IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a submission in respect of the **PROPOSED WAIKATO DISTRICT PLAN** by **AMBURY PROPERTIES LIMITED** pursuant to Clause 6 of Schedule 1 of the Act seeking the rezoning of land at Ohinewai

STATEMENT OF EVIDENCE OF BENJAMIN THOMAS FRASER PAIN

1. INTRODUCTION

1.1 My name is Benjamin Thomas Fraser Pain. I am an associate engineer at Wood & Partners Consultants Limited.

Qualifications and experience

1.2 I have a Bachelor of Engineering (Civil) from the University of Auckland (2008). I am a Chartered Professional Engineer (CPEng), an International Professional Engineer (IntPE), and a Chartered Member of Engineering NZ (CMEngNZ).

1.3 I have 12 years' experience in civil engineering, specifically for greenfield land development. I specialise in Three Water infrastructure projects such pump stations, bulk mains and wetlands, roading geometric and pavement design, earthworks and erosion & sediment control design for multi-staged master-planned developments through to small subdivisions.

1.4 Examples of my experience relevant to this project are:

(a) Paerata Rise – Wesley New Town Development, Paerata, Auckland: I was the author of the Erosion & Sediment Control Design Philosophy Report which outlined the erosion & sediment control (ESC) design standards for each stage on the development. I also produced the Earthworks Stage 1 Erosion & Sediment Control Methodology Report and the Erosion & Sediment Control Methodology Report for the 2 Waters Infrastructure Project Works.

(b) Long Bay Development, North Shore, Auckland: For this project, I wrote the Erosion & Sediment Control Methodology reports for each of the 5 earthworks stages (2.7 million cubic meters of earthworks total), Erosion Sediment Control Methodology reports for several civil works stages and the infrastructure works stages including the wastewater pump station, wastewater tunnel, Awaruku and Vaughan's Streams Bridges, Long Bay Regional Park Access Road, Long Bay Village, and Glenvar Ridge Road. I undertook on-site monitoring of these projects, including weekly inspections with Auckland Council's inspector, reviewed and certified ESC devices, pre storm walkovers, collaboration with stakeholders to improve devices and dynamic updates to the ESC plan during the works. This development was located adjacent to a sensitive marine reserve.

(c) Karepiro Development – Woodridge Estate, Stanmore Bay, Auckland: I have undertaken ESC Plan design and monitoring of this site including weekly inspections with Auckland Council's inspector, reviewed and certified ESC devices, pre storm walkovers, collaboration with stakeholders to improve devices and dynamic updates to the ESC plan during the works.

(d) I have written the earthworks and ESC methodologies for several other projects including:

(i) Hayfield Way Wastewater Pump Station D, Karaka, Auckland: ESC Plan Design.

(ii) Weiti Bay Development, Okura, Auckland: Earthworks & ESC Methodology reports for Karepiro Bay and Village 1 in 2013, and Villages Plan Change in 2018.

(iii) Milldale Wastewater Pump Station, Pine Valley, Auckland: ESC Methodology report.

(iv) Hunua Views Vacuum Wastewater Pump Station, Ramarama, Auckland: ESC Methodology report.

(v) West Hills Stage 1 Wastewater Pump Station, Westgate, Auckland: ESC Methodology report.

(vi) Okura Development, Okura, Auckland: Preliminary Erosion & Sediment Control Layout Plans, USLE Calculations.

1.5 I have completed the two-day Auckland Regional Council's "Erosion & Sediment Control: Workshops for Plan Preparers".

Involvement in the Ohinewai project

1.6 I was engaged by Ambury Properties Limited ("APL") to provide advice on civil engineering matters related to the masterplanning and development process in support of the rezoning proposal for the site at 52-58 Lumsden Road, 88 Lumsden Road and 231 Tahuna Road and ("the Site"). At a more detailed level, I have provided engineering inputs into the Stage 1 resource consent application for the New Zealand Comfort Group factory at the site on the corner of Tahuna Road and Lumsden Road.

