

BRYMER FARMS

EARTHWORKS MANAGEMENT PLAN

PROJECT INFORMATION

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1. Introduction

1.1. Background

Maven Waikato Ltd have been engaged by Brymer Farms Ltd to undertake Earthworks Design in support of Brymer Farms Development at 584 Whatawhata Road (SH23), Hamilton.

1.2. Purpose of this Report

The purpose of this report is to provide an Earthworks Management Plan (EWMP) for the Brymer Farms development at 584 Whatawhata Road (SH23), Hamilton. The information provided herein outlines the methodology associated with the proposed earthworks onsite. This report is to be read in conjunction with the engineering drawings and is to accompany the Fast Track Application.

1.3. Site Description

The Brymer Farms area is an 81ha block of land within the Waikato District, west of the Hamilton City Boundary. The current site access is through 584 Whatawhata Road. The site consists of rural pasture with varying slopes and gully systems to the North, East and South extents of the development area. The development area is low-lying flat farmland, characterised by peat and interspersed with a mixture of streams and straight artificial farm drains. The site currently has two existing farmhouses located within 584 Whatawhata Road near the southern entrance.



Figure 1: Site Locality

1.4. Legal Descriptions

The development site is currently split into seven major parcels of land, which are summarised in Table 1 below:

Lot Description	Area (m ²)
Allot 365 Pukete PSH	1,444
Part Lot 2 DP 18355	183,753
Lot 1 DPS 87291	579,170
Lot 22 DPS 79526	677
Lot 3 DP 385271	44,890
Lot 44 DPS 59874	622
Lot 9 DPS 67823	887

Table 1: Legal Descriptions

1.5. Scope

- Bulk cut-to-fill earthworks and formation of proposed landform, building platforms and road corridors.
- Earthworks associated with overland drainage, stormwater and wastewater infrastructure where these occur within the earthworks.
- Preloading and management of peat ground identified by the geotechnical investigations and current preload earthworks drawings.
- Temporary stockpiling, material tracking and reuse between the four major earthworks stages.
- Erosion and sediment controls, dust management and progressive stabilisation.
- Survey, compaction, geotechnical monitoring, hold points and completion records.

1.6. Management Hierarchy

The four major earthworks stages are the primary management framework for this EWMP. Sub-stages define the detailed construction sequence within each major stage and shall be followed as shown on the current staging/preload drawings. The sub-stage drawings are therefore a construction control document rather than a separate management set.

1.7. Basis of Plan and Related Documents

Document / Drawing	Role in this EWMP
119014-C210 – Proposed Earthwork Staging Overview Plan, 1:7500 @ A3, 08/2026	Major Stage 1–4 extent and current cut/fill staging information.
119014-C210-1-4 – Stage Plans	Detailed Stage 1–4 earthworks plans and stage-specific cut/fill information.
119014-C216 – Earthworks / Civils Staging drawings	Sub-stage earthmoving and preload interfaces, including E1–E4 sub-stages.
CMW Geotechnical Investigation Report, HAM2025-0084AC	Geotechnical setting, compressible ground and surcharge/preloading risk management.
WGA Groundwater Effects Substantive Report, WGA211193-RP-HG-0010_A, July 2026	Groundwater, soil compaction and indicative preload-area context.
Current ESC and civil engineering drawings	Site-specific erosion/sediment controls, drainage and civil interfaces.

2. Geotechnical Investigation

Various site-specific geotechnical investigations have been conducted, and a geotechnical investigation report has been prepared by CMW on 7th August 2026, to support the fast-track resources consent application.

The report identifies the approximate distribution of prevailing landforms and geologies for the local area. The site is predominantly underlain by Holocene Swamp deposits, Piako Subgroup and Hinuera Formation in low-lying areas. Walton Subgroup forms the base of the hills with expectation to be overlain by Hamilton Ash to the north and south, and elevated areas. Please refer to the Geotechnical Investigation Report for more information.

