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Infrastructure Report

Milldale Temporary Wastewater Treatment Plant
168 Argent Lane, Upper Orewa
Fulton Hogan Land Development Ltd
28/03/2025
FINAL

DOCUMENT CONTROL

Project Number	P24-189
Project Name	Milldale Temporary Wastewater Treatment Plant
Client	Fulton Hogan Land Development Ltd
Date	28/03/2025
Version	0
Issue Status	FINAL
Originator	Yang Cui – Associate Engineer
Reviewer	Tim Rickards – Principal Engineer
Approval	Tim Rickards – Principal Engineer
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STATEMENT OF QUALIFICATIONS AND EXPERIENCE

I, Yang Cui, am an Associate 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 2016.

I hold the qualifications of Diploma in Civil Engineering and f Bachelor of Business in Accountancy from Unitec, which I completed in 2010 and 2005 respectively. I am a Chartered Professional Engineer of the Engineering New Zealand.

I have 14 years of professional experience in the Engineering industry. My experience includes Civil Design, Concept Design and Development Planning, Resource Consent Documentation and Approval, Building Consent Documentation and Approval, Engineering Plan Approval, Contract Administration, Construction Observation and Project Management.

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, 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. Previously I have been involved in the design and construction of wastewater pump out facilities at Sidwell and Lysnar road in Milldale, and the design of a wastewater treatment plant in Pukekohe, a wastewater treatment system in the far north of New Zealand and various water treatment facilities in Australia and the Solomon islands.

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 to support 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), which includes consenting for the development of a temporary wastewater treatment plant (WWTP) at Milldale to be owned and operated by FHLD.

Milldale is currently serviced by the Watercare Services Ltd (WSL) owned Army Bay wastewater treatment plant which WSL has indicated will potentially reach capacity prior to their proposed upgrade works projected to be completed in 2031. The Milldale wastewater treatment plant is proposed as a contingency option for the Milldale development if the Army Bay Wastewater is not able to service the development.

The scope of the consent involves earthworks, wastewater discharges, stormwater discharges, vegetation removal, and the constructions of civil infrastructure and buildings.

1.2. Site Description

1.2.1. Site Location

The Wastewater Treatment Plant site subject to this application is located within Lot 4 DP 353309, which is owned by FHLD and has a total area of 10.5ha.

The site is bordered by Lysnar Road to the south, Wainui Road to the east and Waterloo Stream to the west, and just outside the Wainui Precinct. The parent site is characterised by undeveloped rural land that has historically been used for farming. The topography of the parent site generally slopes from north-west to south-east and has two stands of poplar trees. There is an unnamed tributary of the Waterloo stream that bisects the southern portion of the site.

The area subject to the works and enhancement planting covers a total land area of approximately 1.21ha and has been positioned in the southern corner of the parent site, directly adjacent to Lysnar Road. The work site is generally flat, with the slope ranging from approximately 1% to 10%, and has been utilised as a construction compound supporting the ongoing delivery of the Milldale development.

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

The site location is shown below in Figure 1, and a site location plan is provided with the application drawing set P24-189-0100-GE-WWTP.

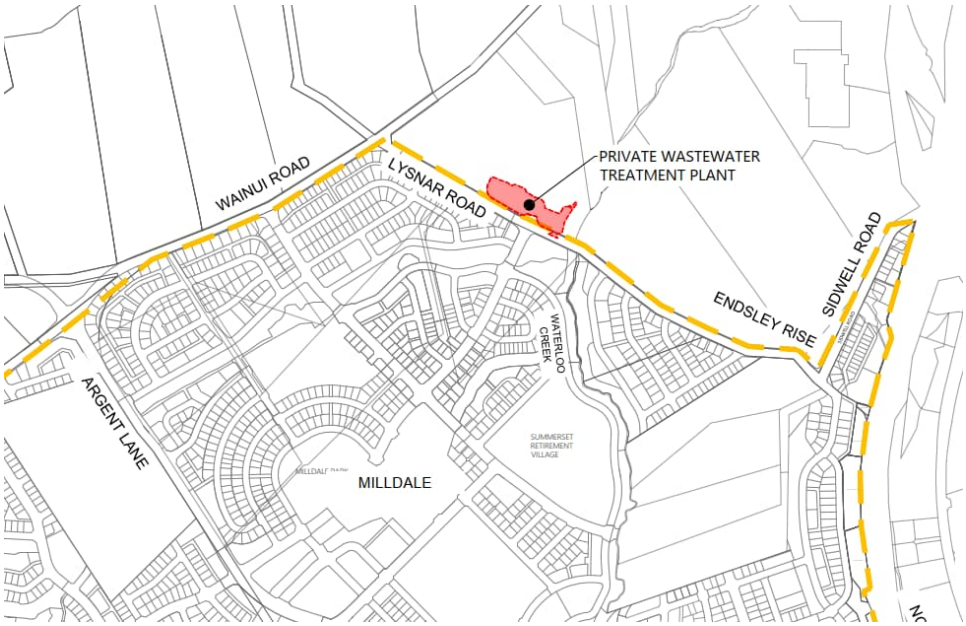

Image 1: Site Location Plan

1.3. Project Description

Milldale is a master planned community designed to provide 4,500 dwellings, including commercial land for a local town centre, public parks, riparian reserves, cycleways and walkways, and education facilities. The Council has approved bulk earthworks and subdivision consents for the first nine stages of Milldale, with approximately 2,000 residential lots consented to date. New dwellings have been constructed in the subdivision stages, with Stages 1–5 already completed and more under construction. The development aims to provide a diverse range of housing options, schools, and businesses over the next 5 – 6 years.