1.7 My work included completing feasibility studies of the Site, master-planning level engineering works for Three Waters, roading, utilities and infrastructure. Relevant to this statement of evidence, I provided advice to APL regarding the erosion and sediment control measures proposed to be implemented on the Site, with a focus on the specific construction activity.

1.8 I have visited the Site several times between June 2019 and most recently 7th July 2020.

Purpose and scope of evidence

1.9 The purpose of my evidence is to explain the scale of earthworks likely in order to develop the Site as proposed by APL, and confirm the feasibility of suitable erosion and sediment control measures that will be implemented during the earthworks phase of the construction period.

1.10 My evidence covers the background to erosion and sediment control and the key principles and practices that will be adopted for the Site. It further illustrates, based on best practice and my experience with earthworks proposals, how an effective erosion and sediment control management approach can be adopted for the Site to meet the requirements outlined in the Waikato Regional Council's (WRC) Erosion & Sediment Control Guidelines for Soil Disturbing Activities, No. TR2009/02, January 2009 (TR2009/02).

1.11 Specifically, my evidence will:

(a) Briefly describe the characteristics of the site relevant to erosion and sediment control (Section 3);

(b) Provide an overview of the proposal and, in particular, the proposed earthworks (Section 4);

(c) Provide an overview of the management of erosion and sediment control generally, including key terms and principles and relevant guidance documents (Section 5);

(d) Provide an overview of probable erosion and sediment control measures to be implemented on site (Section 6);

(e) Describe the erosion and sediment control devices and measures toolbox (Section 7);

(f) Comment on issues raised by further submitters relevant to my area of expertise (Section 8); and

(g) Provide a brief conclusion (Section 9).

1.12 A summary of my evidence is contained in Section 2.

1.13 My evidence should be read alongside the evidence of:

(a) Nick Speight, in relation to geotechnical matters;

(b) Chad Croft, in relation to ecology;

(c) Pranil Wadan, in relation to stormwater;

(d) Ajay Desai, in relation to flooding; and

(e) David Stafford, in relation to groundwater.

Expert Witness Code of Conduct

1.14 I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Consolidated Practice Note (2014) and I agree to comply with it. I can confirm that the issues addressed in this statement are within my area of expertise and that in preparing my evidence I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

2. SUMMARY OF EVIDENCE

2.1 Development of the Sleepyhead Estate as enabled by the Ohinewai Structure Plan (OSP) will require approximately 2,500,000m^3 of earthworks over an expected 10-year construction period. As part of this, approximately 2,000,000m^3 of imported fill will be required in order to transform the landform from low lying areas within the existing flood plain to developable land.

2.2 The existing topography of the site is relatively flat with the land rising in the south adjacent to Tahuna Road and in the centre of the site. This topography results in less erosion compared to steeper sites. The existing soil types are generally sand and peat, with some silts and clay present.

2.3 The site discharges to a sensitive downstream environment of Lake Rotokawau, Lake Waikare and ultimately the Whangamarino wetland. To account for this sensitivity, it is proposed that the erosion and sediment control protection devices and measures to be implemented on site will meet or exceed the requirements outlined in the WRC TR0902 standards.

2.4 For this site, a four-step erosion and sediment control ("ESC") methodology is proposed, using both structural and non-structural control measures to provide appropriate protection measures in accordance with the WRC standards:

(a) Team Approach – it is proposed that the stakeholders involved in this project meet regularly and prior to anticipated storm events to dynamically manage the ESCs for the site;

(b) ESC Devices and Measures Toolbox – it is proposed that a toolbox of ESC devices and measures that meet or exceed the requirements of the WRC TR0902 are approved specifically for this site;

(c) Last Line of Defence – in addition to other ESC devices and measures, a back-up measure shall be put in place to further protect waterways and the receiving environment; and

(d) Monitoring – a monitoring programme is proposed to ensure the installed measures are working correctly or whether further measures should be put in place to improve the system.

