# **55 Brookvale Road, Hastings**

Engineering Servicing Report – VI

H20200141-ESR-V1 Prepared for operings nurseries 21/09/2022

**NOUS** 

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#### 1. INTRODUCTION & SCOPE

Development Nous Ltd (DNL) was engaged by **Oderings Nurseries** (the Applicant), to prepare a civil servicing strategy for the proposed 35 lot residential subdivision at 55 Brookvale Road. The works proposed include the subdivision of the existing property to establish 35 new residential dwellings, a car parking area and the retention of the garden centre and café.

The purpose of this report is to prepare a high-level servicing strategy for the proposed development following ongoing discussions with Hastings District Council. This report will address stormwater, water and wastewater servicing, earthworks design and access requirements for the development

The proposed works as demonstrated on the site layout presented in **Appendix A**, will herein be referred to as "the site".

#### 1.1. Information and Standards

Information provided includes the site location and a proposed layout plan outlining the number of buildings and accessway within the development.

Information on existing services and site conditions were made available through the HDC GIS system, topographic site survey and LiDAR information.

The investigation referenced the following resources:

#### Regulatory Documentation

- Hastings District Council Engineering Code of Practice (HDC ECoP 2020).
- Hastings District City Council IntraMaps HDC.
- Hastings District City Council Hastings District Plan (Partially Operative with the Exception of Section 16.1 & Appendix 50) (dated March 2020).
- Hawke's Bay Regional Council *Hawke's Bay Waterway Guidelines Erosion and Sediment Control* (dated April 2009).
- Hawke's Bay Regional Council *Hawke's Bay Waterway Guidelines Low Impact Design* (dated April 2009).
- Hawke's Bay Regional Council *Hawke's Bay Waterway Guidelines Stormwater Management* (dated May 2009).
- Ministry of Business, Innovation & Employment Acceptable Solutions and Verification Methods for New Zealand Building Code Clause – E1 Surface Water V11 (dated February 2020).
- Ministry of Business, Innovation & Employment Acceptable Solutions and Verification Methods for New Zealand Building Code Clause – G12 Water Supplies V12 (dated June 2019).
- NZS 4404:2010 Land Development and Subdivision Infrastructure; and
- SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice, particularly Table 1: (method for determining required water supply classification) and Table 2: (method for determining Firefighting water supply).

## 2. SITE LOCATION

The site is located at 55 Brookvale Road, Havelock North within the Hastings District Council (HDC) local government area. The properties legal description follows:

- PT LOT 2 DP 311724
- PT LOT 1 DP 8274 GARDEN CENTRE

The Site, as presented in Figure 1-1, occupies an approximate area of 2.03ha.



Figure 2-1 – Site Location

Located on the corner of Brookvale Road and Romanes Drive, the site is situated approximately 1.5km northeast of the Havelock North town centre.

Under pre-development conditions, the site is occupied by Orderings Garden Centre and nursery. The garden centre is situated in the south-eastern corner of the site with a car parking area to the west. Prior to demolition in early 2022, the remaining area of the site was occupied by greenhouses. In July 2022, a resource consent was granted to establish a café within an area of the existing retail building in the south-eastern corner of the site.

Under pre-developed conditions, the site is fully sealed and generally falls from the southern boundary to the north-western corner of the site. The property is bounded by Guthrie Park to the west, Brookvale Road to the south, Romanes Drive to the east and the Havelock BMX Park to the north. The Karituwhenua Stream runs the length of the eastern and northern site boundaries and will act as the discharge location for the development as per existing conditions. Refer to **Appendix B** for the topographical survey plan.

The site is zoned as *Plains Production*.

#### 3. STORMWATER

#### 3.1. Pre-Development Stormwater

Due to the existing site coverage, runoff generated within the property discharges to the Hawke's Bay Regional Council owned Karituwhenua Stream via downpipe outlet arrangements. An assessment utilising the Rational Method calculation was undertaken to determine the flow rate and volume of runoff discharging from the site.

#### 3.1.1. Pre-Development Stormwater Hydrology

The catchment parameters presented in **Table 3-1** below were delineated using aerial imagery, HDC's GIS mapping service and a site inspection. The Time of Concentration (Tc) and Runoff Coefficient (C) for the site was calculated in accordance with Section 2.3 and Section 2.1 of the NZBC – E1 Surface Water respectively.

The run-off coefficient for the site was selected to represent the site under pre-development conditions:

- Developed Surface Types
  - Fully Roofed and/or sealed developments = 0.9
  - Asphalt and concrete paved surfaces = 0.85
  - $\circ$  Unsealed roads = 0.5
- Natural Surface Types
  - $\circ$  Gardens, lawns etc = 0.25

A slope correction was applied to the calculated runoff coefficient in accordance with *Table 2* of the *NZBC – E1 Surface Water*.

- Ground Slope = 0 5%
  - o Subtract 0.05

A summary of the catchments data is tabulated in **Table 3-1** below, refer to the detailed calculation provided in **Appendix D**.

Table 3-1 Pre-Development Catchment Data

P	RE-DEVELOPMENT	CATCHMENT DATA	
Catchment Area Name	Catchment Area (ha)	Runoff Coefficient (C)	Time of Concentration (T <sub>c</sub> )
Pre-Dev	2.027	0.86	5 min

#### 3.1.2. Rainfall Data

The NIWA HIRDS V4 was used to obtain the rainfall intensities (mm/hr) for RCP6.0 for the period 2081-2100 based on the site location.

#### 3.1.3. Pre-Development Runoff Summary

The pre-development runoff summary is presented in **Table 3-2** below, refer to the detailed calculation provided in **Appendix D** for more details.

Table 3-2 Pre-Development Peak Runoff Flows

	PRE-DEVELOP	VIENT DISCHAR	GE RUNOFF FL	OWS	
Catchment Area Name	1:2-year flood (m³/s)	1:5-year flood (m³/s)	1:10 year flood (m³/s)	1:50 year flood (m³/s)	1:100-year flood (m³/s)
Pre-Dev	0.271	0.395	0.499	0.792	0.948

#### 3.2. Post-Development Stormwater

The proposed development seeks to manage runoff generated within the bounds of the development via a combination of a piped network and overland flow conveyance. Due to the considerable site coverage under pre-developed conditions, the proposed development will see a reduction in impervious surfaces throughout the site. It is therefore anticipated that peak flow mitigation <u>will not</u> be required to meet the relevant HBRC and HDC requirements. Refer to **Section 3.2.1.1** for further investigation into peak flow mitigation requirements.

The development is expected to generate additional hydrocarbons, pollutants oils and debris. To protect the receiving waterway following the development works, stormwater quality treatment integrated in to the landscaping and piped network is proposed. Refer to **Section 3.2.5** for further details of the proposed stormwater quality treatment methodology.

The following section presents a summary of the post-development stormwater assessment. Refer to Drawing No. H20200141-50-A-01 and 50-A-02 in Appendix C for the proposed servicing strategy and the detailed calculations presented in Appendix D.

#### 3.2.1. Post-Development Stormwater Hydrology

The Rational Method was used to calculate the post-development runoff flows. The following sections provide summaries of the calculations.

Rainfall data was adopted from the pre-developed runoff assessment for consistency between analysis.