The geotechnical documentation identifies compressible ground and sets out settlement mitigation options and risk controls for surcharge/preloading.

From the ground investigations undertaken by CMW, they have summarized the site geology results in Table 2 and Table 3 below.

Geology	Unit Description	Top of Unit (mBGL)		Thickness (m)	
		Min	Max	Min	Max
Colluvium (debris deposits)	Stiff to very stiff Clayey Silt and medium dense Sand	0.2	0.3	0.8	4.3
Peat (Swamp deposits)	Firm to very stiff fibrous organic Peat	0.0	0.2	0.3	2.7
Piako Subgroup	Very soft to very stiff Clayey Silt and medium dense Sand interbedded with minor organic Silt layers	0.2	2.5	0.2	7.5
Hinuera Formation	Loose to medium dense Sand with interbedded stiff to very stiff Silt, and lenses of Organic Silt	0.2	7.2	5	12.0
*Note: encountered in TP25-01 and TP25-05 only					

Table 2: Summary of Strata Encountered-Low Lying Areas

Geology	Unit Description	Top of Unit (RL m)		Thickness (m)	
		Min	Max	Min	Max
Hamilton Ash	Stiff to hard Clayey Silt and Silty Clay	0.2	0.3	0.5	3.0
Walton Subgroup	Stiff to Hard Clay/Silt and dense to very dense Sand	0.2	0.3	0.9	>25.6

Table 3: Summary of Strata Encountered-Elevated Areas

Upon completion of the proposed earthworks an Earthworks Completion Report will be prepared by the Geotechnical Engineer. This report will certify the adequacy of the earthworks and make recommendations on bearing strengths for foundation design purposes.

3. Earthworks and Sediment Control

Earthworks will be undertaken as required throughout the proposed development area in different development phases and will include re-contouring, excavations for drainage reticulation, formation of building platforms and roading networks and, where applicable, construction of retaining walls. Within each development stage, the site will be further divided into different sub-catchment areas where specific erosion and sediment control measures are to be adopted.

3.1. Design Standards

Proposed measures for erosion and sediment control have been designed in accordance with Waikato Regional Council's Guidelines for Soil Disturbing Activities (TR2009/02, 2009), best practice solutions.

3.2. Earthworks Onsite Progress and Future Programme

Earthworks will be undertaken in stages and commence when all necessary consents are in place. Once consents are in place, then a start date will be determined in the next earthworks seasons. Applications for Winter Works will only be lodged if required.

It is proposed that the bulk earthworks operation will comprise of total four separated work sections (Stages 1 to 4) that will be undertaken independent of each other, as shown on earthworks plans attached in Appendix A.

The current major-stage cut/fill plan indicates approximately 691,319 m² of stage area with 603,168 m³ of cut and 886,430 m³ of fill before accounting for the additional material associated with peat preloading. The plan notes that the initial balance is indicative, volumes are unfactored and in situ, and imported preload material is to be reused within the development after preloading to address the fill deficit over the entire works programme for bulk earthworks.

See below the major stages broken down by area, cut to fill and balances.

Stage	Area (m ²)	Cut (m ³)	Fill (m ³)	Balance (m ³)	Topsoil stripped (m ³)
1	241,945	230,708.4	382,122.5	Fill deficit 151,414.1	72,583.8
2	194,325.5	10,570.7	282,985.2	Fill deficit 272,414.5	58,797.7
3	169,622.6	240,351.8	195,150.2	Cut surplus 45,201.5	50,806.7
4	98,422.5	121,670.1	41,320.8	Cut surplus 80,349.2	29,526.8
Overall	701,185.9	603,251.7	899,961.6	Fill deficit 296,710.0	210,355.8

Note: Values rounded from the current staging plan; source plan notes volumes are unfactored and in situ. Volumes in this EWMP are unfactored and in-situ and include preload material. Refer to the Infrastructure Report for the overall factored earthworks balance."

