Stantec

To:	Craig Mountfort	From:	Cathy Xiong
	Hastings District Council		Newmarket
Project/File:	Hastings Stormwater Average Runoff Coefficient Review	Date:	31 October 2022

Reference: Rational Method Stormwater Average Runoff Coefficient Review

Summary and Recommendations

A review was undertaken by Hastings District Council (HDC) in August 2022 to understand the average stormwater runoff coefficient adopted by other New Zealand territorial authorities for medium density residential land-use. This memo seeks to expand on that review by examining both the Engineering Code of Practice (ECoP) or equivalent, and the District Plan from other territorial authorities, as well as calculating a typical runoff coefficient using the rational method based on the Medium Density Residential Standards (MDRS) in the RMA, Enabling Housing Supply.

Currently only 5 out of 13 ECoPs by other Tier 1 & Tier 2 territorial authorities, who also use the rational method, have specified average runoff coefficient for medium density residential housing. The coefficient ranges between 0.56 to 0.8, for 5-year ARI or 10-year ARI events. For these 5 councils, the district plan rulings for these medium density residential areas are in-line with the MDRS. It is noted that whilst the topography of these 5 councils is like Hastings, the amount of land allocated to medium density residential zones vary widely.

The remaining 8 ECoPs that adopts the rational method, have either only one runoff coefficient for urban/residential areas, or simply refer back to New Zealand Building Code E1.

Calculations using the rational method for 5-year ARI events are done using the proposed MDRS rules, surface type coefficients in NZBC E1 and the current HDC ECoP. The results are as per Table 1 below. Slope adjustment of +0.05 and +0.10 should be applied to any new MDRS sites on 5-10% slopes or 10-20% slopes, should there be any, respectively.

Table 1 Residential Runoff for Hastings, current and recommended

	Average Runoff Coefficient (C)
Current HDC ECoP 2020	0.5 (5-year ARI), 0.6 (50-year ARI)
Recommended Medium Density Residential Standards (MDRS) – min. 20% pervious	0.72[1] (5-year ARI)[2]

[1] Includes slope correction allowance of -0.05 to reflect slopes between 0-5% which covers the majority of Hastings residential area.

[2] Separate value for 50-year ARI has not been considered.

Reference: Rational Method Stormwater Runoff Coefficient Review

Due to the capacity constraint of the existing stormwater system, acceptable runoff from private sites to the public system is expected to be a lot lower and require on-site mitigation. The Hastings District Plan 2020 limits runoff, and that restriction is expected to remain.

1   Background

Hastings District Council's (HDC) engineering code of practice (ECoP) requires, as a part of the site development, to calculate stormwater (SW) runoff from the site using the rational method (equation) in accordance with NZS 4404:2010 Land development and subdivision infrastructure. In this way the volume of stormwater from the pervious and impervious surfaces on the site can be accessed so that it can then be managed. The Rational method equation incorporates a runoff coefficient (C) which estimates the impacts of a number of factors such as surface roughness, storage and infiltration within the area being accessed. The higher the coefficient the greater the flow calculated from the development area.

HDC has provided in their ECoP coefficients for different zoned areas of development as a whole rather than applying specific coefficients to different surfaces such as pervious and impervious. Use of the equation with an average coefficient has a lower level of confidence than if the development site was broken down into individual areas with parameters such as slope, soil type, and specific percentages pervious and impervious areas across each development site.

This memo reviews the average stormwater coefficient in the context of potential runoff from intensified residential land use in Hastings District, specifically for medium density housing that is expected to have an average housing density of one house per $200m^2$.

Rational Method & Runoff Coefficient

The rational method is used in both New Zealand Building Code Acceptable Solutions and Verification Methods E1 Surface Water, Nov 2020 (NZBC E1) to calculate surface water runoff for the catchment. NZS 4404:2010 Land Development and Subdivision Infrastructure refers back to NZBC E1 for the rational method.

The formula is:

$$Q = CIA/360$$

Equation 1

Where

Q = catchment surface water runoff (m^3/s); C = runoff coefficient (dimensionless); I = rainfall intensity (mm/hr); A = area (ha) of catchment above the point being considered.

Where there are mixed types of surface types, the runoff coefficient is determined by averaging the values for each individual parts of the catchment. The formulae is:

$$C = \frac{\sum C_i \times A_i}{A_c} = \sum C_i \times \%A_i$$

Equation 2

Where

C= average runoff coefficient for the catchment; C_i = runoff coefficient for the particular surface type; A_i = the area of the land where the C_i applies within the catchment; A_c = the catchment area; $\%A_i$ = percentage of area within a catchment, where the sum should be 100%.

Reference: Rational Method Stormwater Runoff Coefficient Review

NZBC E1 Table 1 and 2 (Table 2 and Table 3 below) provide the runoff coefficient for different surfaces and land use types, as well as the slope correction to be applied to the coefficient (C). NZS 4404:2010 clause 4.3.5 states that for catchments less than 50 ha (equal to 500,000m^2), the Rational method is generally accepted to calculate surface water runoff.

Table 2 Run-off Coefficients - NZBC E1

Table 1:	Run-off Coefficients Paragraphs 2.0.1, 2.1.1, 2.1.3		Developed surface types	
Description of surface	**C**		Fully roofed and/or sealed developments	0.90
			Steel and non-absorbent roof surfaces	0.90
Natural surface types			Asphalt and concrete paved surfaces	0.85
Bare impermeable clay with no interception channels or run-off control	0.70		Near flat and slightly absorbent roof surfaces	0.80
Bare uncultivated soil of medium soakage	0.60		Stone, brick and precast concrete paving panels	
Heavy clay soil types:			– with sealed joints	0.80
– pasture and grass cover	0.40		– with open joints	0.60
– bush and scrub cover	0.35		Unsealed roads	0.50
– cultivated	0.30		Railway and unsealed yards and similar surfaces	0.35
Medium soakage soil types:			**Land use types**	
– pasture and grass cover	0.30		Industrial, commercial, shopping areas and town house developments	0.65
– bush and scrub cover	0.25			
– cultivated	0.20		Residential areas in which the impervious area is less than 36% of gross area	0.45
High soakage gravel, sandy and volcanic soil types:				
– pasture and grass cover	0.20		Residential areas in which impervious area is 36% to 50% of gross area	0.55
– bush and scrub cover	0.15		**Note:**	
– cultivated	0.10		Where the impervious area exceeds 50% of gross area, use method of Paragraph 2.1.2.	
Parks, playgrounds and reserves:				
– mainly grassed	0.30			
– predominantly bush	0.25			
Gardens, lawns, etc.	0.25			

Table 3 Slope Correction Factors - NZBC E1

Table 2:	Slope Correction for Run-off Coefficients Paragraph 2.1.3	
Ground slope Adjust C by:		
0-5%	subtracting	0.05
5-10%	no adjustment	
10-20%	adding	0.05
20% or steeper	adding	0.10

Hastings District Council Engineering Code of Practice 2020

The current Hastings District Council Engineering Code of Practice (HDC ECoP) was approved in December 2020. NZS4404:2010 Section 4 has been adopted for stormwater drainage. HDC ECoP specifies an amendment to NZS 4404 Clause 4.3.5 for average runoff coefficients as shown in Table 4 below.

There is only one set of coefficients for the residential land use category, but with two different storm event frequencies (5-year and 50-year ARI). There is currently no specific coefficient for medium density residential housing adopted. This poses risks that both public and private stormwater infrastructure is not designed appropriately, or that developments do not adequately mitigate their potential effects with increased risk of flooding or nuisance ponding.

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Reference: Rational Method Stormwater Runoff Coefficient Review

Table 4 Average Runoff Coefficient as per HDC ECoP 2020

Clause 4.3.5: Stormwater Runoff

Add the following:

When calculating stormwater runoff designers shall ensure that the average runoff coefficents for the site post development do not exceed those outlined in Table D1.

TABLE D1 - DESIGN CRITERIA

Type of Surface or Land Use	Return Period	
	5 Year	50 Years
Sealed Surfaces, Roofs	0.9	0.9
Central Business District	0.8	0.8
Industrial Heavy	0.5	0.6
Industrial Light	0.7	0.75
Residential	0.5	0.6
Parks (not residential)	0.3	0.5

The above table above provides typical values for an average runoff coefficient, C, for use on catchments in this District. These can be used for the design of public stormwater infrastructure where there is no other downstream constraint.

Legislation Changes – RMA Enabling Housing Supply

The Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 (RMA-EHS) came into effect on 21 December 2021. The RMA-EHS, under Clause 80F, requires all Tier 1 territorial authorities and Tier 2 territorial authorities with acute housing needs as directed by the Minister for the Environment to incorporate the Medium Density Residential Standards (MDRS) into every relevant residential zone in their district plan, with the plan changes notified by August 2022.

There are currently 14 Tier 1 territorial authorities and 10 Tier 2 territorial authorities. Wellington Water operates the three waters assets on behalf of the 5 Tier 1 authorities in the Greater Wellington region. Waikato region also has the Regional Infrastructure Technical Specification that covers the 3 Tier 1 authorities in Hamilton and Rotorua District Council, whom is a Tier 2 authority at the commencement of the RMA-EHS but subsequently promoted to a Tier 1 authority. This means there are currently 8 ECoPs published by Tier 1 authorities and 9 ECoPs by Tier 2 authorities, which is a total of 17.

The RMA – EHS states that for the MDRS,

- Building coverage is allowed to a maximum of 50% of net site area (Schedule 3A Clause 14), and

- Landscaping is a minimum of 20% of net site area (Schedule 3A Clause 18).

Hastings District Council (HDC) is currently a Tier 2 territorial authority, therefore the incorporating the MDRS into the District Plan is optional.

Hastings District Plan 2020

The current Hastings District Plan was adopted by HDC in February 2020. The current maximum building coverage of net site area is between 35% - 45% for various residential zones. Minimum landscape coverage of net site area is specified as 25% for Havelock North Character Residential zone

Reference: Rational Method Stormwater Runoff Coefficient Review

and Iona Special Character zones, but not specified as a minimum percentage for other residential zones.