#### 3.2.1.1. Post-Development Catchment Data

The proposed works will see no change in the pre-developed catchment area or extent. The time of concentration and coefficient of runoff was updated to reflect the proposed development works. The Time of Concentration (Tc) and Runoff Coefficient (C) for the site was calculated in accordance with Section 2.3 and Section 2.1 of the NZBC – E1 Surface Water respectively.

The post-developed runoff coefficients follow:

- Land use types:
  - $\circ$  Fully roofed and/or sealed development = 0.90
  - Asphalt and concrete paved surfaces = 0.85
  - Grassed = 0.30

A slope correction was applied to the calculated runoff coefficient in accordance with *Table 2* of the *NZBC – E1 Surface Water*.

Ground Slope = 0 - 5%
 Subtract - 0.05

A summary of the catchment data is tabulated in **Table 3-3** below, refer to the detailed calculation provided in **Appendix D**.

Table 3-3 Post-Development Catchment Data

P	OST-DEVELOPMENT	CATCHMENT DATA	
Catchment Area Name	Catchment Area (ha)	Runoff Coefficient (C)	Time of Concentration (T <sub>c</sub> )
Post-Dev	2.027	0.69	7 min

#### 3.2.2. Post-Development Runoff Summary

The post-development runoff summary is presented in **Table 3-4** below.

Table 3-4 Post-Development Discharge Peak Runoff Flows

	POST-DEVELOP	MENT DISCHAI	RGE RUNOFF FL	.OWS	
Catchment Area Name	1:2-year flood (m³/s)	1:5-year flood (m³/s)	1:10 year flood (m³/s)	1:50 year flood (m³/s)	1:100-year flood (m³/s)
Pre-Dev	0.190	0.275	0.349	0.544	0.649

#### 3.2.3. Stormwater Management Strategy

As the proposed works are located within the vicinity of a HBRC drain, the development is to meet the peak flow requirements set out in HBRC's *Hawke's Bay Waterway Guidelines – Stormwater Management* as follows:

- Post-development discharge at the development boundary must be no greater than the pre-development flow in a 1 in 2 and 1 in 10-year ARI (Annual Recurrence Interval).
- Post-development 1 in 100-year ARI discharge must be no greater than 80% of the pre-development flow.
- Mitigate adverse impacts to the 1 in 50 and 1 in 100-year ARI flooding events.
- Piped network must provide a conveyance for a 1 in 5-year ARI rain event.
- Overland flows must provide conveyance for the 1 in 100-year ARI rain event at a minimum.
- The system is to achieve the best practice to mitigate the impacts of urban development on stormwater quality

Table 3-5 presents the comparison between the pre- and post-development peak site discharge.

The development must meet 80% of the pre-developed 100-year discharge rate. The 100-year pre-developed flow rate presented in **Table 3-5** has been adjusted to consider the 80% reduction.

Refer to the detailed calculation provided in Appendix D for more details.

	PEA	K FLOW COMP	PARISON		
Catchment Area Name	1:2-year flood (m³/s)	1:5-year flood (m³/s)	1:10 year flood (m³/s)	1:50 year flood (m³/s)	1:100-year flood (m³/s)
Pre-Dev	0.271	0.395	0.499	0.792	0.758*
Post-Dev	0.190	0.275	0.349	0.544	0.649
Difference	-0.081	-0.120	-0.150	-0.248	-0.109

Table 3-5 Peak Flow Comparison

\*Value denotes 80% of the 100-year pre-development flow

**Table 3-5** above demonstrates the reduction in impervious surfaces throughout the site results in a lower post-development site discharge than the pre-development discharge rate. Therefore, peak flow mitigation is not required.

#### 3.2.4. Flood Displacement

With the Karituwhenua Stream surrounding the eastern and northern site boundaries, it is anticipated some flooding may occur within the bounds of the site. As demonstrated in **Figure 3-1** below, the north-western corner of the site experiences flooding during a 50-year storm event.

Utilising data obtained during previous investigations undertaken on the Karituwhenua Stream and surrounding waterways, the 100-year flood level in the area equates to:

- RL = 18.3 (NZGD2000 Hawkes Bay Circuit)
- RL= 8.04 (NZVD2016) Flood level adopted for future development design

To achieve flood immunity for up to a 100-year storm event, a fill assessment was undertaken in 12d to determine how much area of the pre-developed site sits below RL=8.04 (adopted flood level). This assessment is then utilised to determine the runoff volume which will be displaced when filling the site to achieve immunity levels.

This assessment determined **9m<sup>3</sup>** of runoff will be displaced to the existing flood management area withing Guthrie Park. Flood displacement volumes will be confirmed at detailed design.



Figure 3-1 – Flood Risk Area (Source: HBRC Hazard Portal)

Note portions of the Karituwhenua Stream falls within the bounds of the site. These areas have been excluded from the flood displacement assessment.

#### 3.2.5. Stormwater Treatment Device

The proposed development, if left unmitigated, can increase stormwater pollutants exported from the site. Treatment of the runoff within Stormwater Quality Improvement Devices (SQIDs) is proposed to intercept and capture pollutants to ensure the development aligns with the requirements set out in Hawke's Bay Waterway Guidelines Stormwater Management (dated 2009) and HDC's District Plan.

To treat the water quality generated within the development the following strategies are proposed:

- Rain Gardens Established in the landscaping areas of the shared access link in the north-eastern corner of the site. The rain gardens will capture and treat runoff generated within the shared access link using an engineered filter media. A rain garden is also proposed along the eastern boundary to collect and treat runoff generated within the proposed car park.
- Stormwater 360 Filter System (or suitable equivalent) Established at in the northern reach of the loop road, the proposed piped network within the loop road will collect and convey the water quality event flows to the required manhole. Filters placed within this manhole will treat the discharging flows before discharging to the downstream network; and
- Non-contaminant yielding roofing.

Refer to Drawing No **H20200141-50-A-01** in **Appendix C** for the location and configuration of the proposed treatment devices.

Preliminary sizing of the rain gardens is provided in **Appendix D**.

The design of the systems will be undertaken in accordance with the Hawke's Bay Waterways Guideline – *Stormwater Management* (2009).

Further details of the sizing, location and ongoing operation and maintenance for the devices will be provided during the next phase of the application process.

#### 3.3. Council Consultation – Stormwater

On the 20<sup>th of</sup> July 2022, DNL met with HDC to present a high-level introduction of the site. Following this presentation, a meeting was held with the HDC Stormwater Asset Manager to discuss the proposed stormwater management strategy in more detail. The following finding and actions were recommended by HDC.

- Further discussion regarding the flood level and the validity of the source of the flood information.
- Further investigation into the flood risk management.
- Rainwater tanks on each lot are encouraged to alleviate pressure on the receiving waterway. Concerns with maintenance were voiced.
- Rain gardens are the preferred stormwater quality treatment devices.
- Filter systems are an acceptable method of treatments.
- Agreement between the Applicant and HDC Parks and Reserves to:
  - Run the proposed piped network outlet along the western park edge before discharging to the Karituwhenua Stream; and
  - Displace 9m<sup>3</sup> of additional flooding into the Guthrie Park.

Note, the HDC Parks and Reserves Asset Manager has confirmed the location of the proposed outlet pipe within the bounds of Guthrie Park is an acceptable solution.

The concerns raised by council will be addressed through the ongoing approval process.