Works are intended to be carried out in the following steps:

1. Confirm current approved/certified drawings, earthworks limits, stage boundaries, survey control and construction environmental controls.
2. Install required erosion and sediment controls before Earthworks in the relevant catchment.
3. Strip and stockpile topsoil separately from structural/engineering fill.
4. Establish haul roads, working platforms and safe access consistent with the stage and geotechnical requirements.
5. Undertake bulk cut and fill, including preload placement where identified on the current preload drawings.
6. Place fill in controlled layers and compact/verify in accordance with project specifications and geotechnical requirements.
7. Undertake preload monitoring and observe geotechnical hold points before altering preload loading or removing preload.

8. Progressively form drainage, roads, platforms and other civil works as areas are stabilised.
9. Track material movements, stockpiles and reuse so the final earthworks balance and completion records can be verified.
10. Progressively stabilise completed or temporarily inactive areas and maintain erosion and sediment controls until the catchment is stable.

3.3. Stage to stage Interface

Stages are intended to operate as separated work sections but material may be temporarily stockpiled or transferred between stages where identified on the current staging plans for the likes of Preload, stockpiling or filling. Transfers shall be controlled by the site earthworks manager and recorded in the material tracking system.

3.4. Earthworks Summary

Earthworks will be undertaken as required throughout the proposed development area in different development phases and will include preloading, recontouring, excavation for drainage reticulation, formation of building platforms, roading networks, stormwater wetland and wastewater pump stations. Furthermore, all proposed earthworks are situated beyond the 10 m buffer surrounding the identified existing wetland on the subject site. Where earthworks are required within the 10m buffer a separate erosion sediment control plan will be designed and approved before works within the buffer commence to mitigate risk. Within each earthwork stage, the site will be further divided into sub-catchment areas where specific erosion and sediment control measures are to be adopted.

The details of the preloading design and associated strategies are presented in CMW's geotechnical investigation report. The preloading plan relevant to each earthwork stage is shown in the engineering drawings attached.

To facilitate the construction of the roading network, protect the existing watercourse and to mitigate flooding risks associated with the low-lying terrain in the development site, the consent proposes a series of culvert installations, stormwater facilities upgrades, and stormwater pond works. Please refer to the engineering drawings for detail and the extent of works attached in Appendix A.

Construction represents the period when the most significant potential impacts on the downstream receiving environment may occur due to erosion and sedimentation from disturbed land. Erosion and sediment control measures are to be implemented to avoid or mitigate downstream impacts.

The bulk earthworks on site will be divided into four separated stages. Figure 2 below is an extract from the engineering drawings attached in Appendix A. A summary of the proposed earthworks is included within:



Figure 2: Proposed Cut/Fill Plan

3.5. Stockpiles between Stages

Bulk earthworks are expected to generate a Fill shortfall in Stage 1 and 2, with a surplus of CUT material in Stage 3 and 4. The following approach will be adopted:

Stage	Net Cut/Fill	Action
Stage 1	FILL shortfall (151,414.1 m ³)	Works outside the preloading areas are to be cut to the proposed surface level, with suitable cut material stockpiled for use as preload fill in Stage 2. Topsoil from Stage 1 is to be stockpiled for reuse within the stage 1 preloading areas, with any shortfall made up using imported engineering cleanfill.
Stage 2	FILL shortfall (272,414.5 m ³)	Stage 2 cut material is to be stockpiled within the preloading area for use as preload fill, with any shortfall made up using suitable cut materials from other stages and imported engineering cleanfill.
Stage 3	Surplus CUT (45,201.5 m ³)	Surplus cut material shall be temporarily stockpiled for future placement within Stages 1 and 2. Stockpile locations shall be determined on site as required. Topsoil required for reuse shall be stockpiled within the stage, with any surplus topsoil to be transferred to Stage 1 & 2 for future reuse
Stage 4	Surplus CUT (80,349.2 m ³)	Surplus cut material shall be temporarily stockpiled for future placement within Stages 1 and 2. Stockpile locations shall be determined on site as required. Topsoil required for reuse shall be stockpiled within the stage, with any surplus topsoil to be transferred to Stage 1 & 2 for future reuse

