



Appendix U

Earthworks Management Plan

Bell Road Limited Partnership
Wairakei South
Bell Road
Pāpāmoa

Earthworks Management Plan


PROJECT INFORMATION

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1. EXECUTIVE SUMMARY

The purpose of this report is to describe and assess the proposed earthworks required to service the development, including Erosion and Sediment Control (ESC). This report will support the Fast-track Approvals Act (“FTA”) substantive application.

The Wairakei South Development (the Site) is a transformative, privately funded urban development project which will play a critical role in addressing the Western Bay of Plenty sub-region’s growing housing and business land shortfalls. The site is approximately 350 hectares within the high-growth Eastern Corridor between Pāpāmoa, Te Tumu, and Te Puke. Wairakei South is positioned to become a vibrant, integrated and connected mixed-use community. The project will deliver approximately 2,750 new homes alongside 50 hectares of industrial, 4 hectares of commercial centres, and a 4 hectare primary school over the next 10–20 years.

This report is to be read in conjunction with the Engineering Drawings and Draft Construction Management Plan prepared by Maven BOP Limited.

The existing site presented significant flood engineering challenges requiring the site to be raised from existing ground levels of approximately RL 1.0–2.0 m (NZVD 2016) to proposed finished levels of approximately RL 3.5–5.0 m (NZVD 2016). This filling enables the provision of housing, employment land, and supporting infrastructure.

Ground improvement measures have been recommended by ENGEO Limited to address key geotechnical considerations, including consolidation and creep settlement, liquefaction, and embankment and channel edge stability. The earthworks design has incorporated these considerations and follows the recommendations outlined in ENGEO’s Geotechnical reporting.

The Erosion and Sediment Control, has been designed based on best practise and the council standards. This will utilize sediment retention ponds, clean water diversion swales, and dirty water diversion swales.

2. INTRODUCTION

Maven BOP Limited (Maven) have been engaged by Bell Road Limited Partnership to undertake the Infrastructure Design in support of the Fast-Track Approvals Act Application (FTA) for the Wairakei South FTA090 Development.

2.1. PURPOSE OF THIS REPORT

This report has been prepared to provide an Earthworks Management Plan (EMP) for the proposed development of Wairakei South, Bell Road, Pāpāmoa, on behalf of Bell Road Limited Partnership. The purpose of the EMP is to outline how earthworks will be planned, staged, and managed to support the delivery of the development in a controlled and coordinated manner.

The EMP describes the proposed methodology for undertaking earthworks across the site, including staging, sequencing, and integration with supporting construction activities. The report is to be read in conjunction with the engineering drawings and associated documentation, including the Construction Management Report prepared by Maven and submitted with the substantive application. Measures to manage erosion and sediment effects are addressed as part of the overall earthworks approach.

This plan provides a framework for implementing approved earthworks in a manner that manages construction risk, minimises adverse effects, and aligns with relevant local and regional requirements. Final earthworks design and erosion and sediment controls may be slightly refined through detailed design and contractor input. Final Erosion Sediment Control Plans (ESCP) are anticipated to form a condition of consent, required prior to construction commencing onsite.

2.2. SITE DESCRIPTION

The subject site comprises 12 individual records of title, and a combined area of approximately 349ha (refer Table 1). The site is located immediately south of State Highway 2 (SH2) / the Tauranga Eastern Link, and south of the established Wairakei North and 'The Sands' developments. The site location is shown in Figure 1, below.

Legal and physical access to the site is directly via Bell Road, which traverses the property. A future transport link will become available via the Pāpāmoa East Interchange (PEI) to SH2, pending the completion of the PEI.

The land is zoned rural under the Western Bay of Plenty District Plan, and is situated within a predominantly rural environment. The site contains seven dwellings dispersed across various land parcels.

The site is bounded by State Highway 2 to the north and east of the site. The Kopuaroa Canal, a linear drainage canal, forms the southern boundary across the site extending from the west, eastward before connecting into the Kaituna River. Bell Road bisects the property, creating two distinct land parcels referred to in this application as:

- "The North Block" – land to the north of Bell Road; and
- "The South Block" – land to the south of Bell Road.

The site comprises flat, heavily modified alluvial plains with drained peat soils, rectilinear paddock patterns, channelised drainage networks and limited areas of native vegetation. The land is currently utilised for rural production activities, being predominantly in pasture and grazed by stock, with seasonal maize cropping.