Currently, wastewater from the Milldale development is treated at Watercare's Army Bay treatment plant in Whangaparaoa. The Army Bay facility accommodates wastewater from the Silverdale catchment.

At the commencement of the development, it was recognised that the Army Bay facility would require an upgrade, initially planned for completion in 2024. Unfortunately, this upgrade has been deferred by Watercare to 2031 leading to concerns that the facility's capacity could be reached by 2027.

To address this capacity shortfall and ensure the continued progress of the Milldale development, FHLD are provisionally seeking to design and consent a temporary treatment plant that could service the development in the interim until the Army Bay Treatment Plant upgrade can be completed. This would enable them to continue to provide housing and job opportunities within the area without significant disruptions or delay.

The infrastructure and utilities required to accommodate this development will be designed and constructed to Auckland Council design standards and meet the requirements of all relevant service providers.

This report is in support of the Resource Consent Application and covers the existing and proposed infrastructure required to facilitate the development and operation of the temporary wastewater treatment plant.

2. EARTHWORKS

2.1. Topography

The parent site is characterised by undeveloped rural land that has historically been used for farming. The topography of the parent site generally slopes from north-west to south-east where the Waterloo stream forms the boundary of the site. The site has two stands of poplar trees as well as some mixed planting on the stream edge. There is an unnamed tributary of the Waterloo stream that bisects the southern portion of the site.

The work site is generally flat, with a slope ranging from approximately 1% to 10% falling to the east. A portion of the proposed site has been utilised as a construction compound supporting the delivery of ongoing delivery of the Milldale development. A hard stand area has already been constructed in this area using quarried material.

2.2. Geology

A Geotechnical Investigation Report (GIR) has been prepared by CMW Geosciences (CMW) as part of this consent application and is included in the application pack. The report outlines the underlying geology, geotechnical hazards, and recommendations for mitigation of those hazards.

The site is underlaid by Hukerenui Mudstone, and in low lying areas Tauranga group Alluvium is present.

The Alluvium material is subject to settlement when additional load such as engineered fill or structures is applied to it, and settlement monitoring/ mitigation will be investigated as part of the detailed design. This may include preloading the site to accelerate settlement prior to building construction.

As the site has been used for farming activities there is a risk of uncontrolled fill being present on the site. The construction area of the site will to be completely stripped of topsoil and inspected by the geotechnical engineer prior to fill placement. Any uncontrolled fill will be removed and replaced.

2.3. Earthwork Methodology

2.3.1. Overview

Bulk earthworks are required to shape the site for future civil and building constructions, involving a cut to fill operation. The works are proposed to be completed within one earthworks season (1 October to 30 April). Should unforeseen circumstances occur (such as inclement weather, availability of contractors/plant), an application may be made for Auckland Councils for work outside these months (winter works).

For assessment against the Auckland Unitary Plan requirements;

- The site is flatter than 10 degrees slope.
- A small area of earthworks is proposed within the Stream Riparian Yard.
- Approximately half of the required earthworks take place within the Sediment Control Protection Area (SCPA).

The streams will be protected during the earthworks phase of the works by the proposed erosion and sediment control measures discussed in section 2.4.

The earthworks volume and areas for the project are summarised in Table 1 below.

	Earthwork Volumes (m^3)			Site Area (m^2)
	Cut (-)	Fill (+)	Balance	Site Area (m^2)
Works within Riparian yard (20m)	40	30	10	175
Works within SCPA (50m)	1,500	1500	-	5,040
Total	2,430	2,350	-80	7,500

Table 1: Temporary Wastewater Treatment Plant Earthworks Volumes

Site specific earthwork practices will be adopted in accordance with CMW Geosciences Limited's earthwork specifications. The Designer and Contractor shall collaborate with the Geotechnical Engineer to ensure the final landform is stable and suitable for the development of the treatment plant.

Earthworks are generally done by conventional earthmoving machinery under the direction of a suitably qualified and experienced Contractor. Any additional volume will be placed in stockpile for use elsewhere within the Milldale development.

All works shall be undertaken in accordance with the geotechnical recommendations outlined in the GIR report.

Enabling works, including the clearing of any vegetation and stripping of topsoil will be undertaken prior to the commencement of any earthworks.

2.3.2. Pre-Construction Meeting

A pre-construction meeting onsite with Auckland Council (AC) representatives will be held prior to installing any erosion and sediment control.

2.3.3. Primary Earthworks Methodology

The preliminary staging plan for works during the earthworks season is outlined as follows:

Part 1 – Enable Controls

- Install 'Last Line of Defence 'silt fence along watercourse extents.
- Install clean water cut off drains.
- Construct topsoil or clay bund for conveying dirty water
- Construct DEB A and B
- Certify all controls

Part 2 – Bulk Earthworks Commencement

- Strip topsoil within catchments of DEBs and other controls and stockpile clear of the works.
- Undertake bulk cut to fill operations.

Part 3 – Bulk Earthworks Completion

- Complete cut to fill operation to designed subgrade levels.
- Survey subgrade and provide to Engineer for approval.
- Scarify batters to ensure topsoil does not slump off and obtain signoff from Geotechnical Engineer.
- Place topsoil to depth outlined within specifications.
- Stabilise topsoil area with hay mulch (and seed/fertiliser if required) or sew grass and wait for suitable grass strike.

