

GWE

CONSULTING ENGINEERS

ENGINEERING INFRASTRUCTURE REPORT

224 Great South Road
Remuera, Auckland

URBAN RESORT LTD

April 2021 | V3



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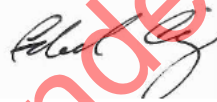
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1 INTRODUCTION

GWE Consulting Ltd (GWE) has prepared this Engineering Infrastructure Report as part of a Due Diligence process for the proposed development at 224 Great South Road, Remuera Auckland (the site of the former Laura Fergusson Trust, a disability rehabilitation centre), for Jim Castiglioni (on behalf of Icon Co Pty (NZ) Limited) as our client. This is in accordance with our letter of engagement, dated December 2020.



Figure 1: Aerial Image of the Site, 224 Great South Road

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

This report provides an assessment of the potential serviceability for the property with respect to the following:

- Water supply and firefighting water supply
- Stormwater
- Wastewater
- Site Investigation

- Contaminated Land Investigation
- Geotechnical Investigation

2 SITE DESCRIPTION

The subject site, which has its main address as 224 Great South Road, Remuera is a collection of properties that include 49-51, 53 and 53A Omaha Road which have the legal descriptions of Lot 1 DP 146628, Lot 4 Deeds Reg 308, Lot 5 Deeds Reg 308, Lot 2 DP 146628, Lot 2 DP 53665 and Lot 3 DP 53665, respectively. The total area of the site is 14,686 m².

The site wraps around the corner of Great South Road and Omaha Road and is situated approximately 500 m to the south-east of the Remuera Railway Station. Refer to Figure 2 below for the site location plan.

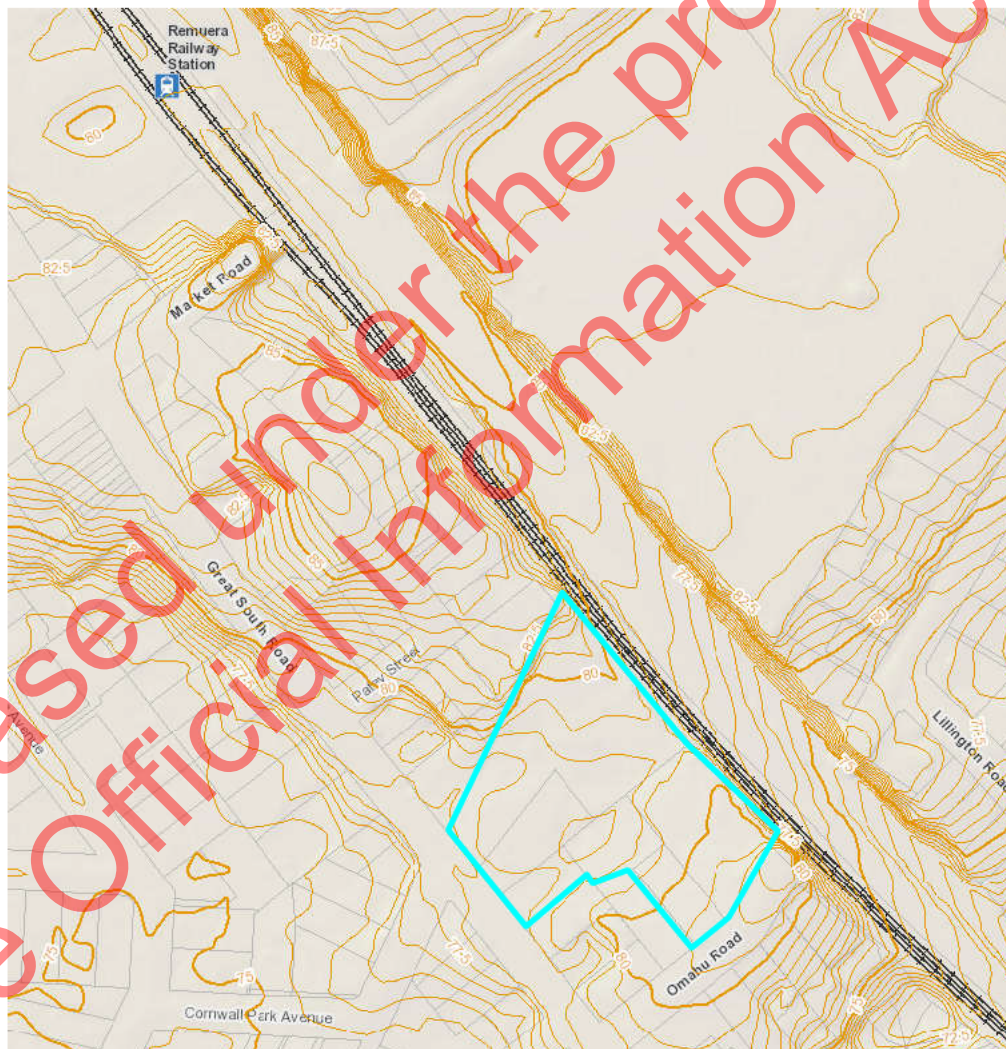


Figure 2: Site Location Plan

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

The site, bordered by residential properties to the north and south (some of which are being used for small businesses) and to the east by the North Island Main Trunk railway line and the Southern Motorway and to the west by some retail shops and visitor accommodation on Great South Road and residential properties beyond.

The terrain is generally regarded as level, with levels across the site being mainly between the 79 and 80 m amsl contour.

3 SITE SERVICING

The existing public water supply, wastewater and stormwater utility network assets are shown on Auckland GeoMaps. The site is indicated to be within close proximity to the required three water services. Figure 3 provides a plan showing the services around the site.

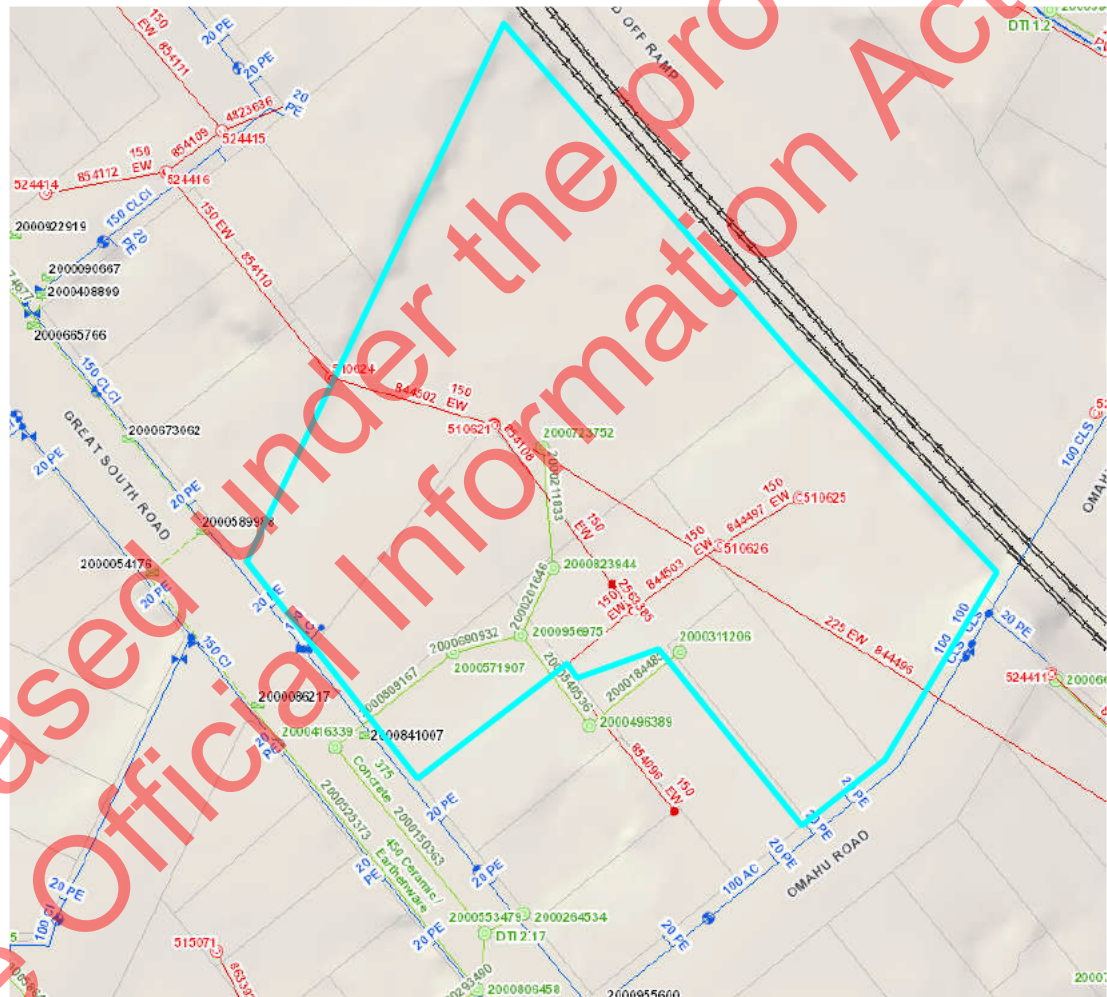


Figure 3: Site Servicing Plan

Note: Public water supply shown in blue, public wastewater in red and public stormwater in green

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

4 PROPOSED DEVELOPMENT

GWE has been provided with concept master plan drawings of the proposed development, prepared by Warren and Mahoney. Based on the drawings, GWE understands that all existing buildings and site features that comprised the Laura Fergusson Trust Rehabilitation Centre, are to be demolished and removed.

The proposed development will comprise 7 medium rise apartment buildings (A to G) that will incorporate 4 commercial/hospitality areas and be constructed around a central park and two pocket parks, all interconnected by laneways and mews. The main pedestrian and service vehicle entrance will be from Great South Road.

The development will be constructed over a single level basement car park and an at ground level, podium car park that will be accessed from the basement car park. The podium carpark will create the base for the central park area above. Access to the basement car park will be from Omaha Road. The proposed site plan is shown in Figure 4 below.



Figure 4: Proposed Site Plan

Source: Master Plan – Landscape, by Warren and Mahoney, dated 14 April 2021

5 WATER SUPPLY

5.1 Existing Public Water Supply Network

The site is currently serviced by a 100mm dia. AC connection off the 150mm dia. CLCI main located in the footpath on the eastern side of Great South Road. Other connections to the site include a 20mm dia. PE connection to 224 Great South Road and separate 20mm dia. PE connections to 49-51, 53 and 53A Omaha Road. Refer to the water supply servicing plan in Figure 5.



Figure 5: Water Supply Network Plan

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

5.2 Proposed Water Connection

It is proposed to provide a bulk meter to the site off the existing 100mm dia. AC connection and for the site to be reticulated with a private water supply network. The apartment buildings and tenancies will be individually metered, via meter banks, by the body corporate/management company that will be established for the development.

It is proposed to disconnect all other existing connections to the site.

All works are to comply with Watercare Water and Wastewater Code of Practice and the New Zealand Building Code G12: Water Supplies. An assessment was undertaken to determine the peak water demand for the proposed development. Refer to Appendix A for the supporting calculations. Table 1 summarises the demand.

Table 1: Peak Water Demand

DESIGN PARAMETER	PRE – DEVELOPMENT	POST – DEVELOPMENT
AVERAGE DAILY DEMAND	0.66 L/s	1.66 L/s
PEAK DAY DEMAND	1.33 L/s	3.33 L/s
PEAK HOURLY DEMAND	3.32 L/s	8.31 L/s

From Table 1, the total existing peak daily water demand is 0.66 L/s which increases by 1.00 L/s post development to 1.66 L/s. The existing peak hourly water demand is 3.32 L/s which is estimated to increase by 4.99 L/s to 8.31 L/s. The existing public water supply network is anticipated to be able to provide the required peak water demand for the demand. As part of further work, a flow test will be undertaken to confirm the available flow capacity of the public water main. On site pressure boosting may be required if capacity issues are identified.

5.3 Firefighting Water Supply

From Auckland GeoMaps, there are six fire hydrants within close proximity to the subject site. The closest fire hydrant (GIS ID: 1093495) is located within the road reserve of Omaha Road, approximately 3 m from the site. The remaining five hydrants (GIS ID: 1093494, 1093493, 1081044, 1096878 and 1082624) are all located within 85 m from the site. Refer to Figure 6 below for fire hydrant locations.