#### 4. WATER SUPPLY

#### 4.1. Existing & Proposed Water Services Infrastructure

There is a reticulated water supply in the vicinity of the site via a DN100 asbestos cement (AC) pipe within Brookvale Road. The Garden Centre and existing dwelling on the western edge of the existing access has a connection at the property boundary. A connection is also available in the southern corner of the site.

Water supply for the proposed development follows:

- The Garden Centre is proposed to retain the existing connection to the reticulated network.
- A new water main is proposed to connect to the reticulated network in Brookvale Road and run throughout the development within the proposed loop road.
  - Lots served by JOALs, and Shared Access Links will be serviced via private water lines sourced from multi-manifold arrangements at the access boundary.

Refer to Drawing No. **H20200141-70-A-01** and **70-A-02** appended for the proposed servicing arrangement.

#### 4.2. Water Demand Calculations

*ECoP 2020* specify an average annual daily demand (AADD) of 400 litres per person per day and an equivalent population (EP) of 3.5 per dwelling unit.

Note, the Garden Centre has been excluded from the following calculation as this area of the site will retain the existing supply arrangement.

#### 4.2.1. Water demands

400 l/p/day x 3.5 EP x 35 Units = **49 kl / day** 

Refer to **Table 4-1** for the post-development water demand.

Table 4-1 Water Demand –	Proposed	Development
WATER DEMANDS		
Parameter	Value	Unit
Typical demand	400	l/person/day
Application lots	35	lots
Estimated Population (EP)	3.5	Per/unit
Average daily demand	49	kl/day
Peak daily demand factor	2.0	
Peak daily demand	98	kl/day
Peak hourly demand factor	5.0	
Peak hourly demand	20,420	l/hr
-	5.67	l/s

Refer to the detailed calculations presented in **Appendix D**.

#### 4.3. Firefighting Demand

To support the development of this site, a water scheme also needs to provide a water supply that can provide water at a flow rate, pressure, and volume for firefighting purposes specific to the land use proposed by the development.

The provision of a firefighting water supply to a reasonable level for the application area has been limited to the fire building classification FW2 non-sprinkled structures; (Housing includes single-family dwellings, and multi-unit dwellings, but excludes multi-storey apartment blocks).

A classification FW2 water scheme is required to provide 750 litres/minute from a maximum of two hydrants with flows and distances being with hydrants located within 135 metres and 270 metres, respectively. The expected water flow rate must be provided with a minimum residual water pressure of no less than 100kPa.

Existing fire hydrants are located along the southern side of Brookvale Road. New hydrants will be placed on the proposed water main to ensure all dwellings fall within the required distances from a fire hydrant.

#### 4.4. Water Network Detailed Design

The detailed design of the water infrastructure will be compiled to meet the requirements of the HDC ECoP 2020 and NZBC – G12.

#### 4.5. Council Consultation – Water Supply

On the 20<sup>th of</sup> July 2022, DNL met with HDC to present a high-level introduction of the site. Following this presentation, a summary of the proposed servicing strategy and anticipated demand for the development was circulated to HDC's Water Asset Manager. Email correspondence received from the HDC Engineering Department confirmed that there are no "Red Flags" when servicing the proposed development.

HDC have advised ongoing sensitivity checks of the model will be undertaken to ensure the reticulated network can adequately accommodate the development.

#### 5. WASTEWATER

#### 5.1. Existing & Proposed Water Services Infrastructure

The site is surrounded by a reticulated wastewater network. An existing DN375 PVC main flows north within Romanes Drive, while a DN150 UPVC pipe flows southwest within Brookvale Road. The Garden Centre has a connection to the existing main in Brookvale Road.

The following is proposed to achieve wastewater servicing for the development:

- The existing connection servicing the Garden Centre will be retained.
- A waste pump station is proposed at the downstream end of the Shared Access Link. A rising main is proposed from the pump station to the existing DN150 in Brookvale Road. A piped network will be constructed within the road to provide connections to most of the lots, ultimately discharging to the pump station.
- Lots 2 & 3 will utilise the existing connection points to Brookvale Road.

Refer to Drawing No. H20200141-60-A-01 and 60-A-02 for the proposed servicing strategy.

#### 5.2. Wastewater Demand Calculations

Wastewater calculations were prepared in accordance with HDC ECoP 2020. The peak average dry weather flow (ADWF) was determined based on 250 litres per person per day, dilution / infiltration factor (IF) of 2, a peak factor (PF) of 2.5 and an equivalent population (EP) of 3.5 per dwelling. The ADWF and peak wet weather flow (PWWF) rate for the new development is calculated as follows:

**Proposed Wastewater Demand** ADWF: 250 l/p/day x 35 lots x 3.5 EP = 30.63 kl/day (0.35 l/s)

**PWWF**: 30.63 kl/day x 2 (IF) x 2.5 (PF) = **153.1 kl/day (1.77 l/s)** 

Table 5-1 below presents the full wastewater demand calculations

Table 5-1 Water Demand –	Proposed Devel	opment
WASTEWATER	DEMANDS	
Parameter	Value	Unit
Typical demand	250	l/person/day
Application lots	35	lots
Estimated Population (EP)	3.5	Per/unit
Average Dry Weether Flow	30.63	kl/day
Average Dry weather Flow	0.35	l/s
Peak Factor	2.5	
Peak Dry Weather Flow	76.56	kl/day
Infiltration Factor	2.0	
	153.1	kl/day
Peak Wet Weather Flow	6,380	l/hr
	8.20	l/s

Table 5-1 Water Demand – Proposed Development
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#### 5.3. **Proposed Pump Station**

As discussed in **Section 5.1**, the proposed development will require a pump station to ensure the site can effectively discharge the generated wastewater to the reticulated network.

Located at the end of the Shared Access Link, the pump station will collect most of the waste generated by the development and discharge to the existing network via a rising main located within Guthrie Park along the western site boundary.

Further details of the pump configuration, storage requirements and piped network sizing will be undertaken through the up-and-coming design phases. All designs will be prepared in accordance with the HDC ECoP 2020.

#### 5.4. **Council Consultation – Wastewater**

On the 20<sup>th of</sup> July 2022, DNL met with HDC to present a high-level introduction of the site. Following this presentation, a summary of the proposed servicing strategy and anticipated demand for the development was circulated to HDC's Wastewater Asset Manager. Two requests were made as follows:

- Does the reticulated network have capacity to accept the anticipated flow.
- Is proposed rising main able to be constructed within the Guthrie Park Reserve. •

The following advice was received.

- Modelling of the network, with consideration of the Brookvale Structure Plan development to the east of Romanes Drive, suggests the existing network is under capacity. HDC is undertaking a detailed investigation into the cause of the issue to determine how to improve the situation. This investigation is anticipated to be completed by January 2023.
- HDC Parks and Reserves Asset Manager has confirmed the location of the proposed rising main is acceptable.

