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Infrastructure Report

Milldale Stage 4C
21 Karapapa Road, Milldale, Wainui
Fulton Hogan Land Development Ltd
28/03/2025
FINAL

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STATEMENT OF QUALIFICATIONS AND EXPERIENCE

I, Tim Rickards, am a Principal Civil Engineer at Woods. Woods is a multi-disciplinary consultancy specialising in planning, urban design, engineering, water infrastructure, and surveying. I have been employed at Woods since Feb 2013.

I hold the qualifications of Bachelor of Engineering (Technology), which I completed in 2008. I am a Chartered Professional Engineer of Engineering New Zealand.

I have 20 years of professional experience in the Engineering industry. My experience includes the design and construction observation of a range of land development projects, including project management and the procurement of earthworks, roading, services and other infrastructure. I have been involved in the design and construction of most of the previous stages of Milldale including the surrounding Milldale Stage 4 development and the development of the secondary superlot developments at Milldale.

I confirm that, in my capacity as the author of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

I, John Madden, am a Civil Engineer/ Surveyor at Woods. I have been employed at Woods since March 2019.

I hold the qualifications of Bachelor of Surveying, which I completed in 2017. I am a Licensed Cadastral Surveyor through the Cadastral Surveyors Licensing Board of New Zealand.

I have 8 years of professional experience in the Land Development industry. My experience includes Land Transfer Surveying, Construction and Topographic Surveying, Civil Design, Resource Consent Documentation and Approval, Building Consent Documentation and Approval, Engineering Plan Approval, Contract Administration, Construction Observation and Project Management. I have been involved in the design and construction of development stages in Millwater, and the development of multiple superlots at Milldale.

I confirm that, in my capacity as the reviewer of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

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1. INTRODUCTION

1.1. General Proposal

This report has been prepared in support of the application by Fulton Hogan Land Development (FHLD) for a resource consent to the Environmental Protection Authority (EPA) under the Fast-Track Approvals Act 2024 (FTAA).

The application seeks approval to authorise comprehensive residential development and subdivision across Milldale Stages 4C-2 – 4C-5 (inclusive), the establishment of a balance lot, three roads to vest, one accessway to vest and associated earthworks and infrastructure in accordance with the Milldale Masterplan.

The staged works will enable residential development to progress in accordance with the AUP:OP planning framework and Wainui Precinct Plan. This will involve the creation of 21 superlots to support urban housing typologies and subsequent subdivision to create individual fee simple lots and associated JOALs. The development will provide housing supply and choice to the residential market and provide a high amenity urban residential form with well-planned connectivity to key amenities and services in Milldale.

This report provides descriptions and assessment of the proposed Earthworks, Road, Stormwater, Wastewater, Potable Water and Utility servicing for the site.

1.2. Site Description

1.2.1. Site Location

The site subject to this application (Figure 1) is located within the Milldale development and referred to as Stage 4C subdivision area (the Site). The 5.1251 ha site extent is comprised of the three balance lots created by the subdivision of Stage 4C-1. Formal titles have not yet been issued for these balance lots which are identified as Lot 9100, Lot 9101, and Lot 9102 on the approved scheme plan. As such, the current legal title for the site applies to the entirety of Stage 4C (including approved Stage 4C-1) and is legally described as Lot 9001, DP 586972 (6.75 ha), 21 Karapapa Road, Milldale, Wainui.

Under the AUP:OP, the site is split zoned Residential Terraced House and Apartment Building zone (THAB) and Open Space Conservation (OSC) zone and is subject to the Wainui Precinct Plan. Located within the centre of the Milldale development, immediately to the south of the Local Centre, the Site is bordered by Parish Drive to the north, Papakiri Road to the west, Karapapa Road to the east and Dendro Ring Road to the south.

The Site extent is bisected north-south by the recently constructed vested road Honohono Avenue and east-west by a vested pedestrian accessway. These elements along with Lots 5700 and 5701 have been approved by Stage 4C-1 and do not form part of this application.

A full description of the Site and surrounds is provided in the application AEE.

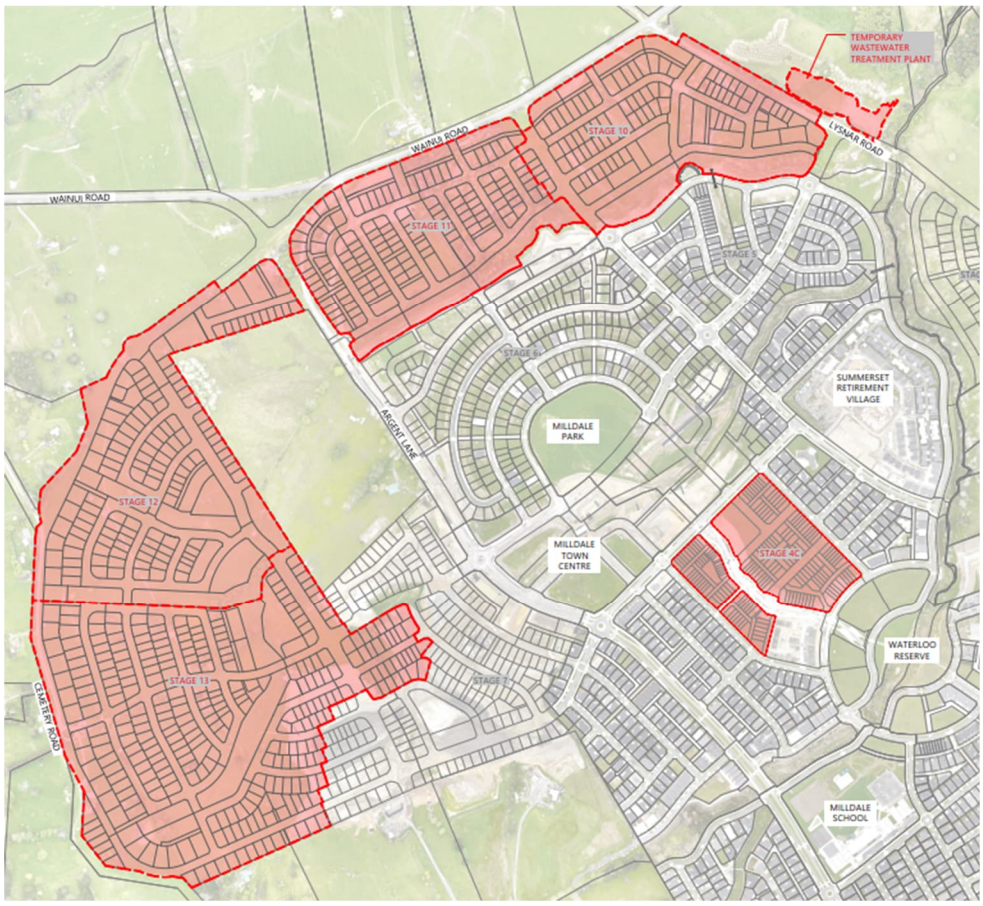

Figure 1: Stage 4C Site Location Plan

1.3. Project Description

The proposed comprehensive residential development and subdivision will be delivered in two parts:

Phase 1 - Civil Works and Subdivision

The civil works and subdivision phase of the development will carry out the preliminary site establishment works and subsequent subdivision of three parent lots to create superlots across Stages 4C-2 – 4C-5 (inclusive). This phase of the development will create a total of 21 superlots, one balance lot, 13 JOALs, three roads to vest, one public accessway to vest and associated infrastructure and servicing. The civil works and subdivision phase will be constructed and completed by the applicant, FHLD.

Phase 2 - Comprehensive Residential Land Use & Subdivision

Following the completion of the civil works and subdivision, comprehensive residential development and subdivision will be carried out across all 21 superlots.

It is proposed to create a total of 168 dwellings and subsequently subdivide the lots to create 168 fee simple residential lots. Each dwelling will be serviced and have direct vehicle access to a JOAL or Road created through the civil works subdivision.

The superlots vary in size with the smallest superlot providing for four residential units, with the largest superlot providing for 15 residential units. All dwellings are architecturally designed two level terraced units, with varying typologies ranging from two to four bedroom units. The dwellings are supported by comprehensive landscaping schemes, outdoor living areas, storage provision, pedestrian access, waste management, and functional service areas.

The comprehensive residential development phase which will be delivered by FHLD's build partners once the relevant Phase 1 civil works stages are completed. The intention is that individual superlots can be developed independently from other superlots (and in any order) as complete individual project packages.

A full description of the project is provided in the application AEE.

1.4. Staging of the Development

1.4.1. Phase 1 Staging

An initial bulk earthworks operation is required to shape the site to the proposed levels. On completion of the bulk earthworks all roads and JOALS will be cut generally to grade and all proposed building platforms will be left generally at platform subgrade level. Area's where retaining walls are proposed will be left as a stable batter slope. It is anticipated that these works will take approximately 5 months, and be able to be completed within one earthworks season (October to April).

Following Bulk Earthworks, civil works will take place to service the proposed superlots. The 4C development is split into five stages, including 4C-1 which is already complete. The developer may choose to complete the civil works for the remaining stages in any sequence as follows;

- Civil works for Stage 4C-1 have been completed and are currently going through the 224c and vesting process.
- Stages 4C-2, 4C-4 and 4C-5 can be completed independently of other stages and each other, as all required connections into the existing road, drainage and utility networks already vested with council, or going through the vesting process through Stage 4C-1 works.
- Stage 4C-3 is reliant on stage 4C-2 for road frontage and Stormwater, Wastewater and Utility servicing. This stage will need to be either completed in conjunction with, or following, Stage 4C-2.