Existing features within the site include farm drainage infrastructure, mature trees and hedgerows, residential dwellings, and associated farm buildings.

Culturally, the site is located within the rohe of Waitaha and Tapuika and forms part of a wider cultural landscape connected to Te Rae o Pāpāmoa, historic wetland systems, and the Kaituna River.

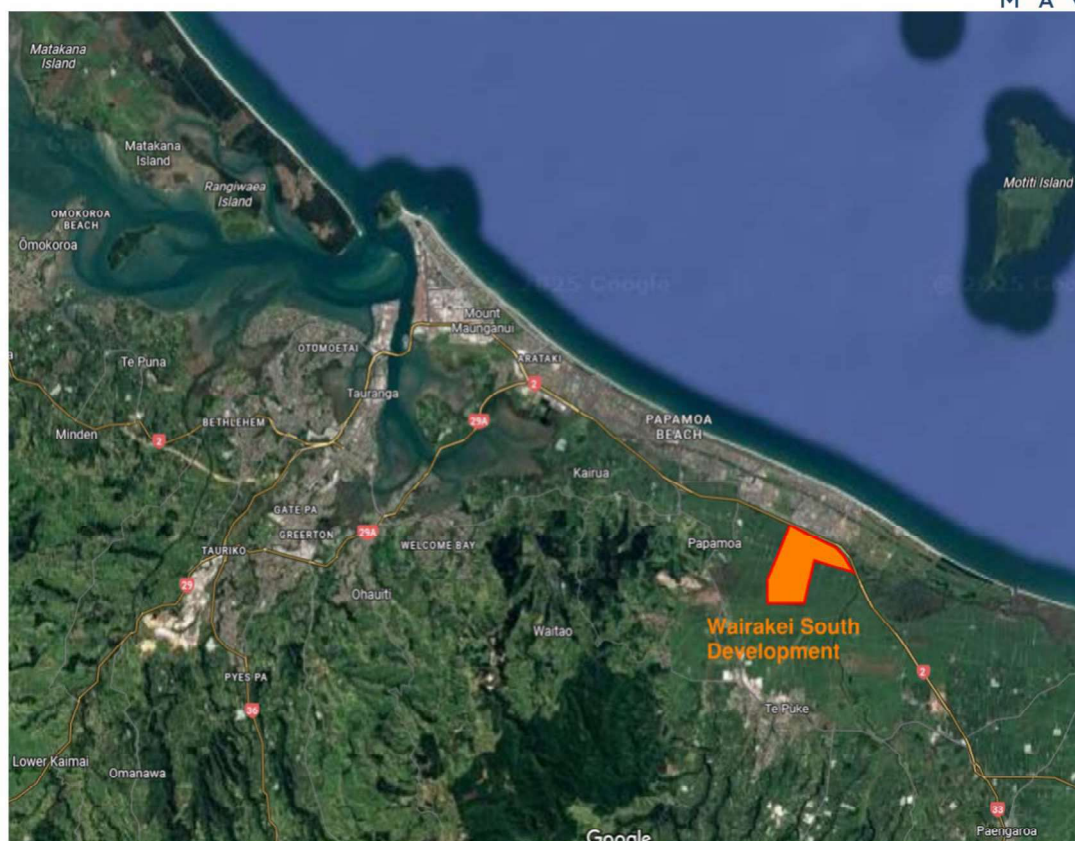


Figure 1 -Wairakei South Development Location (Source: Google Maps)

Table 1: Legal Descriptions of site

Address	Record of Title	Appellation	Area (Ha)
	SA64B/396	Lot 2 DPS 81677 & Lot 1 DPS 54113	24.323
285 Bell Road, Pāpāmoa	SA64B/395	Lot 1 DPS 81677	2.694
	624307	Lot 1 DPS 69524 & Section 26 SO 427562	21.460
285A Bell Road, Pāpāmoa	SA55D/202	Lot 2 DPS 69524	0.982
311 Bell Road, Pāpāmoa	893643	Lot 1 DP 537375	15.291
	893644	Lot 2 DP 537375	3.528
339 Bell Road, Pāpāmoa	687138	Section 1 SO 457222	4.179
	606872	Section 13 SO 458365	59.941
	605743	Section 12 SO 458365	1.788
250, 252 Bell Road, Pāpāmoa	SA7A/206	Part Lot 1 DP 29530	113.762
314D Bell Road, Pāpāmoa	960662	Lot 2 DP 553506	99.110
314 Bell Road, Pāpāmoa	960661	Lot 1 DP 553506	2.063
		Total	349.120

2.3. SUMMARY OF PROPOSED EARTHWORKS

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, and stormwater ponds. Within each development stage, the site will be further divided into sub-catchment areas where specific erosion and sediment control measures are to be adopted.