Table 9: Summary of Earthworks in 4 stages

3.5.1. Stockpiling Details

Stockpiles will be limited to a height and side slope specified by the Geotechnical Engineer, unless otherwise approved. Stockpiles shall be protected with earth bunds where possible and silt fences if ground conditions do not allow for earth bunds. The volume of the material stockpile onsite shall be minimized. It should be covered during windy conditions or significant rainfall events. Stabilisation of stockpiles using hydroseeding or mulch will occur within 7 days of stockpiling.

Temporary stockpiles retained for less than three months will not require permanent stabilisation measures, provided they are appropriately managed to prevent instability and off-site effects. Where stockpiles are to remain in place for longer periods, additional stabilisation and management measures may be required and will be addressed through detailed design or contractor methodology.

Note: All stockpiling and reuse operations will be tracked with GPS or site logs to ensure material origin, volume, and placement areas are accurately recorded for the final Earthwork Completion Report.

3.6. Stockpile Locations

The location, number, and final configuration of stockpiles will be further determined on site by the contractor's nominated geotechnical engineer, having regard to site conditions, construction staging, and safety requirements.

In establishing stockpiles, consideration shall be given to the following:

- Safe and efficient haul routes
- Separation from site boundaries and drainage lines
- Well away from any watercourse, runoff flow paths, and low ponding points
- Flooding
- Stability under wet weather conditions
- Access for construction plant and maintenance

4. Soft Ground and Peat Preloading Management

Preloading is included in the earthworks programme to manage settlement associated with compressible ground. It is not treated as a separate project workstream. Preload areas, loading heights and sequence shown on current engineering drawings are to be implemented together with geotechnical monitoring and hold-point requirements.

4.1. Preload Areas and Sub-stages

The current sub-stage information identifies preload interfaces within the major stages, including E1a/E1c/E1d, E2a–E2d and E3a/E3b. The detailed preload drawing 'C216-2 PRE LOAD SUB STAGING' is to be used to establish the exact preload footprint, levels and loading for each area. This will be confirmed onsite by Geotechnical Engineers.

Major Stage	Relevant Sub-	Description
Stage 1	E1a, E1c, E1d	Progressive fill/preload placement, settlement monitoring and material reuse.
Stage 2	E2a–E2d	Preload placement within identified soft-ground areas and controlled transfer/reuse of material.
Stage 3	E3a, E3b	Preload placement and monitoring; coordinate material transfer between E3 sub-stages.
Stage 4	E4a, E4b	Earthworks and material balance; preload only where shown by current certified design.

4.2. Sub staging section with Methodology

Sub-staging has been developed to minimise the movement of materials throughout the site while accommodating the civil staging and preloading requirements.

The staging methodology has been developed based on calculated cut and fill requirements, together with assumed preloading requirements for areas underlain by peat.

Due to the variable nature and behaviour of peat deposits within the Waikato region, the required preloading duration and surcharge loading requirements cannot be confirmed with certainty at the current stage of design. Accordingly, a conservative design assumption of a 9 to 12 months preloading period has been adopted, with a nominal surcharge loading of 3 m³ per 1 m² of peat area.

The adopted assumptions are intended to provide a basis for the earthworks staging and material movement assessment. Actual preloading durations and surcharge requirements should be confirmed during construction through site-specific geotechnical monitoring and assessment.

To establish the first suitable substage, the proposed methodology is to identify an area that satisfies the following key criteria:

1. Peat constraints: The initial substage is located outside areas of identified peat, where practicable, allowing development to commence while peat areas undergo the required preloading and settlement period.
2. Infrastructure servicing: The substage can be efficiently serviced with the required roading, utility services, and three waters infrastructure.
3. Material availability: The substage is located within a primary cut area, where practicable, allowing additional material to be generated for use as preload material for subsequent substages.