For some zones, the District Plan also has a clause for On-Site Stormwater Management, which states the peak stormwater runoff for the site calculated with the Rational Method should not exceed an (average) runoff coefficient of 0.5 for 5-year ARI storm events and 0.6 for 50-year Average Recurrence Interval (ARI) events. This reflects the current values in the HDC ECoP.

Hastings District Proposed Plan Change 2022

HDC is currently undergoing an update of the District Plan at the time of this memo. The changes proposed include introducing medium density residential zones that allow for site developments with maximum 50% building coverage and minimum 20% landscape of net site area, which would be in line with the RMA – EHS. While the plan change proposes to remove the minimum site sizes for sections, it is anticipated that across the urban residential areas subject to the plan change, sites will be developed to an average density of 1:200 m². This plan change is a key driver for consideration of appropriate average stormwater runoff coefficients.

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Reference: **Rational Method Stormwater Runoff Coefficient Review**

2 Review of Other Territorial Authority Standards

This review sought to understand the current runoff coefficients as well as district plan rules around medium density housing, adopted by other Tier 1 & 2 territorial authorities, especially those that are like Hastings in topography.

Average Runoff Coefficient in ECoPs

Besides Hastings District Council, 13 other Tier 1 & 2 territorial authorities also use the rational method to calculate stormwater runoff. Auckland, Wellington, and Whangarei have adopted the SCS Soil Runoff Curve Number Method instead.

ECoPs from different territorial authorities show different levels of detail when defining the average runoff coefficient for residential sites. Some simply refer to standards like NZBC E1 and NZS 4404 whilst others specify coefficient for different surface and land use types. Currently, other than HDC, only Christchurch City Council and Napier City Council specify different coefficients for different ARI events.

Table 5 summarises and compares the various coefficients in the ECoPs. Information on Level of Service as specified in the ECoPs can be found in Appendix 1.

Table 5 Specified Average Runoff Coefficient adopted by Tier 1 and 2 Councils, as of Sep 2022

Council	Land Use	Average Runoff Coefficient/ARI	Comments	ECoP Last Updated
Hastings (Tier 2)	Residential	0.5 – 5-year ARI 0.6 – 50-year ARI		2020
Napier City Council (Tier 2)	Urban	0.55 to 0.7 – 10-year ARI 0.63 to 0.75 – 50-year ARI	Different coefficients based on time of concentration.	2020
Waikato Region (Tier 1)	Residential Medium/High Density	0.8 – 10-year ARI	This can be lowered upon agreement with Council when the area to be developed has large permeable areas.	2018
Christchurch (Tier 1)	Residential Medium Density	0.56 – 5-year ARI 0.65 – 50-year ARI	Christchurch also provide C for 10-yr and 20-yr ARIs.	2020

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Waimakariri City Council (Tier 1)	Townhouse Development	0.8 – 5-year/10-year ARI	General primary system – 5-year ARI	2019
	Residential	0.65 – 5-year/10-year ARI	Rangiora and Kaiapoi CBD primary system – 10-year ARI.	
Dunedin District Council (Tier 2)	Residential	Residential 1 – 0.45 Residential 2 – 0.65 Residential 3 – 0.7 Residential 4 – 0.75	10-year ARI.	2010

District Plan Rules on Medium Density Residential

The following 5 councils have updated their district plan to allow for medium density zones, in line with MDRS, and have residential sites on flat topography like Hastings. The coefficient for 5-year ARI/10-year ARI ranges between 0.56 to 0.8.

However, the amount of land allocated to Medium Density Residential varies between each council. For example, Christchurch City Council has currently allocated 7.41% of their land to be medium density residential, where Hamilton City have allowed to close to 20% of their land. This could be one of the reasons why the average runoff coefficient specified in Christchurch is much lower than Hamilton, although that has not been validated, and has not been considered relevant for this assessment.

A snapshot of current residential zones in Hastings can be found in Appendix 4.

Reference: Rational Method Stormwater Runoff Coefficient Review

Table 6 District Plan rules on Medium Density Residential, General topography and corresponding Coefficient, as of September 2022

Council	Medium Density Zone Name	Net Site Area	Maximum Building Coverage	Minimum Landscaping	Topography	Average Runoff Coefficient
Christchurch City Council (Tier 1)	Residential Medium Density	200 m^2 minimum, Or 400m2 for Character Area	50% of net site area	20% of net site area	Residential areas mostly on 0-5% slope sites	0.56 (5-year ARI)
Waimakariri City Council (Tier 1)	Residential 1	300 m^2 minimum	50% of net site area	N/A	Residential areas mostly on 0-5% slope sites	0.65 (5-year & 10-year ARI)
Hamilton City Council (Tier 1)	Residential Intensification Zone	350 m^2 maximum	50% of net site area, Or 45% for Hamilton East	20% of net site area	Residential areas on sites between 0 – 10% slopes	0.8 (10-year ARI)
Dunedin City Council (Tier 2)	Inner City Residential Zone[2]	200 m^2 minimum	80% of net site area including impervious surfaces	20% of net site area	Inner City Residential mostly on 10-20% slope sites	Residential 3, 0.7 Residential 4 – 0.75

Reference: Rational Method Stormwater Runoff Coefficient Review

3   Assessment for MDRS in Hastings District

Average Runoff Coefficients based on MDRS

Using Equation 2 (Page 2) of this memo and referencing the maximum building coverage and minimum landscape coverage as specified in the RMA-EHS, the average stormwater surface runoff coefficient is calculated for Hastings. Slope corrections are applied as per NZBC E1.

The following coefficients, based on surface type in Table 7 below, are used. Coefficients for the first two surface types are based on NZBC E1 Table 1. A coefficient of 0.3 is adopted for pervious surfaces, i.e., the garden, landscaping, and lawn surface types, reflecting the current coefficient used in the HDC ECoP for 5-year ARI events. The coefficient used for these types of pervious surfaces can be further refined based on the geology of Hastings District. However, this is beyond the scope of this review.

Table 7 Runoff Coefficients by Surface Type

	Runoff Coefficient
Sealed surfaces, roofs	0.9
Asphalt & concrete paved surfaces	0.85
Garden, lawns, etc.	0.3

For purposes of this calculation, a typical MDRS site is assumed to have the impermeable areas to the maximum permitted to account for the worst-case scenario. It is also worth mentioning that as sections getting smaller over time, the developers tend to develop to the maximum allowable impermeable areas.

Table 8 Average Runoff Coefficient for MDRS sites, Calculated Using the Rational Method

	Max Building Coverage (%)	Min Landscape Coverage (%)	Other Hardstand including Driveway (%)	Average Coefficient
MDRS - 0-5% Slope	50%	20%	30%	0.715
MDRS - No Slope Correction	50%	20%	30%	0.765
MDRS - 10-20% Slope	50%	20%	30%	0.815

According to the MDRS, the average runoff coefficient is between 0.715 to 0.815 adjusting to typical slopes in Hastings District, which is significantly higher than the 0.5 (5-yr ARI) specified in the HDC ECoP.

Slope Corrections

Slope correction is applied as a steeper contour would enable less infiltration and more runoff, whilst a flatter contour encourages more infiltration. As per Figure 1 and Figure 2, most residential sites in Hastings and Flaxmere are on flat topography of between 0-5% slopes. Only residential sites in Havelock North General Residential area have a topography between 5-10% slopes, see Figure 3.

Therefore, the average runoff coefficient of 0.72 is most relevant for MDRS sites in Hastings District. Where the site slope exceeds 5% slopes, slope corrections should be applied.

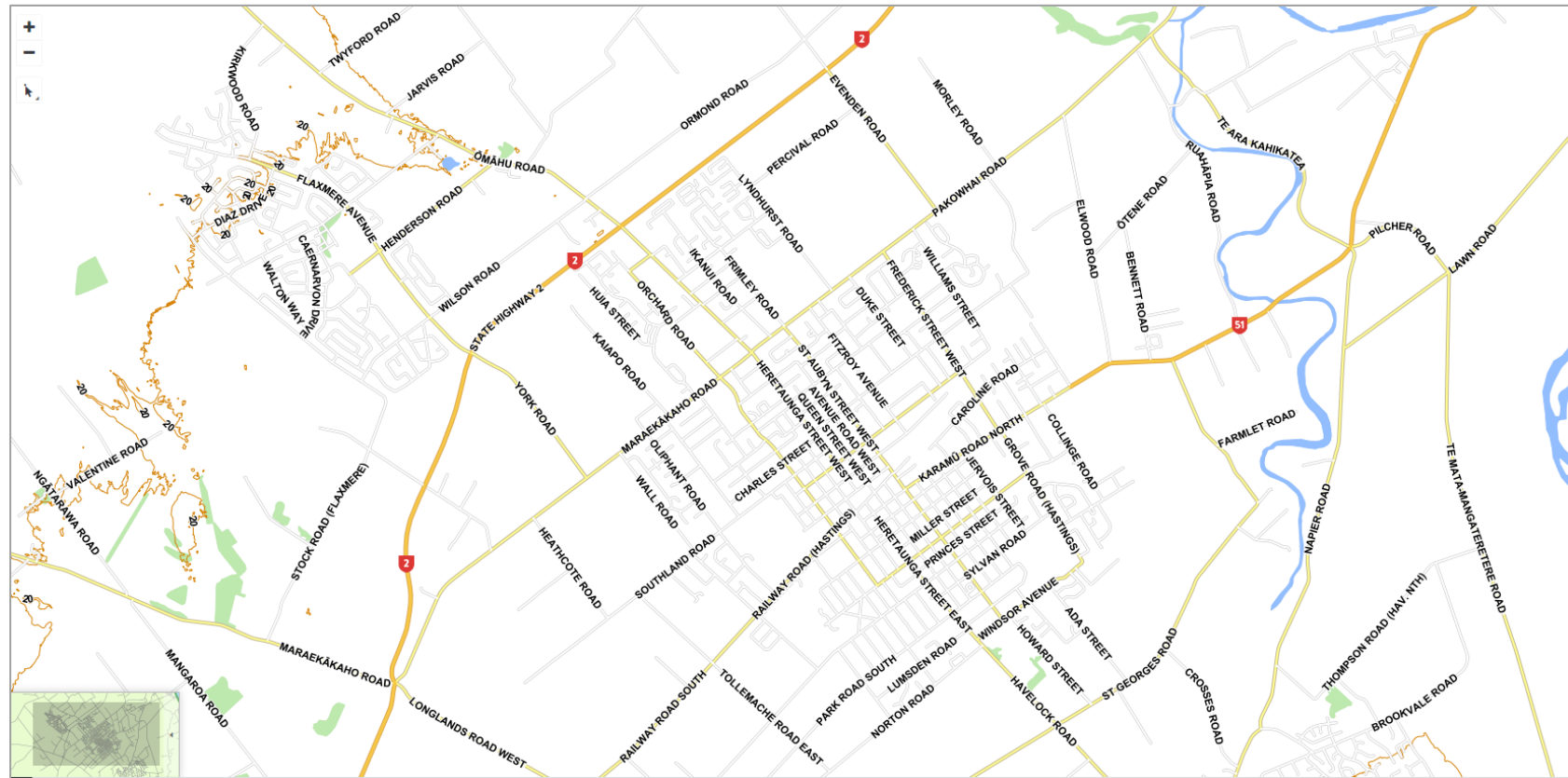**Reference: Rational Method Stormwater Runoff Coefficient Review**