Estimated construction periods for the civil works of each stage are listed below:

- Stage 4C-2 – 6 Months
- Stage 4C-3 – 8 Months
- Stage 4C-4 – 4 Months
- Stage 4C-5 – 4 Months

1.4.2. Phase 2 Staging

Following completion of the Phase 1 civil works and subdivision the 21 individual superlots will be developed as independent stages. Each superlot will be developed and subdivided into individual fee simple lots with house construction, landscaping, paving, vehicle crossings and private drainage being constructed.

The intention is that all public assets will be constructed in Phase 1 including lot connections, and no further public works will be required as part of the superlot development phase.

2. EARTHWORKS

2.1. Bulk Earthworks

The Phase 1 bulk earthworks are proposed to take place during the earthworks season (October to April), and are able to be completed within one earthworks season.

The bulk earthworks will shape the landform from the current sheet contour between the existing roads into a platformed landform that is generally flat and is suitable for the proposed residential development. Generally, this will be achieved by lifting the existing levels at the lower end of the proposed lots above the existing levels and will require fill to be imported from the surrounding Milldale Development. The required earthworks volumes are shown in the table below.

	Cut (m^3)	Fill (m^3)	Balance (m^3)	Area (m^2)
Stage 4C-2	-500	3600	3100.0	13330
Stage 4C-3	-1200	9300	8100.0	23450
Stage 4C-4	-100	2500	2600.0	5970
Stage 4C-5	-100	4700	4600.0	8410
Total	-1900	20100	18200	51160

Table 1: Stage 4C Earthworks Volumes

Material will be imported from the surrounding Milldale development via road truck. It is estimated that this will require 3,500 truck movements. Material will be stockpiled ready for placement into fill areas.

The site has been earthworked previously as part of the Earthworks 3 resource consent works that established the surrounding Stage 4 development. During these works, potions of the site were undercut and backfilled with engineered fill and topsoiled.

The Bulk Earthworks operation will involve:

- Stripping the site of the existing topsoil. Topsoil to be stockpiled onsite for respreading on completion of works.
- Inspection and approval of the fill area subgrade by a suitably qualified Geotechnical Engineer. Any unsuitable areas will be undercut with engineered fill placed as backfill and settlement monitoring undertaken until such time as the Geotechnical Engineer is satisfied.
- Cut to fill operation –
    - Material will be excavated from the cut areas of the site and transported to the fill areas of the site where it will be spread, conditioned and compacted as engineered fill under the observation of a suitably qualified Geotechnical Engineer.
    - It is expected that these works will be undertaken using a top loading operation where an excavator excavates and loads material into dump trucks. The material is then transported by the dump trucks and tipped in the fill areas where it is spread and compacted by compactors.
    - All engineered fill placement will be completed in accordance with the Geotechnical Investigation Report (prepared by CMW and appended to the Milldale Volume 3 Fast Track application) requirements.
    - It is possible that the material won from the cut areas will be wet and require drying prior to compaction. This will preferably be undertaken by air drying, where the material is spread out over a large area and left to dry in the sun/ wind. A tractor pulling discs is used to break up and turn over the drying material.

      If the weather is not accommodating it may be required to lime dry the material, this involves the hoeing of imported lime into the material either before it is cut, or after it is spread in the fill areas prior to compaction.
    - On completion, cut areas will be inspected by a suitably qualified Geotechnical Engineer. Weak areas will be undercut and backfilled with engineered fill.

- Stockpile to fill operation –
    - Material will be transported to site from elsewhere in Milldale, either from open earthworks areas or from spoil of civil construction works. Material will be transported to site using road trucks, these trucks will enter the site and tip to a stockpile location. Specific sediment control measures will be in place to prevent public roads being contaminated with clay spoil during this operation.
    - Stockpile locations will be confirmed at time of construction, but it is expected that there will be three stockpiles; one in stage 4C-3 accessed off Parish Drive, one in stage 4C-4 accessed off Papakiri Rd, and one in Stage 4C-5 accessed off Parish Drive. A bulldozer and/or excavator will be used to manage the stockpile as material is delivered.
    - A top loading operation will be used to move the stockpiled material to be placed as engineered fill. An excavator loads material into dump trucks, the material is then transported by the dump trucks and tipped in the fill areas where it is spread and compacted by compactors.
    - It is possible that the material in the stockpiles will be wet and require drying prior to compaction. This will preferably be undertaken by air drying, where the material is spread out over a large area and left to dry in the sun/ wind. A tractor pulling discs is used to break up and turn over the drying material.

      If the weather is not accommodating it may be required to lime dry the material. This involves the hoeing of imported lime into the material either before it is cut, or after it is spread in the fill areas prior to compaction.
- Site Stabilisation/ Completion -
    - As sections of the earthworks are completed, they will be stabilised to protect the fill material from erosion and weathering.
    - Road and JOAL areas expected to be further worked during civils will be stabilised with hay mulch.
    - Lot areas will be stabilised with either granular material to be used as a working platform for house construction, or topsoiled and grassed.
    - Excess topsoil and any unsuitable material will be removed from the site via road truck. Topsoil will be transported to the Milldale topsoil stockpile, while unsuitable material will be taken to landfill.

2.2. Secondary Earthworks

2.2.1. Phase 1 Civil works

During the Civil construction works of the proposed roads, drainage and servicing, secondary earthworks will take place in the form of road gulleting and trenching.

Spoil from this operation will be stockpiled and used as fill within the adjoining superlots or transported to other earthwork sites within Milldale precinct. It is expected that approximately 3500m3 of spoil will be won from the Phase 1 Civil works operation.

2.2.2. Phase 2 Superlot Development

Secondary earthworks will be required on each of the superlots to prepare building pads and driveways, undertake private drainage works and construct retaining walls. The expected volume of earthworks required for each superlot is shown in the table below.

	Cut (m^3)	Fill (m^3)	Balance (m^3)	Area (m^2)
Stage 2A	-20	430	410.0	2160
Stage 2B	-20	180	160.0	1690
Stage 2C	-20	170	150.0	1330
Stage 2D	-10	280	270.0	1190

Stage 2E	0	450	450.0	2300
Stage 3A	0	420	420.0	1490
Stage 3B	0	180	180.0	1220
Stage 3C	-40	230	190.0	1310
Stage 3D	-10	200	190.0	1820
Stage 3E	-10	150	140.0	1330
Stage 3F	0	110	110.0	930
Stage 3G	-10	360	350.0	1860
Stage 3H	-10	100	90.0	900
Stage 3I	-20	180	160.0	1890
Stage 4A	-10	190	180.0	1430
Stage 4B	-10	200	190.0	1300
Stage 4C	0	610	610.0	1690
Stage 5A	-10	260	250.0	1840
Stage 5B	-10	270	260.0	1500
Stage 5C	-40	260	220.0	2270
Stage 5D	0	490	490.0	1430
Total	-250	5720	5470	

2.3. Erosion & Sediment Control Methodology – Phase 1 Bulk Earthworks

2.3.1. Overview

A best practice management strategy will be implemented for the proposed bulk earthworks. This will involve the application of best practice from Auckland Council Guidance Document 2016/005 (GD05), Amendment 3. It is noted that the adaptive management approach has been and is being undertaken on adjacent earthworks sites. This assesses the performance of the sediment and erosion control network and then adapts in response to any non-conforming performance or sediment discharges should they occur.

The primary sediment controls for the site will be sediment retention ponds (SRP). Secondary controls include decanting earth bunds (DEB) for smaller areas not captured within SRP catchments, silt fences, and / or super silt fences. There will also be a strong focus on erosion prevention prior to rain events.

During each earthworks season it is anticipated to have 30 hectares of bulk earthworks area open and active within the Milldale precinct at any given time. The bulk earthworks operation for 4C will be included in this 30Ha area.

The works will be staged as the Contractor expands the scale of their operation into the height of summer. The methodology is to gradually extend the area open to earthworks, complete the works and progressively stabilise completed areas. Emphasis will be placed on getting areas cut / filled to grade as quickly as possible and then immediately stabilised.

2.3.2. Team Approach

The team approach ensures that adequate resources, commitment, and expertise are provided to support the Erosion and Sediment Control Methodology from start to finish. This team will undertake pre and post storm surveys, discuss Erosion and Sediment Control Methodology at weekly site meetings. At all times the team will utilise a significant resource and “expertise base” to ensure appropriate and technically sound decisions are made. Stakeholders involved in the project will include:

Principal – Fulton Hogan Land Development Ltd

FHLD is committed to development of their landholdings at Milldale, Wainui in an environmentally responsible manner. The Principal has an environmental policy in which they are committed to protecting the environment from damage and minimising nuisance from its operations and activities through effective planning and site management and controls.

The Principal has an excellent track record in managing environmental effects. They are prepared to invest in additional measures that will enable robust systems to be utilised in the effective management of environmental risks.

Civil Engineering, Planning & Surveying – Woods

Woods have been engaged by FHLD to provide civil engineering, planning and surveying services associated with development in Milldale. Woods will act as the lead consultant on the project and liaise with the Principal, all other members of the project team, and statutory authorities and will supervise the Contractor as Engineer to the Contract (under NZ3910). Woods will review as-built data provided by the Contractor and will undertake and submit compliance documents.