#### 6. EARTHWORKS

#### 6.1. Earthworks

Earthworks within the site are required to establish the accessway, internal roading, car parking area, installation of the three water services, utilities, and the establishment of building platforms. The anticipated cut and fill volumes follow:

- Cut = 730 m<sup>3</sup>
- Fill = 1,600 m<sup>3</sup>

#### 6.2. Geotechnical Investigation

*Initia* undertook a geotechnical investigation for the proposed works as documented in the *Brookvale Residential – Geotechnical Assessment Report* (report ref: P-001006 *Rev A*, dated February 2021). Findings of this report include:

- The site subsoils comprise of clayey silts underlain by silty sandy gravels.
- Based on the ground conditions encountered, the key geotechnical hazards are liquefaction and consolidation settlement.
- Liquefaction is not expected under Serviceability Limit State Levels of shaking, however Ultimate Limit State levels, non-continuous layers within the subsoil may liquefy.
- The upper clayey silts are cohesive and considered not susceptible to liquefaction and the underlying gravels are very dense, thus liquefaction potential is low.
- Consolidation settlements from the likely building loads are expected to be low.
- Engineered Raft foundations are recommended.
- Flexible services and service connections are recommended.

Refer to Initia's report for further detail. All earthworks and pavement designs will be undertaken in accordance with the recommendations of the geotechnical specialists.

#### 6.3. Contamination Investigation

Geosciences Ltd undertook a detailed site investigation for the site. Documented in the Detailed Site Investigation (DSI) – 55 Brookvale Road, Havelock North, Hastings (Report ref: REP-H0155/DSI/JUN21), the investigation determined the following:

- Results returned heavy metal concentrations which fell within the naturally occurring soil background range.
- Concentrations of organic compound were detected. Concentrations were assessed to not pose a risk to human health or the receiving environment.
- Due to the detection of organic compounds, the regulation of the MfE National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES) will apply to the proposed subdivision.

• Soil quality has been assessed as not posing a risk to the environment, no further considerations pertaining to the contaminated land are necessary.

#### 6.4. Erosion and Sediment Control

There is a potential for the earthworks to produce pollution from erosion and sediments onsite. The Erosion and Sediment Control Plan (ESCP) will be developed in accordance with the requirements of the Hawke's Bay Regional Council Guidelines for Erosion and Sediment Control. The ESCP plan will be submitted to Hastings District Council for approval at detailed design stage.

### 7. PROPOSED SITE ACCESS

Access for the proposed sub-division is via the existing garden centre access from Brookvale Road. A loop road is proposed to service the internal dwellings with two Jointly Owned Access Lots (JOALs) established off the loop road. Two connections to the park are also proposed, the southern most link will provide pedestrian access whilst the northern link will be a shared access and will provide access for 5 proposed dwellings.

The loop road will feature parking bays throughout while a 43-park car park is proposed directly to the north of the garden centre. This car park is to service the garden centre

East Cape Consulting (ECC) was engaged by Oderings to undertake a *Transportation Assessment Report* (Report Ref: 22-0082 TAR 220921). The findings of the investigation follow:

- The incremental traffic generation from the new residential lots is expected to have a negligible effect on the operation of the surrounding network.
- The proposed internal road cross-sections are a departure from the District Plan standards but have been shown to appropriately accommodate the needs of light and heavy traffic as well as pedestrians and cyclists
- The individual lots are expected to provide on-lot parking and additional on-street parking is also proposed. The garden centre will have a parking area for 43 vehicles.

#### 7.1. Proposed Pavement

Detailed design of the internal road pavements will be undertaken during the future design stages.

Preliminary road cross-sections are provided on Drawing No. **H20200141-40-A-03**, further investigation into the most appropriate roading cross-sections will be undertaken through progression of the design.

#### 8. UTILITY SERVICES

Unison and Chorus have been contacted to confirm power and internet is available for the site. Existing networks surround the site and provide locations for connections.

### 9. CONCLUSION

This report concludes that all civil engineering considerations required to support the proposed 35 Lot sub-division at 55 Brookvale Road by **Oderings Nurseries** (the Applicant) can adequately be addressed in accordance with the Hastings District Council Engineering Code of Practice and HDC's *District Plan* as follows.

- Earthworks Earthworks are required for the formation of the proposed access, roading, infrastructure installation, building platforms and fill to achieve flood immunity.
- Access Access will be provided by the reconfiguration of the existing access via Brookvale Road.
- Stormwater Stormwater will be managed via a combination of pipe and overland flow conveyance. Rain gardens and filters are proposed to achieve stormwater quality treatment. The reduction in hardstand throughout the site following the development will mean the proposed development will not increase flows discharge the site. A small volume of flooding is expected to be displaced because of the development; this displacement can be managed within the flood management area within Guthrie Park to the west.
- Water Potable water supply will be achieved by connecting to the existing water main in Brookvale Road
- Wastewater Wastewater discharge will be via a new connection to the existing main in Brookvale Road. A pump station is proposed to achieve this connection. HDC is in the process of confirming the capacity of the reticulated network.

DOCU	IMENT CONTROL
PREPARED FOR:	Oderings Nurseries
PROJECT NAME:	Oderings – 55 Brookvale Road, Hastings
PROJECT NO.:	H20200141
FILE REFERENCE:	H20200141-ESR-V1
DATE:	21 September 2022
VERSION:	1
	Mitchell Pal
AUTHOR(3).	SENIOR CIVIL ENGINEER – CPENG
	21 September 2022
REVIEWED:	JJ Pretorius
	CIVIL DESIGN ENGINEER
	21 September 2022
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	21 September 2022
APPROVED:	Med
	Mitchell Pal
	SENIOR CIVIL ENGINEER - CPEng
	21 September 2022

Engineering Services Report H20200141 – 55 Brookvale Road Development Nous Ltd



ENGINEERING SERVICES REPORT

SITE LAYOUT

## LANDSCAPE DESIGN INTENT

The landscape design intent for the Oderings proposal aims to achieve the following outcomes:

- Include finishes and materials that provide for a high level of quality, amenity, and interest.
- Highlight the former land use and existing Oderings site by utilising nursery stock throughout the development. Provide vegetation throughout that softens and integrates the new residences within the broader established neighbourhood and ensure the development gives back to the community.
- Provide a streetscape layout and design that encourages a slow speed environment that is safe and welcoming for pedestrians and cyclists and promotes shared use.
- Incorporate innovative stormwater detention and treatment within the development.
- Enhance and restore the ecological and habitat value that the Karituwhenua Stream holds and ensure this can be used and celebrated by the community for an enhanced sense of place.

The proposal is for a 34-lot residential subdivision designed within the existing Oderings site at 57 Brookvale Road in Havelock North. The site is bound by Brookvale Road to the south, Romanes Drive to the east and Guthrie Park to the north and west. The development will include the existing Oderings commercial site with new car park and café facilities.

The landscape plan shows the subdivision with an intimate road network utilising a single access off Brookvale Road. The roadway hierarchy is shown through the change in corridor widths, materials, and finishes and road profile. Specifically, the 18m wide "Entry Road" is designed as a more traditional road with wider traffic lanes and non-mountable kerb and channel which will provide sufficient capacity for the Oderings commercial site. The entry road profile finishes at the roundabout situated fronting the new Oderings car park. The roundabout will allow traffic to filter into the car park or turn around an out, or flow into the residential "Loop Road."

The entry road transitions into the "Loop Road" which is a two-way, laneway style shared environment which provides access to the residential lots. The loop road corridor is reduced at 11m wide with the roadway and pedestrian network designed as a flush environment, with no kerb and channel, instead incorporating in-line rain gardens to treat stormwater runoff from the development. The loop road will include a different materiality to the entry road, triggering a more relaxed slow speed shared area.