Part 4 – Removal of Controls

- Once areas have been mulched or suitable grass strike has been obtained, seek approval from AC Monitoring Officer for removal of controls if required.
- Remove structures within DEBs
- Undertake cut to fill operation within DEB areas
- Prepare for and topsoil area, then stabilise.

2.3.4. Secondary Earthworks Methodology

It is proposed that secondary earthworks will be undertaken during building and drainage works under this consent. An updated Earthworks Methodology report will be submitted for AC Compliance Managers approval for the building works phase prior to the commencement of this stage of the works.

Some control will remain in place following the bulk earthworks operations for use in drainage and building works.

2.4. Erosion & Sediment Control Methodology

2.4.1. Overview

A best practice management strategy will be implemented for the proposed 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 decanting earth bunds (DEB) due to the relatively small catchments (7,000m2), along with silt fences. There will also be a strong focus on erosion prevention prior to rain events.

The earthworks cut to fill volumes within the proposal will require one season of earthworks (October to April) and will be progressively stabilised as areas are completed and prior to winter.

The site will be fully stabilised upon completion of earthworks.

2.4.2. 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:

2.4.3. Principal – Fulton Hogan Land Development

Fulton Hogan Land Development is committed to development of their landholdings at Milldale, Wainui East 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.

2.4.4. 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.

2.4.5. 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 Milldale (AMP). Southern Skies have been involved with the Milldale project in this capacity for six years and have a strong understanding of how the site operates during earthworks construction.

As set out in the AMP, 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 rain fall 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.

2.4.6. 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 (CTMP);
- Dust Management Plan (DMP); and

Refer to Appendix A for details of the requirements of the construction management plan and other associated plans.

Any other plans and documentation required to address the pre-construction conditions of resource consent.

As 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.

2.4.7. 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.

2.4.8. Erosion & Sediment Control Measures for Enabling Works

Erosion and Sediment control measures for the enabling works will include temporary controls for some items during clearing and installation of permanent sediment controls. These will be installed in suitable locations clear of the works areas for use in the construction of these works.

2.4.9. Erosion & Sediment Control Measures for Primary Earthworks

The design standard of the erosion and sediment control measures are summarised in Table 2 below.

Device	Description
DEB A	Decanting Earth Bunds A - primary treatment for this catchment • Catchment =2500m2 • Storage required Volume = 50 m3 (2% of 2500m2) • Design storage Volume=59m3 • Outlet pipe size = 150mm dia • Number of T-bar decants = 1 • Rain Activated Chemical Dosing System See drawing P24-189-1800-EW-WWTP for details.
DEB B	Decanting Earth Bunds B - primary treatment for this catchment • Catchment =5544m2 • Storage required Volume = 90 m3 (2% of 4500m2) • Design storage Volume=124m3

	• Outlet pipe size = 150mm dia • Number of T-bar decants = 1 • Rain Activated Chemical Dosing System See drawing P24-189-1800-EW-WWTP for details.
Clean water diversions	• Size based on 5% AEP rain event • Stabilised against erosion • Discharge into stormwater network or suitable energy dissipation See drawing P24-189-1800-EW-WWTP for details.
Sediment Laden diversions	• Size based on 5% AEP rain event • Discharge into DEBs See drawing P24-189-1800-EW-WWTP for details.
Silt Fence	• Geotextile fabric specifications comprise of: - Grab tensile strength > 440N (ASTM D4632) - Tensile modulus: 0.140pa (minimum) - Apparent opening size: 0.1-0.5mm (ASTM D4751) • Includes returns at approx. 40m spacings • Contributing slope steepness less than 20% • Contributing length to be less than 30m • Minimum trench embedment is 200m • Minimum height of geotextile is 600m • Maximum spacing of waratahs is 4.0m • Top wire (2.5mm HT) See drawing P24-189-1800-EW-WWTP for details.
Catchpit/Raingarden Inlet protection	• Intercept and filter sediment-laden runoff before entering stormwater network • Provided as a secondary erosion and sediment control device • Avoid complete blocking of stormwater network to prevent flooding hazard. • Height of catchpit protection to be less than kerb height See drawing P24-189-1800-EW-WWTP for details.
Stabilised Construction Entrance	• Located at site entry/exit point • Ensure runoff drains back to site • Stabilised entrance specifications comprise of: - 50-150mm washed non-sedimentary aggregate - Minimum thickness is 4m
Stabilisation	• Temporary or permanent stabilisation is considered the equivalent of an 80% of pasture sward • Where hay/mulch is to be applied a suitable tackifier is to be used.

Table 2: Proposed Catchments and Controls Descriptions

Upon completion of erosion and sediment controls within each catchment, as-built plans certification will be provided and a site inspection held with AC seeking approval to proceed with the associated earthworks.

Other devices which may be installed during the works due to operational decisions are:

- Wheel wash facilities to stabilised entrances.

- Other controls if areas can no longer be serviced by the proposed devices.

2.4.10. Last Line of Defence

The 'last line of defence' approach will be implemented as a backup to the primary controls.

The aforementioned DEBs form the primary erosion and sediment control measures used to minimise the discharge of the sediment to the receiving environment. Beyond these primary controls, an extra line of defence is proposed. Super silt fences will provide a backup protection during the initial setup of primary controls and for any small catchments around the extents of the site that may bypass the primary devices.

It is proposed to erect a super silt fence (SSF) immediately beyond the extent of earthworks as a 'last line of defence' along both sides of all retained watercourses around the extent of the site.