2.5 The detail of specific ESC measures to be implemented on the site for each development stage can be appropriately assessed and managed via the WRC resource consent process that ensures compliance with TR2009/02.

2.6 In my opinion, the proposed ESC methodology will be sufficient to ensure that erosion is minimised, and sediment run off is adequately controlled prior to discharge into the receiving environment.

3. THE SITE

3.1 The site's topography is relatively flat with the land raising gently in the south adjacent to Tahuna Road and again centrally in the site.

3.2 The site is approximately 178 hectares in area, and currently consists primarily of rural grazed pasture, with a network of farm drains across the site that lead to WRC Drainage Scheme Drains known as the Balemi Road Drain and Tahuna Road Drain. The Balemi Road drain discharges to Lake Waikare and the Tahuna Road drain discharges to Lake Rotokawau. Both lakes ultimately discharge to the Whangamarino wetland.

3.3 As explained in greater detail in Mr Wadan's evidence, there is no formal stormwater management currently on site, with the exception of the farm drains and WRC drainage scheme. Runoff from the existing farming operations discharge to the drainage scheme and onto neighbouring reserve.

3.4 As explained in in Mr Speight's evidence, the soils are generally sand and peat, with some silts and clay present.

4. OVERVIEW OF THE PROPOSAL AND PROPOSED EARTHWORKS

4.1 The proposed recontouring of the site will reduce the elevation of high areas, and fill low lying areas in order to achieve a relatively flat site above the existing 100 year flood plain. Some parts of the site will be lower lying, in order to provide for stormwater management infrastructure.

4.2 It is anticipated that development finished floor levels shall generally be located between RL 8.5m to 13.0m in order to minimise earthworks volumes while still providing for overland flow from the site.

4.3 Figure 1 shows cut and fill to finished levels proposed for the development, The green areas are fill and the yellow areas are cut.