All of the entire 349.12 ha area of the wider site is proposed to be earthworked. The earthworks footprint lies within the wider Kaituna River catchment. Key existing water conveyance features include the Kopuaroa Canal, a man-made arterial drain forming the southern site boundary, and the Bell Road Drain, located along the northern side of Bell Road. Both systems convey flows eastwards towards the Kaituna River, which is located around 650m to the east of the site.

To facilitate the construction of the roading network and to mitigate flooding risks associated with the low-lying terrain, the consent proposes a series of culvert installations, swale drain upgrades, and stormwater pond works.

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 Engineering Drawings detail the extent of work and sediment control measures.

2.4. GEOTECHNICAL INVESTIGATIONS

The Geotechnical Reports prepared by ENGEO Limited between 2022 and 2025 (reference 19630.000.001) provide detailed site investigation information. A summary of the source reports is included in Section 3.

The site is located within the Maketu Basin, in a back-dune swampy environment that forms part of the Kaituna floodplain. Its geology is the result of recent (Holocene and late Pleistocene) coastal and alluvial processes, creating a landscape of coastal dunes and swampy deposits. The northern boundary of the site marks a transition from the alluvial floodplain to coastal dune sands.

The reports outline that topsoil depths vary between 300-400mm. Beneath this lies a significant deposit of soft, fibrous peat containing organic clays and wood, which reaches a maximum thickness of 4 metres towards the southeast and pinches out to the north. Underlying the peat and topsoil is a 5 to 8 metres thick layer of fine to medium dune sand. Deeper still are two fluvial (river) deposits, comprising of an upper layer of loose sands and gravels, followed by a much denser layer of sands and gravels below 13 metres depth.

Groundwater at the site is very shallow, typically recorded between 0.4 m and 1.5 m below the ground surface. The groundwater level generally follows the landform, being higher in the west and dropping towards the east.

Ground improvement measures have been recommended by ENGEO to address key geotechnical considerations, including consolidation and creep settlement, liquefaction, and embankment and

channel edge stability. The earthworks design has incorporated these considerations and follows ENGEO's recommendations.

Contaminants were primarily identified within shallow topsoil and historic fill materials. Elevated zinc and copper concentrations exceeding standard ecological protection criteria were detected in samples from the Bell Road Drain, likely reflecting contributions from both on-site activities and the upstream agricultural catchment. ENGEO has assessed the overall risk to human health, ecological values, and water quality as low, as contaminated soils will be isolated beneath imported clean fill and managed through effective erosion and sediment control measures.

ENGEO will be engaged during construction to undertake earthwork monitoring. 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.

For further information please refer to the ENGEO Geotechnical investigation report included in this application

2.5. RESOURCE CONSENT REQUIREMENTS

Earthworks Consent is sought through the Fast Track application for the overall project.

Conditions of consent will require that erosion and sediment control measures are implemented and maintained in accordance with this Earthworks Management Plan to ensure that the receiving environment is protected during the construction phase.

Proposed measures for erosion and sediment control have been designed in accordance with Bay of Plenty Erosion and Sediment Control Guidelines for Land Disturbing Activities 2010, best practice solutions, and the Auckland Council design manual GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region as a further guide where necessary.

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 earthwork season.

Applications for Winter Works will only be lodged if required.

2.6. SITE SPECIFIC CONSTRAINTS

The site lies within a large catchment that forms part of the wider Kaituna River catchment. The downstream receiving environment is particularly sensitive to potential sediment discharges associated with earthworks activities. The site is flood prone during larger events due to its flat topography.

An Assessment of Environmental Effects (AEE) has been prepared by Collier Consultants Limited. Further details are presented in the AEE. Any mitigation recommendations in this report must be followed.

A wetland assessment undertaken by Ecological Solutions Limited identified the ecological constraints associated with the existing wetland features. The assessment concluded that the proposed



development does not trigger requirements for wetland effects management. Refer to the Wetland Assessment report for detailed findings.