These SSFs will be regularly monitored during weekly site inspections, and before and after each significant rainfall event. Any damage or maintenance work shall be attended to immediately after discovery.

2.4.11. Erosion & Sediment Control Measures for Riparian Yard & Sediment Control Protection Area

A portion of the proposed earthworks are proposed within the Riparian Yard and SCPA of the existing streams.

The proposed erosion & sediment controls will provide suitable protection for the streams from the proposed earthwork adjacent to them.

A diversion channel & bund will isolate the earthworked area from the stream catchment. Run off from the open earthwork areas will flow to the decanting earth bund for sediment retention prior to controlled discharge to the streams. A sediment fence will also be installed between the bund and the stream as a last line of defence.

2.4.12. Site Inspections

The site will be regularly inspected during the course of the works.

The aim of these inspections is to ensure that all erosion and sediment control devices are installed correctly and are operating effectively throughout the duration of the works. This inspection programme will provide certainty to all parties that appropriate measures are being undertaken to ensure compliance with the conditions of consent and GD05. The inspection regime will keep sediment and erosion control management at the forefront of works on site. Any potential problems will be swiftly identified, and remedial works shall be promptly carried out.

The inspection programme shall consist of:

- Weekly site walkovers involving all stakeholders to inspect and determine the effectiveness of all erosion and sediment control devices installed on site;
- Pre-rain event monitoring involving all stakeholders to inspect and confirm all devices are operational for the predicted rain event and assess the site for any further controls that may need to be established prior to the rain event; and
- Post-rain event inspections will also be carried out to assess the effectiveness of devices and the performance of the sediment and erosion control network as a whole.

Any remedial works shall be documented during these monitoring inspections and immediately attended too.

2.4.13. Dust Management Plan

The Contractor will prepare a Dust Management Plan 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.

This plan will have an allowance for a dedicated water cart resource, dust fences and daily management strategies to avoid dust nuisance to neighbouring properties.

As the site is located in a rural setting, the risk of dust nuisance is relatively low. Nevertheless, the appropriate steps will be taken to prevent the generation of dust and 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 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;
- 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 generation will be closely monitored with site inspections. There will be a dedicated section in the weekly site meetings to review the site's performance in relation to avoiding the generation of dust, to discuss any areas of dust nuisance and reassess the dust mitigation strategy as required.

2.5. Geotechnical Works

CMW Geosciences have been engaged to undertaken geotechnical investigations of the site and have prepared a Geotechnical Investigation Report (GIR), which is provided separately.

All earthworks and geotechnical remediation works will be supervised by a suitable qualified geotechnical engineer.

At the completion of works a Geotechnical Completion Report will be prepared.

3. SITE ACCESS & TRAFFIC MOVEMENTS

The site is proposed to have an access onto Lysnar road via proposed a fourth leg of the Lysnar road roundabout, consented for construction as part of the Milldale Stage 8 consent.

This adjustment to the roundabout will be constructed to Auckland Transport standards and vested as part of the stage 8 Lysnar road works. In the future this leg of the roundabout will be a continuation of the public roading network as the future urban land to the north of Lysnar road is developed. On decommission of the WWTP the roundabout leg will be retained as a road stub to the road boundary line awaiting this future development.

Within the site, a private accessway is proposed to allow vehicle movements to the main treatment plant building. The accessway has been designed as a 3.5m wide and designed to be one-way (circulating anti-clockwise) with widening at corners to allow for large vehicle tracking areas. The horizontal geometry of the accessway has been designed based on the tracking curve of a 17.9m AT semi-trailer with a speed of 6km/h. The vertical geometry is designed no steeper than 8%.

A working area with a total width of 8.5m is proposed at the treatment plant building to facilitate plant activities.

A 3.5m wide maintenance track is proposed to provide an access to the proposed take off manhole, land contact infiltration device and stormwater dry basin for maintenance.

The accessway and treatment plant working area pavements are expected to be concrete but may be a flexible asphalt depending on detailed design assessment. The Access track will likely be a chip sealed pavement.

Refer to drawing P24-189-2000-RD-WWTP for general roading layout and P24-189-2200-RD-WWTP to 2201-RD-WWTP for typical cross sections of the vehicle access, and P24-189-2600-RD-WWTP for long sections, and P24-189-2800-RD-WWTP for tracking in the proposal drawing set.

3.1. Construction/ Decommission phase

During the construction and decommission phases of the project truck access will be required to the site to deliver/ remove plant and materials.

It is expected that the roundabout access leg will have been constructed as part of a previous construction phase (Stage 8A civil works) and will provide a safe site access point for the works.

The proposed Earthworks volumes approximately balance, and very limited truck movements will be required to relocate earthworks material as part of the earthworks phase of the project (Less than 50 movements throughout project).

During construction of the site drainage, pavements, buildings and treatment plant regular truck movements will be present. This is expected to be up to 10 trucks/ hour at peak periods of construction such as pavement construction where pavement materials need to be delivered to site. The construction period for the site is expected to be approximately 6 months, with traffic numbers varying during this period dependant on the site activities.

A similar increase in truck movements will occur when the plant is decommissioned, this process is anticipated to take 2-3 months with trucks removing materials and waste from the site.

3.2. WWTP operation traffic movements

During the operation phase of the proposed plant traffic numbers are expected to be very low. The roundabout adjacent to the site and the connecting road network have been designed to accommodate the future traffic movements from the future urban land the WWTP is being constructed on. The traffic movements generated by the operation of the WWTP are negligible when compared to the expected future traffic which the road network is designed to accommodate.