The roadway design prioritises continued movement off the roundabout heading north along the loop around in an anti-clockwise direction circling around to service the north-western jointly owned access lot (JOAL) and looping south back along the lots fronting Guthrie Park and back out onto the entry road and Brookvale Road.

The loop road also incorporates two (2) reserve connection links through to Guthrie Park. The northern reserve link is shared a with vehicle access to Lots 14-19, and the southern link is pedestrian only connecting the park with Oderings, both visually and physically.

The Karituwhenua Stream is an existing drainage channel that runs along the northeastern edge of the site and curves to the west to run through Guthrie Park and north to the Karamu Stream. This drain in its current form is a utilitarian drain with little ecological function. Further design and discussion are to be had with Hastings District Council to potentially re-vegetate and enhance the portion of the drain as a part of the Oderings development.

14/09/2022 Revision C [H20200141] 57 Brookvale Road - ODERINGS SUBDIVISION LANDSCAPE CONCEPT





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ι.	to resource consent approval and final land tra	ansfer survey.	חוו מודמט מוד טעטודטו		
2. 2	Current Hastings District Council Zoning - Plai	ns Production.	ny plana through a		
5.	Traverse Spreadsheet calculation. Neighbour from the LINZ geodetic database (21/02/2022)	inderlying surve ring Boundaries ).	ey plans through a have been obtained	Section 7 SO 330242	
4.	Lot 100 is to be vested in Hastings District Could Lot 200 is to be vested in Hastings District (Drainage) upon deposit.	uncil as road upc Council as Loc	on deposit. al Purpose Reserve		
5.	Easements to Surrender: Area A & B DP 311724 (EI 5379491.4) are	to be surrender	red in full. This is to		
	become road to vest. Easements created by EI 5379491.4 are subjected as the subject of the subje	ect to Section 243 341038.3) is to b	3 (a) RMA 1991. be surrendered in full		
δ.	Amalgamation Conditions: "That Lot 101 hereon be held in 3 undivided the 18 hereon as tenants in common in the said title be issued in accordance herewith." "That Lot 102 hereon be held in 5 undivided the 9 hereon as tenants in common in the said shared	hird shares by the shares and that hird shares by th ares and that inc	e owners of Lots 16 - t individual record of ne owners of Lots 5 - dividual record of title	27 26	25 24
7	be issued in accordance herewith."	inal Land Transf	ar plan		
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			Pt Lot 1 DP 1956	Park	31
			Pt Lot 1 DP 1956	Park	
	SCI	HEDULE OF	Pt Lot 1 DP 1956	Park	
	SCI	HEDULE OF SHOWN	Pt Lot 1 DP 1956 EASEMENTS SERVIENT TENEMENT (BURDENED LAND)	DOMINANT TENEMENT         BENEFITED LAND)	
	SCI PURPOSE RIGHT TO DRAIN WATER	HEDULE OF SHOWN	Pt Lot 1 DP 1956 EASEMENTS EASEMENTS SERVIENT TENEMENT (BURDENED LAND) LOT 3	Dominant tenement (Benefited Land) LOT 1 DP 311724	
	SCI PURPOSE RIGHT TO DRAIN WATER RIGHT OF WAY, RIGHT TO DRAIN WATER & SEWAGE, RIGHT TO	HEDULE OF SHOWN A LOT 101	Contempose of the second secon	Park	

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MICHAEL







	NOTES						
	1.	This plan has be to resource cons	en produced for resource ent approval and final land	consent purposes. All areas are subject transfer survey.	:t		
	2. 3.	Current Hastings Boundaries hav	District Council Zoning - P been determined from	Plains Production. I underlying survey plans through a	а		
		Traverse Spread from the LINZ ge	Isheet calculation. Neighbood so the second se	ouring Boundaries have been obtaine 22).	d		
	4.	Lot 100 is to be v Lot 200 is to be (Drainage) upon	vested in Hastings District C e vested in Hastings Distr deposit.	Council as road upon deposit. ict Council as Local Purpose Reserve	e		
	5.	Easements to Su Area A & B DP	ırrender: 311724 (El 5379491.4) a	re to be surrendered in full. This is to	0		
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	6.	Amalgamation C "That Lot 101 he	onditions: reon be held in 3 undivided	third shares by the owners of Lots 16	-		
		18 hereon as ten title be issued in "That Lot 102 he 9 hereon as tena be issued in acco	nants in common in the sa accordance herewith." reon be held in 5 undivide ants in common in the said ordance herewith."	aid shares and that individual record o d third shares by the owners of Lots 5 shares and that individual record of title	f - e		
	7.	Party Wall easen	nents may be required upon	n final Land Transfer plan.			
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HT TO DRAI	IN ) &	LOT 101	LOT 101	LOTS 16 - 18			
CATIONS	α	LOT 102	LOT 102	LOTS 5 - 9			
			Clature				
			NOT TO BE USED	OR APPROVAL			

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1 DP 8274 & LOT 2 DP 311724	Datum HB2000	Council Ref.	Scale 1:250	Size A1
	Drawing Number			Revision
	H2020014	1-RC-002		1



# **TOPOGRAPHICAL SURVEY PLAN**



ENGINEERING SERVICES REPORT

Engineering Services Report H20200141 – 55 Brookvale Road Development Nous Ltd

- 1. This plan has been produced for information purposes. Property boundaries for sites surveyed have been sourced from underlying cadastral survey plan and neighbouring information has been sourced from Land Information New Zealand (LINZ) (21/02/2022).
- Horizontal Datum is NZGD 2000 Hawkes Bay Circuit. Origin of coordinates is IT I DP 23150.
- 3. Levels are in terms of New Zealand Vertical Datum 2016 (NZVD2016). Origin of heights is IT I DP 23150 (RL = 11.19 as sourced from LINZ).
- 4. Aerial Imagery has been sourced from LINZ data services.
- 5. Existing service lids shown have been observed using GNSS and Total Station methods. Existing service lines have been sourced from HDC GIS

# LEGEND:

			BOUNDARY
			BOUNDARY NEIGHBOUR
		·	EXISTING BUILDING
×—	\\	———×	FENCELINE
<u> </u>			STORMWATER & MANHOLE/SUMP
<u> </u>			SEWER & MANHOLE
₩—	·		WATER/TOBY/BACKFLOW
	$\bowtie$	Ø	VALVE/WATER MANHOLE
	$\bigotimes$	Ō	POWER POLE AND TELECOM
			TOP OF KERB
			INVERT OF KERB
			EDGE OF SEAL
			EDGE OF FOOTPATH
_			ROAD CENTRELINE
			BOTTOM OF NIB WALL
			TOP OF NIB WALL
			MAJOR CONTOURS
			MINOR CONTOURS

MINIMUM FLOOR LEVEL - RL = 8.54



022	EXTRA TOPO INFORMATION	CB	MV
022	FOR INFORMATION	GG	MV
;	Description	Appd.	Issued





**CIVIL ENGINEERING PLANS** 



ENGINEERING SERVICES REPORT

Engineering Services Report H20200141 – 55 Brookvale Road Development Nous Ltd

## <u>NOTES</u>

- ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE

- (RL=11.19 AS SOURCED BY LINZ)
- SURVEY OF ALL VISIBLE SERVICES.
- CONSTRUCTION WORK.

