of the Auckland Council Guideline Document 05 ‘Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region’ (GD05) for the management of erosion and sediment associated with construction sites. GD05 is considered the current best practice guideline in New Zealand for ESC management. GD05 is a key guideline promoted and used by Auckland Council (Council) and a number of other councils across New Zealand.
- I was the ESC technical specialist for the Papakura to Drury (P2D) southern motorway upgrade project, delivered via four consenting packages.

Although this matter is not before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses as contained in section 9 of the Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I am satisfied that the matters which I address in this report are within my area of expertise, except where I state that I am relying on information provided by another person or expert. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Contents

Figures

Acronyms, definitions and abbreviations

Term	Definition
AEE	Assessment of Environmental Effects
AT	Auckland Transport (or successor organisation)
CMA	Coastal Marine Area
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
FTAA	Fast-track Approvals Act 2024
GD05	Auckland Council Guideline Document 05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region
ha	Hectare(s)
Indicative Design	The indicative design of the Project within the Project Area as shown on the Indicative Design drawings in Part 6 that will be confirmed during detailed design
m	Metre(s)
m^2	Square metre(s)
m^3	Cubic metre(s)
NZTA	New Zealand Transport Agency Waka Kotahi
Project	Te Ara Hauāuru Northwest Rapid Transit
Project Area	The Proposed Designation and the extent of the coastal occupation permits sought
Proposed Designation	The area defined by the Proposed Designation boundary as shown on the Proposed Designation Plans in Part 6
RMA	Resource Management Act 1991
SH16	State Highway 16

1. Introduction

1.1 Purpose and scope of this report

This technical assessment has been prepared to inform a substantive application for the Northwest Rapid Transit Project (the Project) under the Fast-Track Approvals Act 2024 (FTAA). It forms part of a suite of specialist reports that collectively support the applications for statutory approvals.

The purpose of this report is to evaluate the actual and potential effects of the Project on the environment in relation to construction water effects. This report addresses the following matters:

- Assessment of the potential effects of earthworks, stream works and Coastal Marine Area (CMA) activities during construction of the Project; and
- Proposed methods to avoid, remedy or mitigate construction stormwater effects.

It addresses the following activities that will occur across the Project:

- General cut to fill earthworks and trenching activities;
- Stream works associated with the installation of stormwater outfalls, and temporary and permanent structures;
- Works within the CMA associated with the construction of two bridge structures; and
- Final landscaping and stabilisation.

This report should be read alongside the Substantive Application including the Assessment of Environmental Effects (AEE) in Part 4, which contains further details on the context of the Project. The Substantive Application also contains a description of works to be authorised and the typical construction methodologies that will be used to implement this work in Part 2. I have reviewed this and have been considered as part of my assessment of effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

2. Assessment methodology

This assessment is based on the characteristics of the Project Area (the Proposed Designation and the extent of the coastal occupation permits sought), and its receiving environments, the anticipated extent and nature of works, and the anticipated outcomes of well understood best management practices as reflected in Auckland Council Guideline Document 2016/005 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05).

This assessment is also informed by my understanding of the Project Area from my preparation of erosion and sediment control plans and provision of technical advice and support to the staged upgrade and widening of the State Highway 16[1] (SH16) between 2010 to 2018.

3. Existing environment

The following is an overview of the existing topography, freshwater, coastal and stormwater environments of the Project Area as they relate to the management of construction stormwater effects. A detailed overview of the existing environment can be found in Part 2.

Figure 3-1 shows the Project Area and alignment between Brigham Creek and Auckland city centre.

[1] SH16 Northwestern upgrade and widening projects: Royal Road to Westgate; Lincoln Road Interchange; Te Atatū Interchange; Causeway; St Lukes Interchange. I designed and prepared the erosion and sediment control plans for all of the projects, undertook internal ESC auditing and provide technical ESC advice.

Figure 3-1: Project overview between Brigham Creek and Auckland city centre

3.1 Topography and landscape

The topography of the Project Area is generally easy to rolling, with the longitudinal grade generally similar to the immediate adjacent SH16 carriageway (2–8%). The steepest longitudinal section of Project Area is located between Royal Road and Lincoln Road.