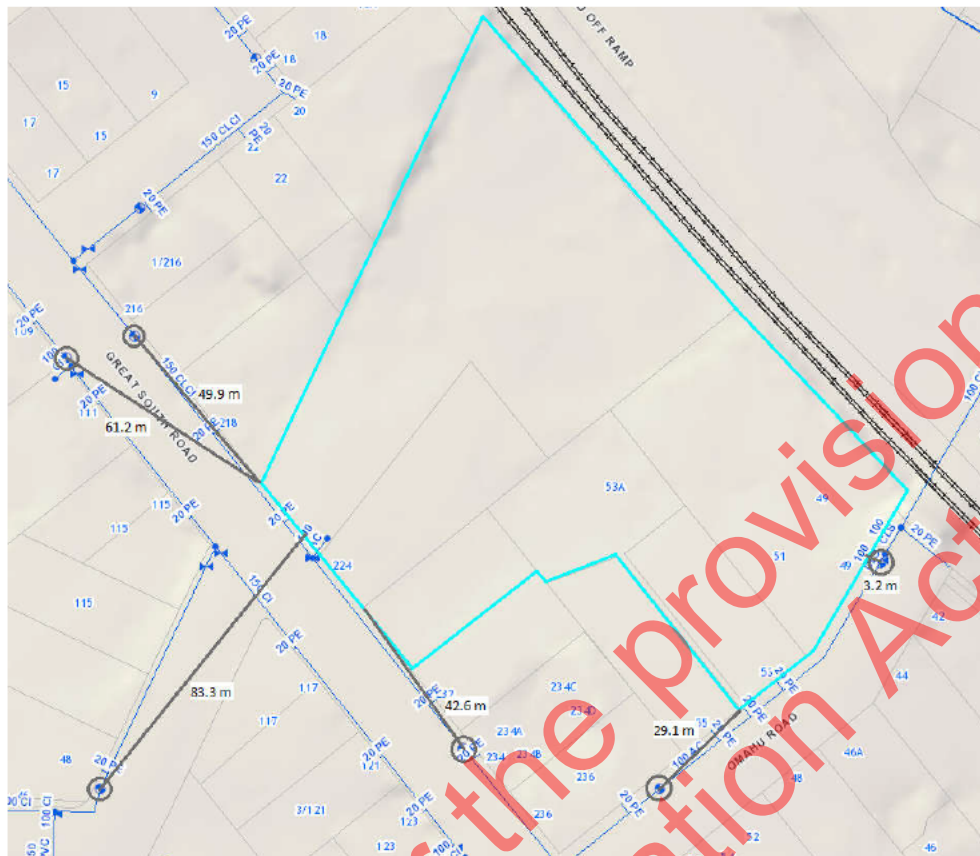


Figure 6: Fire Hydrant Locations and Proximity to the Site

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

The required firefighting water supply flow rate for FW2 (sprinklered buildings) is 12.5 L/s within a distance of 135 m, and another 12.5 L/s within 270 m, from a maximum of 2 fire hydrants (to be confirmed by the fire engineer). Based on the six available hydrants located within 85 m from the site, it is anticipated that firefighting water supply requirements can be met adequately. A watermain pressure test will be conducted to provide input data for the design of the fire protection system.

6 WASTEWATER

6.1 Existing Public Wastewater Network

There are 6 existing 150mm dia. public wastewater pipelines (GIS ID: 844502, 854108, 256385, 854107, 844503, 844497) and four existing public wastewater manholes (GIS ID: 510621, 510623, 510626, 510625) within the subject site. The existing wastewater lines discharge into an existing 225mm dia. earthenware (EW) wastewater pipeline (also partially within the subject site, GIS ID: 844496) to be ultimately discharged downstream into the trunk main. Figure 7 provides a plan showing the location of the existing wastewater assets nearby.

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

6.2.1 Overview

Furthermore, wastewater pipes and manholes will also be installed from the manhole at the south-western site boundary (GIS ID: 510622) to collect and convey the wastewater from the private properties (232, 234, 236 Great South Road; and 55 Omahu Road) next to the project boundary.

The alignment of the new wastewater assets within the proposed development have been developed to avoid crossing the basement car park and apartment building footprints to allow future accessibility. Refer to Figure 8 for a full plan of the proposed amendments to the wastewater network, and Figure 9 for the proposed wastewater connections overlaid onto the architect's plan for proposed Omahu Apartments development.

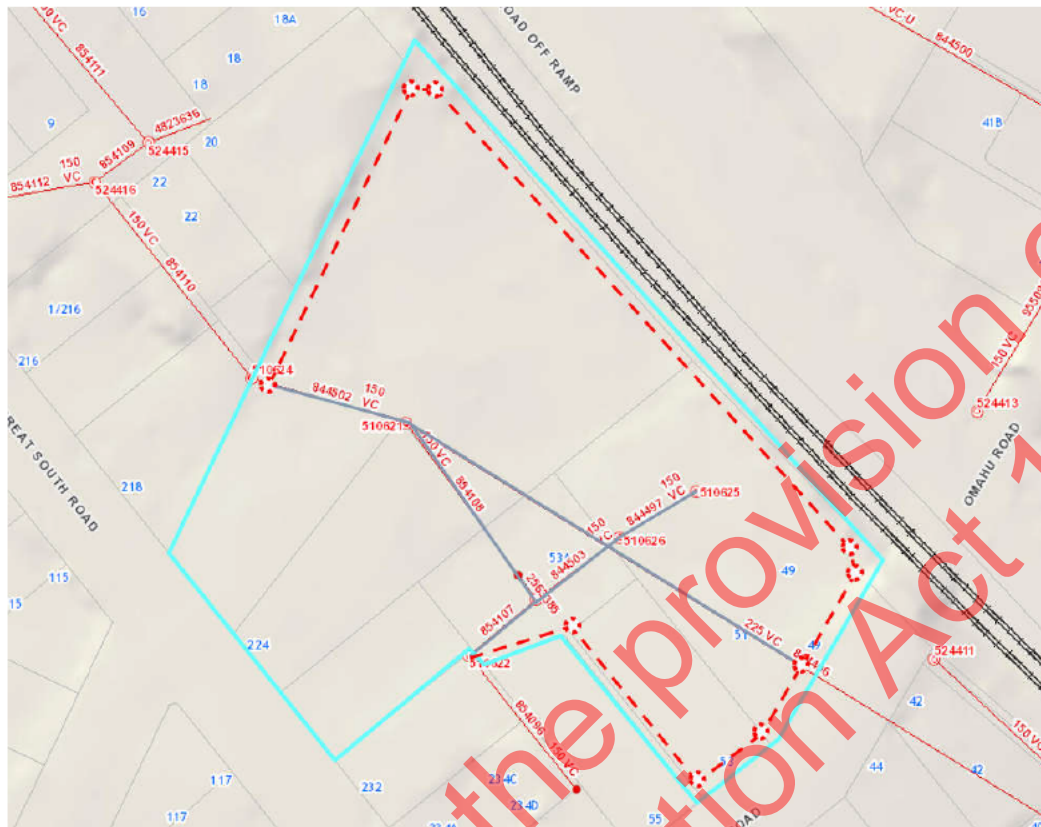


Figure 8: Proposed Amendment to the Wastewater Network

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>



Figure 9: Proposed Wastewater Connections in Subject Site

6.2.2 Network Capacity Assessment

A pipe capacity assessment was undertaken to determine if there is sufficient capacity within the downstream public network to cater for increased wastewater flow from the proposed development. The design Average Dry Weather Flow (ADWF) and the Peak Wet Weather Flow (PWWF) from the site summarised in Table 2 below.

Table 2: Summary of Wastewater Flows

STAGE	ADWF (L/s)	PWWF (L/s)
Pre-development	0.60	3.21
Post-development ^{Note1}	1.39	7.15
Increase between Pre and Post-development	0.79	3.94

Notes:

1. The post development flows have been estimated based on Warren and Mahoney's plans for the Omahu Apartment units, dated 14 April 2021.

The pipe capacity assessment is summarised in Table 3 and Table 4. Figure 10 provides a plan of the wastewater network pipes assessed for capacity downstream of the subject site through to the connection to the trunk main. The supporting calculations are included in Appendix A for reference.

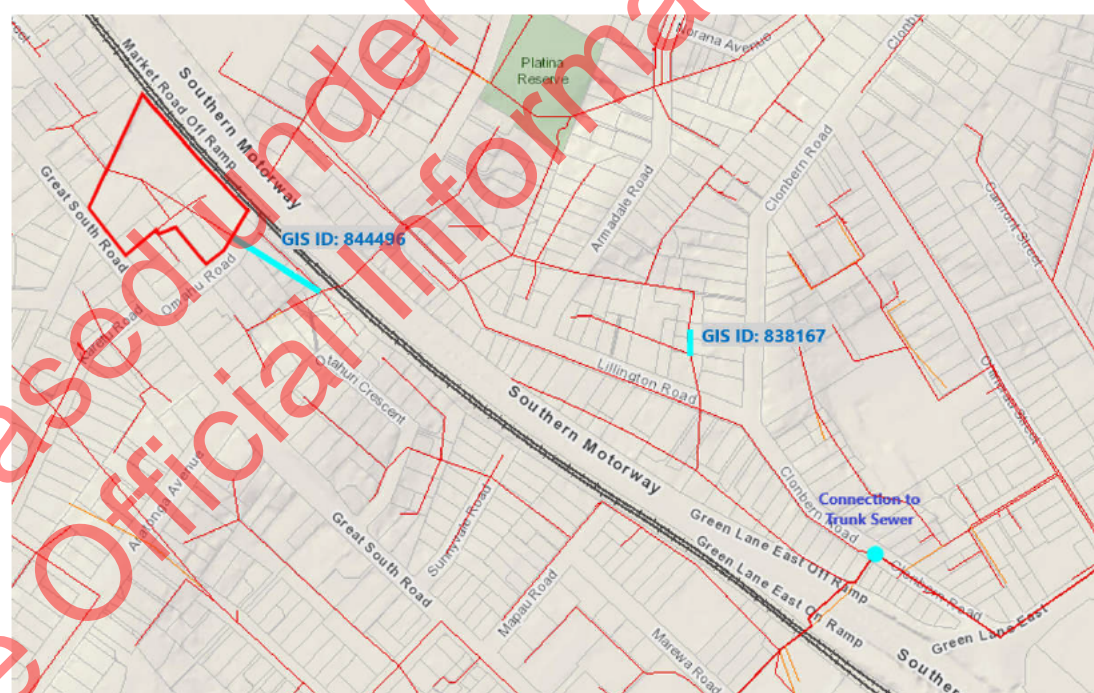


Figure 10: Connection Point of Local Network to Transmission Network

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

Table 3: Summary of Wastewater Pipeline Capacity Assessment – Pre-Development

PIPE	CAPACITY (L/s)	PRE- DEVELOPMENT PWWF (L/s)	RESIDUAL PIPE CAPACITY (L/s)
Existing Downstream Wastewater Pipe (225mm dia. GIS ID: 844496) ^{Note1}	12.88	5.22	7.66
Wastewater Pipe (300mm dia. GIS ID: 838167) ^{Note2}	6.24	23.23	-16.99

Notes:

1. Pipe (GIS ID: 844496) is the first downstream pipe the subject site flows will discharge into.
2. Pipe (GIS ID: 838167) is the last pipe before WW flows combine with sewer flows to enter the trunk main.
3. GIS 838167 pipe grade is assumed to be the minimum allowed grade as per Watercare Wastewater CoP 5.3.5.5 Table 5.4.

Table 4: Summary of Wastewater Pipeline Capacity Assessment – Post Development

PIPE	CAPACITY (L/s)	POST- DEVELOPMENT PWWF (L/s)	RESIDUAL PIPE CAPACITY (L/s)
Existing Downstream Wastewater Pipe (225mm dia. GIS ID: 844496) ^{Note1}	12.88	9.16	3.73
Wastewater Pipe (300mm dia. GIS ID: 838167) ^{Note2}	6.24	27.16	-20.93

Notes:

1. Pipe (GIS ID: 844496) is the first downstream pipe the subject site flows will discharge into.
2. Pipe (GIS ID: 838167) is the last pipe before WW flows combine with sewer flows to enter the trunk main.
3. GIS 838167 pipe grade is assumed to be the minimum allowed grade as per Watercare Wastewater CoP 5.3.5.5 Table 5.4.

Table 4 shows that there is sufficient capacity in the 225mm dia. EW wastewater pipe directly downstream of the subject site to accommodate both the pre and post-development PWWF.

Assessment results also show that there is insufficient capacity in downstream the 300mm dia. EW wastewater pipe (the last pipe before the wastewater flows connect into a combined wastewater + stormwater pipe before entering the trunk main) to accommodate the post-development PWWF. However, Table 4 shows that the 300mm dia. EW wastewater pipe already cannot carry the existing pre-development PWWF. The increase in PWWF from the subject site from pre-development to post development by 3.93 L/s (shown in Table 4) is minor compared to existing under capacity levels (-16.99 L/s).

We intend to work with Watercare Services to develop a solution to overcome the constraints within the network.