Figure 1 Topography of Hastings, Flaxmere and Havelock North, ArcGIS topographic map
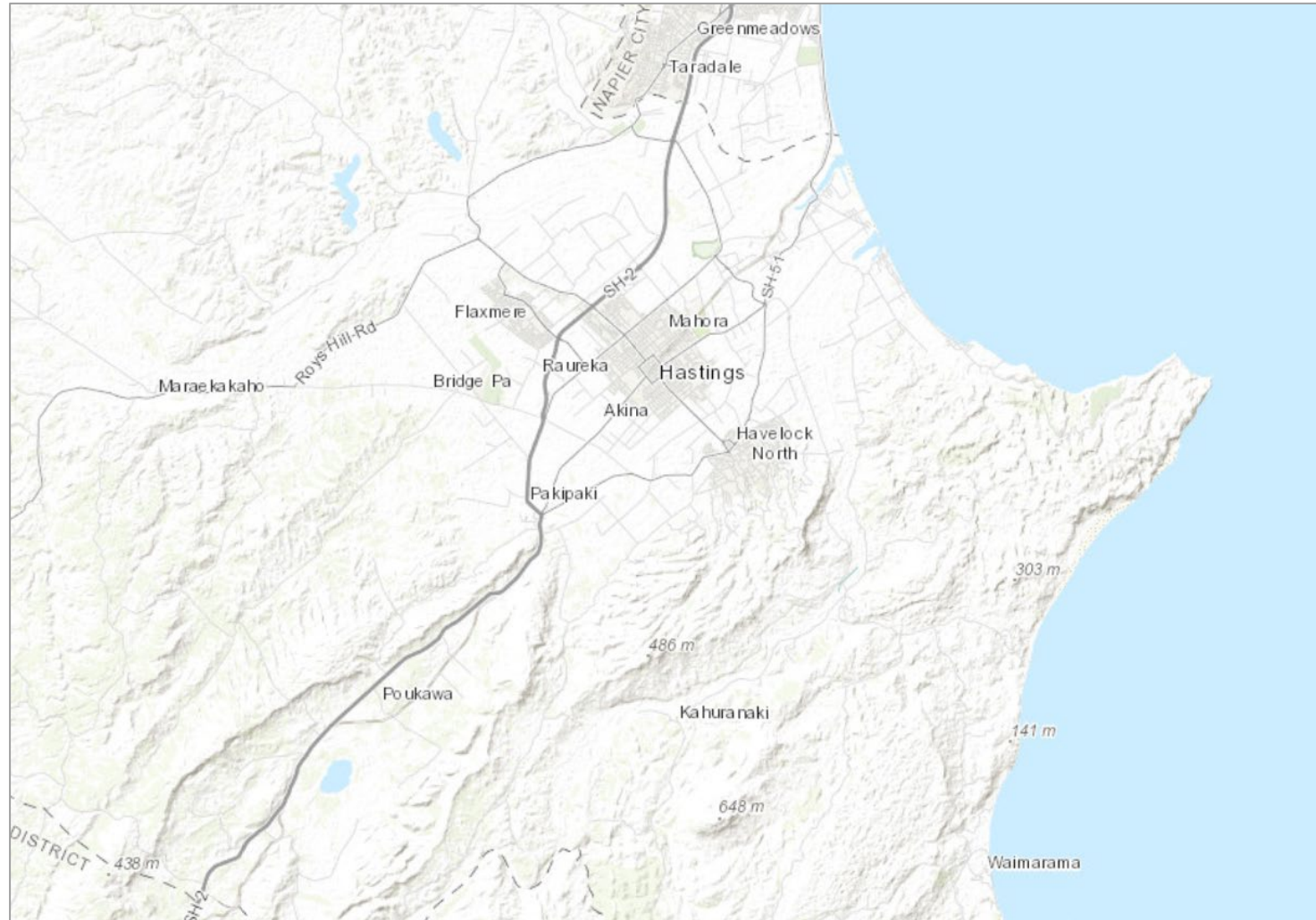

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Reference: Rational Method Stormwater Runoff Coefficient Review

Figure 2 Contour for Hastings and Flaxmere, HDC Online Maps, 20m Contour 2020

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Reference: **Rational Method Stormwater Runoff Coefficient Review**

Figure 3 Typical Slope in Havelock North General Residential Zone, HDC Online Maps, 20m Contours 2020

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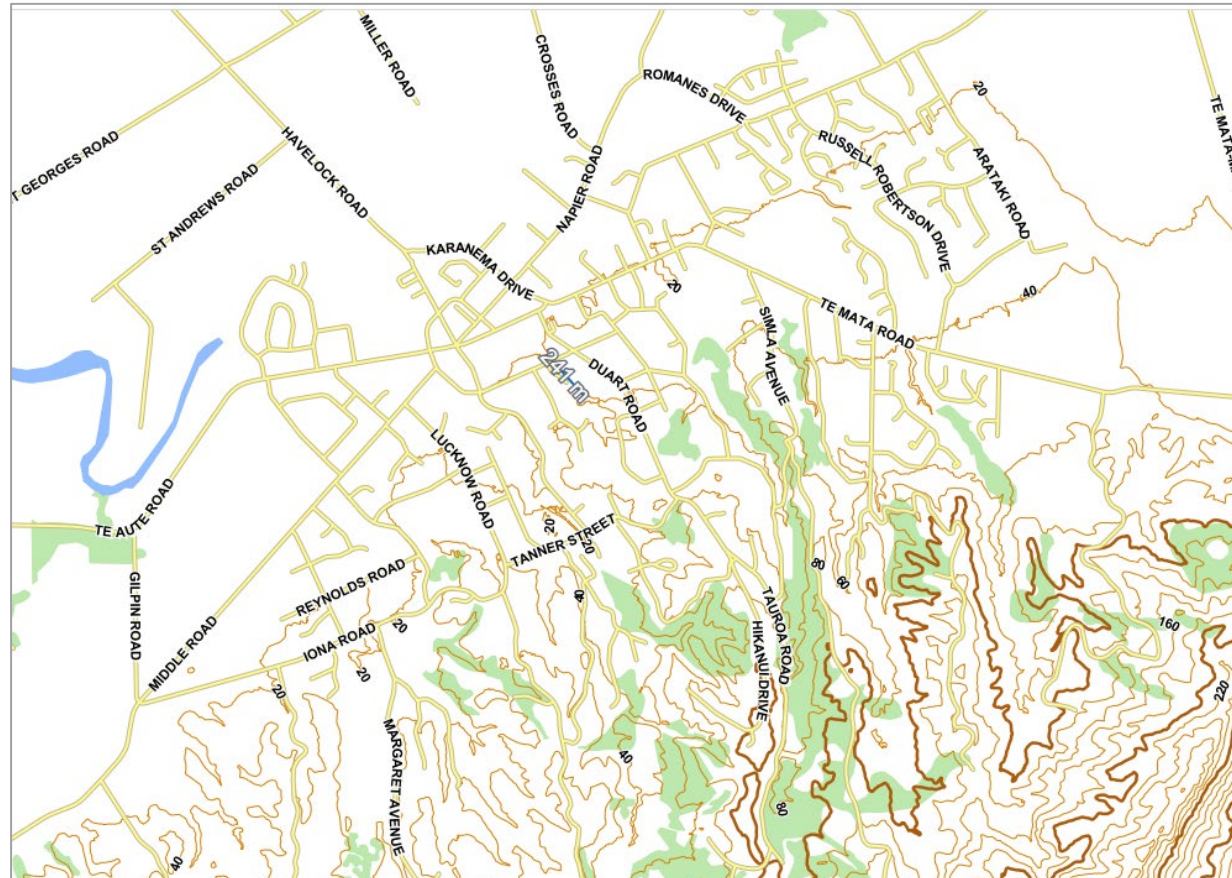
Reference: Rational Method Stormwater Runoff Coefficient Review

4   Recommendations

Based on the calculations and comparisons above, the recommended average runoff coefficient for MDRS sites is noted in Table 9 below. Slope adjustment of +0.05 and +0.10 should be applied to any new MDRS sites on 5-10% slopes or 10-20% slopes, should there be any, respectively.