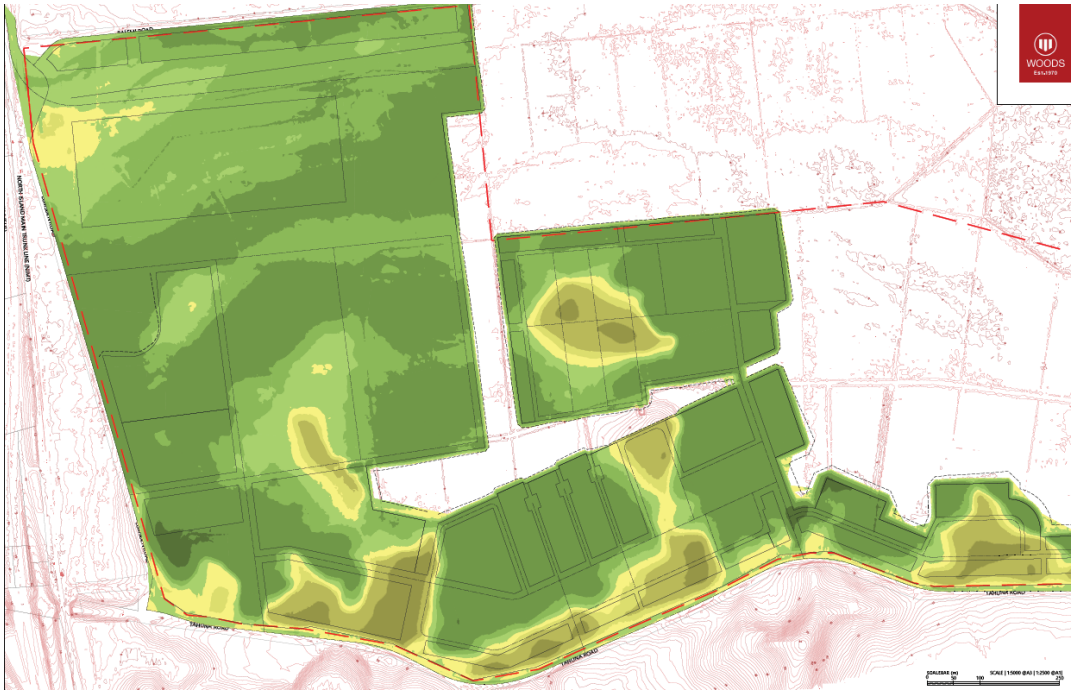

Figure 1: Cut Fill Depth Polygons

4.4 It is anticipated that approximately 500,000m^3 will be cut and 2,500,000m^3 will be filled, which means there is an approximate 2,000,000m^3 deficit in fill which shall be imported to site. The total volume of imported material required is likely to be greater as consolidation and densification of the existing soils will occur as part of the geotechnical remediation works in the order of 20%.

4.5 It is currently proposed that the imported material will comprise overburden obtained from local quarries. This may change as the project progresses and if alternative materials become available.

4.6 It is anticipated that these earthworks will take 5 to 10 years to complete, in accordance with the staging plan set out in the evidence of John Olliver.

5. EROSION AND SEDIMENT CONTROL - OVERVIEW

5.1 Without Erosion & Sediment Control (ESC) measures being in place during earthworks activities, on site erosion can occur at an accelerated level and cause sedimentation of the downstream environment.

5.2 As the site discharges to a sensitive downstream environment, the ESC measures proposed will need to meet or exceed the requirements outlined in the WRC TR2009/02 guidelines. There are a number of factors which influence the erosion of land and therefore sediment generation from within an earthworks site including:

(a) Geology (soil types);

(b) Slope lengths and gradients; and

(c) Rainfall frequency and intensity.

5.3 A key principle of ESC is to minimise the erosion of land. This can be achieved by:

(a) Minimising the exposed area by staging the construction works and rapidly stabilising completed areas (or areas where works will not be undertaken within a short time frame i.e. stockpiles)

(b) Protecting permanent and temporary steep slopes by installing appropriate controls to minimise the flow velocity and quantity.

(c) Utilise an experienced contractor who can assess and adjust controls on site and work with the wider team to evolve the ESC Plan to accommodate a changing site.

5.4 ESC measures include both:

(a) Structural devices such as sediment retention ponds and silt fences; and

(b) Non-structural management practices such as methodologies, works sequencing and staging.

5.5 Earthworks activities in the Waikato region are guided by Waikato Regional Council's (WRC) Erosion & Sediment Control Guidelines for Soil Disturbing Activities (TR0902 Version 1.0, January 2009) ("TR2009/02").

5.6 TR2009/02 provides a guideline for ESC by outlining principles of ESC and the sediment transfer process, providing a ranges of ESC practices which can be implemented in order to minimise adverse environmental effects of soil disturbing activities through the appropriate use and design of ESC techniques.

5.7 For activities of the scale expected within the OSP area, resource consents will be required from the Waikato Regional Council, in line with the requirements set out in the Waikato Regional Plan. The consent process sets out an assessment of the proposed ESC measures and compliance with TR2009/02.

6. OVERVIEW OF PROBABLE EROSION AND SEDIMENT CONTROL MEASURES TO BE IMPLEMENTED ON SITE

6.1 Due to the low gradients of the existing and proposed topography, it is unlikely that significant erosion would occur during earthworks activities. The southern side of the site will have a relatively steeper gradient where the existing Tahuna Road level shall be tied into the lower site topography. It is my opinion that the area of works can be managed appropriately using ESC measures as provided within the TR2009/02 guidelines and will exceed those standards where practicable.

6.2 The different soil types anticipated to be found on site (sand, peat and some clays and silts) and from imported materials, will mean that treatment measures may need to change during the earthworks operation depending on the area of exposed surfaces of each soil type.