7 STORMWATER

7.1 Existing Public Stormwater Network

As indicated by Auckland GeoMaps, there is an existing public stormwater network within the site that also collects stormwater from adjoining residential lots being 232 Great South Road and 53 and 55 Omaha Road. This small part of the network discharges through a 375mm dia. concrete pipe (GIS ID:2000809167) to a manhole located in Great South Road (GIS ID:2000416339). Refer to Figure 11 below for a plan showing the location of the stormwater assets.



Figure 11: Stormwater Network Plan

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

7.2 Proposed Stormwater Connection

7.2.1 Overview

Part of the existing stormwater network within the site will be abandoned and decommissioned. A new pipe will be laid from existing pipe (GIS ID: 2000540536) via a new manhole and traverse along the southern and western boundary to connect to existing pipe (GIS ID: 2000809167) via another new manhole. This pipe will service the development and provide continuity of service to properties at 232 Great South Road and 53 and 55 Omaha Road, without the need to obtain neighbour's approval.

From the proposed manhole on existing pipe (GIS ID: 2000540536), a new private stormwater network shall extend into the development to service each building and the laneways, mews, plaza and landscaped areas. Refer to Figure 12 for a full plan of the proposed amendments to the stormwater network. Engineering Plan Approval (EPA) from Auckland Council will be needed prior to commencing any work on the Council stormwater pipe. All works are to comply with Auckland Council Code of Practice and the New Zealand Building Code E1: Surface Water.

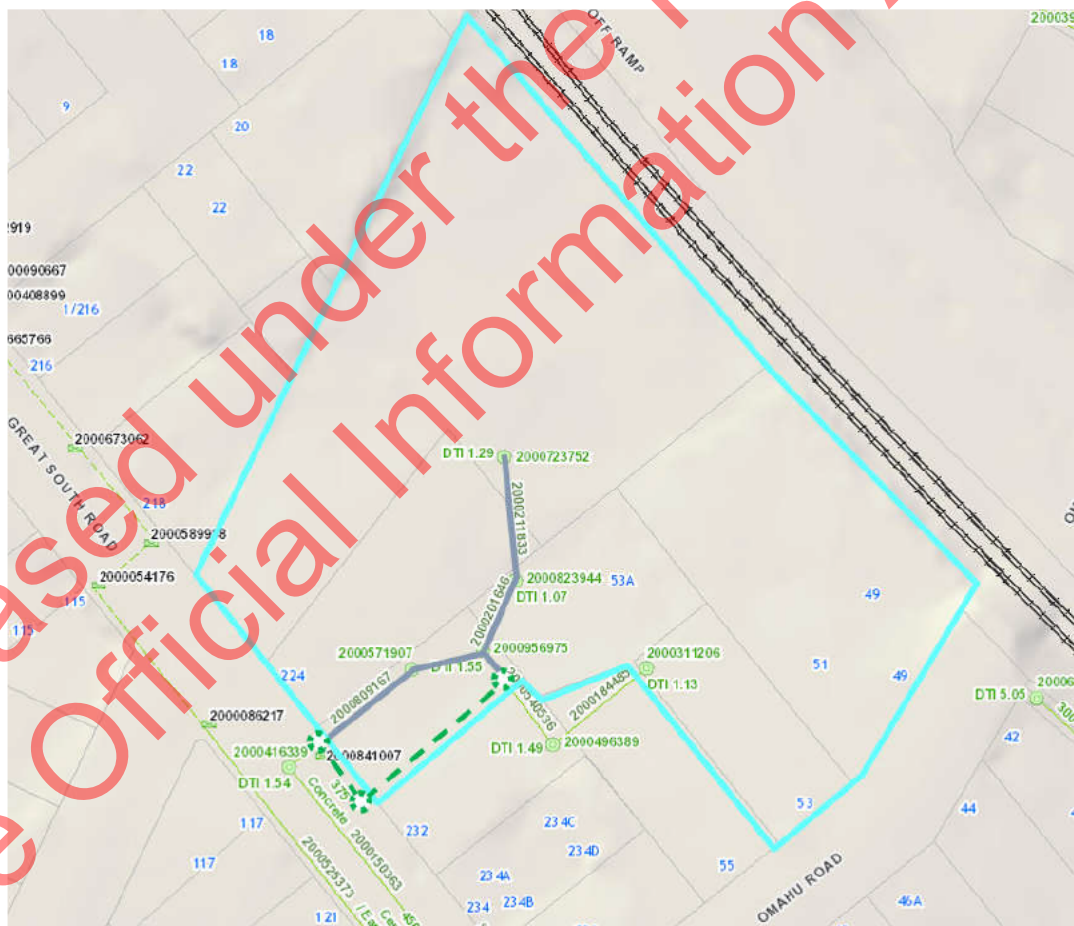


Figure 12: Proposed Amendment to the Stormwater Network

Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

Auckland Council GeoMaps indicates that there are residential sites downstream of the subject site that are at risk of flooding. The existing development within the site has a reasonably high percentage of impervious area, see Figure 1, Aerial Image of the Site, 224 Great South Road. The proposed development also has a similar percentage of impervious area, compare with Figure 4, Proposed Site Plan. Peak flow attenuation will limit flows to predevelopment conditions.

In addition, there is a design commitment to water sensitive design for the development where retention and detention of stormwater run-off from impervious areas is being considered with the use of rainwater tanks, raingardens and pervious paving, where long term functionality can be demonstrated:

- Laneways and plaza areas, any collected stormwater will occur for re-use as irrigation for rain gardens, tree pits and general irrigation of landscape areas; and
- Roof areas, any collected stormwater will occur and be treated to potable standard and be used to supplement the potable supply.

By implementing a water sensitive design for the development including rainwater tanks, raingardens and/or permeable paving areas, the total run-off from the site will likely be less than that occurring from the existing development and could reduce capacity issues on the downstream public stormwater network.

7.2.2 Runoff Water Quality

There are no designated open, above ground car parking areas proposed for the development and stormwater run-off water quality will not be compromised by a contaminant load for vehicles visiting the development.

7.2.3 Overland Flow Paths

There are two minor overland flow paths (OLFP) within the site. The northern OLFP is created by a very small catchment and its outlet point from the site will remain unchanged. The central OLFP has a small catchment and its alignment will be moved towards the southern boundary, to align with the accessway to the site. This minor alignment change will have no off-site effects.

7.2.4 Post Development Infrastructure

The post development stormwater infrastructure constructed as part of the development will be as follows:

- Reuse Tanks – stormwater management providing retention (through reuse) and detention to mitigate runoff (to be designed at Building Consent Stage).
- Pervious Paving – Providing retention and detention to mitigate runoff generated by the previous sections of laneways and plaza areas.
- Raingardens – Providing retention and detention to mitigate runoff generated by the impervious sections of laneways and plaza areas.
- Primary pipe network conveying runoff from the development up to the 10% AEP rain event.

- Secondary overland flowpath network to safely drain flows up to the 1% AEP rain event through the development.

In summary the proposed stormwater management infrastructure meets the hydrology mitigation requirements of the AUP:OP and in addition could provide some attenuation of site discharges up to the 10% AEP event by implementing a water sensitive design.

8 UTILITY SERVICES

Following detailed design for the utility services extensions, loadings will be provided and contact will be made with utility suppliers to confirm there is adequate capacity. Any changes/additions if required to service the development will be addressed at detailed stage through liaison with the suppliers.

8.1 Gas Supply

Vector has provided plans of the gas reticulation in the area and has confirmed there is a live connection to the site, a medium pressure MP4 pipe. Details of the reticulation within the site are currently unknown.

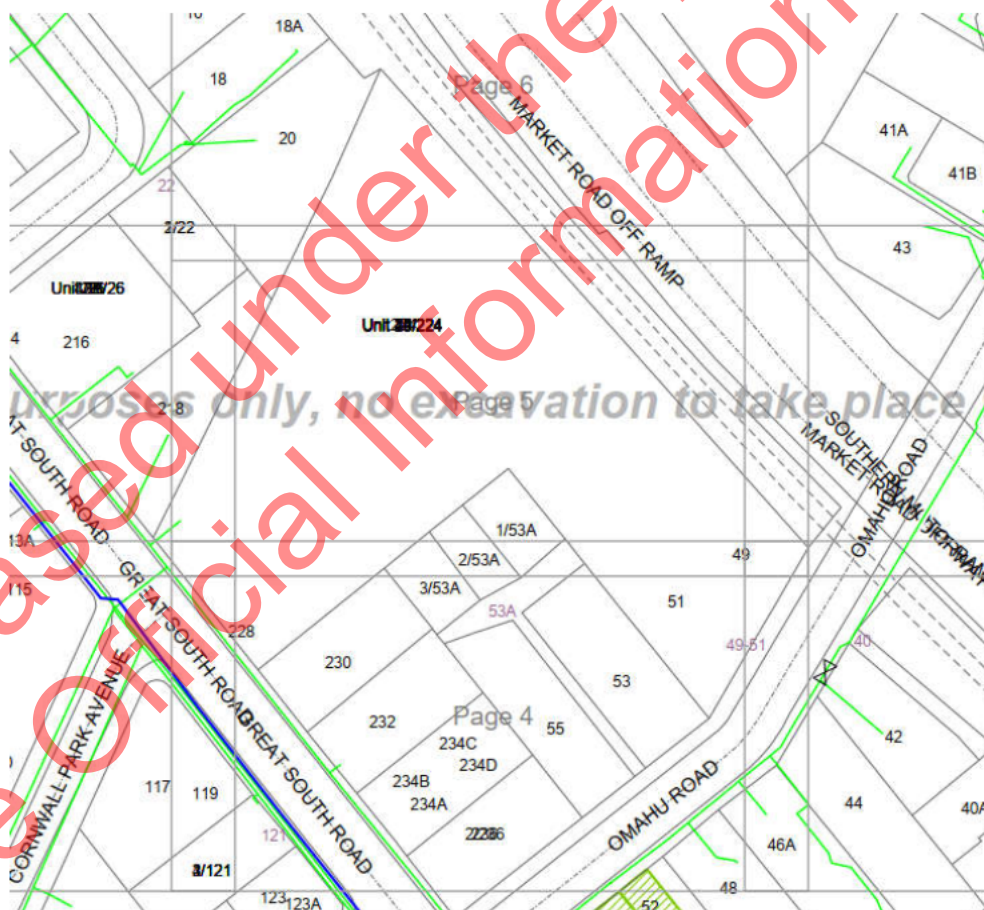


Figure 13: Gas Supply Plan

Source: Vector

8.2 Power Supply

Vector has provided plans of the electricity reticulation in the area and has confirmed there is a live 22 kV cable and transformer and low voltage cabling on site. Details of the reticulation within the site are currently unknown.

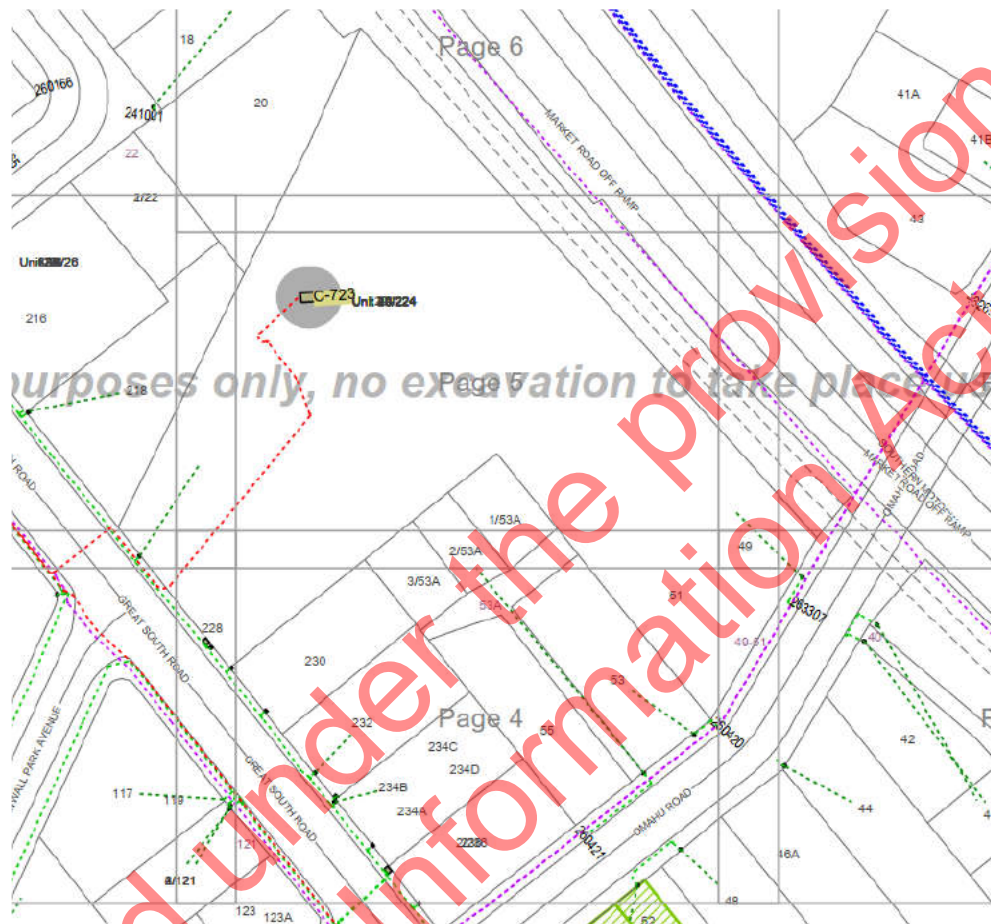


Figure 14: Electricity Supply Plan

Source: Vector

8.3 Telecommunications and Fibre

Vector has provided plans of the underground UFB and overhead copper lines reticulations in the area and has confirmed there is UFB in the footpath on the eastern side of Great South Road. Details of the underground and overhead reticulations within the site are currently unknown.