The Project Area is 'brown fields' in nature and the Project will sit within a constrained environment along the SH16 corridor. From west to east, the Project Area and surrounds is described as:

- Rural areas adjacent to the Brigham Creek Rarawaru station are currently under development for future industrial use.
- Between Brigham Creek station and Westgate Te Waiarohia station, the adjacent land uses include industrial, commercial and residential areas.
- Between Westgate station and Royal Road Mānutewhau station, the adjacent areas include a combination of industrial and commercial areas near the Westgate station progressing to more residential zoning surrounding the Royal Road station.
- The carriageway of SH16 slopes down from Royal Road station towards the Lincoln Road Wai o Pareira station. This section is the steepest section along the Project Area. The site reaches a low point at Lowtherhurst Reserve and is then undulating to Lincoln Road.
- Te Atatū Ōrangihina station is located at the Te Atatū Road Interchange. To the north of the station is a large section of open space which drains west to the Whau River.
- The area adjacent to the Project Area between the Point Chevalier station and Western Springs station is a mixture of commercial, residential dwellings, parks and reserves.
- From the Western Springs station, the busway carriageway is generally flat passing adjacent to residentially dominated areas and reserve along the base of Arch Hill before crossing over SH16 and connecting to Ian McKinnon Drive.

3.2 Receiving environment

The receiving environment for sediment discharges from construction of the Project, from west to east, is:

- The section of works between Brigham Creek station and Westgate station will discharge to Tōtara Creek, a tributary of the Brigham Creek.
- Between Westgate station and the Royal Road station, site runoff will discharge to the Tihema Stream and tributaries of the Mānutewhau Creek.
- Between the Royal Road station and Lincoln Road station, site runoff will discharge to the Rarawaru Stream and Wai-o-Pareira / Henderson Creek.
- Works near the Te Atatū station will discharge to Wai-o-Pareira / Henderson Creek and Whau River.
- From Point Chevalier Road to the western side of St Lukes Road Overbridge, site runoff will discharge into the Meola Creek catchment.
- East of the St Lukes Road Overbridge and for the remainder of the Project, site runoff will discharge into the reticulated stormwater network of Motions Creek.

For details of the receiving environments, refer to Part 2.

3.3 Existing stormwater infrastructure

Stormwater from SH16 is serviced by reticulation and by overland flow paths that drain to the various waterways identified above along the Indicative Design (the indicative design of the Project within the Project Area as shown on the Indicative Design drawings in Part 6 that will be confirmed during detailed design). These waterways discharge to the Waitematā Harbour, making the ultimate receiving environment the Hauraki Gulf.

4. Project description – construction

4.1 Indicative construction programme

The indicative programme for the Project is dependent on how the Project is progressed, including the procurement strategy, property acquisition and funding availability.

It is anticipated the Project will be delivered over an approximately 20-year period with staged construction anticipated to start in 2027.

Construction durations of key elements of the Project are expected to be:

- 18 – 24 months for stations.
- 24 – 36 months for bridges and underpasses depending on number of traffic stages required.
- 2 – 4 years for sections of busway carriageway depending on the length of the section, the extent of structures and staging constraints.

Further details on the indicative construction programme are included Part 2.

4.2 Earthworks

The Project earthworks relate to:

- Bus carriageway and stations – general cut to fill, cut to waste and cut and cover earthworks, and temporary stockpiling.
- Retaining wall construction and associated excavation of footings.
- Services relocation and installation – general trenching activities and the installation of stormwater infrastructure and treatment devices.
- Abutment excavations and piling associated with the new bridge and underpass structures.

The earthworks for the Project are approximately 35ha in total. Approximately 25ha of earthworks will occur west of the causeway and approximately 10ha of earthworks will occur east of the causeway. Over the length of the Project Area, the estimated earthworks are approximately 500,000m^3 of cut and 450,000m^3 of fill. The cut volume as indicated in Part 2 will be typically cut to waste with the fill material being the importation of granular hardfill (defined as a stabilised product).

Construction staging will be required due to the constraints of the limited construction space, being adjacent to a live motorway. The earthwork and construction work areas will also be separated by existing bridges, off ramps and water bodies (streams, creeks and rivers). This separation splits the earthwork areas into a series of smaller projects from an earthworks perspective. The works are to occur on generally easy to rolling grades based on existing site contours. These low gradients have less potential to contribute to sediment generation than would occur on steeper land.

Given the 'brownfields' nature of the Project Area and constraints of works within the SH16 corridor, many of the individual earthworks areas will be relatively small (<5,000m^2) with minor volumes of cut to waste. Works will then involve using imported fill material (primarily aggregate) to widen the existing carriageway, followed by trimming and widening of berms, the excavation and formation of new stormwater infrastructure and civil operations. These activities are essentially progressive cut-and-cover operations which minimise the area exposed to erosion at any given time.

For the larger earthworks areas (>5,000m^2) for the formation of the new stations and larger sections of carriageway widening, the cut material will be excavated and removed directly off site. The imported fill material will be primarily aggregate (regarded as a stabilised product by Auckland Council). This construction methodology results in progressive stabilisation and means that the extents of exposed areas are minimised at any given time.