Table 9 Residential Runoff for Hastings, current and recommended

	Average Runoff Coefficient (C)
Current HDC ECoP 2020	0.5 (5-year ARI), 0.6 (50-year ARI)
Recommended Medium Density Residential Standards (MDRS) – min. 20% pervious	0.72[1] (5-year ARI)[2]

[1] Includes slope correction allowance of -0.05 to reflect slopes between 0-5% which covers the majority of Hastings residential area.

[2] Separate value for 50-year ARI has not been considered.

Due to the capacity constraint of the existing stormwater system, acceptable runoff from private sites to the public system is expected to be a lot lower and require on-site mitigation. The Hastings District Plan 2020 limits runoff, and that restriction is recommended to remain.

5   Limitations

The conclusions and recommendations in this Memo are Stantec's professional opinion, as of the time of this Memo, and concerning the scope described in the Memo. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Memo relates solely to the specific project for which Stantec was retained and the stated purpose for which the Memo was prepared. The Memo is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Hastings District Council (the "Client") and third parties in the preparation of the Memo to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

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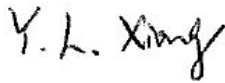
Scope limitations:

Reference: Rational Method Stormwater Runoff Coefficient Review

- Interviewing key Council staff from other territorial authorities, to understand the rationale and any peculiarity behind the runoff coefficients used by them, has not been completed due to lack of availability.

- The coefficient for pervious surfaces could be further refined based on the geology, soil types and ground cover specific to the Hastings District. However, this is beyond the scope of this review and has not been allowed for with an average coefficient used. Consideration of a separate or higher runoff coefficient for the 50-year ARI event has not carried out.
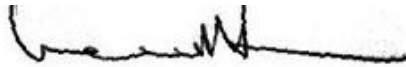
Best regards,

Stantec New Zealand

Y. L. Xiong

Cathy Xiong
Graduate Civil/Water Engineer
Phone: +64 9580 4557
cathy.xiong@stantec.com

Reviewed/Approved by

Wayne Hodson
Senior Principal Civil Engineer
Phone: +64 6873 8935
wayne.hodson@stantec.com

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Reference: Rational Method Stormwater Runoff Coefficient Review

References

- New Zealand Building Code Acceptable Solutions E1 Surface Water, 1st Edition, Amendment 11

- New Zealand Standard 4404:2010 Land Development and Subdivision Infrastructure

- Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021

- Medium Density Residential Standards: A Guide for Territorial Authorities (Ministry of Environment, July 2022)

- Hastings District Engineering Code of Practice 2020

- Hastings District Plan 2020

- Hastings Residential Intensification Guide 2020

- Assessment of Hastings District Council Stormwater Runoff Coefficient, Craig Mountford (HDC Stormwater Manager), August 2022

- Hastings District Council Open Data Portal – Hastings District Operative District Plan Zones, January 2022

- Hastings District Council Online GIS – Survey Portal, accessed September 2022

- Engineering Standards/Code of Practice/Infrastructure Development Code published by other Tier 1 & 2 territorial authorities are referenced, but not listed exhaustively

- District/Unitary Plan and District/Unitary Plan Maps adopted by other Tier 1 & 2 territorial authorities are referenced, but not listed exhaustively

- Contour/LiDAR data published by other Tier 1 & 2 territorial authorities are referenced, but not listed exhaustively

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Reference: Rational Method Stormwater Runoff Coefficient Review

Appendix

Appendix 1 - Level of Service (LoS)

The level of service for stormwater is defined by the rainfall event used for primary and secondary stormwater conveyance systems. NZBC E1 Clause 3.2.2 specifies that the drains (primary systems) should be sized with rain intensities based on 10-yr ARI events, and overflows (secondary systems) with 50-yr ARI events. NZS 4404 recommends 5-yr ARI for rural primary systems and 10-yr ARI for residential, rural residential, commercial, and industrial areas.

As per Table 10, the current primary system Level of Service (LoS) in Hastings is less when compared to other councils and the NZBC E1. Councils across New Zealand suggest the design of primary systems should use a 10-year Average Recurrence Interval (ARI) rainfall whilst Hastings suggest the use of 5-year ARI. However, raising the LoS needs to be considered against the capacity of the current stormwater network in Hastings District, and the risks acceptable. Assessment on the impact of changing the LoS on the current network is beyond the scope of this memo.

Table 10 Level of Service Required in New Zealand Engineering Standards

|	Primary System (Drains)	Secondary System (Overland)
Hastings	5 yr ARI	50 yr ARI
NZBC E1	10 yr ARI	50 yr ARI
NZS 4404	10 yr ARI	100 yr ARI
Auckland	10 yr ARI	100 yr ARI
Waikato - RITS*	10 yr ARI	100 yr ARI
Napier	10 yr ARI	50 yr ARI
Dunedin	10 yr ARI	100 yr ARI
New Plymouth*	5 yr and 10 yr ARI	20 yr, 50 yr and 100 yr ARI
Palmerston North	10 yr ARI	N/A

*Different design level of service is specified based on land use etc.

Reference: Rational Method Stormwater Runoff Coefficient Review

Appendix 2 – Current Medium Density Residential Land in Christchurch and Hamilton

Source: | Canterbury Maps Open Data
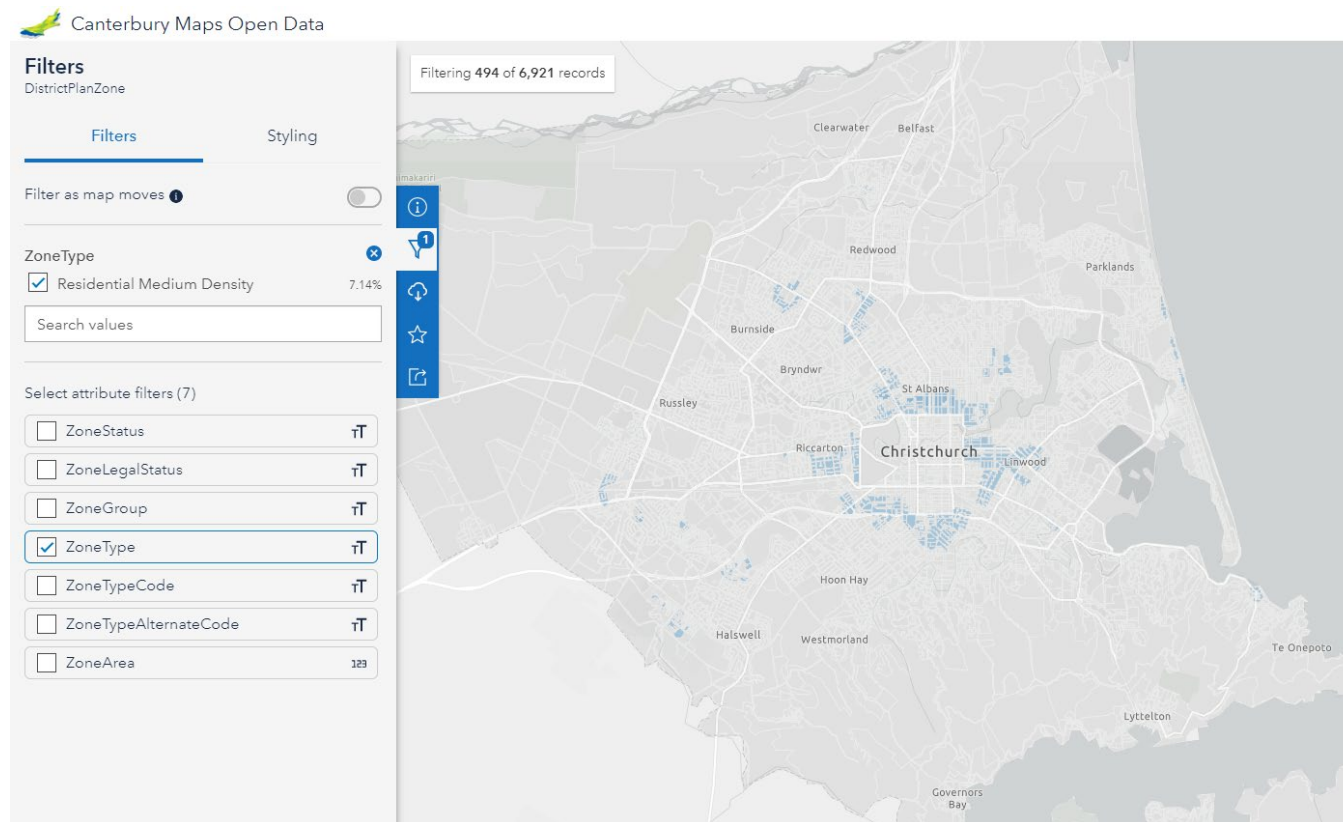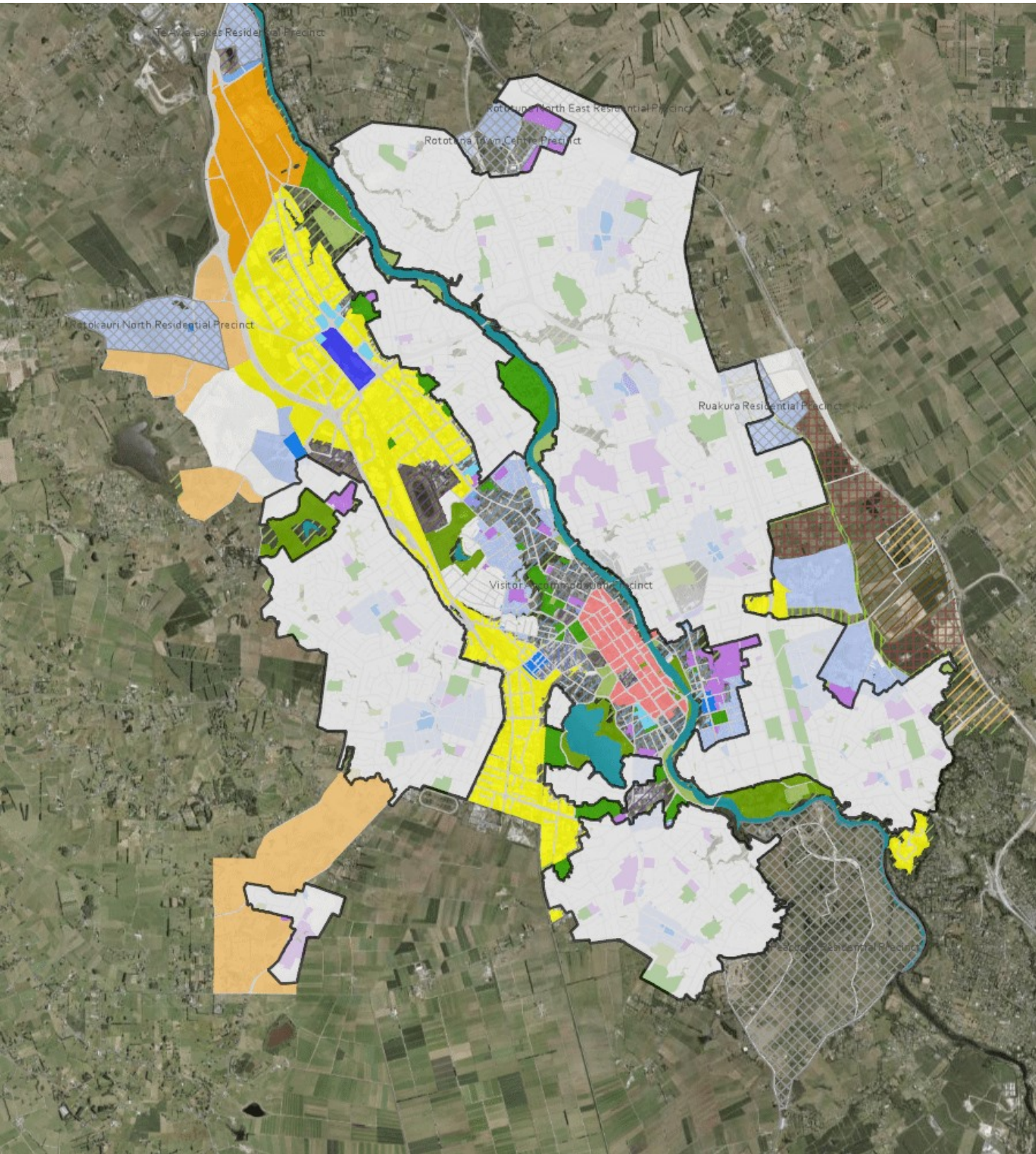
Waikato River Flood Hazard Areas (2,000)