#### <u>LEGEND</u>

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חעוד גרטו ורח. זו מפאפווומפו זמדע ודימה אווו מו יואוו מודר	<ol> <li>ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).</li> <li>HORIZONTAL DATUM IS NZGD 2000 HAWKE'S BAY CIRCUIT. ORIGIN OF CO-ORDINATES IS IT I DP23150.</li> <li>LEVELS ARE IN TERMS OF NZVD 2016. ORIGIN OF HEIGHT IS IT I DP 23150. (RL=11.19 AS SOURCED BY LINZ)</li> <li>NEW ALLOTMENTS ARE SUBJECT TO LAND TRANSFER SURVEY.</li> <li>EXISTING SERVICES HAVE BEEN SOURCED FROM CHBDC GIS DATABASE &amp; TOPOGRAPHIC SURVEY OF ALL VISIBLE SERVICES.</li> <li>CONTRACTORS TO LOCATE ALL EXISTING UNDERGROUND SERVICES PRIOR TO COMMENCING CONSTRUCTION WORK.</li> <li>SEDIMENT AND EROSION CONTOL HAVE BEEN DESIGNED IN ACCORDANCE WITH HAWKES BAY WATERWAY GUIDELINES FOR EROSION AND SEDIMENT CONTROL (HBWG 2009).</li> <li>CONTRACTOR TO MANAGE SEDIMENT AND EROSION CONTROL IN ACCORDANCE WITH HBWG 2009.</li> </ol>		
	EXTENTS OF DEVELOPMENT		8.40
	40.0 DESIGN CONTOUR LINES @0.1m INTERVALS		
	EX. ROADS		



1	20/09/2022	FOR RESOURCE CONSENT	MP	HKS
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## 330242 0.6745 NOTES ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE). HORIZONTAL DATUM IS NZGD 2000 HAWKE'S BAY CIRCUIT. ORIGIN OF CO-ORDINATES IS IT I DP23150. LEVELS ARE IN TERMS OF NZVD 2016. ORIGIN OF HEIGHT IS IT I DP 23150. (RL=11.19 AS SOURCED BY LINZ) NEW ALLOTMENTS ARE SUBJECT TO LAND TRANSFER SURVEY. EXISTING SERVICES HAVE BEEN SOURCED FROM CHBDC GIS DATABASE & TOPOGRAPHIC SURVEY OF ALL VISIBLE SERVICES. CONTRACTORS TO LOCATE ALL EXISTING UNDERGROUND SERVICES PRIOR TO COMMENCING CONSTRUCTION WORK. SEDIMENT AND EROSION CONTOL HAVE BEEN DESIGNED IN ACCORDANCE WITH HAWKES BAY WATERWAY GUIDELINES FOR EROSION AND SEDIMENT CONTROL (HBWG 2009). 8. CONTRACTOR TO MANAGE SEDIMENT AND EROSION CONTROL IN ACCORDANCE WITH HBWG 2009. <u>LEGEND</u> - - - CADASTRAL INFORMATION EXTENTS OF DEVELOPMENT PROP. CUT CONTOUR (0.10m) PROP. FILL CONTOUR (0.10m) PROP. BALANCE CONTOUR (0m) EX. ROADS CUT & FILL VOLUMES TOTAL CUT -730m³ +1 600m³ TOTAL FILL TOTAL BALANCE +870m³

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Datum HB2000	Council Ref. TBC	Scale 1:250	Size A1
Drawing Number			Revision
H2020014	1-40-A-01		1



- 1. ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).
- 2. HORIZONTAL DATUM IS NZGD 2000 HÁWKE'S BAY CIRCUIT.
- ORIGIN OF CO-ORDINATES IS IT I DP23150. 3. LEVELS ARE IN TERMS OF NZVD 2016. ORIGIN OF HEIGHT IS IT I DP 23150.

CADASTRAL INFORMATION

- (RL=11.19 AS SOURCED BY LINZ)
- 4. NEW ALLOTMENTS ARE SUBJECT TO LAND TRANSFER SURVEY.
- 5. EXISTING SERVICES HAVE BEEN SOURCED FROM CHBDC GIS DATABASE & TOPOGRAPHIC
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- 8. CONTRACTOR TO MANAGE SEDIMENT AND EROSION CONTROL IN ACCORDANCE WITH HBWG 2009.

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Drawing Number			Revision	
H20200141-40-A-02 1				



















TYPICAL ROAD CROSS SECTION (FF) (8m WIDE CORRIDOR) SCALE 1:50

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Fieldworked MV	Date 1/03/2022	Client ODERINGS				
Drawn JB Checked MP	Date 20/07/2022 Date 20/07/2022	Project ODERINGS NURSERY HAVELOCK NORTH	Status FO NOT TO BE	R RESOUR	CE CONSE	NT PURPOSES
Designed HKS	Date 20/07/2022	Title	Datum HB2001	Council Ref. TBC	Scale AS SHOWN	Size A2
Approved MP	Date 20/07/2022	ROADING TYPICAL ROAD CROSS SECTIONS	Drawing Number H2020014	1-40-A-03		Revision 1

40-A-03





HAR HIM HERE STREET Lot 1 DP 311724 0.1257 LOT 2 BROOKVALEROAD Lot 4 DP 23150 0.0700 Lot 3 DP

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25m

@A1

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-ieldworked MV	Date 1/03/2022	Client ODERINGS				
Drawn HN	Date 15/09/2022	Project ODERINGS NURSERY	Status FO	R RESOUR	CE CONSE	NT
Checked MP	Date 15/09/2022	HAVELOCK NORTH	NOT TO BE	USED FOR CC	NSTRUCTION F	PURPOSES
Designed HKS	Date 15/09/2022	Title	Datum HB2000	Council Ref. TBC	Scale 1:250	Size A1
Approved	Date	STORMWATER	Drawing Number			Revision
MP	15/09/2022	NETWORK AND RAIN GARDEN LAYOUT_SHEET 1 OF 2	H2020014	1-50-A-01		1

#### NOTES

- 1. ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).
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- SURVEY OF ALL VISIBLE SERVICES. 6. CONTRACTORS TO LOCATE ALL EXISTING UNDERGROUND SERVICES PRIOR TO COMMENCING
- CONSTRUCTION WORK. SEDIMENT AND EROSION CONTOL HAVE BEEN DESIGNED IN ACCORDANCE WITH HAWKES BAY





![](_page_32_Figure_0.jpeg)

Description

Drawn HN 15/09/	Project ODERINGS NURSERY		Status		CE CONSE	NT
Checked MP 15/09/	HAVELOCK NORTH		NOT TO BE	USED FOR CO	NSTRUCTION F	PURPOSES
Designed HKS 15/09/	Title		Datum HB2000	Council Ref. TBC	Scale 1:250	Size A1
Approved	STORMWATER		Drawing Number			Revision
MP 15/09/	NETWORK AND RAIN GARDEN LAYOUT_S	SHEET 2 OF 2	H2020014	1-50-A-02		1

![](_page_33_Figure_0.jpeg)

#### <u>NOTES</u>

- 1. ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).
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- CONSTRUCTION WORK.
- 7. SEDIMENT AND EROSION CONTOL HAVE BEEN DESIGNED IN ACCORDANCE WITH HAWKES BAY WATERWAY GUIDELINES FOR EROSION AND SEDIMENT CONTROL (HBWG 2009).
- 8. CONTRACTOR TO MANAGE SEDIMENT AND EROSION CONTROL IN ACCORDANCE WITH HBWG 2009.