The major structural elements of work anticipated for the Project are the stations, bridges along and over SH16 and bridge crossings over two tributaries of the Wai-o-Pareira/Henderson Creek (which is within the CMA), stream crossings, underpass structures, retaining walls and busway carriageway. All structures will have an element of earthworks, typically piling, abutment foundation excavations and trenching. As earthworks operations, these will be typically isolated works (i.e. at each pile or trench), involving minor volumes and cut-and-cover.

There will also be a number of separate retaining wall structures to be installed both above and below the busway alignment in specific locations. The exact number will be determined during detailed design refinements. Service relocations and new stormwater drainage lines are to be installed. The trenching operations will be staged operations and will comprise a cut to waste trenching excavation, civil works, and a stabilised backfill.

4.3 Stream works and coastal works

As noted, the Project includes two dedicated bus bridges over the CMA at Wai-o-Pareira / Henderson Creek (Huruhuru Creek and Henderson Creek). These bridge sites are tidal. Bridge construction will require installation of temporary staging from both ends to provide access for piling, piers and crosshead construction.

The Project will pass over a limited number of existing freshwater creeks along its length. All existing waterways will be maintained through either culverts or new bridges. Tōtara Creek (between Brigham Creek and Westgate stations) and Meola Creek will be bridged. No piers are proposed in the watercourses. Piers will be constructed within the flood plain. There are other streams that cross under SH16 in culverts, including three in the section between Royal Road and Lincoln Road. It is likely that culvert extensions will be required in these locations requiring temporary diversions, detention and/or over-pumping to enable construction.

5. Assessment of construction effects

5.1 Risk of elevated sediment yield

The potential adverse effects of sediment laden discharges are impacts on water quality. Any reduction in water quality arising from sediment laden discharges can impact on:

- freshwater and marine biodiversity.
- values of specific interest to Mana Whenua.
- other cultural values.
- natural character values.

For the Project, I consider the potential risk of an elevated sediment yield (i.e. discharges with the potential to result in the adverse effects as outlined above), is low due to:

- the low to moderate gradients of the Project Area.
- the anticipated staged delivery of the Project and staged construction incorporating progressive stabilisation.
- the potential extent of materials that will be exposed and placed that are of a lower erosion risk e.g. compacted aggregate.

These factors minimise the risk of elevated sediment yields from the Project.

The parts of the Project Area and activities that I consider have a potentially higher risk of an elevated sediment yield would be:

- The works required in and immediately adjacent to the Wai-o-Pareira / Henderson Creek (Huruhuru Creek and Henderson Creek).
- The works required in and adjacent to streams, including the Tōtara Creek and Meola Creek, plus three other unnamed streams.
- Pumping of any sediment laden water from excavations.
- Minor batter earthworks activities on any steeper slopes (greater than 10 degrees) that may eventuate over the course of the Project works.

However, in those higher risk circumstances, I consider the design, construction, maintenance and monitoring of erosion and sediment control in general accordance with GD05 will manage and mitigate the effects of sediment laden discharges to the receiving environment. The Project and scale of earthworks proposed do not present a significant risk or challenge in terms of managing sediment related effects. Most of the works will include stripping land to various depths and expansion of hardfill areas, which have a reduced risk of erosion and sediment discharge. Stream works and coastal works can also be managed using proven techniques, as discussed later.

5.2 Compliance with GD05

GD05 is based on best practice. It provides a toolbox of sediment controls devices and erosion control methods, that when installed and implemented in accordance with GD05 provide a well understood level of construction water management and outcomes. GD05 requires the use of chemical treatment to maximise sediment removal efficiencies of the larger devices (sediment ponds and decanting earth bunds) and for pumping and dewatering. Progressive stabilisation is inherent in GD05.

I consider the Project can be designed and constructed in accordance with GD05. This is the appropriate approach that has been successfully implemented on similar projects of similar and larger scale, as well as other NZTA projects with significantly steeper topography, earthworks areas and volumes, and sediment-

related risk[2]. This methodology has also been implemented for other upgrades of the state highway motorway system through Auckland[3], including SH16.

Prior to earthworks for a stage of work commencing, an Erosion and Sediment Control Plan (ESCP) should be developed for those works. This staged approach allows for flexibility, fine tuning and ownership of the ESC measures and methodologies by the contractor.

Works within or immediately adjacent to the freshwater and coastal environment require specific attention and I consider they have a higher risk of generating elevated sediment yields.

In this case, Project works are generally landward of the CMA and can be managed through appropriate staging and erosion and sediment controls. However, piers are expected to be required within the tidal zone at the Wai-o-Pareira / Henderson Creek (Huruhuru Creek and Henderson Creek) bridges. The bridge piers can be installed using standard construction practice including containment of the pile holes and pier construction within steel casing such that all construction activities are isolated from the surrounding coastal environment. Machinery can be based on land, or on temporary platforms (staging) constructed to ensure that works areas are above the high tide level.