The erosion and sediment control measures for the project have been developed with consideration of the environmental effects outlined in both the AEE and the Wetland Assessment.

The Geotechnical Reports prepared by ENGEO Limited between 2022 and 2025 (reference 19630.000.001) identified underlying peat within the site. This report contains recommendations on the management of the peat layers. For details refer to the above referenced Geotechnical Reporting.

2.7. STAGING AND CONSTRUCTION METHODOLOGY

It is proposed that the bulk earthworks operation will comprise of total eighteen (18) separated work sections (Stages 1 to 18) that will be undertaken independent of each other, as shown on earthworks plans attached within Maven’s Engineering Plan set (Appendix D of the AEE).



Figure 2 - Proposed Staging Plan (C100s - Appendix D of the AEE)

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

- Install silt control measures, as shown on Engineering Drawings or agreed plan provided at Preconstruction meeting.
- Install sediment retention ponds, clean and dirty water diversion bunds.
- Carry out Bulk Earthworks including pre-loading.
- Install drainage systems, outlets, and riprap.
- Form channel and building platform areas concurrently as site is stabilized.
- Stabilise Road corridors by placing the subgrade improvement layer of brown road ready for civil construction to place.
- Retain and maintain silt control measures until completion.

3. SUMMARY OF DATA SOURCES AND REGULATORY CONTEXT

3.1. SUMMARY OF DATA SOURCES

This section provides a summary on key datasets used in the writing of this EMP, including those that have been used to generate supporting figures provided as part of this application.

Table 2: Data Source Summary

Site Characteristics	Data Source
Topography	ALS/Maven Drone and topographical site survey LINZ Data Service Public Digital Elevation Model data
Geotechnical Soil conditions	ENGEO Geotechnical Interpretive Report (Appendix P of the AEE) Engeo Hydrogeological Assessment Report (Appendix R of the AEE) ENGEO 2022.03.10 - Bell Road Combined Preliminary and Detailed Site Investigation ENGEO 2024.04.17 - Groundwater Monitoring Summary ENGEO 2025.09.26 – Bell Road Interim Summary: Geological Conditions and Geotechnical Parameters
Existing Stormwater Network & Hydrological Features	Public imagery (Google Maps, Bing Maps, New Zealand Imagery from Eagle Technology) Maven Flood Modelling Report (Appendix H of the AEE) ALS/Maven Drone and topographical site survey
Ecological / environmental areas	Ecological Solutions Ecological Impact Assessment (Appendix L of the AEE)
Contaminated land	ENGEO Contaminated Land Detailed Site Investigation Report (Appendix S of the AEE)

3.2. REGULATORY CONTEXT

The earthworks management approach has been developed with reference to the following statutory and technical documents:

Table 3: Regulatory Context

Level	Document
National	Resource Management Act 1991 (RMA)
	National Policy Statement for Freshwater Management 2020 (NPS-FM)
Regional	Bay of Plenty Regional Natural Resources Plan
	Bay of Plenty Regional Council – Guidelines for Stormwater Management
	Bay of Plenty Regional Council – Erosion and Sediment Control Guidelines for Land Disturbing Activities 2010/01
	Auckland Council design manual – GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region
District	Western Bay of Plenty District Plan
	Western Bay of Plenty District Council – The Development Code
Site Specific	Project specific investigations as highlighted in Section 4.

4. EARTHWORK SUMMARY

As mentioned in section 1.8 above, the bulk earthworks on site will be divided into eighteen separated stages. Figure 3 below is an extract from the engineering drawings appended to the AEE. A summary of the proposed earthworks is included within:

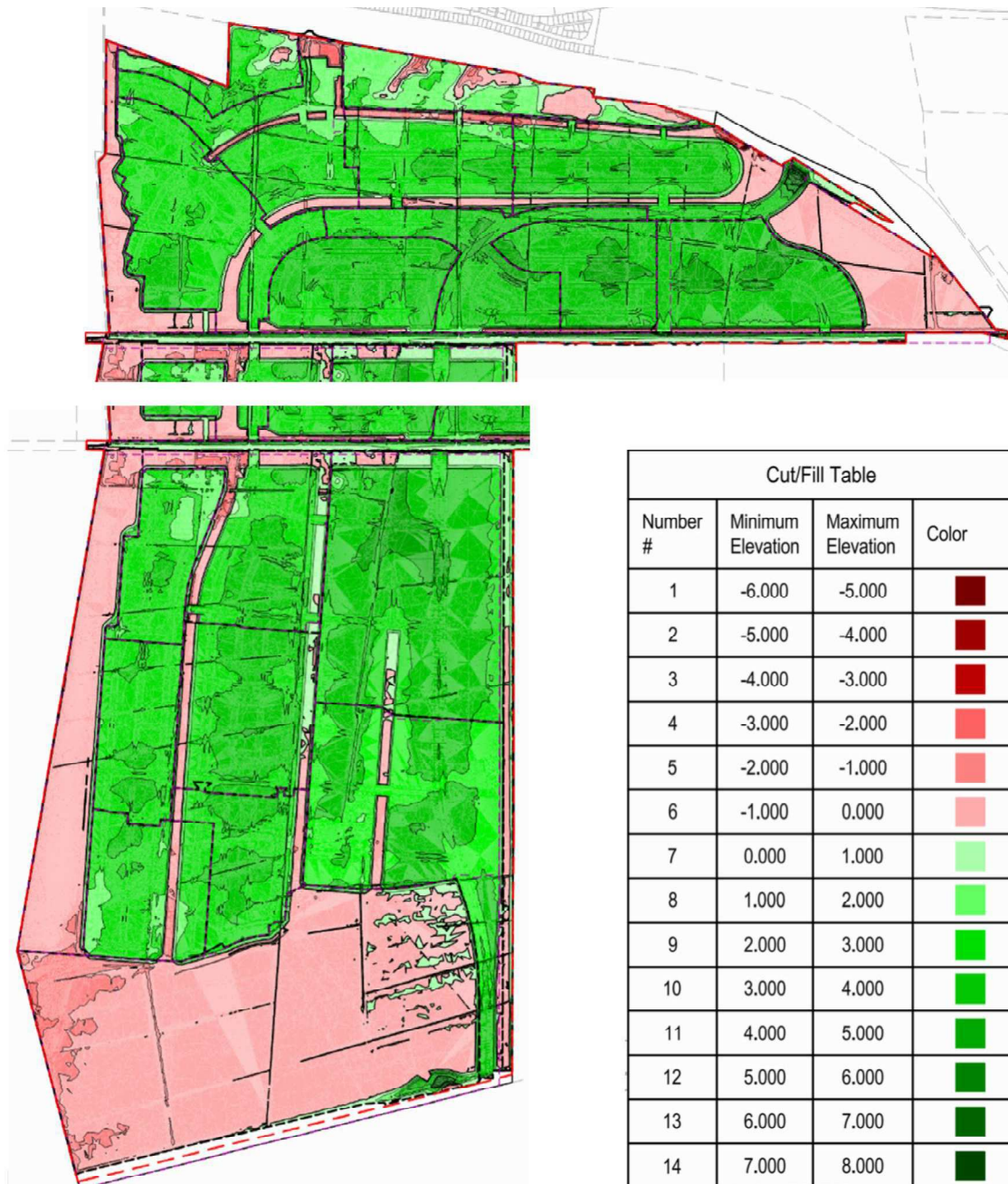


Figure 3 – Proposed Cut/Fill Plan (C220s – Appendix D of the AEE)

4.1. EARTHWORK VOLUMES

4.1.1. TOTAL SITE EARTHWORKS

Table 4: Bulk Earthworks Volume Estimates

Total area of ground disturbance	350 ha
Total volume of cut	591,200m ³
Total volume of fill	6,362,300m ³
Total volume of cut/fill (surplus)	6,362,300m ³
Total Settlement Fill	2,751,800
Total Volume (cut to fill + imported fill)	9,114,100m ³

4.1.2. STAGES 1 - 18

Figure 5 -Staged Earthwork Volumes, below outlines the earthwork volumes for each stage.