![](_page_33_Figure_13.jpeg)

	Status FOR RESOURCE CONSENT NOT TO BE USED FOR CONSTRUCTION PURPOSES			
	Datum HB2000	Council Ref. TBC	Scale 1:250	Size A1
	Drawing Number H20200141-60-A-01			Revision
				1

Lot 9 DP 23150 0.0852

![](_page_34_Figure_0.jpeg)

6	<u> </u>					
Fieldworked	Date	Client				
MV	1/03/2022	ODERINGS	_			
Drawn	Date	Project	Status			
HN	15/09/2022	ODERINGS NURSERY	FO	R RFSOUR	CF CONSE	NT
Checked	Date					
MP	15/09/2022					
Designed	Date	Title	Datum	Council Ref.	Scale	Size
HKS	15/09/2022		HB2000	TBC	1:250	A1
Approved	Date	SEWER	Drawing Number			Revision
			1 0000011	1 60 1 02		1
MP	15/09/2022	NETWORK LAYOUT_SHEET 2 OF 2		1-00-A-02		I

- 1. ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).
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- WATERWAY GUIDELINES FOR EROSION AND SEDIMENT CONTROL (HBWG 2009). 8. CONTRACTOR TO MANAGE SEDIMENT AND EROSION CONTROL IN ACCORDANCE WITH HBWG 2009.

![](_page_34_Figure_13.jpeg)

LEGEND	
	CADASTRAL INFORMATION
	EXTENTS OF DEVELOPMENT
0.5	DESIGN CONTOURS @0.1m INTERVALS
	LOT BOUNDARY
	EX. ROAD CENTRE LINE
	PROP. WALKWAYS
	PROP. VEHICLE CROSSING
	PROP. ROAD
	PROP. BERM
SS	EX. INFRASTRUCTURE
	PROP. Ø150mm uPVC/SN16 SEWER PIPE (PUBLIC)
	PROP. Ø150mm uPVC/SN16 SEWER PIPE (PRIVATE)
	PROP. Ø100mm SEWER LATERAL (PUBLIC)
	PROP. Ø100mm SEWER LATERAL (PUBLIC)
<b>——</b>	PROP. SS Ø1050 MANHOLE (PUBLIC)
<b>———</b>	PROP. SS Ø1050 MANHOLE (PUBLIC)
	PROP. Ø63mm SEWER RISING MAIN (PUBLIC)
———	PROP. SEWER PUMPSTATION

![](_page_35_Figure_0.jpeg)

- 1. ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).
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- WATERWAY GUIDELINES FOR EROSION AND SEDIMENT CONTROL (HBWG 2009).

8. CONTRACTOR TO MANAGE SEDIMENT AND EROSION CONTROL IN ACCORDANCE WITH HBWG 2009.

![](_page_35_Figure_16.jpeg)

Status FOR RESOURCE CONSENT NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Datum HB2000	Council Ref. TBC	Scale 1:250	Size A1
Drawing Number			Revision
H2020014	1-70-A-01		1

Lot 9 DP 23150 0.0852

![](_page_36_Figure_0.jpeg)

- 1. ALL PROPOSED WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH HASTINGS DISTRICT COUNCIL ENGINEERING CODE OF PRACTICE 2020 AND ASSOCIATED DRAWINGS OR WHERE DEFERRED BY THAT CODE NZS4404:2010 (NEW ZEALAND STANDARD FOR LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE).
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LEGEND	
	CADASTRAL INFORMATION
	EXTENTS OF DEVELOPMENT
	LOT BOUNDARY
	EX. ROAD CENTRE LINE
	PROP. WALKWAYS
	PROP. VEHICLE CROSSING
	PROP. ROAD
	PROP. BERM
——— W ———	EX. INFRASTRUCTURE
	PROP. Ø100 MDPE PN16 PE100 WATER MAINS (PUBLIC)
	PROP. Ø63 MDPE PN16 PE100 WATER MAINS (PUBLIC)
	PROP. Ø32 HDPE PN12.5 PE80B WATER HOUSE CONNECTION (PUBLIC)
	PROP. Ø20 HDPE PN12.5 PE80B WATER HOUSE CONNECTION (PUBLIC)
	PROP. Ø32 HDPE PN12.5 PE80B WATER HOUSE CONNECTION (PRIVATE)
M	PROP. WATER GATE VALVE (PUBLIC)
W	PUBLIC WATER TOBY
	PROP. WATER SHUT-OFF VALVE (PRIVATE)
Ξ	PROP. WATER HYDRANT
Η	EX. WATER HYDRANT

Status FOR RESOURCE CONSENT NOT TO BE USED FOR CONSTRUCTION PURPOSES				
Datum HB2000	Council Ref. TBC	Scale 1:250	Size A1	
Drawing Number Revis			Revision	
H20200141-70-A-02			1	

Engineering Services Report H20200141 – 55 Brookvale Road Development Nous Ltd

![](_page_37_Picture_1.jpeg)

## Oderings Nursery, Havelock North - Stormwater Calculation Summary

Date: Job:

20/09/2022

H20200141

PRE-DEVELOPMENT CATCHMENT DATA						
Catchment Area Name	Catchment Area (ha)	Runoff Coefficient (C)	Time of Concentration (T <sub>c</sub> )			
Pre-Development	2.027	0.86	5 min			

POST-DEVELOPMENT CATCHMENT DATA						
Catchment Area Catchment Area Runoff Time of						
Namo	(ba)	Coofficient (C)	Concentration (T)			
Name	(11a)					

PRE-DEVELOPMENT RUNOFF FLOWS								
Catchment Area	1:2 year flood (m³/s)	1:5 year flood (m³/s)	1:10 year flood (m³/s)	1:50 year flood (m³/s)	1:100 year flood (m³/s)			
Pre-Development	0.271	0.395	0.499	0.792	0.948			
Pre-Development (80)%					0.758			

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POST-DEVELOPMENT RUNOFF FLOWS							
Catchment Area	1:2 year flood (m³/s)	1:5 year flood (m³/s)	1:10 year flood (m³/s)	1:50 year flood (m³/s)	1:100 year flood (m³/s)		
Post-Development	0.190	0.275	0.346	0.544	0.649		

## Rational Method Peak Flow Estimation - Pre-Development

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Date:	
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Catchment Area

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Pre-Development

Time of Concentration Calculations								
Reference	Equation Type / Method	Area (m²)	Length (m)	Av. Slope (%)	Height diff. of catchment	Velocity (m/s)	Mannings Roughness	tc (mins)
E1_2.3.2 (a)	Time of entry	20271						5.00
							tc (min)	5 min

Coefficent of Runoff "C" (E1_Table 1)		
Surface Description	Landuse "Ci"	Landuse Area "Ai"
Unsealed roads	0.5	665 m²
Fully roofed and or sealed developments	0.9	18,699 m <sup>2</sup>
Asphalt and concrete paved surfaces	0.85	70 m²
Maintained gardens / lawns	0.25	837 m²
	Coefficent of Runoff "C"	0.86