Medium Flood Hazard Area

High Flood Hazard Area

Overland Flowpath and Ponding Flood Hazard Areas (2,000)

Low

Medium

High

Proposed Three Waters Infrastructure Capacity Overlay (PC12)

Proposed Residential Precincts (PC12)

Zoning (Plan Change 12)

General Residential Zone

Medium Density Residential Zone

Industrial Zone

Te Rapa North Industrial Zone

Business 2 Zone - Events Facilities Fringe

Business 3 Zone - Sub-Regional Centre

Business 4 Zone - Large Format Retail

Business 5 Zone - Suburban Centre Core

Business 6 Zone - Neighbourhood Centre

Sports and Recreation Open Space Zone

Neighbourhood Open Space Zone

Destination Open Space Zone

Natural Open Space - Waikato River and Lakes

Central City Zone

Community Facilities Zone

Future Urban Zone

Knowledge Zone

Transport Corridor Zone

Natural Open Space Zone

Logistics Zone

Logistics Zone

Large Lot Residential Zone

High Density Residential Zone; Residential Zone - High Density Residential Zone

Business 1 Zone - Commercial Fringe

Major Facilities Zone

High Density Residential Zone; Residential Zone - High Density Residential Zone

Industrial Amenity Protection Area

Business 7 Zone - Frankton Commercial Fringe

Hamilton City Council
Te kaunihera o Kirikiriroa

Ruakura Open Space

Ruakura Industrial Park

Ruakura Industrial Park

Ruakura Industrial Park

Rototuna Town Centre

Reference: Rational Method Stormwater Runoff Coefficient Review

Appendix 3 - Average Coefficient for Residential Category Zones in Hastings

Hastings Residential Intensification Design Guide 2020

To facilitate residential intensification, a core goal of the Heretaunga Plains Urban Development Strategy 2017, Hastings District Council published the Hastings Residential Intensification Design Guide in 2020. Although it is a guide only and the District Plan rules takes precedence, it provides typical layouts for various residential intensification scenarios in the Hastings District. This is to provide guidance when assuming the pervious/impervious percentage for average runoff coefficient calculations.

Figure 4 Typical Layout as per HDC Residential Intensification Design Guide 2020
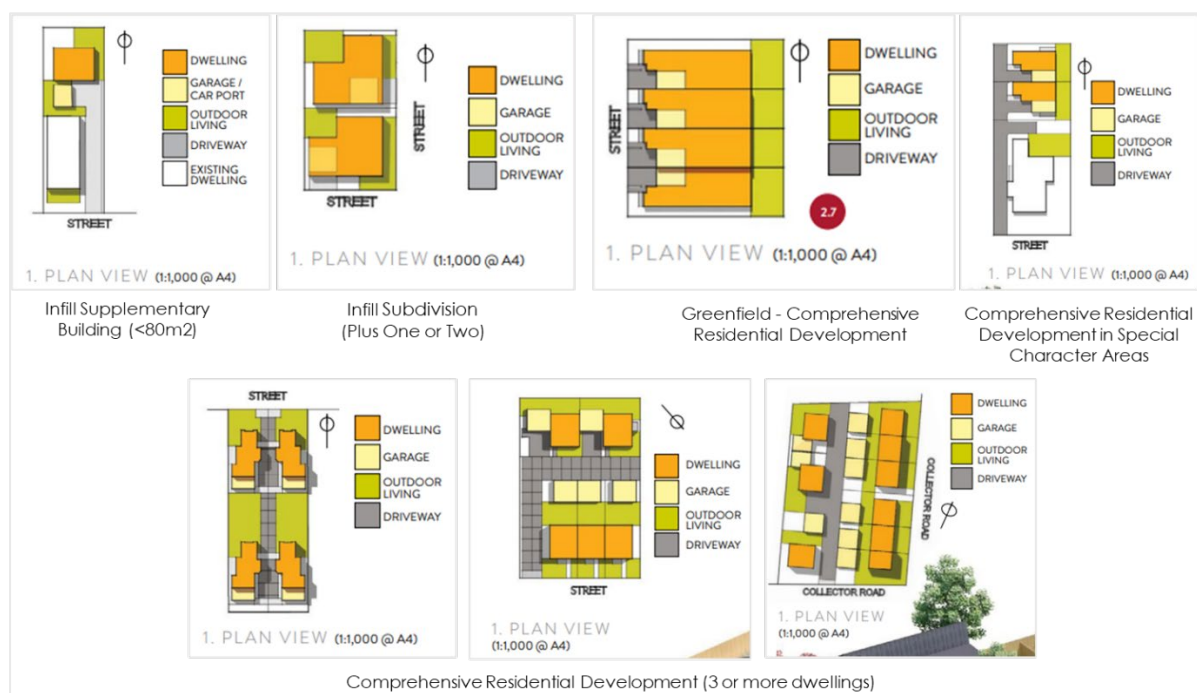
Runoff Coefficients for Different Residential Zones

Table 11 shows the current average runoff coefficient with maximum development allowed in the current District Plan.

It is currently assumed that the driveways will be sealed asphalt/concrete surfaces, except for rural residential zones where unsealed roads are assumed. Where the HDC District Plan does not specify the minimum landscape coverage in the zone, a percentage of the impervious asphalt/concrete surfaces are assumed, and the remainder of the site assumed as lawn, garden, landscaping, or similar pervious surfaces.

Slope correction is **not** applied to the Havelock North General Residential zone or the Iona Special Character Zone as the average slope is between 5%-10%. A slope correction of +0.05 is applied in the Havelock North Character Residential zone, Te Mata and Tuki Tuki Special Character Zones as the average slope is between 10-20%.

For the general residential zones in Hastings and Flaxmere, the average coefficient is 0.63 after slope-adjustment. For the Havelock North General Residential Zone, the average coefficient is 0.68. Currently

Reference: Rational Method Stormwater Runoff Coefficient Review

only the rural residential zones can meet the 0.5 average coefficient outlined in the HDC ECoP for the 5-yr ARI events. For remainder of the residential zones and settlement zones, the coefficient ranged between 0.54 to 0.73.

The average stormwater runoff coefficient in the Hastings District Council Engineering Code of Practice 2020 (HDC ECoP) for residential land use is low compared to what the potential runoff would be with the scale of development currently permitted under the Hastings District Plan 2020.

Whilst a blanket value may have a larger factor of safety, this could mean a higher percentage of existing stormwater assets may be undersized based on the revised values. It should be noted that the implications of raising the average stormwater runoff coefficient on the existing stormwater network in Hastings District is beyond the scope of this memo. This includes any consideration of any restrictions on peak stormwater runoff from residential zones.