This approach provides a logical starting point for development while minimising material movements and allowing subsequent substages to progress in accordance with the earthworks, servicing, and geotechnical requirements.

To satisfy the preloading requirements of future substages, it may be necessary to apply the above criteria across multiple substages containing primary cut areas. This would allow suitable volumes of material to be progressively generated and strategically stockpiled or placed as preload, reducing the requirement to import material or undertake unnecessary movements across the site.

Using the current proposed sub-staging plan (refer Drawing C216-3), three suitable initial substages have been identified to commence the preloading process. These substages have been selected based on the previously outlined criteria, including their location relative to peat areas, servicing requirements, and the availability of suitable cut material for preloading.

The three proposed initial substages are:

1. Earthworks Area 1 – Substage A
2. Earthworks Area 3 – Substage A
3. Earthworks Area 4 – Substage A

These substages provide suitable areas from which the preloading programme can be initiated while allowing the wider earthworks and infrastructure programme to progress. The sequencing of these substages will be subject to confirmation of the required earthworks quantities, servicing constraints, and geotechnical preloading requirements.

It should be noted that, to satisfy the infrastructure servicing requirements for Earthworks Area 1 – Substage A, it will be necessary to undertake additional earthworks within Earthworks Area 1 – Substages B and C. These additional substages are required to facilitate the construction and connection of the required infrastructure.

It has also been identified that Earthworks Area 4 – Substage B requires an additional 3,621 m³ of material to satisfy the proposed earthworks requirements.

As this substage represents the northernmost extent of the development, importing material from other areas of the site and subsequently relocating it to Substage B would result in inefficient material movements and unnecessary double handling.

To minimise material movements, it is therefore recommended that the required 3,621 m³ of material be sourced from the nearest suitable additional cut area and stockpiled within Earthworks Area 4 – Substage B. This material can then be utilised when the substage progresses to full earthworks.



Figure 3: Proposed first 4-year Sub staging Plan

Full earthworks within Substage B are not required at this stage. The proposed approach allows the required material to be strategically placed within the substage when suitable cut material becomes available, without requiring the entire substage to be completed prematurely. This is expected to reduce unnecessary haulage and material handling while maintaining flexibility within the overall earthworks staging programme.

Accordingly, the proposed staging methodology identifies earthworks within the first four years of the development programme. This approach allows the required material to be generated and strategically utilised for preloading, while progressively establishing the infrastructure necessary to support subsequent development stages.

It is considered that extending the detailed sub-staging programme significantly beyond the initial four-year period would not be appropriate at this stage. Geotechnical advice regarding the required preloading duration, surcharge loading, and settlement performance is expected to be reviewed following completion and monitoring of the initial substages. The outcomes of this assessment may require the assumptions and sequencing for subsequent substages to be revised.

While the earthworks requirements beyond the initial four-year period have been tentatively assessed, the longer-term sub-staging programme should therefore be treated as a live document, with the proposed staging and sequencing updated following completion of each substage and review of the available geotechnical monitoring data.

Future sub staging would continue to follow the criteria established above, including:

- consideration of peat locations and preloading requirements;
- availability and suitability of cut and fill material;
- infrastructure and three waters servicing requirements;
- minimisation of material movements and double handling; and
- utilisation of preload material generated from previously completed substages.

Based on the current understanding of the site, it is anticipated that future sub staging could generally progress from east to west across the subject site. This approach is intended to minimise material movements by progressively working through the site and utilising material generated from earlier substages for subsequent preloading requirements.

The final substage would ideally be located in an area where fill material is required, which can be sourced from previous preloading areas. This would reduce the requirement to retain or import additional material at the completion of the development and minimise residual material movements during the final stages of the project.