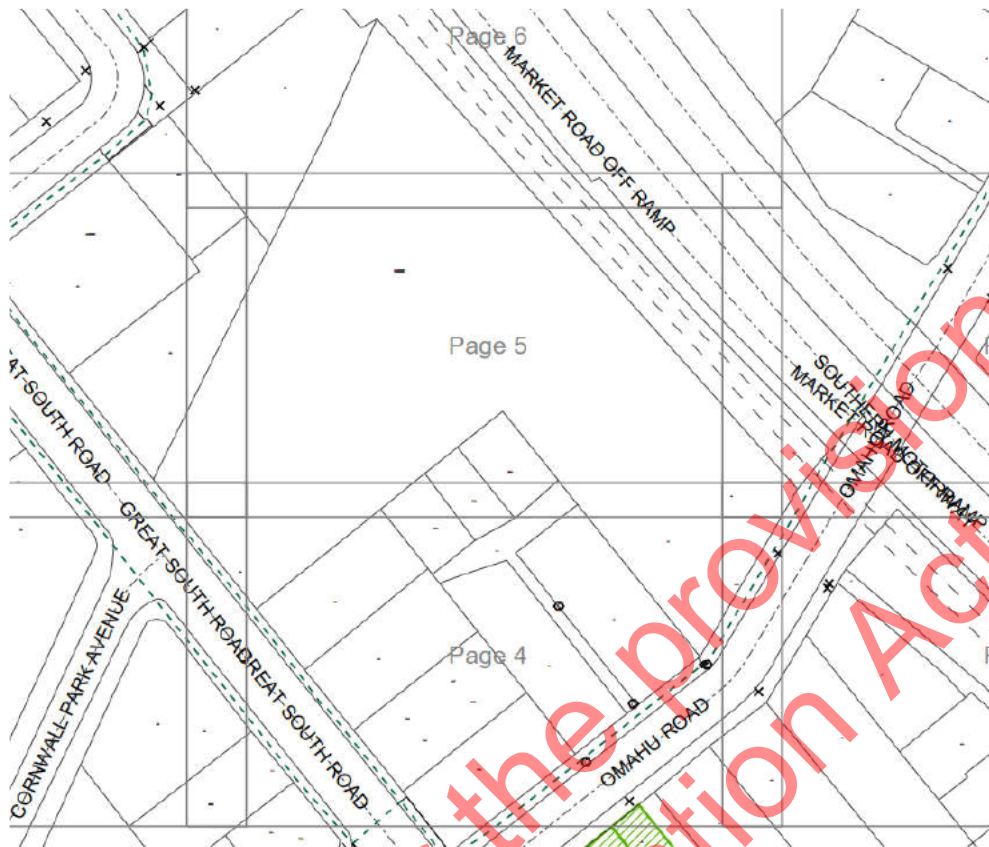


Figure 15: UFB and Telecommunications Plan

Source: Vector

9 REVIEW OF CONTAMINATED LAND REPORT

The scope of works comprises the professional peer review of an existing Preliminary Site Investigation and Detailed Site Investigation (PSI/ DSI) report prepared by Engeo Ltd (Engeo) with preliminary recommendations to determine a scope of works to achieve Resource Consent and possible remediation solutions. The Engeo PSI/ DSI report, (Ref. 15627.000.000_04, dated 7 February 2019) should be read in conjunction with this Section. This review was carried out by Edward Collings, Contaminated Land Specialist and Geotechnical Engineer, GWE Consulting Engineers.

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES:CS) Regulations 2011 provide a methodology for identifying and managing potential contaminants in soils because of current, or historical activities. Potentially contaminative activities are group by land use on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL), 2011.

Regulation 5, Subclause (2) to (6) of the NES:CS defines activities which trigger a contaminated land assessment when proposed within the footprint of a piece of land which has current, previously, or more likely than not been subject to an activity defined by the HAIL. These comprise the removal of a fuel storage system, sampling soil, disturbing soil, subdivision, or a change of use.

The Ministry for the Environment Contaminated Land Management Guidelines 2011 (CLMG) provide guidance to professionals for the assessment of contaminants in soil. The available Engeo report has been assessed in general accordance for suitability to CLMG No. 1¹.

9.1 Engeo Desktop Study Review (PSI)

The PSI/ DSI report included a desktop study which provided information on setting, identification of current exposure scenarios, geology, and an assessment of site history from aerial photographs, an Auckland Council Site Contamination Enquiry, the Property File and Certificates of Titles. A site walkover survey was also undertaken on 7th December 2018, by Engeo.

The Engeo desktop study generally identified changes in land-use over time including a former (from 1940) land-use of residential and possible market gardens being redeveloped for the Laura Fergusson Trust facility in the 1970s with demolitions and additions over time to present day. Surrounding the site, mixed land uses were historically noted including railroads, pasture or possible horticulture, replaced over time by residential or commercial properties. The Southern Motorway also bounds the site from the 1960s.

As a result of the evidence reviewed, Engeo determined that 'activities listed on the HAIL may have been historically and/ or are currently present at the site'. The possible HAIL activities and associated potential contaminants were summarised as:

- **HAIL A10: Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.**
Organochlorine pesticides and metals.
- **HAIL E1: Asbestos product manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition.**
Assigned due to the age of site buildings as 'likely' including Asbestos Containing Materials (ACMs) in adjacent soils.
- **HAIL I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.**

This was assigned to the potential for lead-based paint on the existing buildings which has the potential to leach/ flake and contaminate surrounding soils.

Based on this Engeo determined that a DSI was required to quantify the level of contamination in surface soils at the site.

¹ Ministry for the Environment, Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, Revised 2011.

It is considered that the Engeo desktop study includes a satisfactory level of investigation to provide preliminary recommendations as to the applicability of the NES:CS and HAIL to the site. The report has been prepared in general accordance with CLMG No. 1. However, it is typical that Council require a PSI/ DSI report specific to the proposed development, see GWE recommendations in this Section.

9.2 Engeo Contamination Site Investigation Review

An intrusive sampling investigation was undertaken by Engeo in December 2018, according to Table 7 of the Engeo report with two purposes; to investigate surface soils within an area of former horticulture with a suite of heavy metals and organochlorine pesticides. Secondly to investigate surface soils for potential impacts to soil from lead-based paints and asbestos building materials. Semi-quantitative asbestos analysis was adopted in the investigation.

For a due diligence investigation, the intrusive investigation conducted by Engeo is considered adequate. Principally, that the number of sampling points is adequate in accordance to Appendix B of CLMG No. 5². However, it is prudent to note that when assessing surface soils only while the horizontal delineation of contaminants can be accurately identified, no vertical delineation of contamination is possible.

It is agreed that the potential contaminants will be restricted to the surface or shallow soils (generally up to 0.5 m below ground level). Depending on the adopted risk profile, an additional sub-surface sampling investigation would provide a more accurate estimation of the volume of contaminated soils. Should contaminated soils be retained on site through in-situ remediation accurate vertical characterisation will be critical.

Multiple exposure scenarios were adopted for assessment of human health, however a clear justification of where these apply to the site were not given. This is considered appropriate for a due diligence assessment, however for Resource Consent application a clear assessment assignment of exposure scenarios to the site must be applied.

For this review and conceptual advice, we have based our assessment on the high-density residential exposure scenario to provide the most realistic assessment against the proposed master plan concepts. This is considered most appropriate when determining the human health risk to residents within multiple storey apartment complexes and generally impermeable surfaces with little human/ soil interaction.

9.3 Review of Analytical Results

In the context of a (NES:CS) high-density residential exposure scenario and BRANZ in relation to human health assessment, the Auckland Unitary Plan for environmental discharge assessment and natural background levels, the Engeo PSI/ DSI report identified:

² Ministry for the Environment, Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (Revised 2011).

- Lead exceeded the high-density residential SCS in eight samples.
 - From the available results, we understand there are **seven** sample points above the NES:CS exposure scenario. SS12, SS13, SS14, SS16, SS17, SS18 to the southern portion and SS27 at the eastern boundary.
- Nine soil samples contained lead above the AUP discharge criterion.
 - Comprising the above samples with the addition of HS03 and SS39 to the northern corner of the site.
- Most samples contained lead above the regional background concentrations. Arsenic and edosulfan I (organochlorine pesticide) above the regional background concentration within the area of former market garden.
- Asbestos detected in two samples above the human health exposure criteria.
 - SS8, SS18 and SS20. The latter of which included significant asbestos in soil concentrations.

In general, areas of contamination exist at the site above appropriate to the anticipated final land use. As such it is recommended that the Engeo sampling investigation is built upon for Resource Consent application with the purpose of:

- Confirming the depth of identified contamination (within the scope of a Remediation Action Plan).
- Confirming the scope of remediation by leachability analysis for any soils destined for off-site disposal (within the scope of a Remediation Action Plan).
- Confirmation of the contaminants of concern within the footprints of existing structures and impermeable surfaces (once demolition and clearance facilitates).

For due diligence, the Engeo investigation is adequate. However, the additional sampling will be required to enable Resource Consent and subsequently will reduce undue risk on the proposed development.

9.4 Regulatory Assessment

The recommendations of the Engeo PSI/ DSI are appropriate to the proposed masterplan. Summarised as follows:

- Provided a Remediation Action Plan is prepared and submitted for Resource Consent, the proposed development is a Restricted Discretionary activity according to the NES:CS. A consent is required.
- Depending upon proposed disturbance volumes (of contaminated materials) the activity may be either a permitted or restricted discretionary activity in accordance with the AUP.
 - Should contaminants remain on-site following redevelopment, a long-term environmental discharge consent and monitoring is likely to be required.
- Due to widespread concentrations above natural background levels, excess surface soils cannot be considered 'cleanfill' for the purpose of disposal and/ or reuse at another site according to the definitions of the AUP.

- Where contaminants are either at or below background levels (defined by additional sampling), such as at depth the definitions of cleanfill are most likely met.

9.5 Conclusions and Recommendations for Development

In general, the Engeo PSI/ DSI is appropriate for its purpose of due diligence and goes makes good progress towards characterising the surface horizons. The identified contamination and required works can be summarised as follows:

- Evidence of potential activities defined by the HAIL were identified across the site.
- The sampling investigation outlined areas of unacceptable contamination levels.
- Further delineation of contamination would reduce the risk of encountering unexpected contamination, confirm the volume of contaminated material and possibly determine the depth to cleanfill material or contaminants at the depth of proposed excavations.
- To achieve Resource Consent a Remediation Action Plan is required which would be a suitable time to undertake additional delineation and leachate sampling.
- To prepare the above report, careful consideration of proposed earthworks is critical. In particular:
 - An in-situ remediation option such as capping, blending/ mixing or stabilisation may be suitable for a net balance earthworks programme.
 - Excess earth to be removed from the site requires further clarification to determine disposal routes. Surface horizons (up to 0.5 m below ground level) will most likely require disposal at a suitable landfill. Soils beneath this could potentially meet the requirements of cleanfill.
- Any ground remediation will require suitably controlled monitoring and validation by a Contaminated Land Specialist.

10 REVIEW OF BUILDING MATERIALS SURVEY

At the time of writing an asbestos survey of the existing buildings was available, prepared by Engeo. Progressive Risk Management Ltd (PRM) undertook a gap analysis and peer review of this work under subcontract to GWE. The PRM report is presented as Appendix B to this report.

11 REVIEW OF GEOTECHNICAL REPORT

In January 2019 Engeo undertook a geotechnical assessment of the site for the purpose of due diligence, broadly characterise the subsurface conditions and to identify geotechnical constraints that may affect future developments on the site.