Woods has an excellent track record in managing large residential projects and has a wealth of in-house knowledge to prepare and administer effective sediment and erosion control plans.

Woods will prepare contract documents with a significant allocated budget to allow Contractors to implement sediment and erosion controls and manage the site for the duration of works. Contract allowances will provide sufficient scope for adjusting sediment and erosion control as required in advance of rain events.

Independent Expertise and Oversight – Southern Skies

Southern Skies have been engaged by FHLD to provide technical expertise as specialists in sediment and erosion control and are the author of the Adaptive Management Plan for wider Milldale (AMP). Southern Skies have been involved with the Milldale project in this capacity since 2018, and have a strong understanding of how the site operates during earthworks construction.

As set out in the AMP for the wider Milldale earthworks, Southern Skies monitor water turbidity within key waterways as a marker of the site's performance during rain events. Southern Skies undertake site walkovers following rainfall trigger events, report of the site's performance managing those rain events and provide recommendations under the adaptive management of the site.

These recommendations are then implemented under the contract works.

Earthworks Contractor – TBA

The Principal will appoint a suitably experienced earthmoving Contractor with experience in large earthmoving projects. This Contractor will have experience with many of the commonly used erosion and sediment control practices detailed in GD05 as well as a history of implementing other innovative measures to improve erosion control and discharged water quality. The Contractor will be responsible for implementation, management and maintenance of erosion and sediment control measures. The Contractor will liaise with the site engineer, erosion and sediment control consultant and statutory authorities to ensure all erosion and sediment control measures are operating effectively.

Prior to the pre-construction meeting the Contractor shall produce all pre-construction documentation including:

- Construction Management Plan (CMP);
- Updated Sediment and Erosion Control Plan (SECP);
- Chemical Treatment Management Plan (ChTMP);
- Dust Management Plan (DMP); and
- Any other plans and documentation required to address the pre-construction conditions of resource consent.

Details of the requirements of these plans are provided in Appendix A.

As we have experienced in previous stages of bulk earthworks, the Contractor plays a critical role in the successful performance of the sediment and erosion control network. There will be a strong emphasis on the Contractor's sediment and erosion control track record when tendering for the works. Only Contractors with an excellent record will be considered when awarding works that fall under this consent.

Statutory Authorities – Auckland Council (AC)

The Principal, Engineer and Contractor will liaise with representatives of AC to ensure that erosion and sediment control measures are implemented, maintained and monitored in accordance with consents granted. Weekly inspections undertaken with AC's representative will be utilised for discussion of site variables as works progress.

2.3.3. Indicative Bulk Earthworks E&SC Strategy

Please refer to the E&SC drawings in the consent drawing set for details of the proposed bulk earthworks E&SC strategy. (P23-481-4C-1800).

The 4C site is split into three distinct areas separated by the soon to be vested Honohono Ave and adjoining accessway land. It is proposed to treat each of these areas separately from a sediment and erosion control perspective. These areas are:

- Area A – Stage 4C-2 & 4C-3 – Site area 3.7 ha
- Area B – Stage 4C-4 – Site area 0.6 ha
- Area C – Stage 4C-5 – Site area 0.8 ha

The 4C site generally falls to the east, and it is proposed to construct a sediment retention pond in the eastern corner of each area. The pond will be sized to accommodate to contributing catchment and designed in accordance with GD05, with dirty water diversion channels used to direct run-off from each of the earthwork areas to their accompanying pond.

It is not anticipated that and decanting earth bunds will be needed on the site in addition to the SRP, but these may be used to treat any small catchments not able to be directed to the SRP's.

The existing road network around each of the areas generally acts as a clean water diversion network, ensuring water from stabilised upstream catchments does not enter the earthworks site. In addition to this a topsoil bund will be constructed around the upstream sides of each of the areas to ensure water does not enter the site from upstream catchments.

As a last line of defence, a silt fence will be constructed on the property boundaries, outside the dirty water diversion bunds and SRP devices. This provides a final line of protection should any failures occur to the primary treatment system.

Stabilised site access points will be installed to manage any movements into and out of the site. Generally, road vehicles entering the site will be kept to stabilised metal access routes to avoid them picking up sediment and transporting it outside the earthworks site. The stabilised site accesses will also have wheel wash facilities to provide the ability to wash down any vehicles that do pick up sediment from the site. The contractor will monitor the condition of the adjacent public road network and utilise sweeper trucks to address any sediment that is lost onto the carriageway from the expected truck movements.

2.4. Erosion & Sediment Control Methodology – Phase 1 Civil Works

2.4.1. Team Approach

The team approach used in the bulk earthworks operation will continue through the Phase 1 Civil works. FHLD, Woods, the contractor and council will work closely together to ensure suitable outcomes are achieved for E&SC on the site.

2.4.2. Indicative Civil works E&SC Strategy

As with the bulk earthworks operation, a best practice management strategy will be implemented for the proposed civil works phase of the project. It is noted that the Site is not within a sediment control protection area.

The primary sediment controls from the bulk earthworks operations will continue to be utilised on the site, and there will continue to be a strong focus on erosion prevention prior to rain events.

As civil works are completed and the site is stabilised E&SC measures will be progressively removed. This will include the removal of the SRP's. Silt fences will be left in place on completion of the works in preparation for the superlot development works.

2.5. Erosion & Sediment Control Methodology – Phase 2 Superlot Development

2.5.1. Overview

On completion of the Phase 1 Civil Works and Subdivision, it is anticipated that FHLD will sell the created superlots to their build partners at Milldale. The build partners will then take over responsibility for the site including the E&SC measures.

The superlots have been designed so that they can be further developed independently from each other and the JOAL network. The lots are of a size that GD05 compliant E&SC can be accomplished using super silt fences, and SRP's or DEB's are not required. This removes the requirement to have a ChTMP for the site as the proposed fences filter the water rather than requiring the sediment to settle out.

With the change of ownership of the development at Phase 2, it is likely that the team approach utilised in previous Phase 1 works will no longer be employed. The proposed E&SC controls are simple, and the team approach is no longer required. Each superlot's builders can manage their own sediment control measures for the sites which is the current approach undertaken in Milldale.

2.5.2. Indicative Superlot Development E&SC Strategy

It is proposed that the downhill side of each superlot have a super silt fence installed along its perimeter boundary. Often this fence will have remained in place from the proceeding bulk earthworks operation. The fence acts as silt barrier but also helps to contain larger contaminants from the house construction operation. The proposed silt fences will remain in place throughout the superlot development.

Each superlot will also require a stabilised access point to ensure sediment is not tracked out onto the public road network. The road network will be monitored by the superlot developer, and any sediment deposited onto the carriageway will be removed using sweeper trucks.

3. RETAINING WALLS

Retaining walls are proposed throughout the 4C development to resolve level differences between proposed building platforms. Proposed retaining walls have been shown on the Proposed Contours & Retaining Wall 1100 series drawings in the drawings package.

Walls are up to 2 m in height and are proposed consist of a range of materials. Walls fronting onto public roads and accessways will either be keystone block or honed masonry block construction. Walls internal to the site will be of timber construction, either timber pole or steel I-beam with timber lagging.

Walls greater than 1 m in height will have a building code compliant fall protection fence above them.

Wall subsoil drainage will run behind all proposed walls and be collected at catchpits adjacent to the retaining walls and directed into the development's stormwater drainage network. The primary approach will be to connect the catchpits into the private drainage network for the lots. Where this is not possible a dedicated connection will be provided to connect the catchpits to the public network. Covenants will be established on the property titles to protect the subsoil drainage network.

Retaining walls will be constructed across both phases of the development. During Phase 1 it is proposed to construct a selection of walls to allow the proposed finished building platform levels and JOALs to be established ahead of the lots being handed over to build partners to complete the Phase 2 works independently to each other.

Walls proposed to be constructed during phase 1 are:

- Proposed wall between Stage 4C-2B & 4C-2D – Constructing wall as part of Phase 1 works allows each Phase 2 stage works to be undertaken independently.
- Proposed wall between JOAL 4105 and Stage 4C-3I, extending to include walls around 4C-3H and 4C-3F – Constructing this wall allows JOAL 4105 to be constructed in Phase 1 works and establishes building platforms on the surrounding stages so that they can be developed independently in Phase 2.
- The proposed wall around Stage 4C-3B – Constructing this wall in phase 1 allows levels for the stage to be set, and also ensures no impact from the stages development on the surrounding JOAL's.
- The proposed wall around Stage 4C-4A – Constructing this wall in phase 1 allows levels for the stage to be set, and also ensures no impact from the stages development on the surrounding JOAL's.
- A short section of the proposed walls at the eastern ends of JOAL's 4114 & 4112 – These walls will be constructed to support the proposed JOALs during the Phase 1 works. They will then be extended by the build partners in Phase 2.

During Phase 2 the remaining walls will be constructed by the build partners.

Full design of proposed retaining walls will be undertaken at detailed design and wall designs will be lodged to council for building consent approval.

4. PUBLIC ROAD NETWORK

The roading network within the proposed 4C development is based on Auckland Councils - Wainui Precinct Plan. Deviations from the Precinct Plan are the result of refining the road layout for enhanced urban design outcomes. A design philosophy of providing linkages and connectivity with existing and potential future routes and developments has been adopted.