The WWTP will not be continuously staffed, 1-2 staff are expected to attend the site every 2-3 days to undertake maintenance tasks. Conservatively, light vehicle movements for the WWTP during the operation phase have been assumed at 10 vehicles per day (VPD).

Truck movements to service the site during the WWTP operation are expected to be as follows:

- Chemical delivery: 1 truck movement per week. Likely to be a semi-trailer (This becomes the design vehicle for the internal site access ways).

- Sludge removal: 3 truck movements per week. Expected to be an 8m truck.

3.3. Pedestrians & Cyclists

The proposed Lysnar Road upgrade, to be completed as part of the stage 8 subdivision consent, will include a 1.8m footpath and 1.8m separated cycle lane on the northern side of Lysnar road. These facilities pass around the northern side of the proposed roundabout and will be accommodated as part of the roundabout adjustments by providing safe crossing facilities over the new roundabout leg in accordance with Auckland Transport requirements.

It is not proposed to provide footpath or cycle facilities within the site. The site is expected to have very low traffic numbers, and all vehicles will be familiar with the site and pedestrian movements. The proposed site accessway, working area and maintenance track will be suitable to service pedestrian access requirements. It is not anticipated that cyclist movements will be present within the site, but if they do occur the site accessway can suitably accommodate them.

4. STORMWATER

4.1. Existing Stormwater Infrastructure

There is an existing culvert on the Waterloo tributary running through the site that will be retained. This is outside the proposed construction area.

Image 2: Location of Existing Culvert

4.2. 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 site is located within the Stormwater Management Zone A of the SMP. The general approach for discharge from Zone A 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).

As the proposed WWTP site is within the Future Urban Zone it sits outside the Milldale Stormwater Network Discharge Consent boundary. The AUP(OP) E8.4.1(A7) allows for runoff from impervious areas <5,000 m^2 outside an urban area to be discharged as a permitted activity subject to compliance with Standard E8.6.1 & E8.6.2.4.

The proposed impervious area for the WWTP is 3,670m^2 and is compliant with Standard E8.6.1 & E8.6.2.4.