The following average runoff coefficients (for the 5-year ARI event) could better reflect the residential development allowed in Hastings District Plan 2020:

- Less than 45% total impervious area – 0.52

- 45% to 65% total impervious area – 0.63

- 65% to 80% total impervious area - 0.72

Reference: Rational Method Stormwater Runoff Coefficient Review

*Table 11 Average Coefficient Calculation by Zone in Hastings District, with Slope Adjustment*

	Max Building Coverage (%)	Min Landscape Coverage (%)	HDC District Plan 2020 Clause	Other Hardstand including Driveway (%)	Remaining Coverage as Lawn (%)	Average Coefficient
MDRS - 0-5% Slope	50%	20%	RMS-EHS Schedule 3A Clause 14 & 18	30%	0%	0.715
MDRS - No Slope Correction	50%	20%	RMS-EHS Schedule 3A Clause 14 & 18	30%	0%	0.765
MDRS - 10-20% Slope	50%	20%	RMS-EHS Schedule 3A Clause 14 & 18	30%	0%	0.815
Hastings City Living	45%		7.2.5E	30%	25%	0.685
Hastings General Residential	**45%**		**7.2.5E & 7.2.5J**	**20%**	**35%**	**0.63**
Hastings Character Residential	35%		7.2.5E & 7.2.5J	20%	45%	0.570
Havelock North General Residential	**45%**		**8.2.5F**	**20%**	**35%**	**0.68**
Havelock North Character Residential (<700m2)	40%	25%	8.2.5F & 8.2.5I	20%	15%	0.70
Havelock North Character Residential (>700m2)	35%	25%	8.2.5F & 8.2.5I	20%	20%	0.67
Havelock North Character Residential (no public street frontage)	45%	25%	8.2.5F & 8.2.5G & 8.2.5I	20%	10%	0.73
Flaxmere General + Community Residential	**45%**		**9.2.5F & 9.2.5H**	**20%**	**35%**	**0.63**
Clive-Whakatu Residential	45%		10.2.5E	20%	35%	0.63
Haumoana - Te Awanga Residential	35%		11.2.5I	20%	45%	0.57
Rural Residential	20%		5.3.5H	15%	65%	0.45
Havelock North Rural Residential	20%		8.3.5H	15%	65%	0.45
Coastal Settlement	35%		12.2.5H	15%	50%	0.543
Plains Settlement	35%		6.3.5H	15%	50%	0.543
Waimarama Coastal Settlement	35%		12.3.5H	15%	50%	0.543
Iona Special Character	45%	25%	8.6.5F & 8.6.5J	20%	10%	0.68
Te Mata Special Character	20%		8.4.5H	15%	65%	0.54
Tuki Tuki Special Character	20%		5.4.5H	15%	65%	0.54

Reference: Rational Method Stormwater Runoff Coefficient Review

Appendix 4 - Land with Permitted Residential Activity in Hastings District Plan 2020

Based on the Open Data GIS for Hastings District Council Operative District Plan Zones, the zones where residential activity is permitted can be broken into the following 5 categories. Special character areas include Iona, Te Mata and Tuki Tuki that are of mixed use, where other land uses besides residential are permitted.

Figure 5 Category of Land Use where Residential Activities are Permitted.
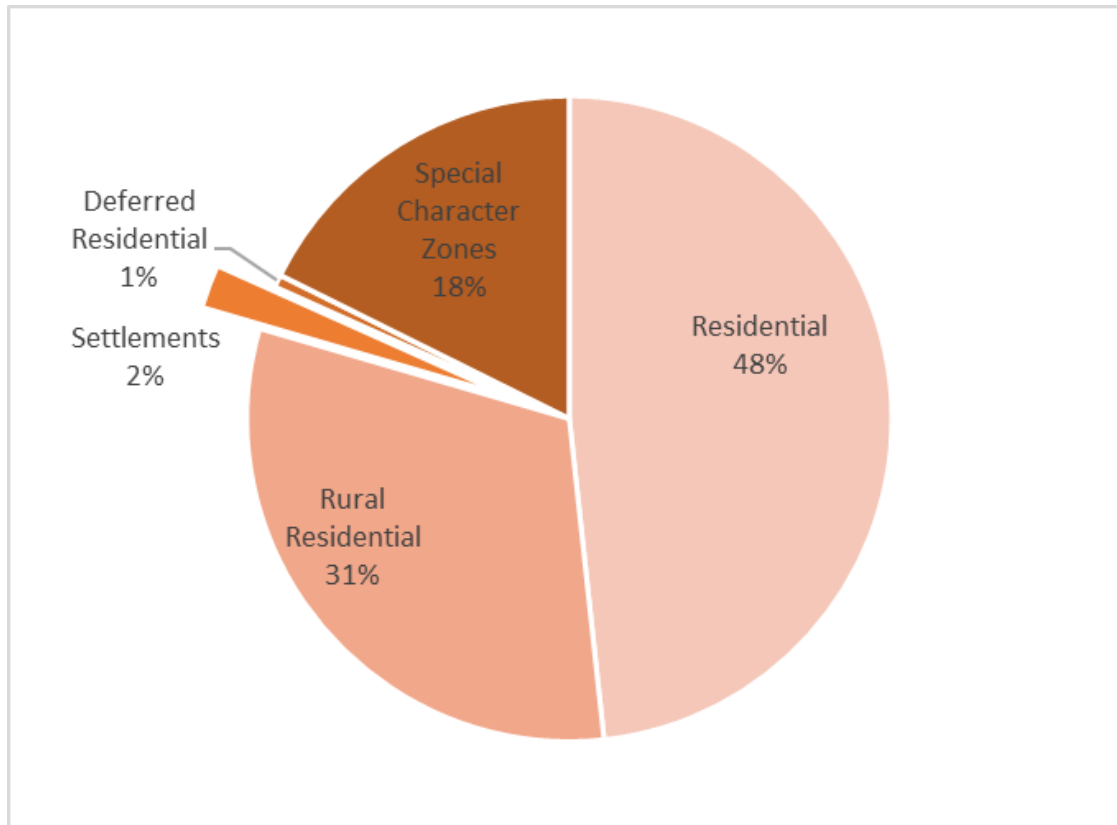
Reference: Rational Method Stormwater Runoff Coefficient Review

The residential category incorporates the following 9 zones as currently defined by the HDC District Plan. Hastings General Residential Zone makes up for nearly half of the land area in this category.

Figure 6 Residential Zones in Hastings District by Land Area in the Residential Category
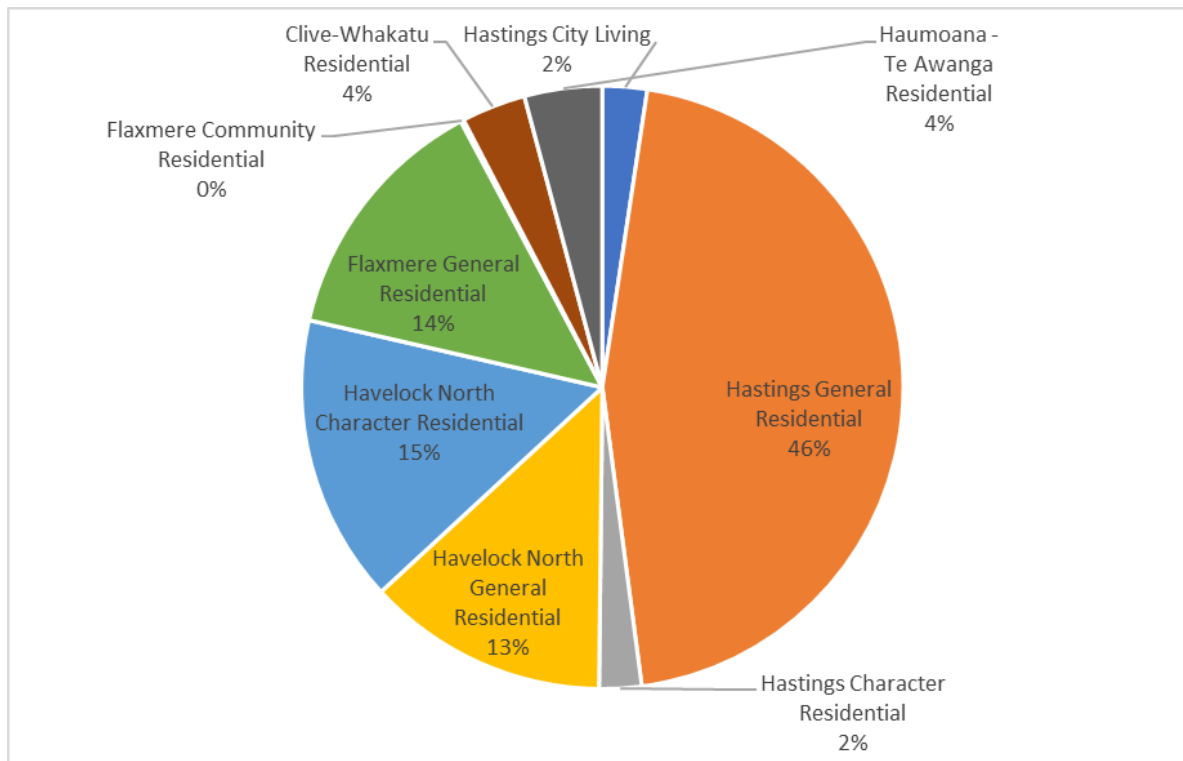
Reference: Rational Method Stormwater Average Runoff Coefficient Review