6.3 A four-step ESC methodology is proposed using both structural and non-structural control measures to provide appropriate protection measures in accordance with the WRC guidelines:

(a) Team Approach – it is proposed that the stakeholders involved in this project meet regularly and prior to anticipated storm events to dynamically manage the ESC's for the site;

(b) ESC Devices and Measures Toolbox – it is proposed that a toolbox of ESC devices and measures that meet or exceed the requirements of the WRC TR0902 are approved specifically for this site;

(c) Last Line of Defence – in addition to other ESC devices and measures, a back-up measure shall be put in place to further protect waterways and the receiving environment; and

(d) Monitoring – a monitoring programme is proposed to ensure the installed measures are working correctly or whether further measures should be put in place to improve the system.

6.4 These are addressed in turn below.

Team Approach

6.5 The Team Approach ensures that adequate resources, commitment and expertise are provided to support the ESC Methodology from start to finish. This team is a significant resource and has an "expertise base" that is utilised to ensure appropriate and technically sound decisions are made.

Stakeholders involved in the project may include: Engineers, Council Representatives, Clients, Mana Whenua Representatives, Contractors, and other key specialists.

ESC Devices and Measures Toolbox

6.6 The ESC Devices and Measures Toolbox includes devices and measures based on a number of standards (including Auckland standards, which in some cases are more recent than TR2009/02) for erosion control and sediment control with additional measures that exceed those standards to be employed as required on a case by case basis. The relevant standards comprise:

(a) Waikato Regional Council's (WRC) Erosion & Sediment Control Guidelines for Soil Disturbing Activities, TR2009/02 Version 1.0, January 2009 (TR2009/02).

(b) Auckland Regional Council Technical Publication No. 90 "Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region" March 1999 (TP90)

(c) Auckland Council GD05 "Erosion and Sediment Control for Land Disturbing Activities in the Auckland Region" June 2016 (GD05)

(d) Industry best practice and innovative ESC devices and measures (where industry best practice has advanced beyond the requirements of the standards).

6.7 The devices and measures that are planned for use on the site are addressed in Section 7 below.

Last line of defence

6.8 The third step, 'last line of defence', has been formulated as a backup to the proposed controls. While the aforementioned primary erosion and sediment control measures will minimise the discharge of the sediment to the receiving environment, an extra line of defence is proposed.

6.9 An example of this last line of defence is that for areas within 20m of a watercourse that is to be retained, a Super Silt Fence will be erected between the works and the watercourse. The Super Silt Fences will provide a backup protection in the unlikely event that the primary erosion and sediment control devices and measures fail.

Monitoring

6.10 The fourth step in the proposed ESC methodology is monitoring. The aim of monitoring is to ensure the proposed erosion and sediment control measures are installed correctly and function effectively throughout the duration of the works. The monitoring programme will provide certainty to all parties that appropriate measures are being undertaken to ensure compliance with conditions of consent and that potential problems or improvements are identified promptly. Monitoring will consist of:

(a) Weekly site walkovers involving all stakeholders to inspect and determine the effectiveness of all erosion & sediment control devices installed on site.

(b) Random sampling of inflows and outflows during storm events to test the effectiveness of controls.

6.11 By implementing a rigorous monitoring programme, the following benefits will result:

(a) Improved response times for rectifying any failures in erosion and sediment control devices with a focused response;

(b) Weather responsive monitoring/ storm preparedness;

(c) Compliance with resource consent conditions; and

(d) Understanding of the levels of sediment discharge and effect of discolouration of the discharge due to different soil types, i.e. staining from peat and low sediment cloudy discolouration from volcanic soils;

(e) The minimisation of sediment discharge in the receiving environment;

7. PROPOSED EROSION AND SEDIMENT CONTROL DEVICES AND MEASURES TOOLBOX

7.1 Erosion Control Devices / Measures are proposed that will slow down the flow of storm flow, dissipate energy, reduce the sediment generated from steeper areas within the exposed area and decrease the volume of sediment transported to the sediment control devices. The devices / measures proposed for this development are:

(a) Minimizing Exposed Areas / Staging Works – reducing the area of open earthworks by staging the works will reduce sediment load into the devices and receiving environment at each rain event.