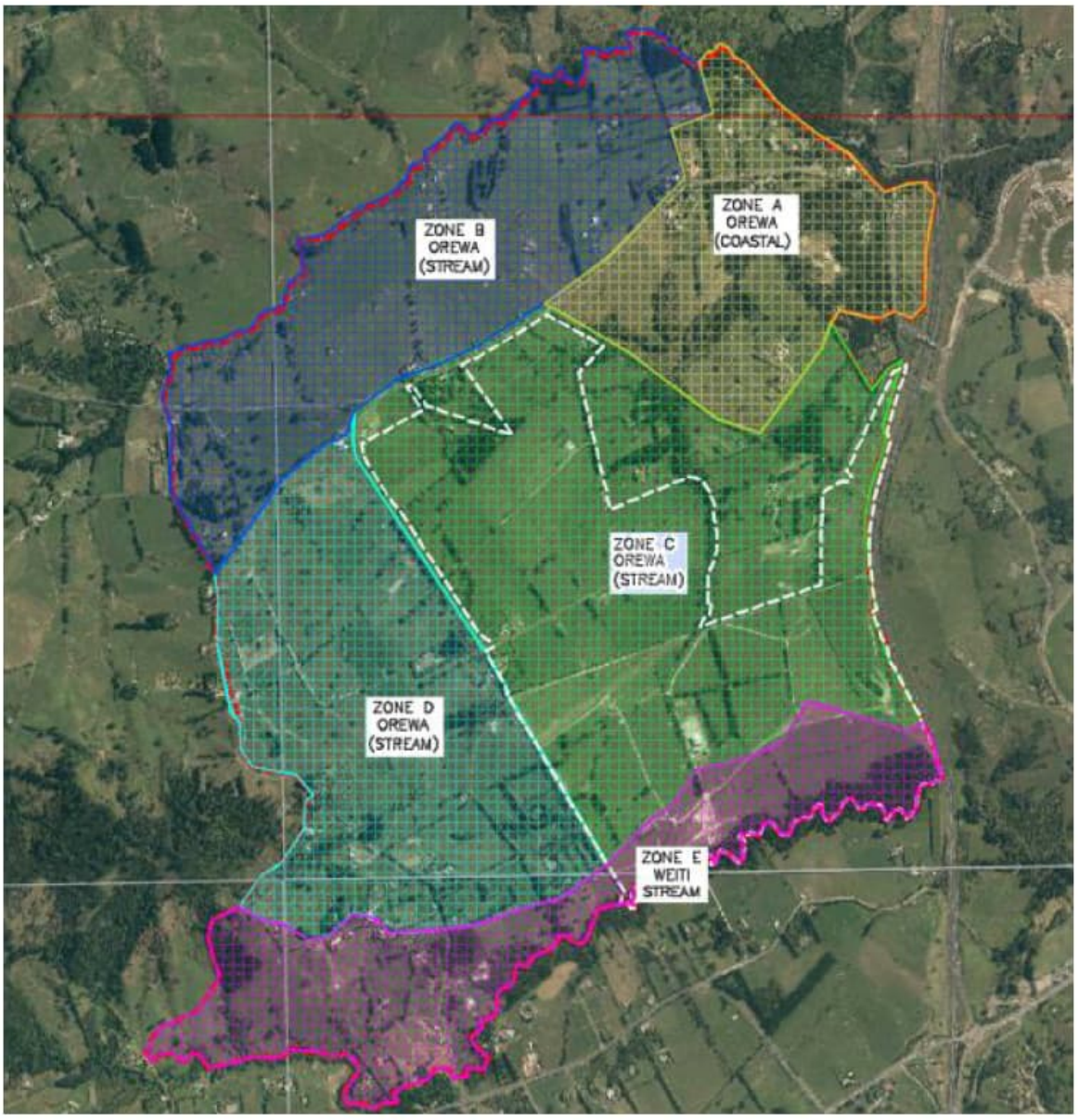

Figure 1: Stormwater Management Zones

4.3. Proposed Stormwater Management

A stormwater dry basin is proposed onsite for meeting the hydrology mitigation requirement of development for hardstand and building areas. It is designed to detain the 95th percentile of rain event and discharge to the nearby watercourse over a period of 24hrs (Equivalent of SMAF1). The device has been oversized to allow for potential future development of the upstream catchment.

No flow mitigation is proposed for storm events larger than the 95th percentile event.

Due to the low expected traffic numbers, it is not proposed to provide stormwater quality treatment. Contaminants from the wastewater treatment process will be isolated within the proposed buildings and not reach the stormwater system.

Refer to drawing P24-189-3300-DR-WWTP and 3310-WWTP for details.

4.4. Primary Drainage Networks

The primary Drainage network for the site is designed in accordance with requirements set out in Chapter 4 of the Auckland Council Code of Practice for Land Development and Subdivision to convey the 10-year (inclusive of climate change), 10-minute duration event.

The network has been designed to convey the 95th percentile of rain event from the impervious areas of the site to the proposed stormwater dry basin to meet the hydrology mitigation requirements. Larger

rainfall events up to the 10yr rainfall event will be conveyed by the network, bypassing the dry basin and discharge to the nearby watercourse via a wingwall outlet.

The pipe network will range in size from 225mm dia.to 525mm dia.

Refer to drawing P24-189-3000-DR-WWTP for details.

4.5. Secondary Drainage Networks

The secondary drainage is designed to convey the 100-year (inclusive of climate change) event in accordance with methods described in Chapter 4 of the Auckland Council Code of Practice for Land Development and Subdivision. The accessway is to be used as an overland flow path to convey the 100yr flow to Waterloo Stream.

4.6. GIS Flood plain

The Auckland GIS website shows a flood plain within the proposed WWTP area. Please see below image taken from Geomaps.

Figure 2: Overland flow path and flood plain from Auckland Council Geomaps.

Inspections of the existing site contours and also the predevelopment Milldale flood modelling have shown this GIS flood plain information to be incorrect. Below is an image from the predevelopment flood modelling undertaken for Milldale. The image shows the proposed earthworks site to be clear of any flood plains or overland flowpaths.

Figure 3: Overland flow path and flood plain from Milldale Flood Model – Pre Development (2.1c).

5. WASTEWATER DESIGN

5.1. Existing Wastewater Infrastructure

There is an existing Watercare transmission main running parallel to the Waterloo Stream, conveying wastewater flows from Milldale to the Army Bay Treatment Plant. All remaining development within the Milldale precinct is proposed to discharge via this existing main including the proposed stages 10-13.

While operational, flows for the proposed Milldale WWTP will be drawn from this existing transmission main, removing the required flow volume from the Army Bay treatment catchment. When the WWTP is decommissioned flows that had been captured and treated by the Milldale WWTP will continue within the transmission main to the Army Bay Treatment Plant.

5.2. Plant Configuration

It is proposed to locate the treatment plant on the lot northeast of Lysnar Road. For details of the treatment plant, refer to APEX designs and specifications lodged as part of the resource consent application.