Figure 7 Zones under the Residential Category
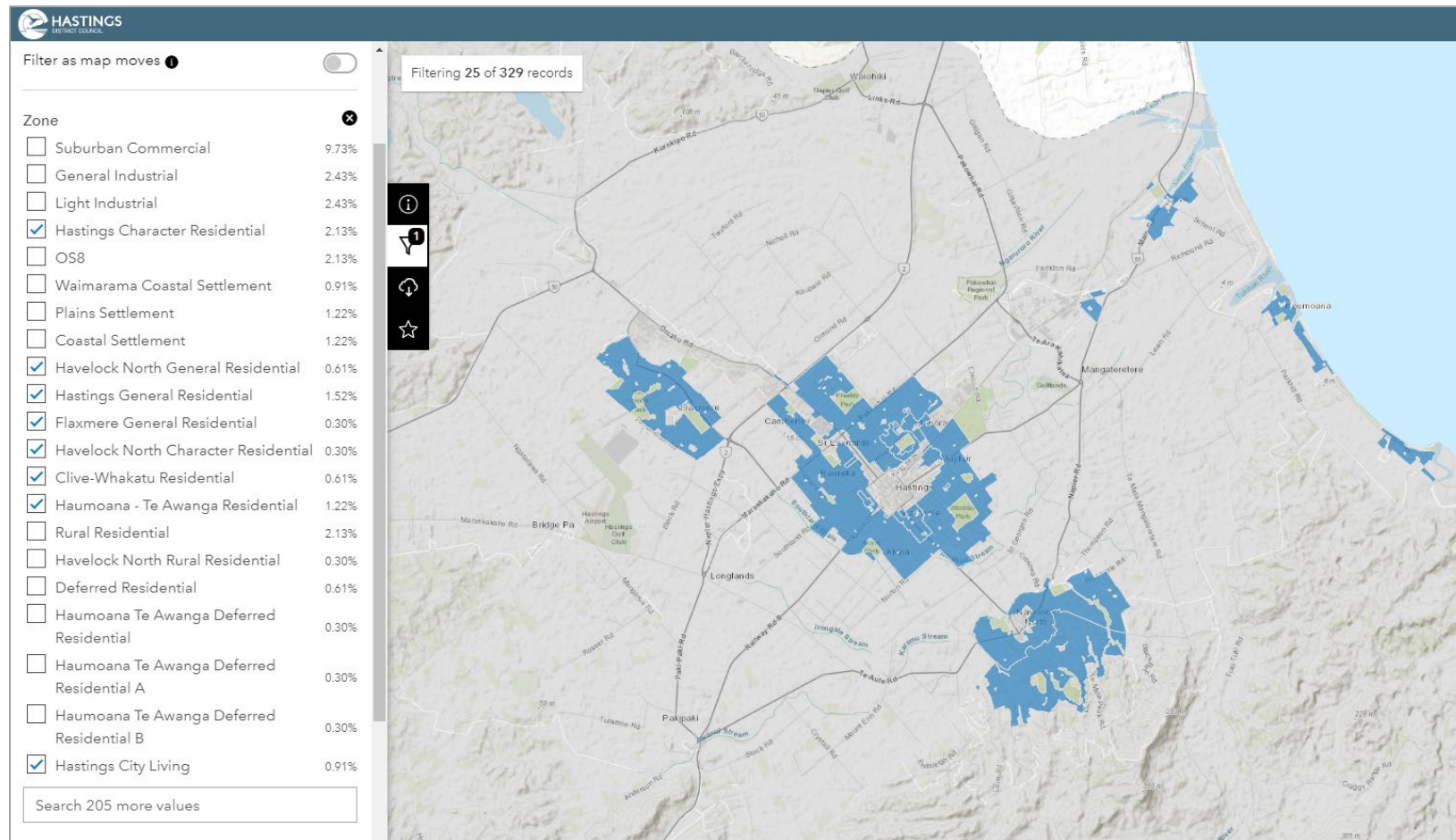

Figure 8 Zones under the Deferred Residential Category

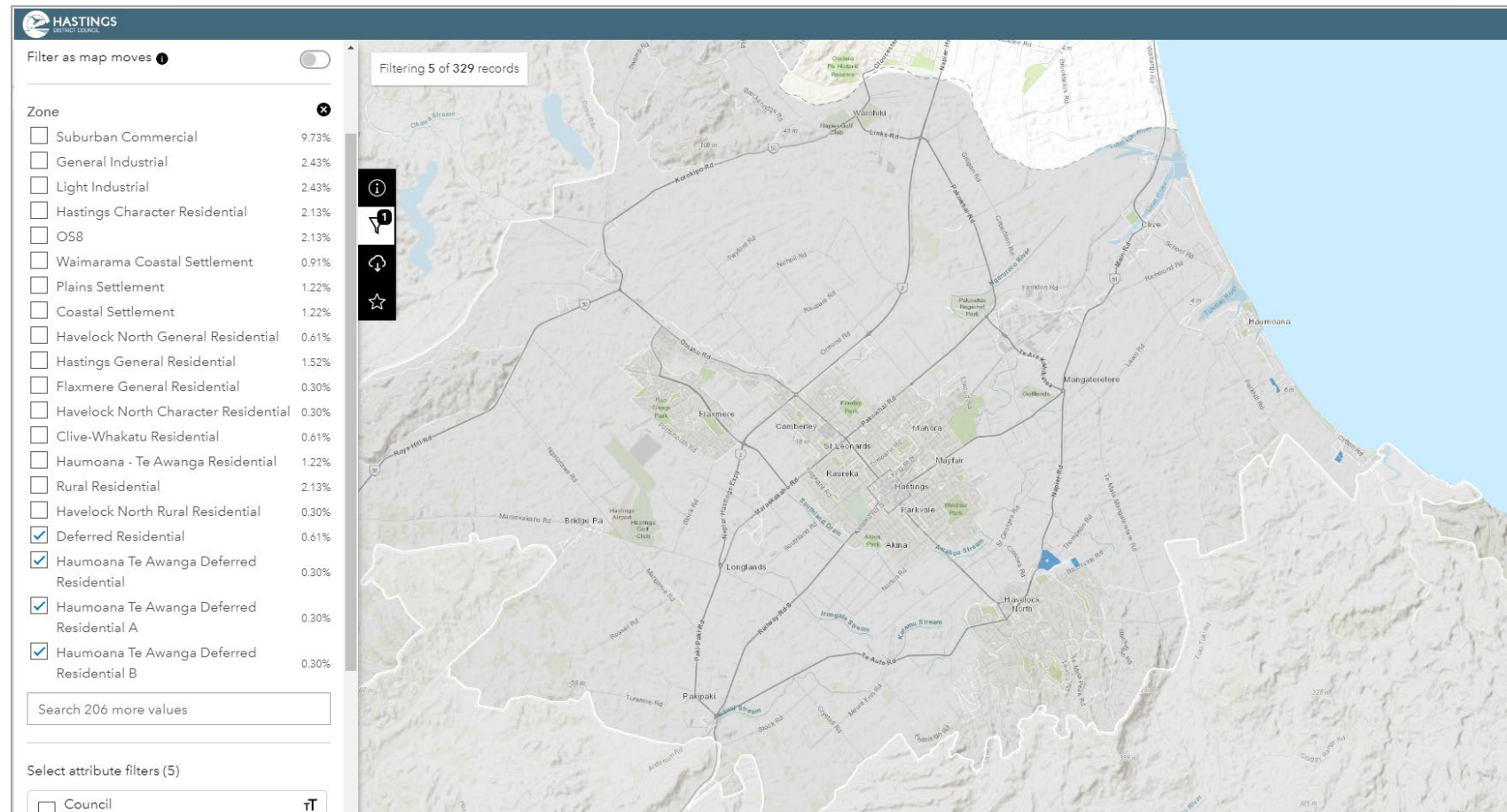**Reference: Rational Method Stormwater Average Runoff Coefficient Review**

Figure 9 Zones under the Rural Residential Category

Reference: Rational Method Stormwater Average Runoff Coefficient Review
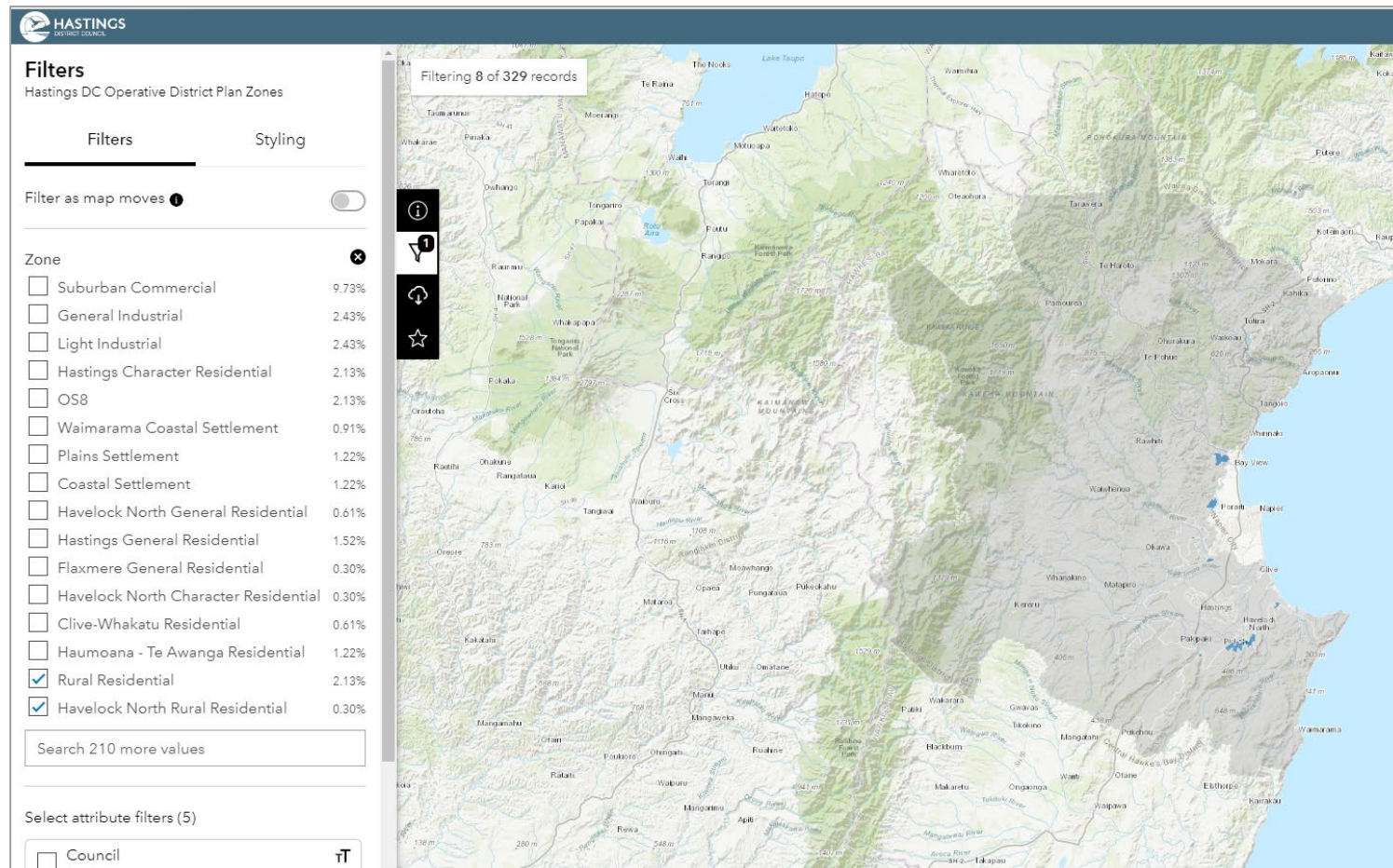

Figure 10 Zones under the Special Character Category

Reference: Rational Method Stormwater Average Runoff Coefficient Review
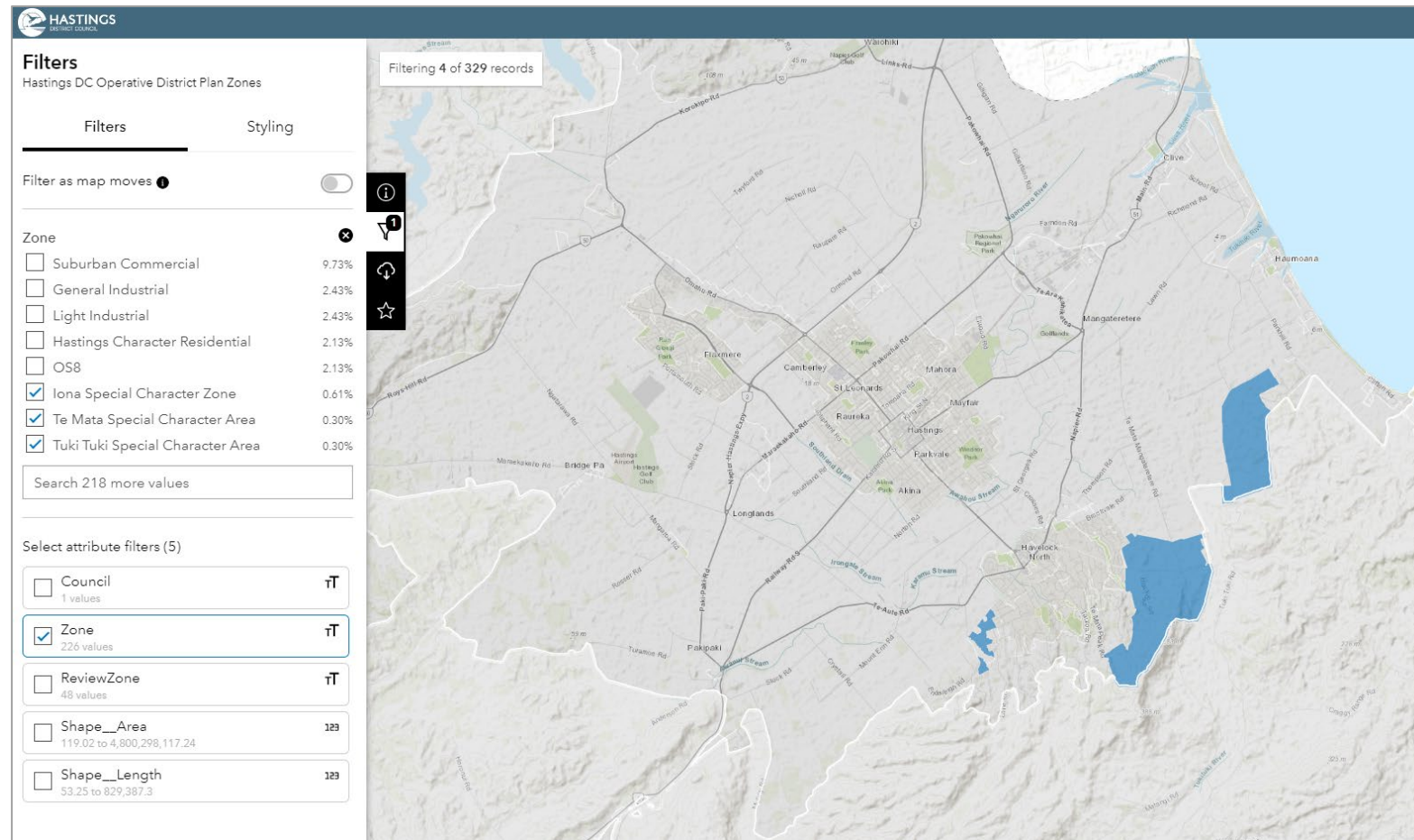

Figure 11 Zones under the Settlement Category

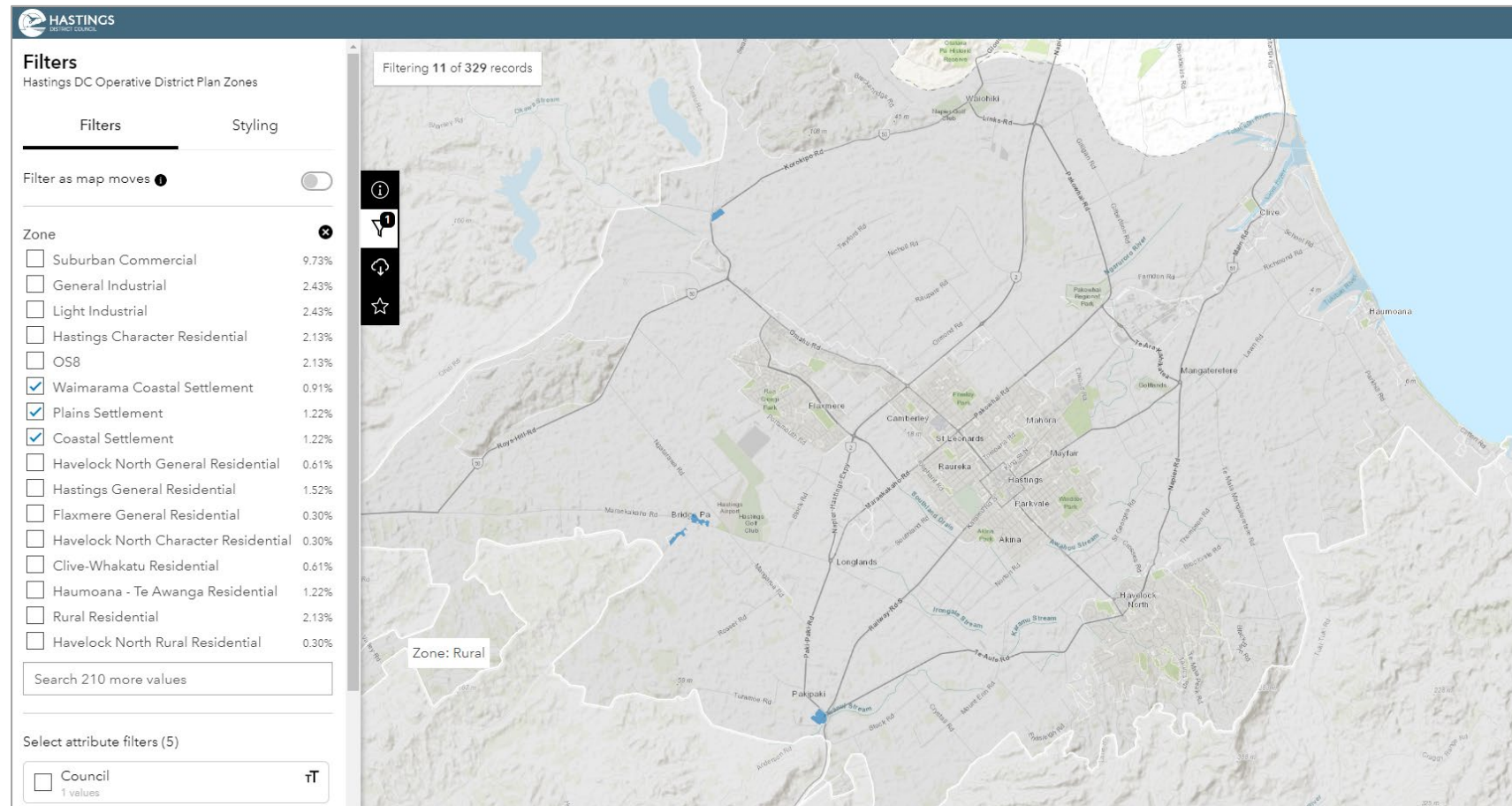**Reference: Rational Method Stormwater Average Runoff Coefficient Review**

Figure 12 Havelock North Residential Zones

Reference: Rational Method Stormwater Average Runoff Coefficient Review

Filters

Hastings DC Operative District Plan Zones

Filters	Styling

Filter as map moves ⓘ

Zone ✖

☐	Suburban Commercial	9.73%
☐	General Industrial	2.43%
☐	Light Industrial	2.43%
☐	Hastings Character Residential	2.13%
☐	OS8	2.13%
☐	Waimarama Coastal Settlement	0.91%
☐	Plains Settlement	1.22%
☐	Coastal Settlement	1.22%
☑	Havelock North General Residential	0.61%
☐	Hastings General Residential	1.52%
☐	Flaxmere General Residential	0.30%
☐	Havelock North Character Residential	0.30%

Search 214 more values

Select attribute filters (5)

☐	**Council** 1 values	ᴛᴛ
☑	**Zone** 226 values	ᴛᴛ
☐	**ReviewZone** 48 values	ᴛᴛ
☐	**Shape__Area** 119.02 to 4,800,298,117.24	123

Filtering **2** of **329** records

Zone: Havelock North Character Residential