It is proposed to construct three new roads (Roads 8000, 8001 and 8002) as part of the 4C works. The proposed roading layout is shown on the road hierarchy plan and typical cross sections in the P23-481-4C-2200-RD drawing series included in the drawing set. The roads will be constructed as part of the Phase 1 Civil Works and Subdivision.

4.1. Surrounding Transport Network

Stage 4C is located in the centre of Milldale and surrounded by the previously developed Stage 4 roading network. It is bound by Parish Drive to the north west, Karapapa Road to the North East, Dendro Ring Road to the south east and Papakiri Ave to the south west.

Construction works for Stage 4C-1 have recently been completed, and the stage is currently going through the 224c and vesting process. This stage included the construction of Honohono Ave through the centre of Stage 4C running uphill from Dendro Ring Road to Parish Drive. The intersections for the two roads 8001 and 8002 proposed as part of this Fast Track application were formed as part of the Stage 4C-1 works.

Parish Drive has been designed as a collector road with allowance for bus movements. All other roads have been designed as local roads with design speeds of 30km/h. All roads have a posted speed of 50km/h

As part of Stage 4C-1 a pedestrian link has been established and constructed between Parakiri Rd and Honohono Ave. The link is 8m wide with a 3m path through its centre and will be vested with Auckland Transport.

The existing Milldale transport network provides good linkages for Stage 4C, both locally and on a wider scale.

A neighbourhood centre has been established to the southwest of the site on Archibald Drive. The neighbourhood centre has a range of café and food options as well as convenience stores. The Milldale local centre is currently under on the northern side of Parish Drive and will include a medical centre and supermarket. Both of these centres are within a short walk of Stage 4C and Walking and Cycling facilities have been established to support active transport links to these facilities.

Ahutoetoe School has been opened on the southern side of the Waterloo Stream, also within walking and cycling distance of the proposed development.

Stage 4C also has good transport links on a wider scale with Parish Drive connecting the proposed development to Argent Lane, which provides a route to the Northern motorway via Pine Valley Road, Dairy Flat Highway and the Silverdale Interchange.

Ongoing development of Argent Lane will establish a connection to Wainui Road (already consented) and consequently the Millwater motorway interchange. Milldale already has links to this interchange via Stage 1 and Sidwell Road.

The John Fair Drive motorway overbridge has recently completed construction and provides a link for the development to the Highgate business park.

A bus network currently operates on Argent Lane and John Fair Drive, providing a public transport connection the Hibiscus Coast Bus Station, and ongoing links to the city centre. As the Milldale development progresses it is planned for the bus network to be extended along Parish Drive providing a more immediate link to the public transport network.

4.2. Design Standards

The geometric design of all the roads within Stage 4C are to be designed to the following relevant road design guidelines and standards:

- Auckland Transport Design Manual (TDM). TDM permits to have a maximum gradient of 12.5% on local roads and 8% on collector roads (bus route). The proposed roading network meets these requirements, while being designed so that the location and gradient of the final landform complement the existing landform.

- Austroads: Guide to Road Design (Austroads) series
- Waka Kotahi NZ Transport Agency - Manual of traffic signs and markings (MOTSAM) series and Traffic Control Devices (TCD) series.

4.3. Design Speed

A design speed of 30km/h will be used for the proposed roads in the 4C development. A combination of road geometry, intersections and traffic calming is used to ensure this target design speed is achieved.

A design speed of 30km/h will be used for intersections onto Honohono Ave and Karapapa Road. The proposed intersection with Parish Drive will use a 50km/h design speed for vehicles on Parish Drive.

4.4. Geometric Design

The road design completed to date is considered sufficient for resource consent. Detailed design for the roads will be provided at Engineering Plan Approval (EPA) stage.

All three proposed roads are generally straight, with only short radius bends proposed at the southwestern end of the roads to enable square intersections with Honohono Ave. The roads are also relatively flat compared to the rest of Milldale, with a most sections of the roads being at 4% or flatter, and maximum vertical gradient of 6%. Suitable sight distances will be able to be provided across the road network, this will be confirmed at EPA stage.

All standard intersections are designed based on the AT residential compound kerb return with a 1 in 20m taper on the entry and exit, and a radius of 4m on the approach curve and 15m on the exit curve.

All three proposed new roads are local roads with a 16.4m Road Reserve width. They are designed with a 3% dual crossfall carriageway, with 2.7m lane widths, 450mm kerb and channel, a 2.25m wide front berm corridor, 1.8m footpath, and 1.0m back berm on both sides.

4.5. On-Road Car Parking

Both kerbside and fully indented parking bays will be allowed for within Stages 4C. This arrangement is depicted on the road cross section plans provided on drawing P23-481-00-2201.

The desired parking allocation is proposed at 0.5 carparks per lot. However, parking allocation is subject to other streetscape requirements, including the adjacent lot density, vehicle crossings, street trees, streetlights, raingardens, and safety in design aspects.

Indicative carparking has been shown on drawing P23-481-4C-2000-RD. A detailed car parking layout will be provided with detailed design at EPA stage.

4.6. Pedestrian and Cycling Network

4.6.1. Overview

The proposed 4C development is well connected with pedestrian and cycling facilities.

The surrounding road network has a minimum of 1.8m footpaths on both sides of the road carriageway. Parish drive has a 3m footpath on the northern side, and Honohono Ave has a 4m shared path on its western side.

Off road cycle lanes are provided on each side of Parish Drive. Local Roads in Milldale are designed to be low speed, allowing cyclists to safely use the road carriageway on these streets.

4.6.2. Pedestrian Network

1.8m wide pedestrian footpaths are proposed on both sides of all three new roads for 4C. These will provide pedestrian access to the proposed lots and add to the permeable pedestrian network of the Milldale development.

A public accessway is proposed between stage 4C-1 and 4C-4 providing a pedestrian connection between Honohono Ave and Papakiri Road. This will be an 8m wide accessway with a 3m concrete pathway.

4.6.3. Cycle Network

No dedicated cycle facilities are proposed on the three new roads in stage 4C. This is in keeping with the local road strategy at Milldale where the roads are designed to have low traffic speeds allowing

cyclists to safely use the road carriageways. This allows cyclists to link to the formal cycle infrastructure on the collector roads, as well as the shared path networks on the stream edge roads and on Honohono Ave.

4.7. Pavement Design

The Milldale generic pavement design has been adopted for the proposed roads. These pavement designs are reliant on ground conditions and in-situ CBR testing at the earthworks construction stage. Specific modifications to the design parameters may occur under consultation with Auckland Council Engineers.

Local Roads

- 40mm thick of DG10 placed over a bitumen membrane seal
- 120mm thick TNZ M/4, Basecourse
- 200mm thick GAP 65, Sub-base
- 250mm thick 3% Lime / 3% Cement stabilised. Effective CBR 8%

The pavement design will be further assessed and refined at EPA stage.

4.8. Street Lighting

Street lighting shall be provided on all new roads and also on the proposed access way south of stage 4C-5, in accordance with the following standards:

- Applicable standards listed within the AT TDM Engineering Design Code – Street Lighting standard.
- AT Road Lighting Column Approved List – AT-LCAL.
- Appendix documents for Street Lighting Engineering Design Code.
- AS/NZS 1158 Lighting for roads and public spaces.

Lighting shall be provided along the edge of the road on all corridors, with lighting fixtures placed at appropriate intervals, whilst not obstructing walking and cycling paths and to improve safety at night and allow street users to be clearly seen.

Separate fittings will be investigated during the EPA design to cater for the different lighting needs for both pedestrians and vehicle traffic.

4.9. Streetscape

The proposed streetscape is shown on drawing P23-481-4C-2000-RD as well as in the application landscape design package. The proposed streetscape design is consistent with the existing Milldale streetscape design. The full detailed design for the streetscape will be provided at engineering approval stage.

4.10. Vehicle Crossings

It is proposed to construct a range of vehicle crossings within the 4C development. The location of these proposed crossings are shown on drawing P23-481-4C-2000-RD in the drawing pack.

During the Phase 1 civil works, vehicle crossings will be constructed to provide access to the proposed JOAL network.

The construction of the JOAL vehicle crossings onto the existing roads required some existing site features to be reconfigured.

- Raingardens on Karapapa Road at the JOAL 4101 crossing and Papakiri Road at the JOAL 4110 crossing will need to be reconfigured or removed and offset storage provided elsewhere in the stage 4 catchment.
- A street light will need to be relocated at the JOAL 4111 crossing.
- Street trees will need to be relocated or removed to allow JOAL 4112 & 4114 crossings onto Papakiri Road.

During the Phase 2 development the individual vehicle crossings for lots fronting onto Roads 8000, 8001 & 8002 as well as onto Papakiri Road will be constructed. One of the crossings onto Papakiri road requires the relocation of an existing streetlight and another requires the removal of a street tree. This work will be undertaken in conjunction with the vehicle crossing works for the relevant Phase 2 superlot development stages.

All proposed vehicle crossings will be constructed to Auckland Transport standards in accordance with AT standard drawing VX0103.

5. JOAL NETWORK

In addition to the proposed public roads, it is proposed to provide a network of Jointly Owned Access Lots (JOALs) to provide private access to the proposed residential lots. The proposed JOAL network is shown on drawing P23-481-4C-2000-RD.