Similar to the contaminated land report, the geotechnical works undertaken form a preliminary site assessment and additional geotechnical investigations will most likely be required to achieve Resource and Building Consents. At the time of the Engeo investigation, the proposed architectural concepts presented to GWE were not available.

This review was carried out by Edward Collings, Contaminated Land Specialist and Geotechnical Engineer, GWE Consulting Engineers.

11.1 Geology

The Engeo geotechnical report provided a detailed overview of the regional geology and seismicity to the site. In summary, the review highlighted:

- Geological mapping indicates the site to be directly underlain by Auckland Volcanic Group (AVF) deposits, typically basalt rock and tuff soils. East Coast Bays Formation (ECBF) sediments are understood to underlie the site at depth.
- No active faults were recorded on-site. The nearest active fault is located approximately 22 km southeast of the site. Three inactive faults were recorded within 15 km of the site.
- The Engeo report states 'although the AVF is thought to have a high risk of [volcanic] eruption, it is generally considered to have a low occurrence. Based on the number and frequency of past eruptions it is estimated there is approximately a 1 in 1000 (0.1 %) chance an eruption could occur in any one year'.
- No obvious signs of geomorphic, geological or geotechnical changes are visible from an aerial photograph review.

No further statements are made in the assessment report regarding active faults or volcanic eruptions.

11.2 Engeo Ground Investigation

The Engeo ground investigation comprised:

- Ten hand auger boreholes with regular in-situ field vane testing to a maximum depth of 5.0 m below ground level (bgl).
- Two machine boreholes with regular Standard Penetration Testing (SPT) to a maximum depth of 21.5 m bgl, and;
- Six scala penetrometer tests to 1.0 m bgl.

Upon completion of fieldworks, a single disturbed soil sample was submitted for shrink-swell laboratory analysis.

11.3 Ground Conditions

The Engeo geotechnical assessment highlighted that the site is underlain by a sequence of two differing soil types (AVF and ECBF), broadly typical of the geology described within the published geological map for the area. A summary of the recorded strata properties are presented as Table 5, reproduced from Table 1 of the Engeo geotechnical assessment.

Table 5: Summary of Engeo Ground Investigation

LAYER DEPTH AND RANGE (M)	MATERIAL DESCRIPTION	MATERIAL STRENGTH
0.0 to 0.2	Topsoil	Not assessed
0.2 to 2.3	Auckland Volcanic Field¹ Layered silty clay and clayey silt with trace gravel (basalt)	Very stiff to hard
2.3 to 14.5	East Coast Bays Formation Soil Predominantly silty clay and layers of clayey silt and sandy silt	Very stiff to hard
9.5 – 14.5 to 15.5 – 19.5	Transition Zone Silty clay	Hard (SPT 'N' >50)
9.5 – 15.5 to 21.5	East Coast Bays Formation Rock Layered siltstone and sandstone	Extremely weak to very weak

Note:

*Fill material encountered in HA07, HA08 and HA10.

11.4 Groundwater Conditions

Groundwater monitoring standpipes were installed within each of the machine boreholes. However, the Engeo report states that the standpipe piezometers had not been dipped for groundwater levels prior to issue. At the time of drilling, three hand auger boreholes³ encountered groundwater ranging between 2.8 m and 3.6 m bgl.

In assessment of groundwater levels for Resource Consent, in accordance with Chapter E7 of the Auckland Unitary Plan (AUP), it is our understanding that Council will not accept groundwater measurements taken at the time of drilling. Particularly, Chapter E7 applies where a groundwater drawdown or groundwater take may occur, including static (long-term) and temporary, short-term events such as during winter or wet periods. This includes for

As such, it is recommended as part of Resource Consent that the site undergoes a period of groundwater monitoring to provide an assessment of groundwater levels and any associated fluctuations. The Engeo standpipe piezometers may still be accessible but should be supplemented within a development specific geotechnical investigation.

For concept planning, consideration to groundwater take and/ or drawdown must be made where proposed permanent excavations and/ or drainage (including retaining or basement wall drainage) intercepts the natural groundwater level. For master planning this can be generally expected between 2.8 m and 3.6 m bgl during summer months and may fluctuate and rise during winter or wetter periods.

³ HA02, HA04 and HA05.

11.5 Laboratory Analysis

A single (presumably disturbed) soil sample of the shallow clayey silt soils was submitted to an analytical laboratory for shrink-swell analysis within the Engeo assessment. The sample obtained from 0.2 to 0.7 m bgl recorded a moisture content of 40.2 % and a shrink-swell index of 4.2 %. However, it is stated within Appendix 5 that the Engeo laboratory does not currently hold ISO9001 accreditation for lab testing.

The result should be taken as a preliminary assessment of expansivity at the site and in Section 5.6 the soils are determined to be highly expansive. This should be confirmed within the scope of a detailed ground investigation at the time of Resource Consent and is a general requirement at the Resource Consent stage in accordance with the Auckland Council Geotechnical Code of Practice.

11.6 Preliminary Geotechnical Assessment and Recommendations

Recommendations presented within the Engeo report have been reviewed and developed according to the proposed development concept. A summary of preliminary geotechnical recommendations are presented below.

- Localised pre-existing fill was identified within the ground investigation adjacent to underground services, building footprints and landscaped areas. The possibility of further areas of localised existing fill cannot be ruled out, particular within the footprint of former structures or landscaping.
 - The appointed geotechnical engineer should evaluate the stripped subgrade across the site to assess the suitability for use or advise if undercutting with engineered fill is required.
 - In areas of shallow foundations or roading and pavements existing non-engineered fill is considered unsuitable and should be undercut and replaced with suitably selected engineered fill.
 - Around existing services, any localised fill may be deep and require a bridged pile design to minimise structural deformation.
 - A development specific geotechnical investigation is required at the Resource Consent stage which may outline additional areas of pre-existing fill.
- Minimal earthworks were expected by Engeo due to site topography. Future earthworks should be conducted in accordance with NZS4431 and under the observation of a geotechnical engineer. Stiff to hard silty and clayey soil was encountered in the upper 10 m of the ground surface. These materials are generally suitable for handling and compaction using conventional earthworks plant.
- It is recommended that the stability of land at the northern boundary should be specifically assessed. In this area land slopes steeply down to the railroad. A form of boundary stabilisation may be required in this area to protect building footprints.
 - In this area foundations may be required to extend below the zone of influence of the steep slope.

- The groundwater level at the site is approximately 2.8 m bgl. If future developments at the site incorporate a one-level basement, de-watering is likely to be required during excavations. In this scenario a Consent under E7 of the Auckland Unitary Plan can also be anticipated.
 - It is understood that car parking is proposed above the existing ground level. Where the groundwater table is intercepted, specific geotechnical analysis of the effects on neighbouring buildings and infrastructure including the railroad can be anticipated. For simplicity of Consenting, excavations above the groundwater table should be considered.
 - The groundwater table levels should be specifically assessed within a development specific geotechnical investigation. Groundwater monitoring wells shall be installed across the site, monitored during both dry (static) and wet events. Groundwater details shall be recorded over the anticipated pile depths to enable a suitable construction methodology.
- The potential for liquefaction at the site is low due to the cohesive nature of the underlying soils. Specific liquefaction assessment is not required.
- Shrink-swell testing indicates a preliminary expansive soils site classification H1 in accordance with AS2870. The development specific geotechnical investigation shall provide an undisturbed sample for laboratory analysis and confirmation of site subsoil expansivity class.
- Shallow foundations are considered suitable for typically light-weight timber framed buildings of two to three storeys in height. For mid and high-rise building development (appropriate to the proposed development), deep foundations are likely to be required.
 - However, shallow foundations may be suitable for localised decking, outbuildings etc.
 - Shallow foundation design should be undertaken in accordance with AS2870 by a suitably experienced Chartered Professional Engineer. An unfactored Ultimate Bearing Capacity of 300 kPa will likely be available within the undisturbed clay and silt materials.
- Deep foundations should extend down to the underlying ECBF rock, encountered at approximately 15 m to 20 m bgl from south to north across the site. Potential deep foundation solutions include screw piles, driven, bored or Continuous Flight Auger (CFA) concrete piles.
 - Careful consideration must be given to the most appropriate piling type. For example, bored and cast piles will most likely require additional measures such as de-watering and casing to avoid collapse in identified sand layers at depth (approximately 14 m bgl).
 - Additional deep geotechnical investigation should be undertaken for any future development requiring deep foundations.

- Engeo highlighted that at preliminary assessment stage, the site was not considered to be subject to erosion, significant subsidence (including liquefaction), falling debris, slippage or inundation by soil or rock in accordance with the provision of Section 106 of the RMA.
 - This is considered suitable as a preliminary assessment. However, a development specific geotechnical investigation will undertake an assessment of geotechnical hazards. Particularly in relation to the stability of the site close to the northern boundary.

To enable Resource Consent, it is recommended that the development specific geotechnical investigation detailed above is undertaken at an early stage in the Consent process. The geotechnical investigation shall undertake both shallow and deep boreholes in areas of building development and provide samples for specific laboratory analysis. From this, development specific geotechnical recommendations shall be enhanced.

At Building Consent, additional geotechnical works may be required, however it is anticipated these will be limited to specific geotechnical input for design. Such as basement or retaining wall designs, foundation, or earthworks design. As a minimum a geotechnical review of structural designs should be undertaken when available.

12 MINUTES OF MEETING WITH COUNCIL AND WATERCARE (26 FEBRUARY 2021)

COMMENTARY	GWE RESPONSE
WATERCARE SERVICES LIMITED	
In terms of wastewater and water supply considerations, the following points were raised at the meeting:	
• With respect to wastewater, Council officers identified that the downstream network is significantly under capacity. At this point in time further investigation is required in this space. The applicant has been advised that an internal discussion is currently underway with WSL's planning team in order to ascertain where there may be constraints within the network. • In terms of water supply, the applicant queried whether WSL has any existing fire hydrant testing that could be relied upon for the purposes of this application. Council officers confirmed that there are no existing fire hydrant tests that have been undertaken within the locality, and that it is the applicant's responsibility to undertake their own testing to ascertain whether there is sufficient pressure and flow to cater for the proposed development. Notwithstanding, Council officers also indicated that there may be issues towards the west of the subject site where the applicant proposes to connect into an existing bulk supply point ("BSP"). The applicant has been advised that WSL are looking	Also identified by GWE. We will work with Watercare to develop a wastewater network solution that addresses the capacity issues Accept that we will provide a flow and pressure test on the network in the vicinity of the site. We will provide the test data to Watercare to assist with the calibration of the network model. In the event that there are pressure constraints for the medium rise apartment blocks on-site pressure boosting will be a solution option

COMMENTARY	GWE RESPONSE
to undertake the preparation of a calibration model, and subsequently a working model, over the next few months to better understand the availability within the water supply network. On both accounts, Council officers are keen in further collaborating with the applicant around a catchment analysis for the locality to help inform the infrastructure assessment.	Agreed

HEALTHY WATERS

In terms of flooding and stormwater considerations, the following points were raised at the meeting:

- | | |
|---|---|
| <ul style="list-style-type: none"> It was noted that there are overland flow paths both contained within the subject site and off-site. Council officers acknowledged that these overland flow paths appear to feed into a downstream property that is containing the 1 per cent annual exceedance probability ("AEP") floodplain. Therefore, careful consideration is required around ensuring that the proposed development will not exacerbate the flood characteristics of the downstream environment. The applicant was advised that there is an existing flood hazard model available for the site, particularly in relation to the Ellerslie catchment, which would be useful to be utilised in conjunction with the assessment to be provided by the applicant | <p>GWE acknowledges the existence of the two minor overland flowpaths on the site. The concept design accommodates the flowpaths and the development will not exacerbate downstream flooding issues.</p> <p>GWE accepts that Council has developed a flood hazard model for the catchment which will be referred to in subsequent stages of the design.</p> |
| <ul style="list-style-type: none"> Discussions were held around the 1 in 10-year storm event. Council officers indicated that there are capacity issues within the downstream stormwater network. In response, it was highlighted that detention would be required in order to mitigate any additional stormwater runoff. The applicant subsequently indicated that detention is proposed to be incorporated into the design of the proposal in order to achieve pre-development levels. As part of this assessment, Council officers requested further assessment to establish the pre-development situation, notably an assessment around confirming the extent of any existing impervious areas across the site, to help inform the detention volumes required to reduce any additional stormwater runoff to pre-development. | <p>GWE has stated that post development run-off will not exceed predevelopment levels and stormwater management devices will be utilised to achieve necessary levels of detention. If detention alone cannot achieve the attenuation requirements retention will be included.</p> |
| <ul style="list-style-type: none"> The applicant indicated that they are intending to cross Great South Road to install a new stormwater pipe. From within the initial infrastructure appraisal, it is suggested that this extension is proposed to be private. However, the applicant clarified that this is not the case and that the extension is proposed to be a public. Notwithstanding the proposal to increase the capacity within the existing network by way of the additional pipe length, given the issues with the downstream environment the applicant was advised that it would likely require a mix retention and detention devices on- site. | <p>A design refinement has superseded the need to partially cross Great South Road with a stormwater line.</p> |