(b) Progressive & Rapid Stabilisation – stabilisation with aggregate or straw/bark mulch dissipates energy and reduces erosion and sediment generation.

(c) Dirty Water Diversion Channels / Bunds – these are designed to accommodate storm flows from the 20-year storm (5% AEP) and transport dirty water flows to the sediment control device.

(d) Clean Water Diversion Channels / Bunds – these are designed to accommodate storm flows from the 20-year storm (5% AEP) and for overland flow paths the 100-year storm (1% AEP). These divert clean water away from exposed areas reducing sediment generation within the works areas.

(e) Lining of Diversion Drains – lining of diversion drains with woven geotextiles, non-woven geotextiles or polythene within steep topography will greatly reduce sediment generation and erosion of the drains.

(f) Check Dams – installation of check dams within steep diversion drains (over 5% grade) will dissipate the energy of the water flow and reduce sediment generation and erosion.

(g) Contour Drains – these are spaced at minimum 30m centres within the exposed area to break up flows running down slope, reducing the energy of the water flow which reduces sediment generation. These will be installed when rain is forecast or in areas where works is not anticipated in the next 24 hours.

(h) Drop Out Pits – Drop out pits within dirty water drains will reduce the sediment reaching the sediment control devices.

(i) Track Rolling Slopes – track rolling temporary slopes with earthmoving plant can break up the flow paths within the slope which provides energy dissipation of the storm flows which reduces erosion and sediment generation.

(j) Sealing/Compaction of Open Cut / Fill Areas – depending on the material present, sealing or surface compaction of the earthworks

areas prior to rain events by rolling with earthmoving machinery can reduce the sediment generation and erosion within the site.

(k) Stabilised Entranceways – these can reduce the transportation of sediment off-site where there are no sediment controls.

(l) Stabilising Haul Roads – for key high use haul roads, these shall be stabilised with metal and (if required) a dust suppressant chemical application applied.

(m) Straw Wattles – these can be installed on temporary or completed slopes to break up the flows and reduce erosion of soils and transportation mulch.

7.2 Sediment Control Devices reduce the loading of sediment discharged into the receiving environment by allowing the sediment to settle before it is discharged. The devices / measures proposed for this development are set out in the following paragraphs.

Sediment Retention Ponds

7.3 Sediment Retention Ponds (SRP) are proposed, as follows:

(a) Storage based on the 2% criteria (i.e. 200m3 of storage per 1ha of contributing catchment) for catchments less than 10% and/or length less than 200m or 3% criteria (i.e. 300m3 of storage per 1ha of contributing catchment) for steeper than 10% or longer than 200m.

(b) Contributing catchment size will be confirmed during detailed design and the resource consent process. Where grades within the SRP catchment exceed 10% or above, the catchment will be limited to 5 Ha.

(c) Side slopes no steeper than 1 in 2.

(d) Compacted sides certified by the Geotechnical Engineer for stability of the temporary embankment and infiltration.

(e) Rain Activated Chemical Dosing Systems (RACDS) if bench testing confirms benefits of utilising flocculant for specific soil types. Application rates and flocculation types to be confirmed in stage specific Chemical Treatment Management Plans (CTMP) to be prepared by an Environmental Consultant prior to the commencement of works. The rate at which the flocculant is utilised

will be confirmed via bench testing of specific soils and this will be specified in the CTMP. In addition, manual batch dosing will occur when pumping of sediment laden water from site ponding areas to the Sediment Retention Ponds is necessary.

(f) Forebay sized in accordance with the standards.

(g) Outlet manhole and pipework sized for the 20 year ARI event, with benching to reduce risk of leaks, min. 2x anti-seep collars and erosion protection at outlet.

(h) T-Bar decants installed so that there is 30% of the total storage volume below the invert of the T-Bar. Maximum 1.5 Ha per Decant. Number of holes in decant limited to 200.

(i) A Secondary Spillway lined with dual geotextile layers (non-woven on base and woven or polythene on top) sized for 100 year event.

(j) Non-woven geotextile inlet channel.

(k) Non-woven geotextile batter into pond complete with level spreader.

(l) Inlet to pond at opposite end to the T-Bar decant no lower than 300mm below top of pond level.

Decanting Earth Bunds

7.4 Decanting Earth Bunds (DEB) will be used in catchments of up to 3000m^2 where grades exceed 10% or catchments up to 5000m^2 where catchment grades are less than 10%.

7.5 The DEBs proposed for this development will consist of:

(a) An excavated pond with 1:3 to 1:5 width to length ratio.

(b) Storage based on 2% (20m^3 storage per 1000m^2 contributing catchment) for catchments with grades less than 18 degrees and 200m slope lengths or 3% for all other catchments (30m^3 storage per 1000m^2 catchment). Storage is calculated from the base of the pond to the top of the primary spillway (upstand on T-Bar decant). A further 150mm from the primary spillway to the secondary spillway and 300mm from the secondary spillway to the top of pond level is required.

(c) Side slopes no steeper than 1 in 2.

(d) Compacted clay bunds compacted with either turfed, clothed or topsoil & mulched outside faces.

(e) A T-Bar decant installed so that there is 30% of the total storage volume below the invert of the T-Bar and a unpunched novacoil outlet to the Stormwater system or watercourse.

(f) A Secondary Spillway lined with dual geotextile layers (non-woven on base and woven on top).

(g) Non-woven geotextile inlet channel and batter into pond.

(h) Inlet to pond at opposite end to the T-Bar decant no lower than 300mm below top of pond level.

(i) Flocculation device in accordance with the CTMP for larger or high-risk catchments if bench testing confirms benefits of utilising flocculant for specific soil types.

(j) Safety fence around pond area and appropriate signage.

Super Silt Fence

7.6 A Super Silt Fence (SSF) – SSF provide robust filtration of stormflows prior to discharging to the receiving environment. The SSF is suited to larger flows than the standard Silt Fence however should only be used in areas where DEB are impractical to install. SSF will also be utilised as a 'Last Line of Defence' adjacent to open watercourses.

7.7 The SSF proposed for this development will consist of:

(a) Dual layers of black woven geotextile;

(b) 5 wire (min) or chain link fence which can be tightened at ends and corners;

(c) Geotextile imbedded min 300mm into ground and 200mm return;

(d) Returns at regular centres and either side of localised low points;

(e) Bunds to reduce catchment; and

(f) Plastic caps for waratahs.

Silt Fence

7.8 Silt Fences (SF) will be largely used as temporary controls to set up other controls such as DEBs, during demolition and clearing and removal of controls such as DEBs. A SF will also be installed along the low point of the catchment once the earthworks has been completed and GAP65 placed on the completed platform to be used as a back-up control during civil works and building works.

7.9 The SF proposed for this development will consist of:

(a) Single layer of black woven geotextile;

(b) Geotextile imbedded min 200mm into ground and 200mm return;

(c) Returns at regular centres and either side of localised low points;

(d) Bunds to reduce catchment; and

(e) Plastic caps for waratahs.

Cesspit / Manhole Protection

7.10 Protection around cesspits and manholes will reduce dirty water entering the piped stormwater system. There are several ways proposed for this project to achieve this, as follows:

(a) Proprietary cesspit protection devices;

(b) Silt fences installed around manholes and cesspits, which provide filtration before entering the pit;

(c) Bunds around manholes and cesspits, which eliminate the risk of dirty water entering these pits; and

(d) Straw bales, straw wattles or soil socks, which provide filtration before entering the pit.

Other ESC measures

7.11 Other ESC measures proposed include:

(a) Straw Wattles / Soil Socks – these can be utilised as temporary bunds to divert flows or as filtration devices.

(b) Grass buffer zones between open earth areas and the receiving environment will be established where practicable.

Potential additional measures

7.12 It is proposed that some measures may be implemented that exceed the standard guidelines should there be the need to apply additional measures on a case by case basis based on areas of high risk, pre-storm inspections and areas identified during monitoring that could be improved. These measures include but are not limited to:

(a) Reverse sloped SRP invert to ensure that sediment not deposited in the fore bay area is impounded adjacent to the pond's fore bay for convenient removal. This will also help maintain the working volume of the device.

(b) The provision of a structured fore bay, sized on a 15% volume basis, to ensure that settled sediment particles are captured to the maximum extent possible before entering the pond.

(c) A floating nova coil boom will be established across Sediment Retention Ponds when needed to trap any floating material (such as mulch) to minimise blockages of decants.

(d) Drop out pits within dirty water diversions drains in areas identified as beneficial to reduce total sediment delivered to fore bays.

(e) Application of flocculant to SRPs and DEBs using Rain Activated Chemical Dosing System (RACDS) or other chemical dosing systems as specified in the CTMP (such as floc socks) if bench testing confirms benefits of utilising chemical flocculant for specific soil types. Batch dosing will also be utilised as necessary. Chemical application will be in accordance with the Chemical Treatment Management Plan attached to the Site Management Plan provided by the Contractor.

(f) Dual Flocculation Sheds for SRPs to increase the time between restocking with flocculant.

(g) Super Silt Fence Baffles in SRP's and DEB's to assist with drop out of sediment during low flow rain events.

(h) Manual decant raising devices within Sediment Retention Ponds to increase live volume attenuation for smaller storm events and also

enabling further chemical batch dosing as necessary to enhance suspended solid removal efficiencies.

(i) Providing additional storage in devices where practicable to allow flexibility for catchments to change and if other devices fail or are not working correctly, catchments can be temporarily diverted to these controls until the necessary repairs/remedial works are made.

(j) Rapid stabilisation with a polymer based product such as liquid soil or Vital Bon-Matt Stonewall with hydroseed.

(k) Sediment Pits where areas of high infiltration are present.

(l) Regular de-silting of devices to reduce resuspension of solids during rainfall events.

7.13 In my opinion, these measures will be effective to ensure that sediment is managed appropriately.

8. COMMENT ON ISSUES RAISED BY FURTHER SUBMITTERS

8.1 The further submission by Fish and Game raises concerns about the proximity of the site to Lake Waikare and the Whangamarino Wetland.

8.2 As detailed in this statement of evidence, it is my opinion that the earthworks and sediment control methodology for the development of this site reflects the sensitivity of the downstream environment and proposed measures can adequately manage the potential for sediment discharge off site.

9. CONCLUSION

9.1 Development of the Sleepyhead Estate will require approximately 2,500,000 m^3 of earthworks in order to transform the landform from low lying areas within the flood plain to developable land.

9.2 A four-step erosion and sediment control methodology is proposed using both structural and non-structural control measures to provide appropriate protection measures for the sensitive downstream environment including:

(a) a team approach to erosion & sediment control on site;

(b) an erosion & sediment control devices and measures toolbox;

(c) additional last line of defence measures for protecting watercourses; and

(d) a monitoring programme.

9.3 The detail of specific ESC measures to be implemented on the site for each development stage can be appropriately assessed and managed via the WRC resource consent process that ensures compliance with TR2009/02. Consents will be required in line with the requirements set out in the Waikato Regional Plan and TR2009/02.

9.4 In my opinion, the proposed ESC methodology to be implemented on site will be sufficient to ensure that erosion is minimised and sediment is adequately controlled prior to any discharge to the receiving environment.

9.5 On that basis, I do not consider that there is any reason related to the required earthworks which poses a barrier to development of the Site.

Benjamin Thomas Fraser Pain
9 July 2020