Any specific future Wai-o-Pareira / Henderson Creek (Huruhuru Creek and Henderson Creek) bridge bank erosion protection works, both in the CMA and upstream of the CMA boundary can be undertaken during low tide and from the adjacent banks. ESC methodologies can be developed to allow the works to be completed in isolation from coastal waters. Isolating the works from the receiving environment, through coffer dams, working around the tide, and detailed design removing structures from below the low water levels are all appropriate methodologies for works in, above and adjacent to the CMA environment and can be specified as a requirement of the ESCPs.

The Project works associated with the culvert works (extensions / upgrades / replacements) can also be completed offline, in accordance with well-designed and considered ESC methodology and plans. Design and planning to undertake the culvert works offline is an appropriate methodology for works in, above and adjacent to the freshwater environment and can be specified as a requirement of the ESCPs.

With the adoption of a GD05-compliant ESC methodology (to take the works off line and complete in the dry), I consider the potential adverse effects of treated sediment-laden runoff on the water quality of the receiving environments will be temporary and minor, as will the effects of the disturbance of the stream bed and / or CMA associated with the installation of culverts and the construction of the bridge piers.

5.3 Sensitivity testing of Indicative Design

This assessment has addressed the actual and potential effects arising from the proposed Project. This section of the assessment considers potential amendments that could be made in the future to the Indicative Design within the Proposed Designation (the area defined by the Proposed Designation boundary as shown on the Proposed Designation Plans in Part 6).

The potential adverse effects of sediment laden discharges from the Project during the construction phase, relate to the area of earthworks, time of exposure, and management and implementation of erosion and sediment control. I consider changes to the location (within the Proposed Designation), design of or construction methodology for the Project will not fundamentally change the assessment of sediment-related effects because:

- The final design is unlikely to require particularly complex or high-risk earthworks when compared to the Indicative Design.
- The Proposed Designation is limited to a relatively narrow corridor and does not allow for a significant expansion of the area that could be exposed to erosion.
- This assessment identifies the likely works within waterways and the coastal environment.

[2] Including Ara Tūhono – Pūhoi to Warkworth; SH1 Mercer to Longswamp, SH1 Longswamp, SH1 Rangiriri, SH1 Huntly Bypass.

[3] Including Northern Corridor; Southern Corridor; SH16 Upgrades (St Lukes, Causeway, Te Atatū, Lincoln Road, Royal Road); SH20 Waterview).

- There are no unusual or specifically high-risk elements of the Project that would prevent a GD05 compliant ESC methodology being successfully implemented irrespective of where within the Proposed Designation the Project is constructed.

Accordingly, the ESC techniques recommended to mitigate effects are generally applicable to all likely construction works for the Project within the Project Area.

6. Recommended measures to avoid, remedy or mitigate effects

6.1 Recommendations

My assessment is based on the ESC methodology for the Project complying with GD05, and ESCPs being prepared to set out the detailed ESC approach for each section of Project works.

To support the compliance with GD05 and the ESCPs, a Chemical Treatment Management Plan should be prepared for the Project, to identify and confirm the chemical treatment set up and including all relevant batch dosing information, and a Pumping Management Plan to confirm the specific pumping procedures and management.

The progressive stabilisation has a direct relationship on the risk of sediment generation from the Project. The use of hardfill (aggregate) will ensure that the work areas are progressively being stabilised. If in some areas aggregate is not being used, and the area is not being actively worked, then restrictions on the length of time left exposed should be included.

The timing and delivery of the Project is yet to be determined. The Project has a low elevated sediment risk of the works. This is due to the low gradients, anticipated staged delivery of the Project and staged construction incorporating progressive stabilisation, and the extent of materials that will be exposed and placed are of a lower erosion risk e.g. compacted aggregate. The time of any potential exposure, not the timing of the exposure, will manage and mitigate elevated sediment discharge risk. As such, a winter works restriction is not necessary as staged works during winter and the use of aggregate hardfill will not result in an unacceptable high risk of elevated sediment discharge.

For works in the coastal environment, I consider that a Coastal Works Management Plan should be prepared which includes details of the final construction methodology proposed for works in the CMA, including any temporary staging, and specific provisions for minimising runoff, turbidity, debris and dust.

I have reviewed the draft conditions included in the application and I consider they will appropriately manage the potential for adverse construction water effects from the Project.

7. Conclusion

The construction water management proposed for the Project is in accordance with current best practice, can be successfully implemented and provides certainty that any actual and potential adverse effects will be appropriately managed. Ongoing monitoring, and the ability to amend or improve ESC practices during the construction of the Project to directly address any identified issues over the construction period is essential. The draft conditions requiring preparation of ESCPs provide further certainty that the construction water management can be effectively managed throughout the stages of the works.

I conclude that any change in water quality associated with the construction runoff during the construction phase will be temporary and minor.