COMMENTARY	GWE RESPONSE
• Council officers advised the applicant that there are requirements of Auckland Council's Network Discharge Consent ("NDC") that are to be complied with. In this regard, it was noted that the proposal would fall under the "Brownfield – Large" category under the NDC, and that there would likely be a requirement for stormwater treatment devices prepared in accordance with GD01. Council officer identified that they would be looking for a draft Stormwater Management Plan ("SMP") for the site at the resource consents stage. Given the scale of the proposal, and the implications for the stormwater strategy, Council officers strongly encourage the approach of ensuring that matters pertaining to the NDC are resolved throughout the course of processing this resource consent application. • The applicant queried whether Healthy Waters would be interested in the adoption of the principles surrounding water conservation, which is being explored as part of this development. In response, Council officers outlined that re-use, by way of swales or raingardens or other retention device(s), is being frequently more utilised in this space. This led onto a discussion surrounding the use of permeable paving, which Council officers noted can present challenges around ensuring the long-term functionality of these devices. Over time, these devices can often be ineffective as suitably attenuating stormwater runoff due soil compression and clogging of the device(s). • Council officers highlighted that they would be interested in understanding how the effectiveness of any proposed stormwater device(s) will be maintained. In this vein, the applicant indicated that a draft Operation and Maintenance Plan will be provided as part of the application. • The applicant has outlined that a unit title subdivision is proposed for the development, and that a body corporate would be established to ensure that common elements are suitably managed and maintained.	GWE has stated that the principles of Water Sensitive Design will underpin stormwater management for the site. In taking this approach the guidelines of GD01 will be followed. The design of stormwater management devices will follow GD01 and positive, industry experience, including best practicable options. GWE accepts the appropriateness of a Operations and Maintenance Plan for stormwater management devices that will be designed and constructed for the development. Agreed
GENERAL MATTERS	
In addition to the commentary that was discussed surrounding the stormwater servicing approach to the site, Council officers raised additional concerns around the implications of possibly extending the publicly reticulated stormwater network across Great South Road to the subject site and the methodology(ies) that would be required to facilitate the installation of any required infrastructure. In this regard, the applicant was advised that construction effects, specifically relating to the potential closure of Great South Road, would be a matter for consideration as part of this assessment noting that consent would be required in order to exceed the 24-month construction duration outlined under Section E40 –	No longer applicable, see note above.

COMMENTARY

GWE RESPONSE

"Temporary Activities". Whilst it is acknowledged that there are third party process, such as Auckland Transport's Corridor Access Request ("CAR"), that the applicant is required to pursue, it is expected that a reasonably comprehensive assessment, inclusive of a draft Construction Traffic Management Plan ("CTMP"), be provided with the application upon lodgement. Additionally, given the significance of Great South Road as an arterial and the anticipated adverse effects of its potential closure (partial or otherwise), Council officers have further expressed that notification of the application may be likely.

13 CONCLUSIONS

GWE Consulting Ltd has been engaged to provide a Engineering Infrastructure report to support a Resource Consent application for the proposed development at 224 Great South Road, Remuera, Auckland. Based on our preliminary, desktop engineering assessment and a meeting with Auckland Council, Healthy Waters and Watercare Services Ltd, we consider that the proposed development can be adequately serviced as per the following:

- The existing 100 mm dia. water supply connection off the 150 mm dia. public watermain is to be retained, a bulk meter is to be installed and a private network is to be constructed to service the development, subject to flow and pressure testing. On site pressure boosting may be required if capacity issues are identified. Metering of the separate buildings and tenancies is to be established as part of the detailed design phase.
- There are six fire hydrants within 85 m from the subject site. It is anticipated that firefighting water supply will not be of concern.
- The existing wastewater network through the site will be abandoned and decommissioned. A new public network will be laid through the site to avoid apartment building footprints and the basement car park. The new network will be designed to collect wastewater flows from 232, 234 and 236 Great South Road, thereby providing continuity of service to those properties. All works will comply with Watercare Water and Wastewater Code of Practice and the New Zealand Building Code F1: Foul Water. A high level network capacity assessment confirms that there is adequate capacity within the network to accommodate the proposed development, except for lower parts of the network, in particular Pipe (GIS ID: 838167), which is the last pipe before WW flows combine with sewer flows to enter the trunk main.
- A new pipe will be laid along the southern boundary of the property, off 224 Great South Road, and connect via a new manhole on the stormwater pipe that enters Great South Road (GIS ID: 2000809167) downstream. This new pipe will connect to existing pipe (GIS ID: 2000540536) at a new manhole to service the development and provide continuity of service to properties at 232 Great South Road and 53 and 55 Omaha Road. The stormwater network within the development will be private.

- The principles of Water Sensitive Design will be applied to the design of the development.
- Following detailed design for the utility services extensions, loadings will be established and contact will be made with utility suppliers (electricity, gas and UFB/telecommunications) to confirm there is adequate capacity.

14 RECOMMENDATIONS

The following recommendations on the Master Plan are made;

- Approval in principle will be required from Watercare Services regarding the amendments to the wastewater network and capacity of the network downstream of the site.
- Approval in principle will be required from Auckland Council (Healthy Waters) regarding the amendments to the stormwater network and capacity of the network downstream of the site.
- Refer section 9.5 for recommendations on contaminated land investigations and action planning for development of the site
- Refer section 11.6 for recommendations on geotechnical engineering for development of the site

15 LIMITATIONS

This report has been prepared for the sole benefit of **Urban Resort Ltd** as our client, and its appointed representatives, according to their instructions, for the specific objectives described herein. It is not to be relied upon or used out of context by any other party for any other objective without reference to GWE Consulting Ltd. The reliance by other parties on the information or opinions contained in the report shall, without prior review and agreement in writing, be at such parties' sole risk.

APPENDIX A
CALCULATIONS

Omahu Apartments



Water Demand Assessment - Pre Development

Reference	J2852	Revision	1
Prepared by	CS	Date	15-Apr-2021
Checked by		Date	

Laura Fergusson Rehabilitation Center

Residents (Clients)

Total Residential Population	67		
Design Water Flow Allowance	630	L/p/day	Watercare W CoP Table 6.1.b
Peaking Factor: Peak Day Demand	2		Watercare W CoP Table 6.1.b
Peaking Factor: Peak Hourly Demand	2.5		Watercare W CoP Table 6.1.b

Average Daily Demand =	42210	L/day	or	0.49	L/s
Peak Day Demand =	84420	L/day	or	0.98	L/s
Peak Hourly Demand	211050	L/day	or	2.44	L/s

Staff

Number of Live-in Staff	5
Number of Day Staff	45

Live-in Staff

Design Water Flow Allowance	50	L/p/day	Watercare W CoP Table 6.1.b
Peaking Factor: Peak Day Demand	2		Watercare W CoP Table 6.1.b
Peaking Factor: Peak Hourly Demand	2.5		Watercare W CoP Table 6.1.b

Average Daily Demand =	250	L/day	or	0.00	L/s
Peak Day Demand =	500	L/day	or	0.01	L/s
Peak Hourly Demand	1250	L/day	or	0.01	L/s

Day Staff

Design Water Flow Allowance	50	L/p/day	Watercare W CoP Table 6.1.b
Peaking Factor: Peak Day Demand	2		Watercare W CoP Table 6.1.b
Peaking Factor: Peak Hourly Demand	2.5		Watercare W CoP Table 6.1.b

Average Daily Demand =	2250	L/day	or	0.03	L/s
Peak Day Demand =	4500	L/day	or	0.05	L/s
Peak Hourly Demand	11250	L/day	or	0.13	L/s

Maintenance Workshop - Dry Industry Light Water

Area	55 m ²		
Routine Peak Daily Discharge	4.5 L/d/m ²		Watercare W CoP Table 6.1.d
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	248	L/day	or	0.00	L/s
Peak Day Demand =	495	L/day	or	0.01	L/s
Peak Hourly Demand	1238	L/day	or	0.01	L/s

Wood Workshop - Dry Industry Light Water

Area	145 m ²		
Routine Peak Daily Discharge	4.5 L/d/m ²		Watercare W CoP Table 6.1.d
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	653	L/day	or	0.01	L/s
Peak Day Demand =	1305	L/day	or	0.02	L/s
Peak Hourly Demand	3263	L/day	or	0.04	L/s

Dining and Recreation Center - Wet Retail

Area	270 m ²		
Design Water Flow Allowance	15 L/d/m ²		Watercare CoP 6.3.5.6 Table 6.1.c
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	4050	L/day	or	0.05	L/s
Peak Day Demand =	8100	L/day	or	0.09	L/s
Peak Hourly Demand	20250	L/day	or	0.23	L/s

Pool - Dry Industry Light Water

Area	233 m ²		
Routine Peak Daily Discharge	4.5 L/d/m ²		Watercare W CoP Table 6.1.d
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	1049	L/day	or	0.01	L/s
Peak Day Demand =	2097	L/day	or	0.02	L/s
Peak Hourly Demand	5243	L/day	or	0.06	L/s

Gym - Dry Retail

Area	455 m ²		
Area per Person	15 m ²		
Design Population	30		
Design Water Flow Allowance	65 L/p/d		Watercare CoP 6.3.5.6 Table 6.1.c
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	1972	L/day	or	0.02	L/s
Peak Day Demand =	3943	L/day	or	0.05	L/s
Peak Hourly Demand	9858	L/day	or	0.11	L/s

Private Properties

Number of Residential Properties	7		
Design Person Per Dwelling	3		
Design Population	21		
Design Water Flow Allowance	220	L/p/day	Watercare CoP 6.3.5.6
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	4620	L/day	or	0.05	L/s
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Peak Day Demand =	9240	L/day	or	0.11	L/s
Peak Hourly Demand	23100	L/day	or	0.27	L/s
Summary of Total Pre-Development Water Flows					
Average Daily Demand =	57300	L/day	or	0.66	L/s
Peak Day Demand =	114600	L/day	or	1.33	L/s
Peak Hourly Demand	286501	L/day	or	3.32	L/s

Released under the provision of
the Official Information Act 1982

Omahu Apartments



Water Demand Assessment - Post Development	Reference	J2852	Revision	0
	Prepared by	CS	Date	15-Apr-2021
	Checked by		Date	

Omahu Development

Residential Apartments

Unit Type	Units	Occupancy	Population
1 Bedroom	29	2	58
2 Bedroom	133	3	399
3 Bedroom	35	3	105
4 Bedroom	8	3	24
Total Residential Population		586	
Design Water Flow Allowance		220	L/p/day Watercare CoP 6.3.5.6
Peaking Factor: Peak Day Demand		2	Watercare CoP 6.3.5.3
Peaking factor: Peak Hourly Demand		2.5	Watercare CoP 6.3.5.3

Average Daily Demand =	128920	L/day	or	1.49	L/s
Peak Day Demand =	257840	L/day	or	2.98	L/s
Peak Hourly Demand	644600	L/day	or	7.46	L/s

Retail - Dry Retail

Area	791	m ²	
Area per Person	15	m ²	
Design Population	53		
Design Water Flow Allowance	65	L/p/d	Watercare CoP 6.3.5.6 Table 6.1.c
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	3428	L/day	or	0.04	L/s
Peak Day Demand =	6855	L/day	or	0.08	L/s
Peak Hourly Demand	17138	L/day	or	0.20	L/s

Gym - Dry Retail

Area	120	m ²	
Area per Person	15	m ²	
Design Population	8		
Design Water Flow Allowance	65	L/p/d	Watercare CoP 6.3.5.6 Table 6.1.c
Peaking Factor: Peak Day Demand	2		
Peaking Factor: Peak Hourly Demand	2.5		

Average Daily Demand =	520	L/day	or	0.01	L/s
Peak Day Demand =	1040	L/day	or	0.01	L/s
Peak Hourly Demand	2600	L/day	or	0.03	L/s

Pool - Dry Industry Light Water

Area	164	m ²	
Routine Peak Daily Discharge	4.5	L/d/m ²	Watercare W CoP Table 6.1.d
Peaking Factor: Peak Day Demand	2		

Peaking Factor: Peak Hourly Demand

2.5

Average Daily Demand =	738	L/day	or	0.01	L/s
Peak Day Demand =	1476	L/day	or	0.02	L/s
Peak Hourly Demand	3690	L/day	or	0.04	L/s