5.1. Geometric Design

JOALs have been designed to provide vehicle access to the lots. They are designed as dual directional with allowance for two 85 percentile cars to pass each other. Most JOALs have also been designed to allow rubbish collection vehicles (truck size 8.8m) to pass through them to collect household rubbish bins.

The JOALS are generally straight, with only the JOAL in Stage 4C-2 and 4C-4 having horizontal curves. Detailed vehicle tracking has been undertaken on these curves to ensure design vehicles can pass around them.

The JOALS grade gently, with a most sections being at 4% or flatter, and maximum vertical gradient of 15% has been used in some locations to provide tie-in to the adjoining road carriageways.

JOALs will be designed with a design speed of 20km/h. Traffic calming in the form of carriageway geometry, vertical deflection and pavement treatments will be used to control vehicle speeds.

All JOALs have been designed to have a 5.5m wide carriageway. All JOALs (except for a short section of the JOAL in 4C-4) have been designed to have a 1.5m Pedestrian footpath that is separated from the carriageway vertically by a kerb. As a default this kerb will be a AT Type 3 vertical kerb and channel. Where vehicle access is required across the footpath into individual lots or at JOAL intersections, this kerb will be changed to a AT Type 6 mountable kerb and channel.

Most JOALs will be paved from boundary to boundary with the carriageway and footpath proposed above for a total legal width of 7m. The JOAL in stage 4C-2 has been designed with an additional landscaped berm area of approximately 1m on either side of the carriageway for a total legal width of 9m.

5.2. JOAL Car Parking

In JOAL Parking has been proposed within JOALS 4101, 4105 and 4150. These parking spaces will be a mix of allocated to specific lots and visitor parking.

Parking spaces have been designed in accordance with the building code, with suitable manoeuvring space provided by the adjoining JOAL carriageways.

5.3. Pavement Design

JOAL's will be constructed using a concrete pavement designed to accommodate the proposed waste removal vehicles. Specific pavement design will be undertaken at detailed design.

5.4. JOAL Lighting

Street lighting shall be provided on all JOALs where pedestrians are expected to be present, in accordance with the following standards:

- Applicable standards listed within the AT TDM Engineering Design Code – Street Lighting standard.
- Appendix documents for Street Lighting Engineering Design Code.
- AS/NZS 1158 Lighting for roads and public spaces.

Lighting will be provided by the adjoining superlots as part of the Phase 2 superlot development. Confirmation of proposed light fittings will be provided at building consent phase for each superlot.

6. WASTE COLLECTION

A waste collection strategy has been developed for the site. This strategy locates expected bin placement locations and collection truck routes. Refer to drawing P23-481-4C-0-2050-RD and the 2050-RD series drawings in each of the stages within the drawing pack for details.

It is proposed that the collection trucks will utilise both the public street berms and private JOALs for waste collection. The use of JOALs for rubbish collection allows the public streetscape, particularly Honohono Ave, to be less cluttered with bins on collection day and avoid conflict with street features such as raingardens and landscaping. It also enables bin collection to occur in close proximity to each individual lot's onsite bin storage areas which are typically JOAL facing to meet both urban design outcomes and site function given that most front yards are retained with steps to the street. This approach has been discussed and agreed in principle with Auckland Council at a pre-application meeting.

In order to achieve an efficient and achievable rubbish bin placement plan and collection route it is proposed the rubbish trucks reverse along JOAL's 4109, 4112 and 4114, as well as reverse manoeuvring into the proposed communal bin bay in JOAL 4150.

As part of the 224c process, agreements will be reached with Auckland Council to allow waste pick up on JOALs 4101, 4102, 4103, 4104, 4107, 4108, 4109, 4110, 4111, 4112, 4113 and 4114. For Stage 4C-5C a communal bin bay is proposed to allow a single collection point for council waste services.

7. STORMWATER

7.1. Existing Stormwater Infrastructure

The surrounding development of Stage 4 has installed stormwater infrastructure designed to provide connections for Stage 4C. Stormwater pipes have been installed and vested with council in Dendro Ring Road and Karapapa Road that have been sized to take the expected flows from the proposed development. The recently completed 4C-1 development included the extension of the network from Dendro Ring Road up Honohono Ave. The existing drainage network drains to the Waterloo stream to the east of Stage 4C.

Several manholes have already been constructed within the 4C balance lot as connection points for future development. The majority of these manholes are in locations that do not align with the proposed development and will be reconfigured as part of the proposed works.

Stage 4 has utilised raingardens to provide detention for the run-off from public impervious areas. Later stages of Milldale have switched to detention basins being the preferred treatment option. While no allowance has been made in the existing network to allow for the proposed 4C impervious areas, there is some excess capacity available within the existing raingarden network in Stage 4 to provide offset for shortfall from the proposed development.

The existing stormwater infrastructure can be seen on the drainage layout plans, the 3000 series in the drawing set.

7.2. Milldale Stormwater Management Strategy

A Stormwater Management Plan (SMP), entitled Wainui East Stormwater Management Plan, dated July 2016, and corresponding updated Flood Modelling Report for the Milldale Development have been completed by Woods.

The SMP was prepared based on the mediated Proposed Auckland Unitary Plan (PAUP) Stormwater Management Area Flow 1 (SMAF1) hydrology mitigation requirements. The SMAF1 hydrology mitigation requirements in the Auckland Unitary Plan (AUP(OP)) for detention and retention are similar to those included in the Wainui East SMP.

The Milldale Subdivision Stage 4 Geotechnical Investigation Report (2020) produced by GMW Geosciences suggests that due to the high clay content of the Milldale soils, soakage devices will have limited and potentially detrimental effects to ground conditions. Soakage is not proposed and with limited opportunities for stormwater reuse in the development it is proposed that the retention volume be provided as detention instead.

The Milldale 4C site is located within the Stormwater Management Zone C of the SMP (Figure 2). The general approach for discharge from Zone C is to meet SMAF hydrology mitigation requirements (retention, detention) at source. The recommendation as per the Wainui East Stormwater Management Plan is to allow flows from larger storm events to be passed forward (no attenuation).

It is noted that whilst the stormwater approach is guided by the Wainui East Stormwater Management Plan, guidance is also sought from the underlying planning requirements of the Auckland Unitary Plan. Consideration of the principles of Water Sensitive Design as discussed in Auckland Council's Guideline Document 04 (GD04), the Stormwater Management Devices in the Auckland Region as discussed in Auckland Council Guidance Document (GD01) as recommended in the AUP(OP) and the AT Bioretention Design Guide, is also utilised to provide effective stormwater management across the proposed development and mitigate against downstream stormwater effects on the wider Milldale subdivision and environment.

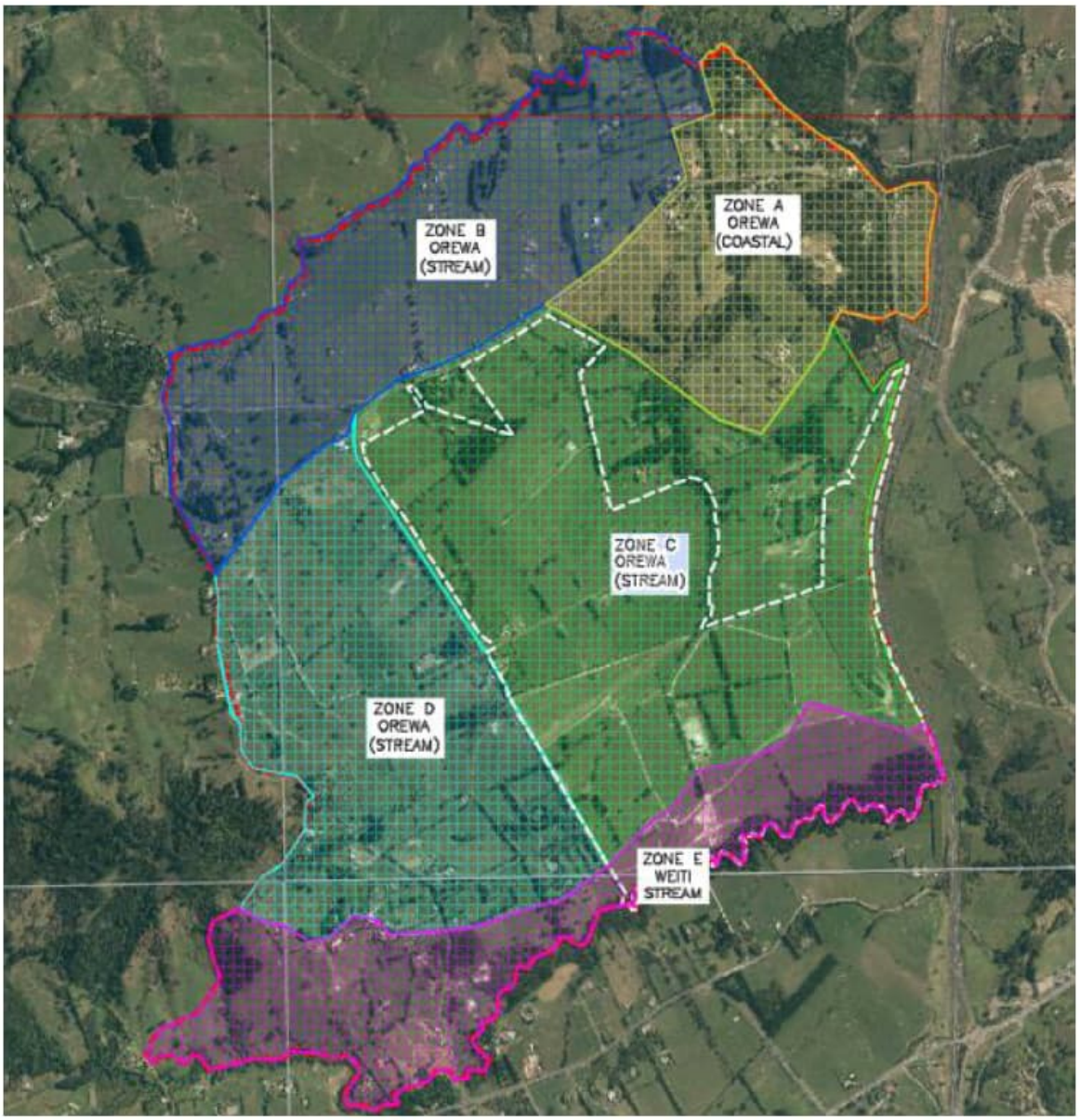

Figure 2: Stormwater Management Zones

7.3. Proposed Stormwater Network

It is proposed to extend the existing public drainage networks into the 4C site. Public reticulation will be installed to provide a connection point to 17 of the proposed superlot stages as well as individual lot connections for each of the lots in stages 4C-2B, 4C, 3B, 4C-3I and 4C-4A. A private network will to be installed within the remaining 17 superlot stages to provide individual lot connections. This allows the proposed tanks in the JOALs to be sized to provide detention for the lot impervious areas also and remove the need for each individual lot within these stages to have its own stormwater tank.

The four stages proposed to have their own individual public connections will need to provide onsite stormwater mitigation in the form of rainwater tanks as they will not be able to direct flows to a communal device.

All drainage reticulation with the exception of the private drainage network in Stage 4C-5C will be installed as part of the Phase 1 works.

Both the private and public stormwater networks will be sized to convey the 10% AEP storm event. Bypass systems will be installed on the tank outlets to allow these large storms to pass.

The proposed stormwater infrastructure can be seen on the drainage layout plans, the 3000 series in the drawing set. The design is indicative at this stage and will be further developed during the detailed design phase and submitted for council approval through the EPA/ building consent process.

7.4. Stormwater Treatment

7.4.1. Water Quality Treatment

The proposed building development avoids high-use contaminant-yielding roof and cladding materials, as required by the Auckland Unitary Plan. Further, the impervious area of the public roads, JOALs and carpark areas do not meet the threshold for a high contaminant generating carpark. As such, no water quality treatment elements are required as part of the design. Raingardens are proposed to provide retention for the road network and will provide quality treatment of the runoff passing through them as an additional benefit.

7.4.2. Detention

As per the stormwater strategy above, it is proposed to provide run-off mitigation in the form of detention for the new impervious areas of the site. As discussed in the earlier section, it is not possible to suitably provide water retention at Milldale and as such the required retention volume will be provided in the form of additional detention.

Raingardens have been widely and effectively used at Milldale, and the design has been progressively improved as the development has progressed. In later stages of Milldale, detention basins have been used instead of raingardens. Unfortunately, there is no opportunity for basins to be retrospectively installed for detention in Stage 4 and the underlying raingarden strategy will be continued. Public road carriageways and footpath areas on the proposed three new roads will be treated via kerbside raingardens.

Some modification to the existing raingarden network within the surrounding Stage 4 development and recently completed Stage 4C-1 is proposed to allow for the proposed Road and JOAL connections. Removed raingardens will be offset either within the new road networks or by adding or increasing the size of raingardens on the existing roads.

Offsetting of catchment treatments is used at Milldale to allow raingardens to be constructed in optimal areas of the site, allowing raingardens to be of sufficient size to be stable from a vegetation establishment perspective. Care is taken to ensure raingardens are not oversized for their natural catchment and that the design detention volume can be achieved. There is some excess capacity in the existing raingarden network which will be assessed and utilised as required.

Refer to the 3000 series in the drawing set for the indicative raingarden design. A detailed assessment and design of the raingardens will be undertaken at detailed design stage and submitted to Auckland council for approval at EPA stage.

The stormwater detention mitigation for the proposed JOAL impervious surfaces will be catered for via in-ground stormwater tanks located below the JOALs. In most cases, these JOAL tanks will be sized to also provide detention for the adjacent lot impervious areas. These tanks will be sized in accordance with the Wainui East (Milldale) Stormwater Management Plan.

Refer to the 3000 series in the drawing set for indicative JOAL tank locations and sizes. Detailed design of the tanks will be provided at EPA stage.

Stages 4C-2B, 4C-3I, 4C-3B and 4C-4A do not have associated JOAL tanks. As such these stages will need to provide individual onsite detention storage as part of the Phase 2 comprehensive development of these individual superlots. Detailed design of the tanks in these stages will be provided as part of the building consent packages for Phase 2.

7.5. Overland Flowpath

All flood plains and overland flow paths shown on the Council's GIS have been addressed as part of the underlying Stage 4 subdivision works (approved consent BUN60352918), and as such the 4C site does not contain any flood hazards. The Auckland Council Geomaps' indication of a flood plain in the 4C-1 area of the site, and overland flow paths across the southern and eastern parts of the 4C site is outdated and does not include the latest landform changes and diversions in the area.

Flood modelling undertaken as part of the wider Milldale consent confirmed that all flows up to the 100-year ARI (including climate change) will be contained within the adjoining road reserves and nearby watercourse, Waterloo Creek.

Overland flow has been managed within the 4C development, in almost all cases flows from individual lots are directed to the adjoining JOALS and channelled to the adjoining road network before flowing to the Waterloo stream. Landscape design grades will direct flows away from the proposed buildings.

JOAL 4105 is not able to be graded out to the road network and collected flows instead need to be passed through the adjoining Stage 4C-3I. Accordingly Lot 4007 will be subject to an overland flow path covenant restricting the type of fences and structures able to be constructed in the rear yards to ensure flows can pass around the proposed buildings to Road 8002.

Refer to the 3300 drawing series in the drawing set for details on the proposed overland flow path routes, flowrates and depths.

8. WASTEWATER DESIGN

8.1. Existing Wastewater Infrastructure

Milldale is part of a master planned wastewater catchment. Stage 4C is situated within the broader framework identified as the Waterloo Wastewater catchment.

The Waterloo Wastewater catchment accumulates at the lower reaches of the catchment into an existing wastewater transmission line, 675mm ID. This transmission line then extends through to Wainui Road, where it discharges to the Milldale Wastewater Tunnel. This tunnel then conveys wastewater flows through to the Orewa West Pump Station.

Existing wastewater infrastructure has been installed through the surrounding Stage 4 development with pipe networks in the surrounding road networks, and extended up through the centre of the 4C site as part of the 4C-1 development works. This existing infrastructure will be extended to serve all of the proposed development for wastewater flows via new gravity networks.

Several manholes have been constructed within the 4C balance lot as connection points for future development and will be utilised in the proposed development. Unfortunately, some of these manholes are in locations that do not align with the proposed development and will be removed as part of the proposed Phase 1 works.

8.2. Wastewater Servicing Strategy

The wastewater network proposed for Stage 4C will comprise of a series of gravity sewer networks. There will be seven connection points to the existing wastewater network, aligning with the anticipated catchments for each part of the underlying network.

The wastewater network will be located in road reserves where possible, but due to the narrow street scape and limited space with other utility services, wastewater networks will primarily be located within lots.

Refer to the 3000 series in the drawing set for the indicative proposed wastewater network. Detailed design of the wastewater reticulation for the site will be undertaken in accordance with the Watercare Code of Practice standards for engineering design and construction as part of the future Engineering Approval application.

All proposed wastewater network extensions and lot connections, with the exception of stage 4C-5C, are proposed to be constructed as part of the Phase 1 works.

9. WATER RETICULATION

9.1. Existing Water Infrastructure

Existing water supply infrastructure is present in the berms of the surrounding Stage 4 subdivision, and was extended through the centre of the 4C site as part of the construction of Honohono Ave during 4C-1.

Allowance has been made in the underlying subdivision for the development of stage 4C and capacity is available in the existing infrastructure to supply the site.

9.2. Water Supply Servicing Strategy

It is proposed to extend the existing water supply network along either side of the proposed new Roads.

The majority of the proposed superlots will be connected directly to the existing public main via a point of supply at their road frontage and a single meter box. Stages 4C-2D, 4C-3H, 4C-3F, 4C-4C and 4C-5C will have combined points of supply and utilise meter banks on the property boundaries with a 20mm diameter feed for each dwelling run up through the JOAL's to provide connections to the lots.

A memorandum detailing the water supply modelling for the Stage 4C area is included in the application pack. This is to be read in conjunction with the previous reports submitted to Watercare as part of the modelling undertaken for the wider Milldale Water Supply Zone.

The water reticulation for Milldale Stage 4C will be designed and constructed in accordance with the Watercare document "The Water and Wastewater Code of Practice for Land Development and Subdivision". Detailed design of the proposed new network will be provided at EPA stage.

Refer to the overall water reticulation layout plan drawing series numbered 6000-WR series, which depicts the proposed reticulation system. All new water reticulation works, with the exception of stage 4C-5C will be constructed in phase 1, with water meters and individual lot connections then being applied for through the standard WSL process as part of the Phase 2 building works.

10. UTILITY SERVICES

Where new lots (Phase 1 and Phase 2) are reticulated for power and telecommunications from new proposed Roads 8000, 8001, and 8002, or JOALs (4102, 4104, 4107, 4110, 4112), individual lot connections or ducts, for power and telecommunications will be provided as part of the overall Phase 1 civils construction. Phase 1 and Phase 2 lots which are reticulated from the existing roading network or JOAL 4150, will be serviced during the Phase 2 construction. Please see drawing set 7000 for detailed information.

10.1. Power Reticulation

Stage 4C will be supplied by extending power reticulation laid in the surrounding Stage 4 subdivision. Any reticulation extension or upgrades required for the development of Stage 4C will be undertaken following reticulation design by Vector.

10.2. Telecommunication

Stage 4C will be supplied by extending telecommunications reticulation laid in the surrounding Stage 4 subdivision. Any reticulation extension or upgrades required for the development of Stage 4C will be undertaken following reticulation design by Tuatahi First Fibre and/or Chorus.

10.3. Natural Gas

Natural gas is not proposed to be installed in Stage 4C.

11. SAFETY IN DESIGN

While developing the design, the philosophy was to integrate hazard identification and risk assessment methods early in the design process to eliminate or minimise the risks of injury throughout the life cycle of the development.

Safety in Design (SiD) has been considered during the design of Stage 4C. The SiD commentary in this Section should be used to inform further detailed design of the project.

A detailed review of SiD will also be provided as part of the future EPA application, which will incorporate further SiD considerations with detailed design.

11.1. Construction Considerations

11.1.1. Site Access

Stabilised site accesses will be provided from public roads to each Stage during both Phase 1 and Phase 2 siteworks. These site access points should be located in areas of good visibility both to and from the access point. Priority for these locations should be given to public roads with posted speeds of 50 km/hr and must be accompanied by suitable temporary traffic control.

11.1.2. Steep Batter Slopes

Batter interfaces are required where the design model interfaces with the following features:

- Existing ground levels at the extents of the earthworks area (batter slopes typically 1V:5H to maximum 1V:3H).

Construction mitigation:

- Batter slopes modelled to a maximum grade of 1V:3H.
- All batter slopes will be identified with the contractor at the pre-construction meeting.
- Batter slopes are to be fenced at the top of batter with high-visibility safety mesh fencing or high-visibility line flags at the completion of each stage.

11.1.3. Trenching

The proposed stormwater and wastewater reticulation networks have been designed in accordance with the Auckland Council Stormwater Code of Practice Version 3, January 2022 (AC SW COP v3, 2022) and to Watercare Code of Practice standards.

All trenching operations shall be carried out in accordance with the Approved Code of Practice for Safety in Excavation and Shafts for Foundations, Part One: Trenches and Open Excavations.

Trenching depths have been minimised based on the design finished surface where possible. It should be noted that Watercare Services Limited clearance standards have the effect of forcing drainage lines deeper to achieve clearances. Full details of trenching are to be provided on drainage long sections at EPA Stage.

11.1.4. Drainage Networks Layout

The layout of the drainage networks (stormwater and wastewater) will be reviewed with detail design drawings to be submitted with the EPA.

At this stage consideration has been given to the network layout including:

- Location of manholes to provide for safe maintenance access.
- Minimising the number of stormwater pipes crossing future roads, to reduce the amount of possible future maintenance works within the carriageway.

11.2. Operations Considerations

Stage 4C has been designed for the purposes of a residential subdivision. The design has considered the following maintenance operations risks:

11.2.1. Safe Access for Maintenance

- Manholes are generally located in the road reserve or within 3.0m set back of lot frontage, clear of the carriageway, to provide safe access.
- Landscaped batters are no steeper than 1V:3H, providing a safe working slope for landscape operations.

11.2.2. Retaining Walls and Reinforced Earth Slopes

- The retaining walls (no higher than 2.0m in height) will be constructed as part of this consent. All retaining walls will be fenced in accordance with the building code.

11.2.3. Safe Transport Operations

- SiD has been considered for vehicle, cyclist, and pedestrian modes of transport.
- A planned roading hierarchy is implemented with a low-speed environment on local roads connecting to collector roads.
- The road layout is designed in general accordance with the Wainui Precinct Plan and in accordance with the AT TDM, Austroads and NZS 4404 where applicable.
- Detailed intersection and street lighting designs will be provided at EPA stage.

11.2.4. CPTED

A safe pedestrian environment has been created with:

- 8m wide accessways;
- Passive surveillance from lots;
- Retaining wall heights reduced as much as possible at the public interface;
- Lots orientated towards pedestrian amenities; and
- Lighting of accessways, public roads, and JOALs.

11.2.5. Stormwater Overland Flow Paths

Overland flow paths are designed in accordance with the AC SW COP v3, 2022. To reduce the height of retaining walls and vegetated batter slopes between Lots 4010, 4009, and 4007 an overland flow path conveying an area of approximately 616m² at the 1% AEP, will be discharged via Lot 4007 to the road reserve within Lot 8002. Detailed design of the stormwater network and concentration of flow at EPA, covenants, building finished floor levels, and fencing materials, will mitigate the effects of this design outcome. It should be noted that the Auckland Council CoP Chapter 4: Stormwater 2024 generally requires the assessment and covenanting of overland flow paths from catchments of 4000m² or greater. The design model ensures that no other private property is located within the 1% AEP flow. Overland flow paths are generally contained within the road reserve, JOALs, pedestrian accessway and are clear of private property. Refer to Woods' drawing P24-128-00-3020-DR series for the overland flow path plans and sections.

12. CONCLUSION

The application seeks approval to authorise comprehensive residential development and subdivision across Milldale Stages 4C-2 – 4C-5 (inclusive) which is the balance of FHLD's Stage 4C. The proposal will be developed in two distinct phases which will be delivered respectively by FHLD and their build partners.

Phase 1 civil works and subdivision will deliver the establishment of a balance lot, three roads to vest, one accessway to vest, 13 JOALs and associated earthworks and infrastructure. The Phase 2 comprehensive residential development will involve the creation of 21 superlots to support urban housing typologies and subsequent subdivision to create 168 individual fee simple lots and associated residential buildings. The staged works will enable residential development to progress in accordance with the AUP:OP planning framework and the Wainui Precinct.

This Infrastructure Design Report discusses the proposed finished levels of the site as well as the required retaining walls and earthworks to achieve these finished levels.

This Infrastructure Design Report explains the servicing strategy for Milldale Stage 4C. The report identifies where existing infrastructure is located in relation to the site and where connections will be made to service the development. It discusses the existing and proposed transport links for the development as well as the drainage and utility servicing provisions.

The proposed servicing works will be delivered within the Phase 1 works by the applicant, leaving fully serviced lots for the future build partners to construct the proposed dwellings.

This report confirms that Milldale Stage 4C within the Wainui Precinct can be adequately serviced by implementing the new infrastructure as shown on the application drawings and as described in this report. The proposed works are a continuation of the surrounding development and are in keeping with the standards, expectations and allowances of the previously completed works.

APPENDIX A – CONSTRUCTION MANAGEMENT PLAN REQUIREMENTS

Milldale Construction Management Plan Requirements (CMP)

Date: 26 March 2025

Status: Draft - Subject to Contractor Construction Methodology

This document provides and preliminary outline of the content expected within CMPs required as preconstruction conditions to each season of earthworks or stage of subdivision works with the Milldale Fast Track works.

After each contract is awarded for the various stages of earthworks and subdivision construction works, the awarded contractor shall prepare a site specific CMP.

These CMPs shall include but not be limited to the following information:

1. Project Description

Details of the Project Description will to be provided for each earthworks construction season and each sub-stage of civil construction.

Project Description will be contract and stage specific and include the following details:

a) Site location
b) General scope of works
c) Specific construction elements to be undertaken, ie Earthworks, drainage works, retaining, landscaping, etc.
d) Project deliverable, ie completed subdivision, Stage number.
e) Timeframes for key stages of works

2. Project Management

Details of Project Manager(s) to be provided for each earthworks construction season and each sub-stage of civil construction.

Project Manager(s) will be contract and stage specific. The CMP shall include the following details:

a) Site Supervisor – name and contact information
b) Project Engineer – name and contact information
c) Project Manager - name and contact information
d) Project Director - name and contact information

3. Health and Safety Plan

Health and Safety Plans shall be prepared specifically for each earthworks construction season and each sub-stage of civil construction.

The contractor shall take responsibility for preparing an appropriately detailed Health and Safety Report and implement the Health and Safety Plan for the duration of the works.