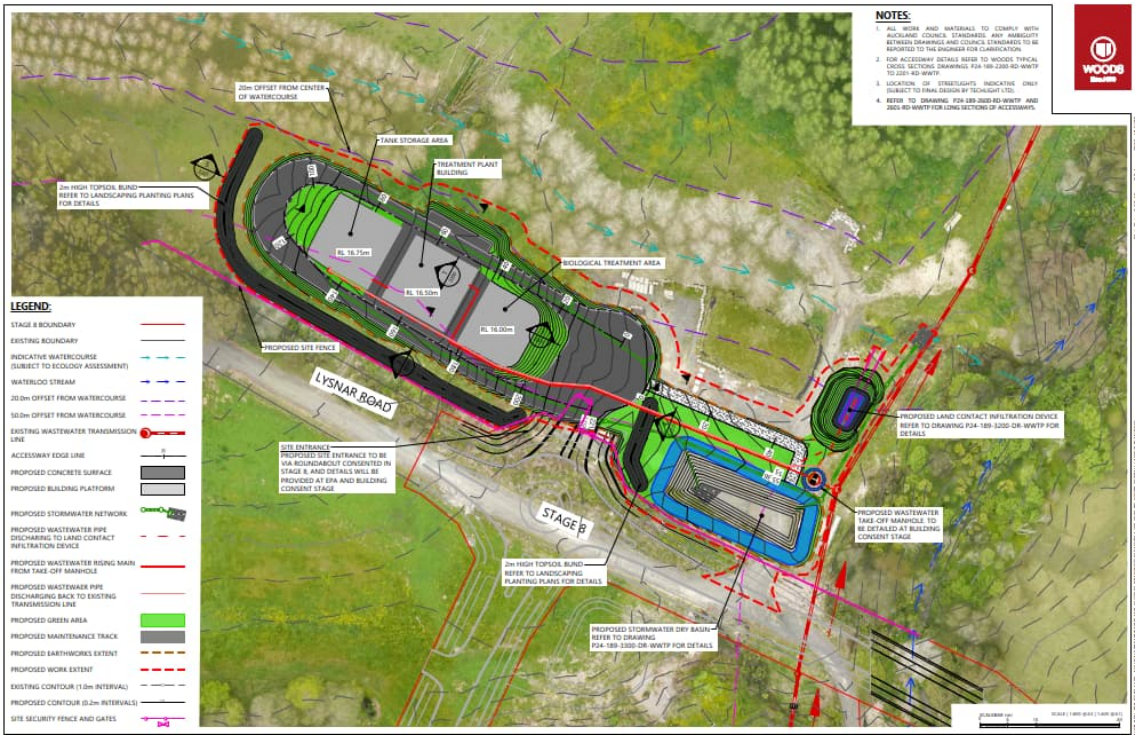

Figure 4: Proposed Treatment Plant Location

It is proposed to install a take-off manhole onto the transmission main to pump flows out of the transmission line to the proposed treatment plant. The take-off manhole will be a pump chamber with a take-off pipe from the main transmission main. It is proposed to locate the take-off manhole adjacent to the upstream transmission main manhole within the Milldale WWTP site. The wastewater in the transmission main will flow to the chamber until it is full and then bypass back along the existing transmission main to flow to the Army Bay Treatment Plant. Offtake flow volumes to the proposed Milldale treatment plant can then be controlled via a pump system drawing down the pump chamber as required.

There is suitable capacity in the downstream network to accommodate balancing of the Diurnal peaks and wet weather events from the network, the treatment plant is designed to treat the average flows from the network over a 24hr period.

It is proposed that the take-off manhole and treatment plant system would be private and remain in FHLD ownership to maintain and operate.

Design offtake treatment volumes will be agreed with Watercare as part of future EPA submissions depending on the available remaining capacity of the Army Bay Treatment Plant.

It is anticipated that there will be three design offtake flow rates which will be calculated to achieve the required target daily volume removal from Wastewater transmission main. These flow rates will change over time as the Milldale WWTP services more lots from the development.

- Normal flow will be designed to achieve the average dry weather daily volume. This will be via two design flows,
    - a standard offtake flow
    - a low offtake flow which will be used during the night when flows in the transmission main are not expected to be high enough to service the standard offtake flowrate.
- There will also be a wet weather offtake flowrate which will make allowance for any infiltration into the network during wet weather events.

Flows from the pump chamber will be pumped to the proposed Milldale treatment plant, which is proposed to be a Hybrid Membrane Aerated Bioreactor with Ultrafiltration Membranes (MABR+MBR Hybrid). The treatment plant will include the following components:

- Pump stations
- Steel panel tanks for storage
- Compact modular containers housing the treatment system
- Sludge tanks

While highly effective, the proposed treatment process will still leave residual nutrients in the treated effluent which have the potential to affect the receiving environment. In order to address this, as a final step in the treatment process the treated effluent will be split into two discharge flows;

- A primary polished flow suitable for discharge to the receiving environment,
- A secondary flow containing some residuals nutrients which is discharged back to the Wastewater Transmission main.

Additional flow will be drawn and treated from the Wastewater Transmission line to offset this flow being discharged back to the line, resulting in the correct offtake rates being removed from the Army Bay catchment

The primary discharged treated effluent will flow to the land contact infiltration device where it will soak into the ground, eventually making its way to the waterloo stream.

Refer to drawing P24-189-4000-DR-WWTP for details.

5.3. Peak Wastewater Plant Flows

An assessment has been undertaken of the expected flows to the Milldale treatment plant from the proposed 1250 lots.

Using WSL guidance of 3 people per dwelling, and average water use of 180L per person per day gives an expected average dry weather flow (ADWF) of 675 m^3/day.

Wet weather peaking

Wet weather peaking has been assessed using the Auckland Council TP 108 temporal pattern combined with the WSL code of practice wet weather peaking factor of 6.7.

The wet weather peaking factor of 6.7 has been assumed to include the dry weather peaking factor of 3, as the peaking volumes are being calculated separately an adjusted wet weather peaking factor of 3.7 has been used in the calculations.

The peak wet weather flow is expected to be encountered during the peak of the storm, with reduced peaking factors expected outside of this period. The peak volume generated during the peak 10min of the storm is expected to be 17.34 m^3. Over a 24hr storm the total expected volume is 154 m^3. This is in line with GD06 guidance flow rates.

The wet weather flow rate combined with the expected dry weather flowrate gives a total peak treatment volume of 829 m^3 per day.

As discussed above, the actual design flowrate will be dependant on the number of households being treated by the wastewater treatment plant. The design flowrates will be agreed with Watercare and these will be revised as each section of the proposed subdivision is vested to council.

6. WATER RETICULATION

6.1. Existing Water Infrastructure

There is currently no existing water supply infrastructure for the site.

Once constructed, the recently consented Milldale Stage 8 will provide a public water supply to the Lysnar road site frontage to provide water supply connections. Construction of stage 8 of Milldale is currently in the EPA phase and will be completed prior to the treatment plant construction.

6.2. Proposed Water Supply

A public network of 100mm ID watermain is proposed to be connected to the water reticulation in Stage 8. A fire hydrant is proposed at the boundary of Stage 8 to provide sufficient flow and pressure for firefighting for the site, with a sluice valve followed. A private network of 25mm watermain is proposed within the site to provide potable water to the treatment plant facility.

Refer to drawing P24-189-6000-DR-WWTP for details.

7. UTILITY SERVICES

7.1. Power Reticulation

The site will be supplied by extending power reticulation laid with Stages 8 civil works. Any reticulation extension or upgrades required for the development will be undertaken following reticulation design by Vector.

7.2. Telecommunication

The site will be supplied by extending power reticulation laid with Stages 8 civil works. Any reticulation extension or upgrades required for the development will be undertaken following reticulation design by Tuatahi First Fibre.

8. TREATMENT PLANT DECOMMISSION

On completion of the upgrade of the Army Bay facility the Milldale WWTP will no longer be required.

The take-off manhole will be decommissioned, with the connection to the Wastewater Transmission main and the weir within the main being removed. Flows previously being pumped to the Milldale WWTP will flow down the transmission line to the Army Bay facility.

Once the take-off manhole is decommissioned the Milldale WWTP will be isolated from the public wastewater network and can be decommissioned independently from the public system.

It is expected that the treatment plant treatment system, buildings and tanks would be removed from the site.

The land contact infiltration device will also be removed with the area filled and stabilised.

It is likely that the pavement, hardstand, building foundations and drainage pipes (including the take-off manhole and wastewater rising mains) will remain on the site until it is developed in the future. This avoids unnecessary disturbance of the site from an E&SC perspective.

The stormwater basin will also remain in place to provide detention for the remaining impervious areas.

The roundabout leg site access will remain, with the fencing allowing the site to remain secure and isolated from the public roading network.

9. 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. 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 and Building Consent application, which will incorporate further SiD considerations with detailed design.

9.1. Construction Considerations

9.1.1. Site Access

Stabilised site access is to be provided from public road via the previously constructed roundabout leg.

9.1.2. 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).
- Riparian margin either side of the Streams and dry basins (batter slopes typically 1V:3H).

Construction mitigation:

- Batter slopes modelled to a maximum grade of 1V:3H. This is traversable on foot for construction staff is required.
- Batter slopes will be discussed with the contractor at the pre-construction meeting. The contractor will need to address the slope in there site management plan.
- Batter slopes are to be fenced at the top of batter during construction with high-visibility safety mesh fencing or high-visibility line flags.

9.1.3. 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 as much as possible. Full details of trenching are to be provided on drainage long sections at EPA Stage.

Specific design will be required around the construction of the take-off manhole given the depth of excavation required.

9.1.4. Drainage Networks Layout

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

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

- Location of manholes to provide for safe maintenance access.
- Locating manholes out of the future riparian margin to provide safe maintenance access. Only stormwater outlets will be located adjacent to the stream with the upstream manhole located on, or in close proximity to the future road reserves or pedestrian accessways.

9.2. Operations Considerations

The design has considered the following maintenance operations risks:

9.2.1. Safe Access for Maintenance

Manholes are generally located roads, to allow safe maintenance access.

Landscaped batters are no steeper than 1V:3H, providing a safe working slope for landscape operations.

Grassed slopes are no steeper than 1V:4H to ensure they are mowable.

9.2.2. Space for delivery vehicle to wait while opening gate

Space has been allowed for in the fencing design to allow delivery vehicles to wait clear of the roundabout while the gate is opened to the site.

9.2.3. Dry Basin

Dry basin is designed with batter no steeper than 1V:3H providing a safe working slope to access the basin inlet and outlet structures.

The standing water within the basin is designed up to 600mm during wet period to minimize the potential drowning hazard.

Maintenance access of the dry basin will be via a 3.5m wide formed concrete path.

9.3. Decommissioning Considerations

9.3.1. Disconnection from public network

The off-take manhole has been designed to be able to be quickly disconnected from the public Wastewater Transmission line. Removal of the Weir, and re-benching of the transmission manhole to remove the lead to the take-off manhole will allow the take-off manhole to be isolated from the public network. Following these works no further works are required on the public network to decommission the Milldale WWTP.

9.3.2. Removal of treatment plant

Construction materials selected for the treatment plant building will ensure easy/ safe dismantling and removal.

9.3.3. Hardstand and drainage lines

The hardstand and drainage materials have been designed to allow them to remain in place following the decommissioning of treatment plant. They will then be removed as part of the future civil works developing the site into an urban development. This allows efficiencies with providing suitable machinery to undertake the removal which will also be used as part of the civil construction works, as well as opportunities for reuse of the pavement and drainage materials.

9.3.4. Stormwater basin

The stormwater basin and associated drainage network has been designed so that it may be reused to provide detention for the future urban development of the site. The avoids further construction works being required to remove the basin.

10. CONCLUSION

Fulton Hogan Land Development (the Developer) is seeking consent to develop a temporary Wastewater Treatment Plant at Milldale to service their adjoining Milldale development should capacity be reached at the downstream Army Bay Treatment Plant.

An upgrade is planned for the Army Bay Treatment Plant, due to be completed in 2031. Once the upgrade is completed the Temporary Milldale treatment plant will be able to be decommissioned.

This Infrastructure Design Report explains proposal for the temporary WWTP. The report identifies the existing site constraints, the surrounding development works and the proposed design for the WWTP including the diversion of flows from the existing Wastewater Transmission main. It also covers the decommissioning of the plant once the Army Bay Treatment Plant upgrade has been completed.

The report has not identified any constraints for the development of the site as a Temporary WWTP and supports the application for resource consent for the project.

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