Restaurant - Wet Retail

Area	291	m ²			
Design Water Flow Allowance	15	L/d/m ²		Watercare CoP 6.3.5.6 Table 6.1.c	
Peaking Factor: Peak Day Demand	2				
Peaking Factor: Peak Hourly Demand	2.5				

Average Daily Demand =	4365	L/day	or	0.05	L/s
Peak Day Demand =	8730	L/day	or	0.10	L/s
Peak Hourly Demand	21825	L/day	or	0.25	L/s

Café - Wet Retail

Area	300	m ²			
Design Water Flow Allowance	15	L/d/m ²		Watercare CoP 6.3.5.6 Table 6.1.c	
Peaking Factor: Peak Day Demand	2				
Peaking Factor: Peak Hourly Demand	2.5				

Average Daily Demand =	4500	L/day	or	0.05	L/s
Peak Day Demand =	9000	L/day	or	0.10	L/s
Peak Hourly Demand	22500	L/day	or	0.26	L/s

Co-Working Space - Office

Area	272	m ²			
Area per Person	15	m ²			
Design Population	18				
Design Water Flow Allowance	65	L/p/d		Watercare CoP 6.3.5.6 Table 6.1.c	
Peaking Factor: Peak Day Demand	2				
Peaking Factor: Peak Hourly Demand	2.5				

Average Daily Demand =	1179	L/day	or	0.01	L/s
Peak Day Demand =	2357	L/day	or	0.03	L/s
Peak Hourly Demand	5893	L/day	or	0.07	L/s

Summary of Total Post-Development Water Flows

Average Daily Demand =	143649	L/day	or	1.66	L/s
Peak Day Demand =	287299	L/day	or	3.33	L/s
Peak Hourly Demand	718247	L/day	or	8.31	L/s

Omahu Apartments



Wastewater Design Flows - Catchment (Outside of Development Site)

Reference		Revision	0
Prepared by	CS	Date	17-Jan-2021
Checked by		Date	

Subcatchment to Wastewater Pipe 844496

Private Properties

Number of Residential Properties	28
Design Person Per Dwelling	3
Design Population	84
Design Wastewater Allowance	180 L/p/day
Peaking factor: Self-cleansing design flow (Normal PDWF)	3
Peaking factor: Peak design flow (PWWF)	6.7

Design ADWF =	15120	L/day	or	0.18	L/s
Self-cleansing design flow PDWF =	45360	L/day	or	0.53	L/s
Peak design flow PWWF =	101304	L/day	or	1.17	L/s

Office

Area	720 m ²
Design Wastewater Allowance	15 L/d/m ²
Peaking factor: Self-cleansing design flow (Normal PDWF)	2
Peaking factor: Peak design flow (PWWF)	6.7

Design ADWF =	10800	L/day	or	0.13	L/s
Self-cleansing design flow PDWF =	21600	L/day	or	0.25	L/s
Peak design flow PWWF =	72360	L/day	or	0.84	L/s

Subcatchment to Wastewater Pipe 838167

Private Properties

Number of Residential Properties	250
Design Person Per Dwelling	3
Design Population	750
Design Wastewater Allowance	180 L/p/day
Peaking factor: Self-cleansing design flow (Normal PDWF)	3
Peaking factor: Peak design flow (PWWF)	6.7

Design ADWF =	135000	L/day	or	1.56	L/s
Self-cleansing design flow PDWF =	405000	L/day	or	4.69	L/s
Peak design flow PWWF =	904500	L/day	or	10.47	L/s

Wet Retail

Area	5000 m ²
Design Wastewater Allowance	15 L/d/m ²
Peaking factor: Self-cleansing design flow (Normal PDWF)	2

Peaking factor: Peak design flow (PWWF)

6.7

Design ADWF =	75000	L/day	or	0.87	L/s
Self-cleansing design flow PDWF =	150000	L/day	or	1.74	L/s
Peak design flow PWWF =	502500	L/day	or	5.82	L/s

Dry Retail

Area	8000 m ²
Area per Person (for Design Population)	50 m ²
Design Population	160
Design Wastewater Allowance	65 L/p/day
Peaking factor: Self-cleansing design flow (Normal PDWF)	2
Peaking factor: Peak design flow (PWWF)	5

Design ADWF =	10400	L/day	or	0.12	L/s
Self-cleansing design flow PDWF =	20800	L/day	or	0.24	L/s
Peak design flow PWWF =	52000	L/day	or	0.60	L/s

School - Remuera Primary School

Number of Pupils	600
Number of Staff	55
Design Wastewater Allowance for Pupils	20
Design Wastewater Allowance for Staff	45
Peaking factor: Self-cleansing design flow (Normal PDWF)	2
Peaking factor: Peak design flow (PWWF)	6.7

Design ADWF =	14475	L/day	or	0.17	L/s
Self-cleansing design flow PDWF =	28950	L/day	or	0.34	L/s
Peak design flow PWWF =	96982.5	L/day	or	1.12	L/s

Total

Design ADWF =	234875	L/day	or	2.72	L/s
Self-cleansing design flow PDWF =	604750	L/day	or	7.00	L/s
Peak design flow PWWF =	1555983	L/day	or	18.01	L/s

Omahu Apartments



Wastewater Design Flows - Pre Development	Reference	J2852	Revision	1
	Prepared by	CS	Date	15-Apr-2021
	Checked by		Date	
Laura Fergusson Rehabilitation Center				
Residents				
Total Population	67			
Design Wastewater Allowance	570	L/p/day	Watercare WW CoP 5.3.5.1.1.F	
Peaking factor: Self-cleansing design flow (Normal PDWF)	1.5			
Peaking factor: Peak design flow (PWWF)	5			
Design ADWF =	38190	L/day	or	0.44 L/s
Self-cleansing design flow PDWF =	57285	L/day	or	0.66 L/s
Peak design flow PWWF =	190950	L/day	or	2.21 L/s
Staff				
Number of Live-in Staff	5			
Number of Day Staff	45			
<i>Live-in Staff</i>				
Design Wastewater Allowance	45	L/p/day	Watercare WW CoP 5.3.5.1.1.F	
Peaking factor: Self-cleansing design flow (Normal PDWF)	2		Watercare WW CoP 5.3.5.1.1.F	
Peaking factor: Peak design flow (PWWF)	5		Watercare WW CoP 5.3.5.1.1.F	
Design ADWF =	225	L/day	or	0.00 L/s
Self-cleansing design flow PDWF =	450	L/day	or	0.01 L/s
Peak design flow PWWF =	1125	L/day	or	0.01 L/s
<i>Day Staff</i>				
Design Wastewater Allowance	45	L/p/day	Watercare WW CoP 5.3.5.1.1.F	
Peaking factor: Self-cleansing design flow (Normal PDWF)	2		Watercare WW CoP 5.3.5.1.1.F	
Peaking factor: Peak design flow (PWWF)	5		Watercare WW CoP 5.3.5.1.1.F	
Design ADWF =	2025	L/day	or	0.02 L/s
Self-cleansing design flow PDWF =	4050	L/day	or	0.05 L/s
Peak design flow PWWF =	10125	L/day	or	0.12 L/s
Maintenance Workshop - Dry Industry Light Water				
Area	55	m ²		
Routine Peak Daily Discharge	4.5	L/m ² /d	Watercare WW CoP Table 5.1.4	
Peaking factor: Self-cleansing design flow (Normal PDWF)	5		Watercare WW CoP Table 5.1.4	
Peaking factor: Peak design flow (PWWF)	6.7		Watercare WW CoP Table 5.1.4	
Design ADWF =	247.5	L/day	or	0.00 L/s
Self-cleansing design flow PDWF =	1237.5	L/day	or	0.01 L/s

Peak design flow PWWF =	1658.3	L/day	or	0.02	L/s
Wood Workshop - Dry Industry Light Water					
Area	145	m ²			
Routine Peak Daily Discharge	4.5	L/m ² /d			Watercare WW CoP Table 5.1.4
Peaking factor: Self-cleansing design flow (Normal PDWF)	5				Watercare WW CoP Table 5.1.4
Peaking factor: Peak design flow (PWWF)	6.7				Watercare WW CoP Table 5.1.4
Design ADWF =	652.5	L/day	or	0.01	L/s
Self-cleansing design flow PDWF =	3262.5	L/day	or	0.04	L/s
Peak design flow PWWF =	4371.8	L/day	or	0.05	L/s
Dining and Recreation Centre - Wet Retail					
Area	270	m ²			
Design Wastewater Allowance	15	L/m ² /d			Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2				Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	6.7				Watercare WW CoP Table 5.1.3
Design ADWF =	4050	L/day	or	0.05	L/s
Self-cleansing design flow PDWF =	8100	L/day	or	0.09	L/s
Peak design flow PWWF =	27135	L/day	or	0.31	L/s
Pool - Dry Industry Light Water					
Area	233	m ²			
Routine Peak Daily Discharge	4.5	L/d/m ²			Watercare WW CoP Table 5.1.4
Peaking factor: Self-cleansing design flow (Normal PDWF)	5				Watercare WW CoP Table 5.1.4
Peaking factor: Peak design flow (PWWF)	6.7				Watercare WW CoP Table 5.1.4
Design ADWF =	1049	L/day	or	0.01	L/s
Self-cleansing design flow PDWF =	5243	L/day	or	0.06	L/s
Peak design flow PWWF =	7025	L/day	or	0.08	L/s
Gym - Dry Retail					
Area	455	m ²			
Area per Person	15	m ²			
Design Population	30				
Design Wastewater Allowance	65	L/p/d			Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2				Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	5				Watercare WW CoP Table 5.1.3
Design ADWF =	1972	L/day	or	0.02	L/s
Self-cleansing design flow PDWF =	3943	L/day	or	0.05	L/s
Peak design flow PWWF =	9858	L/day	or	0.11	L/s
Private Properties					

Number of Residential Properties	7
Design Person Per Dwelling	3
Design Population	21
Design Wastewater Allowance	180 L/p/day
Peaking factor: Self-cleansing design flow (Normal PDWF)	3
Peaking factor: Peak design flow (PWWF)	6.7

Design ADWF =	3780	L/day	or	0.04	L/s
Self-cleansing design flow PDWF =	11340	L/day	or	0.13	L/s
Peak design flow PWWF =	25326	L/day	or	0.29	L/s

Summary of Total Pre-Development Wastewater Flows

Design ADWF =	52190	L/day	or	0.60	L/s
Self-cleansing design flow PDWF =	94911	L/day	or	1.10	L/s
Peak design flow PWWF =	277574	L/day	or	3.21	L/s

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Omahu Apartments



Wastewater Design Flows - Post Development

Reference	J2852	Revision	1
Prepared by	CS	Date	15-Apr-2021
Checked by		Date	

Residential Apartments

Unit Type	Units	Occupancy	Population
1 Bedroom	29	2	58
2 Bedroom	133	3	399
3 Bedroom	35	3	105
4 Bedroom	8	3	24

Total Residential Population	586	
Design Wastewater Allowance	180	L/p/day
Peaking factor: Self-cleansing design flow (Normal PDWF)	3	
Peaking factor: Peak design flow (PWWF)	5	

Design ADWF =	105480	L/day	or	1.22	L/s
Self-cleansing design flow PDWF =	316440	L/day	or	3.66	L/s
Peak design flow PWWF =	527400	L/day	or	6.10	L/s

Retail - Dry Retail

Area	791 m ²	
Area per Person	15 m ²	
Design Population	53	
Design Wastewater Allowance	65 L/p/d	Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2	Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	5	Watercare WW CoP Table 5.1.3

Design ADWF =	3428	L/day	or	0.04	L/s
Self-cleansing design flow PDWF =	6855	L/day	or	0.08	L/s
Peak design flow PWWF =	17138	L/day	or	0.20	L/s

Gym - Dry Retail

Area	120 m ²	
Area per Person	15 m ²	
Design Population	8	
Design Wastewater Allowance	65 L/p/d	Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2	Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	5	Watercare WW CoP Table 5.1.3

Design ADWF =	520	L/day	or	0.01	L/s
Self-cleansing design flow PDWF =	1040	L/day	or	0.01	L/s
Peak design flow PWWF =	2600	L/day	or	0.03	L/s

Pool - Dry Industry Light Water

Area	164 m ²	
Routine Peak Daily Discharge	4.5 L/d/m ²	Watercare WW CoP Table 5.1.4
Peaking factor: Self-cleansing design flow (Normal PDWF)	5	Watercare WW CoP Table 5.1.4
Peaking factor: Peak design flow (PWWF)	6.7	Watercare WW CoP Table 5.1.4