STAGES	AREA	CUT TO WASTE	IMPORTED FILL	SETTLEMENT FILL	TOTAL IMPORTED FILL*
STAGE 1	264296.67	57601	389303.35	129575	518878
STAGE 1 - SOUTH EAST SWALE	40326.74	3984	13845.7	0	13846
STAGE 2	107860.17	14634	214804.48	62515	277320
STAGE 3	132118.72	20755	250040.0	90007	340928
STAGE 4	131773.88	5460	427092.8	220755	647848
STAGE 4 - NW SWALE	54796.75	23604	7255.08	0	7255
STAGE 4 - SW SWALE	160276	102970	13823	0	13823
STAGE 4 - SOUTH DETENTION AREA	607930	285230	50889	0	50889
STAGE 5	90405.97	1971	310383.29	145754	456138
STAGE 6	109410.05	1725	349381.81	181470	530852
STAGE 7	108148.58	3290	326830.99	131449	458280
STAGE 8	177136.9	8227	426144.81	173917	600062
Bell Rd Only	53600	700	61500	0	61500
STAGE 9	157840	22500	318500	109630	428130
STAGE 10	153669.92	3844	401348.24	135341	536690
STAGE 11	96902.6	2900	273050	142621	415671
STAGE 12	87510.32	0	210567.55	95389	305956
STAGE 13	94236.58	0	255150	117118	372268
STAGE 14	115211.18	7100	248650	164986	413636
STAGE 15	322881	850	1004658	513797	1518455
STAGE 16	266351.19	3600	724050	314969	1039019
STAGE 17	94124.7	14070	100278.81	7966	108245
STAGE 18	48824.64	2700	94900	13641	108541
TOTAL	350	587800	6480500	2751800	9233000
	ha	m³	m³	m³	m³

Figure 5 -Staged Earthwork Volumes (Maven)

4.2. STOCKPILING DETAILS

The location, number, and final configuration of stockpiles will be determined on site by the contractor's nominated geotechnical engineer, having regard to site conditions, construction staging, and safety requirements. It is anticipated that stockpiles will be up to 3.0m in height, with side slopes no steeper than 1V:2H, unless otherwise approved.

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

- Safe and efficient haul routes
- Separation from site boundaries, waterways, and drainage lines
- Flooding and overland flow
- Stability under wet weather conditions
- Access for construction plant and maintenance

Temporary stockpiles retained for less than three (3) 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 durations, 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 Earthworks Completion Report.

4.3. FILL COMPACTION

Each layer of material shall be compacted by approved compacting machinery throughout its whole area and depth to achieve:

Table 4: Fill Compaction Requirements by Soil Types

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:		Clays and Silt 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 Area deeper than 600mm below finished formation level	Maximum value 15%	Minimum value 75 KPa

5. SEDIMENT CONTROL

5.1. SEDIMENT AND EROSION CONTROL PHILOSOPHY

As the site is currently a low-lying flat farmland, multiple sediment controls and devices need to be constructed onsite. The following section outlines the general principles and philosophies that will be adopted for proposed erosion and sediment controls. Regular compliance inspections will be undertaken by Bay of Plenty Regional Council/Western Bay of Plenty District Council to confirm that erosion and sediment control measures are installed, maintained, and operating in accordance with the approved design.

Any sediment and erosion controls will be in general accordance with Bay of Plenty Erosion and Sediment Control Guidelines for Land Disturbing Activities 2010/01, best practice and Auckland Council Design Manual GD05.

Sediment control measures will be installed onsite, checked, and confirmed acceptable by the project 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, clean aggregate or mulch and seeded as earthwork levels are achieved, and with the compacted subbase in areas of proposed road and accessway. Silt control measures will only be removed once the site is considered stable by Council and/or the Site Engineer. All settlement pre-load material will be stabilized with a chemical dust and erosion suppressant while settlement takes place.

The proposed erosion and sediment control philosophy for this site is as follows:

- Bulk earthworks are to be completed during suitable (fine or dry) weather, to limit the risk of erosion and sediment runoff.
- Stabilized entranceways are to be installed at all entrances into the site that will be used for construction traffic and are to be maintained throughout construction. If required wheel washes should be installed to ensure material is not tracked onto the public roads.
- Existing features shall be used to manage run-off where practical.
- Where possible, clean water diversions bunds are to be placed on the high side of the earthworks area, clean stormwater runoff shall be diverted away from site works and other environmental controls.
- Dirty water diversion drains and bunds shall along the low side of the catchment areas will collect any peripheral runoff and direct it to temporary sediment retention ponds located in natural low-lying areas.
- The temporary sediment retention ponds located within each sub-catchment shall capture the dirty water. Each pond will be adequately sized spillway design as per council guidelines.
- All temporary stockpiles shall have silt fencing installed around the base. Clean water diversions will be required if clean runoff would otherwise drain through stockpile zones.
- Silt fencing will be placed along contours to intercept sediment laden sheet flows.

Prior to works commencing, a review of the current design, season, ground conditions and catchments will be undertaken to ensure the most appropriate erosion and sediment controls are installed and plans are adopted as required.

5.2. SITE SPECIFIC CONSIDERATIONS

The following principles have been considered with respect to the site, in the preparation of this report and plans.

- **Minimize disturbance** – only the areas necessary to be earth worked to support the land use application, are proposed. The proposed earthworks utilise the existing contour as far as practical, and the cut/fill areas are planned to occur as close as possible to transport material the shortest distance possible.
- **Seasonal Earthworks** - The earthworks are anticipated to occur during the earthworks season only, unless the consent holder applies for approval from the Council to undertake certain earthworks outside the earthworks season and approval is given.
- **Staged construction approach** – The proposal has been split into sub-catchments, in accordance with the stages proposed. The staged approach relates to both stages of the development, but also smaller earthwork areas which are in many instances their own isolated catchments. This allows for earthwork areas to be stabilised quickly, whilst minimizing exposed areas within the site.

5.3. EROSION AND SEDIMENT CONTROL

Erosion and sediment controls shall be put in place will be adequate to prevent that the generation of potentially contaminated sediment and stormwater is minimised and managed.

Sediment controls will be undertaken in accordance with:

- The site-specific Erosion and Sediment Control Plan (ESCP),
- Industry best practice.
- Erosion and sediment controls will be adequate to ensure that contaminated soil does not travel offsite.

5.3.1. EROSION CONTROLS

A series of clean water and dirty water diversion bunds will be installed as detailed within the engineering plans in **Appendix D of the AEE**. Clean water from outside of the earthwork areas will be excluded from works areas by clean water diversion bunds.

Dirty water diversion bunds will be sized to convey flows from the 5% AEP storm event with a freeboard of 300mm and will be established prior to earthworks commencing.

Regular monitoring of the bunds will be undertaken to identify any areas of actual/potential erosion.

5.3.2. SEDIMENT CONTROLS

Sediment Retention Pond (SRP) will be installed in the low-lying area at the southern extent of the earthworks. The SRP is sized to the requirements set out in the Regional Council's Erosion and Sediment Control Guidelines and will successfully accommodate runoff generated from the larger catchment for the required design rainfall events.

The SRP is strategically placed at the low spot of the development for all stages. This is to ensure that all diversion channels (dirty water) can easily flow into the SRP. Of the overall SRP storage volume, 30% caters for the dead storage, and the remaining 70% live storage volume. The pond will discharge to the existing stormwater flow path via floating T-bar decants, discharging to a stabilised rock riprap outlet structure.

5.4. STABILISATION AND REVEGETATION

It is proposed that stabilisation and revegetation is to occur progressively as earthworks are completed.

Acceptable stabilisation techniques are:

- Natural regeneration in low-risk areas.
- Topsoil and grassing.
- Hydroseeding.
- Mulching or metaling of roads, laydown areas and pads.

Once established, vegetation protects exposed soils from raindrop impact, reduces runoff velocity and volume, binds soil particles together and can also inhibit weed growth.

5.5. DUST CONTROL

Dust control will be undertaken on the site on an as required basis to minimise the creation of dust and nuisance to neighbouring landowners. There are several methods on how dust will be managed at the site including the following potential controls listed below.

Dust must be managed during construction works to ensure that it generally complies with the MfE Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (2016). To control the generation of dust, the contractor will ensure that the soils are regularly dampened down with a misting system, such as a water truck and/or portable water sprays, during dry and windy conditions. When utilising water to control dust, the contractor will ensure that:

- The volume of water used does not exceed soil field capacity of the wetted areas causing surface run-off that could discharge in stormwater systems or other waterways.
- The application of water does not induce soil erosion and/or soil pugging.
- Stockpiled material is covered.
- Vehicle access onto the works area is limited.
- Working in windy conditions is avoided, as far as practicable.
- A dust and odour complaints log will be maintained by the site contractor.
- Time and date of the complaint.

- Name and location of the complainant.
- Weather conditions, description of site activities, and location of site activities.
- Nature of the complaint.
- Mitigation measures undertaken and evaluation of effectiveness.

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 earthworks staging described in this report.
- 2) Upon completion of earthwork areas, stabilisation using the following methods to provide dust suppression;
 - Topsoiling and grassing.
 - Hydroseeding.
 - Using hay or straw mulching.
 - Metaling roads, laydown areas and pads.
 - Water cart (where required).
 - Stabilisation work shall be completed prior to the opening of any subsequent earthworks.
- 3) The consent holder shall ensure that an adequate supply of water for dust control and effective means of application is available on site at all times during earthworks, until such time as the earthworks area is fully stabilised.
- 4) In the event that wind conditions render dust control impractical, the client shall ensure that any machinery generating airborne dust ceases to operate until effective dust control is established.
- 5) In the event dust control management is in-effective and if found necessary, the client shall employ the use of soil stabilisers (such as polymers or similar) or weatherproof cover where possible.
- 6) Dust control will be monitored on a daily basis by the contractor and various measures employed as required to ensure dust pollution into neighbouring properties does not occur.
- 7) The Site Manager will inspect the earthworks area on a weekly basis (along with other erosion and sediment controls) and ensure that dust is being managed appropriately and the controls in place (such as water cart or stabilisation) are effective.
- 8) The Site Manager will also monitor infiltration pond water supply for dust suppressant to ensure adequate water supply for short notice use.

It is proposed to source the water for dust suppression from infiltration ponds given the high water table in the area. These will be constructed to hold sufficient water to meet the Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (2016) standard for each stage. The Hydrogeologist confirms that the infiltration rate between 1l/s and 10l/s can be expected. Tests shall be undertaken before works commence to adequately size the required pond or series of ponds for each stage to meet the daily water required. If the water supply is interrupted during construction, works are to temporarily stop until alternative sources of water are found. A method of dust suppression, such as a water cart, shall be available onsite at all times to ensure dust is not transferred outside of the site boundaries.

5.6. 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 and documentation of remedial action 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.

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, this will be at a minimum done weekly. Any large floating matter including any organic matter, i.e., fallen tree litter reaching the pond or discharge structures, are to be removed immediately.

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

5.6.1. SRPS AND DEBS

- Inspect Weekly 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 above 5mm/h or 10mm per day until vegetation is established and promptly undertake any necessary repairs. Ensure vegetation is kept in a healthy and thriving condition.
- Clean out before the volume of accumulated sediment reaches 20% of the total 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 to the pond if 100mm of water clarity is not achieved before discharge, this will be achieved by dosing/flocculation.

5.6.2. DIVERSION DRAINS/CLEAN WATER CUT-OFF BUNDS

- Inspect after every rainfall event above 5mm/h or 10mm per day 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.

5.6.3. SILT FENCE

- 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.

5.6.4. SILT SOCKS

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

5.6.5. STABILISED VEHICLE ENTRANCE

- Maintain the Stabilised Construction Entrance in a condition that prevents 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. ACCIDENTAL DISCOVERY PROTOCOL

Ground disturbing works associated with the project have the potential to encounter archaeological material. An Authority under the Heritage New Zealand Pouhere Taonga Act 2014 is being sought from Heritage New Zealand Pouhere Taonga to authorise works that may modify or destroy archaeological sites. All works will therefore be undertaken in accordance with the conditions of the granted Authority.

7. CONCLUSIONS

This Earthworks Management Plan has set out the sediment and control methodology that will support the earthworks associated with the intended development.

The methodology contained within accords with the Bay of Plenty erosion and sediment control guidelines for land disturbing activities 2010/01 and Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05), June 2016.

The design has taken into consideration the possible impact of the proposed development and has minimised potential impacts to the receiving environment using accepted engineering practices.

8. LIMITATIONS

The calculations and assessments included in this report are a 'desktop' analysis and are preliminary in nature based on information available at time of issue. To the best of our knowledge, it represents a reasonable interpretation of available information.

This report is solely for our clients use for the purpose for which it is intended in accordance with the agreed scope of work. It may not be disclosed to any person other than the client and any use or reliance by any person contrary to the above, to which Maven BOP Limited has not given its prior written consent, is prohibited. Notwithstanding the above, the Panel may rely on the assessments and conclusions in this report for the purposes of assessing and determining the fast-track application.

This report must be read in its entirety and no portion of it should be relied on without regard to the limitations and disclaimers set out.

Maven BOP Limited makes no assurances with respect to the accuracy of assumptions and exclusions listed within this report and some may vary significantly due to ongoing stakeholder engagement