The Health and Safety plan shall include but not be limited to the following information:

a) Site specific health and safety managers and contact details. Identify roles and responsibilities
b) Site specific health and safety risks
c) Identification of hazards and risks specific to the project
d) Risk Assessment and management controls
e) Procedures for undertaking High Risk Activities
f) Site layout of Health and Safety inventory on site
g) Sign in procedures for visitor management
h) Emergency management response
i) Health and Wellbeing procedures
j) Incident Reporting and investigation procedures
k) Required Personal Protective Equipment (PPE)
l) Monitoring and review procedures

4. Working Hours

The hours of construction work are to be identified in the plan and are to be in accordance with the approved Resource Consent conditions. The proposed condition in the application is:

All construction works authorised by this consent must only take place between 7.00am and 6.00pm, Monday to Saturday, with no works undertaken at any time on Sundays, or on public holidays. Heavy plant must not be operated within 130m of any occupied building before 7.30am.

5. Site Access

Details of Site Access will to be provided for each earthworks construction season and each sub-stage of civil construction.

Site Access will be contract and stage specific and include the following details:

a) A plan showing the stage of works, including street / road names
b) Site ingress and egress locations
c) Site compound and site office locations.
d) Location of signage and hazard boards.
e) Extent of security fencing
f) Location of wash down facilities at egress locations
g) Location of first aid and health and safety equipment.

6. Construction Traffic Management Plan

Construction Traffic Management Plan (CTMP) outlines measures to ensure the safe and efficient movement of vehicles, pedestrians, and cyclists in and around the construction site. The plan shall include details around the access to the site to comply with the Code of Practice for Temporary Traffic Management (CoPTTM) and all relevant local and national regulations.

Details of Construction Traffic Management will to be provided for each earthworks construction season and each sub-stage of civil construction.

Within Milldale Construction Traffic will be managed in a way to minimise any distribution to residents within the development and to users on the surrounding road network.

Construction Traffic Management will be contract and stage specific and include the following details:

a) Provide a parking management plan for construction traffic.
b) Address the transportation and parking of oversize vehicles (if any).
c) Provide appropriate loading / working areas to minimise disruption to traffic.
d) Provide cleaning facilities within the site to thoroughly clean all vehicles prior to exit to prevent mud or other excavated material from being dropped on the road. In the event that material is dropped on the road, resources should be on hand to clean-up as soon as possible.
e) Provide traffic management plans in compliance with the latest edition of the NZTA "Code of Practice for Temporary Traffic Management" (COPTTM) document.
f) Ensure the site access point shall be clearly signposted.
g) Include measures that are to be adopted to ensure that pedestrian access on the adjacent public footpaths in the vicinity of the site is safe during construction works.
h) Detail how the works will be undertaken to maintain access to properties adjacent to the work site during construction and address the duration time frame for sites with no-vehicle access during the works.
i) Identify proposed numbers and timing of heavy vehicle movements throughout the day.
j) Identify the location of vehicle and construction machinery access during the period of site works.
k) Identify the storage and loading areas for materials and vehicles.
l) For each construction phase, identify the location and duration of any road or lane closures, division of road closures into segments, duration of works in each closure, indication of detour routes for each closure and assessment of the effects on the Auckland Transport Road network of any road closures and a plan to mitigate these effects.
m) Detail how communication with drivers that they should divert, be done and how it would be monitored to ensure that the expected level of diversion is achieved.
n) Identify the relevant Auckland Transport approvals.

It is the responsibility of the applicant to apply for the Traffic Management Plan from Auckland Transport.

7. Site Notice Board

A large and visible notice board will be located at the entrance points on site and be clearly visible to any construction traffic prior to entering the site. The notice board will include site hazards along with contact details for the Site Manager. Example of the site notice boards;

450mm x 600mm

450mm x 600mm

DINES **THINK SAFETY**

HEAD PROTECTION · HIGH VIZ CLOTHING · SAFETY FOOTWEAR
Personal protective equipment must be worn on this site

HAZARD	CONTROL	DATE ADDED	PERSON RESPONSIBLE

8. Environmental Management

Details of Environmental Management shall be provided for each season of earthworks or stage of subdivision works.

Environment plans prepared within the CMP shall be in accordance with the requirements of the resource consent conditions.

9. Sediment and Erosion Control Plan

Prior to the commencement of each earthworks construction season and each sub-stage of civil construction on the subject site, finalised Erosion and Sediment Control Plans must be prepared in general accordance with the application documents referenced in condition 1 and in general accordance with Auckland Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Incorporating Amendment 2 (GD05), and submitted to the Council. No earthworks activity on the subject site must commence until the Council has confirmed that that the ESCP(s) satisfactorily meets the requirements of GD05. The plans must contain sufficient details to address the following matters:

a) specific erosion and sediment control measures for the earthworks stages (location, dimensions, capacity) including the location of any sediment retention ponds and decanting earth bunds, super silt fences, clean and dirty water diversion bunds and stabilised construction entrances, in general accordance with GD05;
b) supporting calculations and design drawings as necessary;
c) details of construction methods;
d) monitoring and maintenance requirements;
e) catchment boundaries and contour information as necessary;

f) confirmation of any erosion and sediment control measures associated with construction of pedestrian bridges and culvert installation; and
g) details relating to the management of exposed areas (e.g. grassing, mulching).
h) Outline conformance measures to ensure compliance with the approved Adaptive Management Plan (AMP)
i) Site inspection procedures including timings for regular inspections and specific inspections for rainfall trigger events as detailed in the AMP.
j) Streamworks management and detailed methodologies for in stream works, such as culvert installation

10. Chemical Treatment Management Plan

Prior to the commencement of earthworks activity on the subject site, a Chemical Treatment Management Plan (ChTMP) must be prepared in general accordance with Auckland Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Incorporating Amendment 2 (GD05), and submitted to the Council. No earthwork activities must commence until confirmation is provided by the Council that the ChTMP, meets the requirements of GD05, and the measures referred to in that plan for the sediment retention ponds and / or decanting earth bunds have been put in place. The plan must include as a minimum:

a) Specific design details of a chemical treatment system based on a rainfall activated methodology for the site's sediment retention ponds, decanting earth bunds or any other approved impoundment devices;
b) Monitoring, maintenance (including post storm) and contingency programme (including a record sheet);
c) Details of optimum dosage (including assumptions);
d) Results of initial chemical treatment trial;
e) A spill contingency plan; and
f) Details of the person or bodies that will hold responsibility for long term operation and maintenance of the chemical treatment system and the organisational structure which will support this system.

11. Dust Management Plan

The Contractor will need to prepare a site specific Dust Management Plan (DMP) for each new season of earthworks and submit this as part of their pre-construction documentation prior to works commencing. This plan will identify appropriate dust mitigation strategies for the site.

The site specific DMP will have an allowance for a dedicated water cart resource, dust fences and daily management strategies to avoid dust nuisance to neighbouring properties.

While the Contractor's Dust Management Plan will ultimately provide the management regime for dust nuisance mitigation, the following measures will be expected as part of an effective dust mitigation strategy for this site. Allowance will be made in the construction contract for implementation of these dust control measures.

- The Contractor shall prepare a site specific DMP in accordance with Southern Skies, Milldale Dust Management Plan (included in Appendix D of the Earthworks Methodology Report)

- The Contractor is to monitor dust emissions daily and implement appropriate measures as necessary;
- The Contractor shall provide sufficient water carts and / or sprinklers that are capable to ensure that the exposed areas of the site are appropriately moistened to avoid dust nuisance towards neighbouring properties. Particular attention shall be given to those sensitive receivers identified in the Southern Skies DMP;
- On site traffic management, including specific traffic control measures in areas that are sensitive to dust generation;
- The site is to be watered at the end of each working day when it is considered that a dust nuisance may exist following the close of works for that day. (unless there is sufficient rain or showers, falling or forecasted);
- The site is to be watered if strong winds are forecast, and these coincide with dry ground conditions to avoid dust nuisance towards neighbouring properties;
- Adjoining owners will be informed with a pre-construction communication which will include a 24-hour contact telephone number to call the site Contractor for dust and other complaints;
- The Contractor is to promptly implement additional dust control measures when a complaint is received, and they are to note the complaint, outcomes, and actions;
- A record of dust events and complaints are to be recorded in weekly site meetings;
- Earthworks on site are to be staged to allow for progressive stabilisation. Once areas of works are completed to finished ground, progressive revegetation to pasture is to be undertaken over these areas. Monitoring of this revegetation is to be undertaken to ensure good uptake until stabilisation is achieved;
- A 3m high dust fence can be erected along the boundary of a neighbouring property where an actual dust nuisance has arisen;
- Stockpiles to be stabilised if not in use;
- When loading / unloading trucks, materials are to be dropped from as low a height as practicable;
- Removal of sediment or dust generating materials from the access roads, haul roads, and public roads with a suction sweeper; and
- Use of a wheel wash facility that also has capabilities to wash dust from vehicles.
- Dust monitoring procedures in accordance with the Southern Skies DMP;
- Complaint response procedures in accordance with the Southern Skies DMP.

12. Construction Staging Methodology

For each earthworks construction season and each sub-stage of civil construction, a site specific construction staging will be necessary to enable the site to be constructed in a methodical, safe and timely manner.

A Construction Staging Methodology Plan shall include the following items:

- Site Establishment
- Sediment and Erosion Control implementation
- Spatial staging of works across the site
- Detailed programme of the construction works tasks
    - Earthworks
    - Geotechnical works

    - Streamworks
    - Retaining works
    - Drainage works
    - Roading works
    - Services
    - Landscaping
- Stabilisation of the site
- Removal of Sediment and Erosion Control devices
- Demobilisation and site presentation
- Final walkovers and site certifications