Design ADWF =	738	L/day	or	0.01	L/s
Self-cleansing design flow PDWF =	3690	L/day	or	0.04	L/s
Peak design flow PWWF =	4945	L/day	or	0.06	L/s
Restaurant - Wet Retail					
Area	291	m ²			
Design Wastewater Allowance	15	L/m ² /d			Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2				Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	6.7				Watercare WW CoP Table 5.1.3
Design ADWF =	4365	L/day	or	0.05	L/s
Self-cleansing design flow PDWF =	8730	L/day	or	0.10	L/s
Peak design flow PWWF =	29245.5	L/day	or	0.34	L/s
Café - Wet Retail					
Area	300	m ²			
Design Wastewater Allowance	15	L/m ² /d			Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2				Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	6.7				Watercare WW CoP Table 5.1.3
Design ADWF =	4500	L/day	or	0.05	L/s
Self-cleansing design flow PDWF =	9000	L/day	or	0.10	L/s
Peak design flow PWWF =	30150	L/day	or	0.35	L/s
Co-working Space - Office					
Area	272	m ²			
Area per Person	15	m ²			
Design Population	18				
Design Wastewater Allowance	65	L/p/d			Watercare WW CoP Table 5.1.3
Peaking factor: Self-cleansing design flow (Normal PDWF)	2				Watercare WW CoP Table 5.1.3
Peaking factor: Peak design flow (PWWF)	5				Watercare WW CoP Table 5.1.3
Design ADWF =	1179	L/day	or	0.01	L/s
Self-cleansing design flow PDWF =	2357	L/day	or	0.03	L/s
Peak design flow PWWF =	5893	L/day	or	0.07	L/s
Summary of Total Post-Development Wastewater Flows					
Design ADWF =	120209	L/day	or	1.39	L/s
Self-cleansing design flow PDWF =	348113	L/day	or	4.03	L/s
Peak design flow PWWF =	617372	L/day	or	7.15	L/s

Omahu Apartments



Wastewater Pipe Capacity

Reference	J2852	Revision	1
Prepared by	CS	Date	15-Apr-2021
Checked by		Date	

Reference: Colebrook-White Formula

Sub-catchment draining to pipe (GIS ID: 844496) - Pre Development

Average Design Flow (ADWF)	78110	L/day	0.90	L/s
Self-cleansing Design Flow (PDWF)	161871	L/day	1.87	L/s
Peak Design Flow Rate (PWWF)	451238	L/day	5.22	L/s

Sub-catchment draining to pipe (GIS ID: 844496) - Post Development

Average Design Flow (ADWF)	146129	L/day	1.69	L/s
Self-cleansing Design Flow (PDWF)	415073	L/day	4.80	L/s
Peak Design Flow Rate (PWWF)	791036	L/day	9.16	L/s

Sub-catchment draining to pipe (GIS ID: 838167) - Pre Development

Average Design Flow (ADWF)	312985	L/day	3.62	L/s
Self-cleansing Design Flow (PDWF)	766621	L/day	8.87	L/s
Peak Design Flow Rate (PWWF)	2007221	L/day	23.23	L/s

Sub-catchment draining to pipe (GIS ID: 838167) - Post Development

Average Design Flow (ADWF)	381004	L/day	4.41	L/s
Self-cleansing Design Flow (PDWF)	1019823	L/day	11.80	L/s
Peak Design Flow Rate (PWWF)	2347018	L/day	27.16	L/s

PIPE CAPACITY

Pipe size (mm)	Type	Roughness factor	Pipe Grade*	Capacity (L/s)	PWWF (L/s)	Residual Pipe Capacity (L/s)
EXISTING DOWNSTREAM WASTEWATER PIPE (GIS ID: 844496) - PRE DEVELOPMENT						
225	Asbestos Concrete	1.5	8.2%	12.88	5.22	7.66
EXISTING DOWNSTREAM WASTEWATER PIPE (GIS ID: 844496) - POST DEVELOPMENT						
225	Earthenware	1.5	8.2%	12.88	9.16	3.73
EXISTING DOWNSTREAM WASTEWATER PIPE (GIS ID: 838167) - PRE DEVELOPMENT						
300	Earthenware	1.5	0.45%	6.24	23.23	-16.99
EXISTING DOWNSTREAM WASTEWATER PIPE (GIS ID: 838167) - POST DEVELOPMENT						
300	Earthenware	1.5	0.45%	6.24	27.16	-20.93

*pipe grades calculated based on pipe lengths and ground levels data from Auckland GeoMaps, where contour information was insufficient, minimum grades were used.

APPENDIX B
ASBESTOS SURVEY REVIEW

15 January 2021

GWE Consulting Engineers | Attn: Edward Collings

**Peer Review of Asbestos Survey Documentation
Site: 224 Great South Road, Greenlane Auckland**

Introduction

Progressive Risk Management (PRM) was engaged by Edward Collings of GWE Consulting Engineers (the client) to undertake a peer review of provided asbestos survey documentation for the Laura Fergusson Rehabilitation site located at 224 Great South Road, Greenlane Auckland (the site). PRM have also provided an estimate cost for asbestos removal.

Objective

The objective of the services is to provide the client with a concise technical asbestos peer review of the provided asbestos surveys. A secondary objective is to provide indicative costing of the removal of the identified items at the site.

Documents

The following asbestos survey documents prepared by ENGEO (all listed as Reference 15627.000.000 and dated 06/12/2018) were reviewed:

- CNU and 53a (full document)
- Dining and Recreation Centre (partial document).
- Green House (partial document).
- Maintenance Workshop (partial document).
- Rehab Centre (partial document).
- Residential Units 1-12, L2, 46 (partial document).
- Residential Units 13-25 (partial document).
- Residential Units 26-33 (partial document).
- Residential Units 34-43, L3 (partial document).
- Unit 44 (OT Kitchen) and Unit 45 (partial document).
- White House (partial document).
- Wood Workshop (partial document).
- MCR Farrell (partial document).

At the client's request, the Combined Preliminary and Detailed Site Investigation (soil contamination report) on the same site was not reviewed.

Methodology

PRM undertook the following elements as part of this project:

- Peer review of the full CNU and 53a Asbestos Survey document.
- Brief review of the other partial Asbestos Survey documents.
- Summary detailing the key findings of the Peer Review.
- Cost estimate of the consulting elements associated with potential asbestos removal.
- Engage a licensed asbestos contractor to provide indicative pricing for the removal of the identified asbestos items.

Legislation

PRM undertook the review works in general accordance with the following:

- New Zealand Health and Safety at Work Act 2015.
- New Zealand Health and Safety (Asbestos) Regulations 2016.
- WorkSafe New Zealand Code of Practice: Management and Removal of Asbestos 2016.
- WorkSafe New Zealand Code of Practice: Conducting Asbestos Surveys.

Review Findings: Asbestos Surveys

As mentioned previously, only 1 of the 13 Asbestos Surveys provided is present in its entirety. As such, PRM have undertaken a full peer review of the complete report only and have assumed similar items are likely present in the partial reports. This would need to be confirmed once full documents have been sourced.

Generally, the survey document appears to contain the required information as would be expected within an asbestos demolition survey, with the following points noted:

- The surveys appear to have been undertaken whilst the buildings were tenanted/occupied. This can be problematic as it generally prohibits complete destructive sampling being undertaken and the building fabric being fully inspected. This is also discussed in *Section 6 Limitations viii* where it states that *building materials and/or structure were not inspected*.
- The scope of the surveys appears to be inspections of "all internal, external, sub-floor and roof spaces" at the site. Where this has not been achieved, then this should be highlighted within *Section 1.4 Inaccessible Areas Presumed to Contain Asbestos*.
- *Section 1.5 Building Notes* provides a concise summary of the structure and key items at each site.
- The methodology presented in *Section 3 Survey Methodology* appears suitable for the works that were undertaken.
- The details provided within *Section 4 Identified Asbestos Materials* appears suitable to enable successful identification of the ACM to external contractors, etc.
- The Asbestos Register contains a hot water cylinder (1998) in multiple instances which have not been sampled due to live electrics. It is correct to presume positive samples where sampling access cannot be gained. However, given the age of the cylinder it is extremely unlikely to be asbestos and a recommendation of sampling before demolition proceeds may be more prudent than removing and presumed asbestos, due to the cost implications of this.
- The survey does not list the found asbestos to be either friable or non-friable in nature. The Conducting Asbestos Surveys ACoP states a surveyor should be able to 'be able to confirm that material may be friable or non-friable asbestos'. This is particularly important for demolition surveys as removal contractors will use this information to quote against.
- Although the survey acknowledges in the *Survey Type and Extent* section that it may be used to help in the tendering process for asbestos removal, the document does not confirm which class of removal contractor is required for the identified ACM. This would be common practice for demolition surveys or a removal scope document.
- The asbestos register lists the soffits as being positive for Crocidolite asbestos. The attached IANZ laboratory report lists the same product as having been found to contain both Crocidolite and Chrysotile asbestos.

Cost Estimate

PRM have provided a cost estimate for consulting elements which are legislatively required, or considered necessary/best practice, for the project – based upon the information provided within the ENGEO surveys. PRM has included the following:

- Site establishment and general project preparation.
- Additional destructive surveying/sampling to access areas not sampled by ENGEO.
- Asbestos assessor services including air monitoring and clearance inspections.

PRM approached Richard Roberts, General Manager of McMahon Services, a NZ WorkSafe licensed Class-A (friable) asbestos removal and demolition contractor, to provided cost estimates for the asbestos removal and waste disposal element of the works.

McMahon Services have estimated the asbestos removal on all items identified in the ENGEO survey reports will take approximately 35 days to achieve. PRM has extrapolated this to be a total of 6 x 6 day weeks (eg Mon-Fri plus Sat).

It should be noted:

- Both PRM and McMahon Services have prepared these costs without having inspected the site. As such, site specific issues and access constraints may not have been realised.
- These costs estimates are indicative only and are not considered a comprehensive cost assessment of the project and required works.
- General demolition costs are not included in these estimates.

Consulting Costs:

The estimated consulting costs required for compliance as part of the asbestos removal are summarised in the following table.

Table 1: Consulting Costs Estimate:				
Task	Description	Rate:	No:	Cost:
Preparation	PM, WHS and project preliminaries	\$1,500	1	\$1,000
Survey	Undertake final destructive survey	\$4,500	1	\$3,400
Removal Scope	Technical removal scope and contractor tendering / management	\$4,000	1	\$4,000
Assessor	Weekday (air monitoring plus 2 h supervision)	\$860	30	\$25,800
	Weekday (air monitoring plus 2 h supervision)	\$1,060	6	\$6,360
Clearance	Clearance certificates	\$450	9	\$4,050
Cost Estimate (ex GST):				\$44,610

Contractor Costing:

The estimate contractor costs required for the asbestos removal element of the project are summarised in the following table.

Table 2: Contractor Costs Estimate:		
Task / Building	Description / Item of Removal	Cost:
Preliminaries	Mobilisation, documentation and establishment	\$4,560
PPE	Required PPE, RPR and other items	\$3,000
Building CNU & 53a	Hot water cylinder (HWC) and soffits	\$2,000
Dining and Recreation Center	Insulation boards and soffits	\$11,750
Rehab Center	HWCs, boilers and metal piping	\$3,550
Residential Units 1-12, L2 46	HWCs, soffits, bituminous material, base boards and fuse boards	\$22,250
Residential Units 13-25	Base board, soffits and insulation boards	\$17,600

Table 2: Contractor Costs Estimate:

Task / Building	Description / Item of Removal	Cost:
Residential Units 26-33	Base board, soffits and insulation boards	\$9,050
Residential Units 34-43	HWCs and bituminous material	\$9,150
Kitchen	Soffits, base board, insulation board	\$4,750
MCR Farrell	HWCs	\$450
Disposal	Disposal of all items	\$10,000
Demobilisation	Site final clean-up and equipment demobilisation	\$3,500
Cost Estimate (ex GST):		\$101,610

Note: Exact scope and cost would need to be formally quoted and agreed prior to works commencing.

Closure

If you have further questions, please do not hesitate to contact the undersigned.



Alex Wood | Team Leader Property Risk
NZ WorkSafe Asbestos Assessor (AA18090126)

E: s 9(2)(a)

P: s 9(2)(a)

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Document Control

Project Details:	
Report Name:	Peer Review of Asbestos Survey Documentation
Client:	GWE Consulting Engineers
Site Details:	Laura Fergusson Rehabilitation - 224 Great South Road, Greenlane Auckland
Project Reference:	P034950.001 / C0326

Report Version:					
Version Date	Review Process:			Issued to:	Summary of changes from previous version:
	Reported:	Reviewed:	Approved:		
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Report Review:					
Reported:		Technical Review:		Approved for Issue:	
					
Name:	Alex Wood	Name:	Nick Passlow	Name:	Nick Passlow
Position:	Team Leader	Position:	Director	Position:	Director
Date:	15/01/2021	Date:	15/01/2021	Date:	15/01/2021