The proposed approach provides a flexible framework for the long-term earthworks programme while allowing the staging methodology to respond to actual settlement and consolidation performance as the development progresses.

4.3. Preload Construction Methodology

1. Confirm the preload area and required loading/material from the latest approved/certified preload and earthworks drawings. This may vary stage to stage with other preload quantities becoming available and the possibility of longer settlement times
2. Confirm underlying ground condition and any geotechnical requirements before loading.
3. Ensure erosion/sediment controls are certified and as-builts confirmed via Waikato Regional Council's Monitoring Officer before placing preload.
4. Place preload and in sequence so construction stability can be assessed.
5. Base levels with Survey control of preload footprint and proposed levels.

6. Install and maintain settlement where required and lateral movement monitoring points.
7. Hold preload for duration required with monitoring data provided monthly to the Geotechnical Engineer. Approval required prior to removal of Preload.
8. Following geotechnical release, remove or redistribute preload material to the next approved placement area and update the material tracking record.

4.4. Settlement and Stability Controls

The geotechnical risk management approach is observational. Settlement predictions are to be checked against field monitoring and surcharge duration or height may need adjustment if settlement is slower or faster than predicted. Staged filling and hold points are required where construction instability or lateral deformation could occur but will be confirmed by Geotechnical Engineer.

- Settlement monitoring shall be established before preload loading in representative areas and maintained through the preload period.
- Survey-controlled preload heights shall be maintained and verified.
- Unexpected lateral movement, cracking, excessive pore pressure response, slumping or instability shall trigger immediate review.
- Preload shall remain in place until the Geotechnical Engineer confirms that relevant acceptance criteria have been met.
- Preload removal shall be controlled to avoid abrupt unloading or destabilisation of adjacent works.

Geotechnical control: The current geotechnical risk assessment recommends staged filling with hold points, settlement monitoring and an observational approach. The exact monitoring regime and acceptance criteria are to be confirmed by the Geotechnical Engineer during construction.

4.5. Preload material and Fill Deficit

The earthworks drawings note that imported fill, clay and roading aggregate required for peat preloading are not reflected in the initial cut/fill balance. Following completion of preloading, this material is intended to be reused within the development to address the fill deficit. Material shall therefore be treated as a controlled temporary resource rather than permanent waste. Topsoil and any other materials that may be utilised will be used for preloading.

4.6. Wetland Areas/Peat Wetlands

The WGA groundwater effects documentation identifies that preload is not to be applied to proposed stormwater wetland areas. Preload boundaries shall therefore be coordinated with current stormwater and wetland drawings. Where earthworks, pond/wetland excavation, drainage changes or surcharge areas interact the sequence shall be reviewed by the relevant Engineer/Geotechnical Engineer.

5. Proposed Erosion Control

As the site is currently a low-lying flat farmland, multiple sediment controls and devices need to be constructed onsite. Below we have outlined the general principles and philosophies that will be adopted for any current controls and/or future proposed controls. Regular site inspections to be undertaken by Waikato Regional Council (WRC).

Any future proposed controls will be all in general accordance with the Waikato Regional Council best practice erosion and sediment control measures as per WRC TR2009/02 guidelines.

Silt control measures will need to be installed onsite, checked, and confirmed acceptable by the Engineer before works commence in the designated areas. During earthworks, the sediment control measures will be maintained such that they function as proposed.

The site will be progressively stabilised with topsoil and grass seed as earthwork levels are achieved. Silt control measures will only be removed once the site is considered stable in terms of silt run-off.

5.1. Proposed Controls

The following system of silt and sediment control protection measures are proposed: below sections covers the generic methodology for all stages of the development. For clarity, Refer to staging plans as part of this application, in conjunction with the attached engineering drawings for detail staging works methodology.

- A system of clean & dirty water diversions bunds will be placed around the stage earthworks area. Bunding within the working area will direct dirty water into SRP/DEB corresponding to the designed catchment size in each stage.
- Topsoil and Clay stockpiles will be located outside of the Staging area each with bunding and Decanting earth bunds to mitigate rain events. Temporary haul roads to allow for stockpiling will have drop out pits.
- Where possible, clean stormwater runoff shall be diverted away from site works and other environmental controls. This is particularly important when constructing SRP/DEB, wetland, and downstream swales. Diversion locations have been marked on the ESC plans.
- Works shall proceed in a manner that allows worked sections to be completed to a finished standard prior to moving to a new section. In general, this is considered to restrict earthworks exposure to an area no greater than can be started and finished within one to two days or as agreed with councils monitoring engineer. It is particularly important to ensure works are being planned according to the forecast, so that no area is exposed which cannot be completed or rapidly stabilised prior to a rain event. The programme of works will be discussed with the Contractor to consider their input regarding planned construction processes and methodologies.
- All works are to be stabilised as soon as possible following completion. Cut and Fill slopes are to be stabilised using hydroseed, or other methods listed in Section 4.2 of this report.
- Erosion and sediment control devices are to be kept in place until the completed works are fully stabilised to the approval.
- Existing wetlands and watercourse within the site are of utmost concern. Construction methodology and programme shall be developed to ensure works near wetlands/watercourse are completed in a timely manner and during a dry weather window. No more area shall be exposed than can be stabilised immediately if required by an unanticipated weather event.

5.2. Potential Environmental Impacts

During the earthworks there is a risk of dust nuisance during dry and windy weather. To manage potential dust effects, the following management measures are proposed:

1. The area exposed for earthworks will be minimised where possible, in accordance with the earthwork staging described in this report.
2. Earthworks shall be effectively stabilised using the following methods:
 - a. Topsoiling and grassing
 - b. Hydroseeding

- c. Using hay or straw mulching
 - d. Water cart (where required)
 - e. Stabilisation work shall be completed prior to the opening of any subsequent earthworks
3. An adequate supply of water for dust control and effective means of application is always available on-site during earthworks, until such time as the site is fully stabilised.
 4. Sufficient water will be available on site with the consented two bores providing water for dust suppression and conditioning. Additional water can be trucked in from offsite once the consented bore allocation has been spent.
 5. Sufficient water will be available for dust mitigation with water storage tanks retained on site until it is fully stabilised. The water tanks will be re-charged via on site bores then distributed to truck and trailer water cart.
 6. In the event dust control management is ineffective and if found necessary, the contractor shall employ the use of soil stabilisers (such as polymers or similar) or weatherproof cover where possible.

6. Additional Information

6.1. Fill Compaction

Fill shall be placed in controlled layers using approved material and compacted with suitable plant over the full placement area. Fill placement shall be coordinated with survey control, drainage and preload requirements and should achieve:

Not less than the following percentages of maximum dry density obtainable for the material by standard compaction at optimum moisture content determined by NZS 4402, Pt 2P: Test 14 or current equivalent test method under NZS 4402:		Clays and Silty Clays	Sands and Gravel
A	Within 500mm of the finished carriageway sub grade levels and within 3m of batter edges	98%	100%
B	Elsewhere	95%	97%
Clays		Air Voids % (as defined NZS 4402: Part 1)	Undrained Shear (measured by in-situ vane)
A	Within 500mm of road subgrade levels and within 3 meters	Average value less than 8% (any 10 tests) Maximum single value 10%	Average value not less than 170 KPa minimum single value 140 KPa
B	General Fill	Average value less than 10% (any 10 tests) Maximum single value 12%	Average value not less than 150 KPa minimum single value 110 KPa
C	Reserve Areas deeper than 600mm below finished formation level	Maximum value 15%	Minimum value 75 KPa

Table 10: Fill Compaction Requirements by Soil Types

6.2. Monitoring

All sediment control measures will be checked to ensure that they are performing as intended.

A site walk over shall be undertaken daily before leaving the site to identify any corrective maintenance required. A more thorough inspection will be undertaken at the end of each week, or

before and after a forecast major storm event, to identify any preventative and/or corrective maintenance required. The Site engineer or representative will undertake monthly inspections and will also accompany the contractor in pre and post storm event inspections.

A regular program of sediment, debris and trash removal will be undertaken to ensure sediment control measures do not become blocked and ensure they function as proposed. Any large floating matter including any organic matter, i.e., fallen tree litter, reaching the pond or discharge structures is to be removed immediately.

Specific monitoring and maintenance of each mitigation method is included below:

6.2.1. Retention Ponds & Decant Bund with forebay.

- Inspect every day and before every forecasted rainfall event. Inspect for correct operation after every runoff event. Immediately repair any damage caused by erosion or construction equipment.
- Inspect Level Spreaders after every rainfall until vegetation is established and promptly undertake any necessary repairs. Ensure vegetation is kept in a healthy and vigorous condition.
- Clean out before the volume of accumulated sediment reaches 20% of the total forebay volume. To assist in gauging sediment loads, clearly mark 20% volume height on the riser.
- Clean out with high-capacity sludge pumps, or with excavators (long reach excavators if needed) loading onto sealed tip trucks or to a secure area.
- Deposit the sediment in such a location so that it does not lead to a direct discharge to receiving environments. Stabilise all disposal sites as required.
- Chemical treatment will be provided if 100mm of water clarity is not achieved before discharge, this will be achieved by dosing/flocculation.

6.2.2. Diversion Drains / Clean Water Cut-off Bunds

- Inspect after every rainfall event and during periods of prolonged rainfall for scour and areas where they may breach.
- Repair immediately if required to ensure that the design capacity is maintained.
- Remove any accumulated sediment deposited in the Runoff Diversion Channel / Bund due to low gradients and velocities.
- Carefully check outlets to ensure that these remain free from scour and erosion.

6.2.3. Silt Fence

- A silt fence will only be installed where site constraints prevent the practical installation of diversion drains and/or cut-off bunds.
- Inspect Silt Fences at least once a week and after each rainfall. Make any necessary repairs when bulges occur, or sediment accumulation reaches 50% of the fabric height.
- Any areas of collapse, decomposition or ineffectiveness need to be immediately replaced.
- Remove sediment deposits as necessary to continue to allow for adequate sediment storage and reduce pressure on the Silt Fence. Ensure that the sediment is removed to a secure area.
- Do not remove Silt Fence materials and sediment deposition until the catchment area has been appropriately stabilised. Stabilise the area of the removed Silt Fence.

6.2.4. Silt Socks

- Inspect Filter Socks at least once a week and after each rainfall. Make any necessary repairs when necessary.

6.2.5. Stabilised Vehicle Entrance

- Maintain the Stabilised Construction Entrance in a condition to prevent sediment from leaving the construction site. After each rainfall inspect any structure used to trap sediment for the Stabilised Construction Entrance and clean out, as necessary.

6.3. Stabilisation

Stabilisation of earthworked areas shall be undertaken progressively as final ground levels are reached or where works are temporarily paused for more than 14 days. The following stabilisation measures and timing are proposed in line with WRC guidelines:

Condition	Stabilisation Method	Timeframe
Final earthwork levels achieved	Topsoil and grass seeding	Within 5 working days
Temporary pause in work >14 days	Hydroseeding or straw mulching	Within 7 calendar days
Final surface not expected within 60 days	Polymer stabilisation or erosion control matting	Within 10 working days
Post-winter shutdown	Stabilisation of all exposed area	Before 30 April annually

Table 11: Stabilisation Measures and Timing in WRC Guidelines

Maintenance: All stabilised areas will be monitored weekly and after heavy rainfall (>20mm/hr) to ensure full vegetation cover (minimum 80%) is achieved. Any bare patches or erosion will be repaired promptly with mulching or swift remedial action.

Appendix A – Earthworks Drawings