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2081-2100

ARI	AEP	С	A (ha)	l (mm/hr)	Q (m <sup>3</sup> /s)	Q (I/s)
2	0.50	0.86	2.027	55.916	0.271	270.732
5	0.20	0.86	2.027	81.628	0.395	395.223
10	0.10	0.86	2.027	103.090	0.499	499.139
20	0.05	0.86	2.027	127.301	0.616	616.363
50	0.02	0.86	2.027	163.539	0.792	791.817
100	0.01	0.86	2.027	195.795	0.948	947.993

## Rational Method Peak Flow Estimation - Post-Development

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Date: Job:

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20/09/2022

Job: Catchment Area H20200141 Post-Development

Time of Concentration Calculations								
Reference	Equation Type / Method	Area (m²)	Length (m)	Av. Slope (%)	Height diff. of catchment	Velocity (m/s)	Mannings Roughness	tc (mins)
E1_2.3.2 (a)	Time of entry	20271						7.00
							tc (min)	7 min

Coefficent of Runoff "C" (E1_Table 1)						
Surface Description	Landuse "Ci"	Landuse Area "Ai"				
Fully roofed and or sealed developments	0.9	3,735 m²				
Asphalt and concrete paved surfaces	0.85	11,960 m <sup>2</sup>				
Grassed	0.3	4,576 m <sup>2</sup>				
	Sub-Total:	0.74				
Slope Correction for Runoff Coefficients (E	1_Table 2)					
0-5%	subtracting	0.05				
	Coefficent of Runoff "C"	0.69				

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2081-2100

ARI	AEP	С	A (ha)	l (mm/hr)	Q (m <sup>3</sup> /s)	Q (I/s)
2	0.50	0.69	2.027	49.202	0.190	189.793
5	0.20	0.69	2.027	71.379	0.275	275.341
10	0.10	0.69	2.027	89.775	0.346	346.301
20	0.05	0.69	2.027	110.420	0.426	425.939
50	0.02	0.69	2.027	141.126	0.544	544.384
100	0.01	0.69	2.027	168.313	0.649	649.254

# Oderings Nursery, Havelock North - Residential Water Quality Volume Calculations (Excl Roof)

Date:

20/09/2022 H20200141 Job:

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#### Water Quality Design (m<sup>3</sup>)

Fraction Impervious Calculation							
Surface Type	Roof	Grassed / Landscaped Area	Asphalt	Total	Fi		
Area (m <sup>2</sup> )	0	248	520	768	516		
Fraction Impervious	0.9	0.30	0.85	0.0768	0.67		

First Flush Volume							
Parameter	Descrtiption/Formula	Value	Unit				
Fraction Impervious (F <sub>i</sub> )	Calculated in the table above	0.67	n/a				
Catchment	Calculated in the table above	0.0768	ha				
A <sub>eff</sub>	Fi%/100 x catch area	0.05	ha				
D <sub>ff</sub>	First flush water quality depth	17.5	mm				
V <sub>wq</sub>	10 x Aeff x dff	9.04	m <sup>3</sup>				

Rain Garden Surface Area - Northern Access Link								
Parameter	Descrtiption/Formula	Value	Unit					
D <sub>ff</sub>	First flush water quality depth	17.50	m³					
$V_{wq}$	10 x A <sub>eff</sub> x D <sub>ff</sub>	9.04	m³					
V <sub>live</sub>	0.4 x V <sub>wq</sub>	3.61	m³					
WQV	V <sub>wq</sub>	9.04	m³					
d <sub>rg</sub>	Planting soil depth	0.60	m					
k	coefficient of permiability	0.75	m/day					
h	average height of water	0.075	m					
t <sub>rg</sub>	time to pass WQV through soil bed	1.50	days					
A <sub>rg</sub>	$(WQV \times d_{rg}) / (k(h+d_{rg}) \times t_{rg})$	7.14	m²					

Rain Garden Live Storage Check - Northern Access Link			
Parameter	Descrtiption/Formula	Value	Unit
A <sub>rg</sub>	Area of Rain Garden Calculated above	7.14	m²
Depth of Storage	2 x h	0.15	m
V <sub>live</sub>	$0.4 \times V_{wq}$	3.61	m³
Volume of Storage Available	A <sub>rg</sub> x Depth of Storage	1.07	m³
Storage Check	Is Volume of Storage Available > V <sub>live</sub>	NO	n/a
Area of Rain Garden Required to provide V <sub>live</sub>	V <sub>live</sub> / Depth of Storage	24.10	m²

Rain Garden Design Volume Check - Northern Access Link			
Parameter	Descrtiption/Formula	Value	Unit
Des A <sub>rg</sub>	Area of Rain Garden As Designed	248.00	m²
Depth of Storage	2 x h	0.15	m
Volume of Storage Available	$A_{rg}$ x Depth of Storage	37.20	m³

# Oderings Nursery, Havelock North - Carpark Water Quality Volume

Date:

20/09/2022 H20200141

Water Quality Design (m<sup>3</sup>)

Fraction Impervious Calculation			Fi adjusted		
Surface Type	Roof	Grassed	Asphalt	Total	Fi
Area (m <sup>2</sup> )	0	263	1210	1473	1107
Fraction Impervious	0.9	0.30	0.85	0.1473	0.75

First Flush Volume - Car Park Only			
Parameter	Descrtiption/Formula	Value	Unit
Fraction Impervious (F <sub>i</sub> )	Calculated in the table above	0.75	n/a
Contributing Sealed \Catcment	Calculated in the table above	0.1473	ha
A <sub>eff</sub>	Fi%/100 x catch area	0.11	ha
D <sub>ff</sub>	First flush water quality depth	17.5	mm
V <sub>wq</sub>	10 x Aeff x dff	19.38	m³

Rain Garden Surface Area - Car Park Only			
Parameter	Descrtiption/Formula	Value	Unit
D <sub>ff</sub>	First flush water quality depth	17.50	m³
V <sub>wq</sub>	10 x A <sub>eff</sub> x D <sub>ff</sub>	19.38	m³
V <sub>live</sub>	0.4 x V <sub>wq</sub>	7.75	m³
WQV	V <sub>wq</sub>	19.38	m³
d <sub>rg</sub>	Planting soil depth	0.85	m
k	coefficient of permiability	0.75	m/day
h	average height of water	0.15	m
t <sub>rg</sub>	time to pass WQV through soil bed	1.50	days
A <sub>rg</sub>	$(WQV \times d_{rg}) / (k(h+d_{rg}) \times t_{rg})$	14.64	m <sup>2</sup>

Rain Garden Live Storage Check - Car Park Only			
Parameter	Descrtiption/Formula	Value	Unit
A <sub>rg</sub>	Area of Rain Garden Calculated above	14.64	m²
Depth of Storage	2 x h	0.30	m
V <sub>live</sub>	0.4 x V <sub>wq</sub>	7.75	m³
Volume of Storage Available	A <sub>rg</sub> x Depth of Storage	4.39	m³
Storage Check	Is Volume of Storage Available > V <sub>live</sub>	NO	n/a
Area of Rain Garden Required to provide V <sub>live</sub>	$\mathbf{V}_{live}$ / Depth of Storage	25.84	m²

Job: