



North Kaiapoi Greenhous Gas Emission Evidence Review

Prepared for Waimakariri District Council
Prepared by Beca Limited

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Executive Summary

This report reviews the evidence related to Greenhouse Gas (GHG) emissions provided by the proponent for the Momentum development proposed at North Kaiapoi in the District Plan Review hearing.

The proposed development site is currently zoned as Rural Lifestyle Zone and has been identified as a future growth area. The proposal seeks to rezone the site to Medium Density Residential Zoning.

This analysis focused on the GHG impacts of the submitter's proposal and did not consider the requested zoning, except where the GHG assessment suggests the proposal aligns with the NPS-UD Objective of reducing GHG emissions.

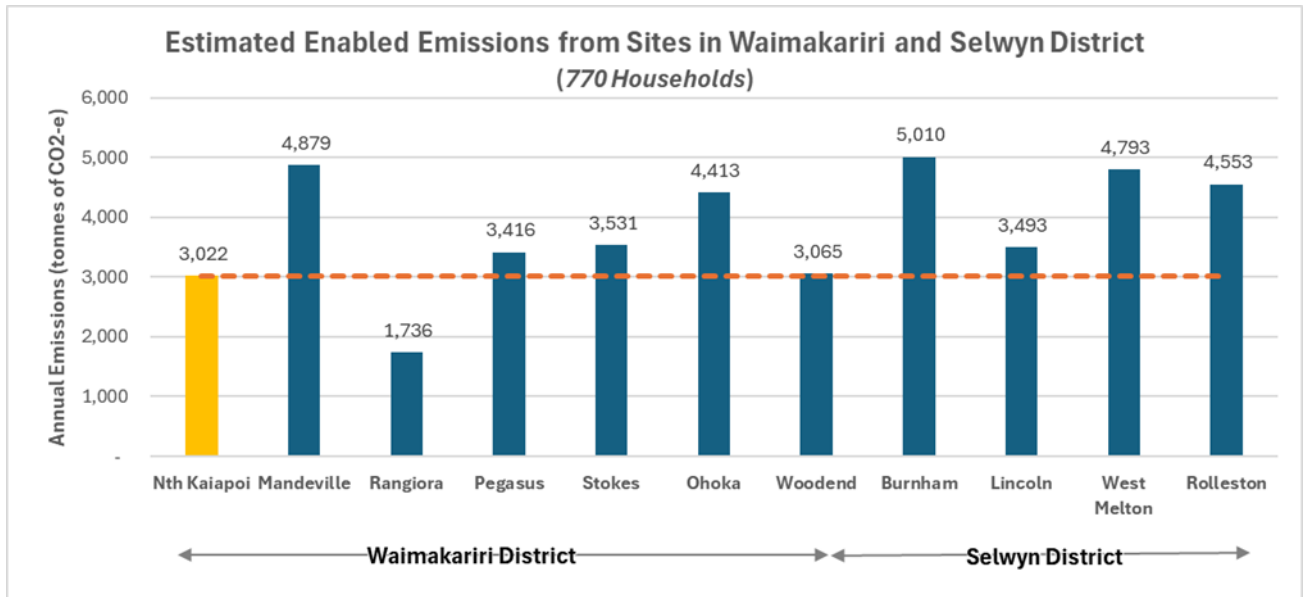
In reaching this conclusion the submitter's assessment compares the proposal against two baseline scenarios, namely:

- **Baseline 1:** The same type and scale of development at alternative sites but without proposed design features that would support the reduction of GHG emissions (e.g. provision of cycling facilities, improved public transport services); and
- **Baseline 2:** The same type and scale of development at alternative elsewhere in Waimakariri.

Baseline 1 is not considered suitable for the purposes of land use planning decisions of the development itself as the NPS-UD requires good accessibility via public transport and active modes. These features will be key elements in design considerations for developments. We consider that Baseline 2 is the more relevant and intuitive scenario for the assessment of NPS-UD.

It is considered that the embodied and operational emissions reduction opportunities outlined for the Proposal by the submitter will also be applicable to a comparative development. However, in general, the comparative assessment of embodied and operational emissions for the development undertaken by the submitter is considered appropriate

The submitter estimates that the vehicle emissions from the development in the Baseline 2 scenario will amount to approximately 59,000 tCO₂e over a 30-year period, making it the second lowest among other sites in the Waimakariri District. This aligns with the comparison assessment conducted in this report for the same scale of development in other locations as per the following figure. The figure shows the estimated annual vehicle emissions for comparative purposes and does not show the effect of EV take up over time which will be applicable for all developments. As shown the vehicle emissions for this location will be lower than other locations in the Waimakariri and Selwyn District, except for Rangiora, due to its close proximity to Kaiapoi Town Centre and public transport.



This review indicates that the GHG emissions associated with this proposal would likely be lower than a development elsewhere that is further away from established centres. Only when compared against similar development in areas more established such as Rangiora would this site be likely to have greater GHG emissions. While development in Rangiora will likely generate the least enabled emissions, it is unlikely to accommodate all the growth in the area. It is therefore reasonable to assume that other locations are needed to support the growth. In this context, North Kaiapoi will reflect a reduction in GHG emissions if growth in Rangiora reaches capacity and development has to occur elsewhere.

1 Introduction

Beca Limited (Beca) has been commissioned by Waimakariri District Council to provide a review of the Greenhouse Gas (GHG) emissions assessment related to the Momentum Proposal at North Kaiapoi as proposed by a submitter to the District Plan Review hearing.

The scope of this report is a review of the evidence related to GHG emissions provided by the proponent of the development. This has included a review of the following assessments in the evidence of Mr Robert Wilson for the submitter:

- The assessment of embodied emissions associated with the infrastructure development (roads, footpaths, drainage etc.), earthworks and material transportation;
- The assessment of emissions enabled by the land use change, specifically as relates to long term operational vehicular emissions associated with development;
- Assessment of a 'Reference Proposal', a baseline against which the development was assessed; and
- Assessment against the policies and objectives of the National Policy Statement on Urban Development (NPS-UD), as relates to planning decisions supporting reductions in greenhouse gas emissions.

This assessment is focused on traffic and GHG impacts of the activity proposed by the submitter but has not considered any broader planning consideration of the specific zoning requested except for consideration of the NPS-UD. This review has relied on details of the proposal (e.g. assumptions of development size) provided in the submitter evidence of Evidence of Mr Robert Wilson (for GHG).

The report presents its findings in the following sections:

- Summary of submitter evidence;
- Discussion of baseline for comparison;
- Review of carbon effects for embodied and enabled emissions;
- Review of the proposal against NPS-UD requirements, to support reductions in greenhouse gas emissions; and
- Conclusion

2 Summary of Submitter Evidence

This section summarises the submitter evidence around the following points:

- The proposed development details;
- Lifecycle GHG emissions over a 30 year study period and as compared against a 'Reference Proposal' (the development being built elsewhere in Waimakariri District). The emissions considered included:
 - a) Embodied and operational emissions associated with the development and operation of the urban environment ;
 - b) Emissions enabled from the development, namely vehicle emissions from the residents and visitors to the site. This was assessed in two ways which is further discussed in Section 3.
- NPS-UD – Consideration of the NPS-UD for land use planning decisions to support reductions in greenhouse gas emissions.

The relevant source of information is included in the footnote.

2.1 The Proposal

The proposal seeks to extend the existing Beach Grove development in North Kaiapoi. The proposal as shown in Figure 2-1 includes¹:

- North block – approximately 650 residential lots
- South block – approximately 120 residential lots
- Ecological reserve – ecological reserve and stormwater area with wetland restoration adjacent to the development.

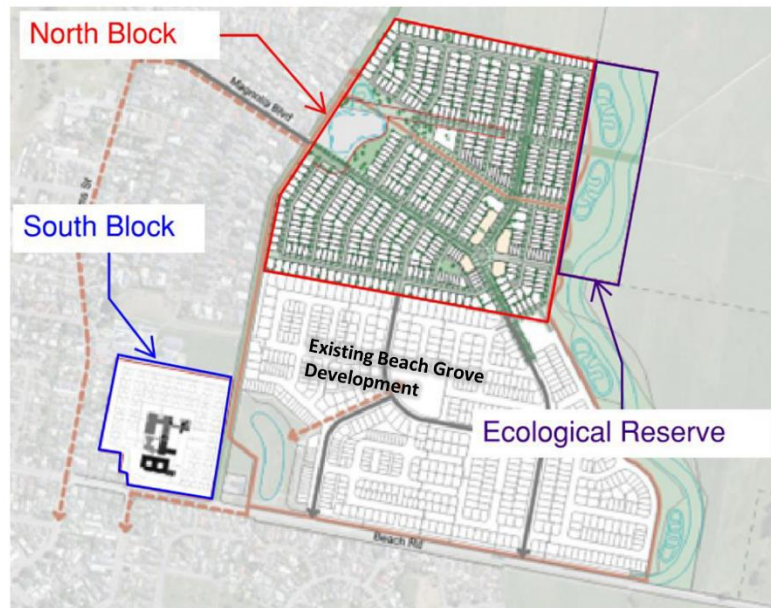


Figure 2-1 – Momentum Proposal Summary

2.2 Embodied and Operational Emissions

A review of emissions factors applied for the calculation of embodied and operational emissions was not completed as limited information was provided in the evidence. A broad range of industry data sources was included in the submission, but no specific references relating to the sourcing of each emissions factor were given. Emissions factors used by the submitter for the Momentum and Reference Proposal assessments were consistent, however, which is the more important part of the methodology given that the purpose of the assessments in the evidence was for comparison only.

2.3 Emissions from Transportation

2.3.1 Vehicle Generation

The assessment of transport GHG emissions was assessed based on the following trip assumptions for all assessment scenarios as noted in Paragraph 139 of Mr Wilson's evidence:

- “
- Activity trips – 1 round-trip to KAC per dwelling per day for 6 days per week, 50 weeks per year.*
 - Retail trips – 1 round-trip to KAC per dwelling per day for 6 days per week, 50 weeks per year.*
 - Employment trips – 1 round-trip per dwelling per day for 5 days per week, 48 weeks per year.* “

¹ Paragraph 39 of evidence of Robert (Bob) Christopher Wilson

Based on this, the daily weekday trip rate is 6 vehicles per dwelling.

While we note the typical daily generation rate is 8.2 vehicles per day for Outer Suburban dwellings as per Waka Kotahi NZTA Research Report 453, we also note that the rate for a medium density residential development under the RTA Guide to Traffic Generating Developments provides a rate of 4 to 6.5 per dwelling dependent on the unit size. Given the development is adjacent to an existing built up area and is within close proximity to the an existing Kaiapoi Town Centre or a Key Activity Centre (KAC), we consider the trip rate adopted of 6 vehicles is reasonable and is in line with the RTA guidance. In addition, the trip rate will have minimal impact on this GHG assessment, particularly in the context of the comparative analysis against other similar locations discussed later in this report.

2.3.2 Avoided Vehicle Emissions through use of Cycling

The evidence of Mr Wilson outlines the Proposal will provide a 'dedicated micro-mobility path or bicycle lane' within the development to separate pedestrians, vehicles and cyclists² which will promote its uptake especially for short trips to the likes of KAC. He further assumes that 25% of activity or retail trips will be replaced by cycling based on an assumed median of international studies³. This equates to 1 of the assumed total 6 trips will be replaced by active modes. We consider this shift of 17% to be fairly ambitious given the current 2018 census journey to work data suggests only roughly 3-4% of people cycle in Kaiapoi. However, we acknowledge that the implementation of cycle lanes and the development's proximity to the Kaiapoi Town Centre will positively impact active mode uptake. The exact mode shift is difficult to determine at this stage, and we consider the current vehicle trip rate suitable for estimating comparative GHG transport emissions, with no further reductions needed to account for the proposed active mode facilities at this time.

It should be noted that in the Reference scenario, Mr. Wilson has assumed that no cycle lane will be included in the development, resulting in a reduction of embodied GHG savings of 1,571 tCO₂e⁴. We do not consider this to be a fair comparison given the NPS-UD requires active mode considerations for a well-functioning urban environment and as such these will typically be part of large development proposals. However, this assumption does not affect this GHG assessment, or the further the location-based GHG comparison assessment conducted by Mr. Wilson.

2.3.3 Avoided Vehicle Emissions through use of Public Transport

The evidence of Mr Wilson notes that the Proposal '*employs the 15-minute neighbourhood principle in the design and structure of the residential expansion, maximising micro-mobility and connectivity*' and that nearly all residential are '*within 400m of a local convenient retail centre and multiple bus stops to nearby KACs and Christchurch.*'⁵ Mr Wilson discusses this will promote public transport use and reduce private vehicles especially for longer trips to Christchurch given the Proposal is located to existing bus routes into Christchurch. Mr Wilson notes he hasn't determined a precise mode share change but has assumed a 33% mode shift from car trips based on Environment Canterbury' study. He considers this is more conservative than the Auckland Regional Urban Transport Plan 2023 projection of 50% increase in public transport patronage.⁶

We are unaware of the Auckland Regional Urban Transport Plan 2023 and this may be referring to the Auckland Regional Public Transport Plan 2023 – 2031. Regardless, we consider using the this will be inappropriate given the population density and landform differences between the two cities. The 33% adopted will be more suitable, however we consider this to be ambitious noting that the 2018 journey to walk

2 Paragraph 95 of evidence of Robert (Bob) Christopher Wilson

3 Paragraph 98 and 99 of evidence of Robert (Bob) Christopher Wilson

4 Paragraph 95 of evidence of Robert (Bob) Christopher Wilson

5 Paragraphs 102 and 103 of evidence of Robert (Bob) Christopher Wilson

6 Paragraph 104 of evidence of Robert (Bob) Christopher Wilson

census data suggests public transport use is approximately 4%.⁷ We acknowledge that the existing services within close proximity to the Proposal will promote its use and note that enhancements to public transport will likely also occur overtime further contributing to its uptake and will impact the likely use of private vehicles. However, noting the current census data, we do not believe this will make a material difference to vehicle use from the site. We consider the vehicle trip rate is suitable for the use in estimating comparative GHG transport emissions, with no further reductions needed given the uncertainty in the exact mode share anticipated at this stage.

2.3.4 Consideration of Greenhouse Gases

Mr Wilson has undertaken his analyses of GHG emissions based on 'EN15879 :2011 – Sustainability of Construction Works Standard' and 'EN16258:2013 – Methodology for calculation and declaration of energy consumption and GHG emissions of transport services'⁸. He makes the following points in relation to the potential of the Proposal reducing GHG emissions:

- The Proposal's proximity to Kaiapoi and onwards connection to Christchurch reduces vehicle trip length especially when compared with the Reference Proposal⁹. This is further discussed in Section 4.
- As discussed earlier, the provision for cycle lanes in the development to promote its uptake especially for shorter trips '*helps reduce GHG emissions, and supports health and well-being benefits for residents*'¹⁰. In addition, accessibility to public transport and the 15-minute neighbourhood concept further promotes positive modal shift.¹¹
- Design features of the Proposal such as ecological restoration and stormwater areas or reserve which will serve as a carbon sink reducing emissions.
- Other opportunities such as the use of low carbon concrete/ infrastructure material, electrical vehicle infrastructure, solar powered systems, higher home efficiency energy requirements and developing a convenient commercial centre to reduce vehicle trips to Kaiapoi.¹²

2.4 NPS-UD Considerations

The NPS-UD requires planning decisions to contribute to well-functioning urban environments which are environments that "*support reductions in greenhouse gas emissions*" and '*are resilient to the current and future effects of climate change*'¹³ and '*have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport*'. This report focuses on the reduction in greenhouse gas emissions.

Mr Wilson's evidence provides assessment of the proposal against a 'Reference Proposal' where the development occurs elsewhere in Waimakariri District. He concludes that when compared to a Reference proposal of having the same type of development elsewhere, there is a reduction in GHG emissions especially in transport emissions. He does acknowledge that the Proposal will have a greater transport GHG emission when compared with Rangiora¹⁴. We agree with Mr Wilson that the proposal is likely to have lower transport GHG emissions when compared to developing the site elsewhere that is further from an established centre or where there is planned growth.

This is further discussed in the following sections.

⁷ Information retrieved from Waka Commute(<https://commuter.waka.app/>) for 'Departures' for Kaiapoi Central, South, North West , West and East.

⁸ Paragraph 12 of evidence of Robert (Bob) Chistopher Wilson

⁹ Paragraph 89 of evidence of Robert (Bob) Chistopher Wilson

¹⁰ Paragraph 94 of evidence of Robert (Bob) Chistopher Wilson

¹¹ Paragraph 101 and 102 of evidence of Robert (Bob) Chistopher Wilson

¹² Paragraph 117 to 135 of evidence of Robert (Bob) Chistopher Wilson

¹³ Paragraph 28 of evidence of Robert (Bob) Chistopher Wilson

¹⁴ Paragraph 152 and 154 of evidence of Robert (Bob) Chistopher Wilson

3 Discussion of Baseline

The NPS-UD policy relates to planning decisions so requires an assessment of the proposal against a relevant baseline, in order to assess if there is likely to be a reduction in greenhouse gas emissions.

The baseline requires particular attention when considering housing development for a future, growing population. Given the cumulative, global impact of GHG emissions and the context of these planning decisions impacting the future environment, the most valid baseline is considered to be a future scenario with similar global population. That is, the proposal with future, new residents should not be compared against the current-day population. Mr Wilson appears to agree where he has assessed the proposal against two different baseline scenarios:

- **Baseline 1:** The same type and scale of development at alternative sites but without proposed design features that would support the reduction of GHG emissions (e.g. provision of cycling facilities, improved public transport services).
- **Baseline 2:** The same type and scale of development at alternative sites elsewhere in Waimakariri or Selwyn Districts.

Baseline 1 assumes that the same proposed activity would take place, but without suitable mitigating design features. This is not considered a valid baseline for the purposes of planning decisions on whether to allow for the development in the first place for the following reasons:

- The NPS-UD requires planning decisions to contribute to well-function urban environments which includes good accessibility for all purposes by public transport and active modes.
- As such design features such as cycle lanes and consideration of public transport will be key elements of design of developments elsewhere.

Baseline 2 is considered the most relevant and intuitive scenario for the assessment of NPS-UD.

4 Review of Carbon Effects

Taking account of the submitted evidence and the considerations for suitable baseline to assess NPS-UD Policy 1(e) against, this section summarises the review of carbon effects for the embodied and operational, and enabled emissions. It covers the following emissions categories:

- **Embodied and operational emissions** – Embodied (or embedded) emissions are the GHG emissions resulting from manufactured products and materials used in construction of the built environment. Operational emissions are the GHG emissions resulting from the energy use of an asset or building during its lifetime of operation. Combined, the sum of embodied emissions plus the sum of the operational emissions constitutes ‘total emissions in the built environment’.
- **Offset emissions** - An activity that sequesters or stores carbon in perpetuity (e.g., through land restoration or the planting of trees) – that is, can be used to compensate for emissions that occur elsewhere.
- **Enabled emissions** – Emissions that occur from third party use of infrastructure (for example tailpipe emissions as a result of vehicle kilometres travelled (VKT)).

4.1 Embodied, Operational and Offset Emissions

Although a detailed review of the embodied and operational emissions assessments was not completed, we agree in general with the GHG assessment methodology for embodied and operational emissions outlined in the Mr Wilson's evidence report.

Our additional comments relating to the *Momentum Proposal GHG Emissions Reductions Features and Opportunities* in Mr Wilson's evidence report are outlined below.

The following comments relate to the embodied and operational and offset emissions components of the Momentum Proposal GHG Emissions Reduction Features.

The GHG savings indicated for the *Ecological Rehabilitation* in Paragraphs 114 and 115 of the evidence would be considered as offset emissions (as opposed to an actual reduction in GHG emissions resulting from the construction or operation of the development). Guidance relating to GHG offsetting that is within a company's value chain (known also as 'insetting') is under development in the NZ and in the global context. To be considered credible, these offsets must adhere to several quality criteria. It is not clear in the context of the evidence provided that these criteria can be met. We recommend that GHG offsets relating to the Ecological Rehabilitation should not be considered as 'reductions' in the context of Policy 1(e) of the NPS-UD.

The submitter has provided no evidence or assumptions for the GHG savings calculation for the Ecological Rehabilitation (Paragraphs 114 and 115), therefore a detailed review of this has not been completed. It is not evident that the Momentum Proposal emissions assessment has considered embodied emissions (construction materials or fuel related) associated with the construction of the ecological reserve, which could be material.

The following comment relates to the embodied and operational and offset emissions components of the Momentum Proposal GHG Emissions Reduction Opportunities:

The opportunities relating to embodied and operational emissions (opportunities 6,7,8,9 in table, Paragraph 134) are considered valid, however we believe that all of these opportunities could all be applicable to the Reference Proposal also.

4.2 Enabled Emissions from Transportation

Mr Wilson has estimated total emissions from transport for both baseline scenarios. For both scenarios, Mr Wilson has considered a 'Reference Proposal' to represent the development at an alternative site. He has assumed a 'nominal average' distance of travel based on nearby areas in Waimakariri District (Rangiora, Ohoka, Pegasus)¹⁵ to represent this Reference Proposal.

Mr Wilson's Baseline 2 assessment is based on associated trips and distances to work and education and the nearest Key Activity Centre for each of the locations ¹⁶. The same trip rate and emission factor of 0.208 kgCO₂e/km (average of 2025-2050 from Vehicle Emissions Model (VEPM))¹⁷ for all locations were used for the assessment. The distances and the assessment results are shown below.

¹⁵ Paragraph 136 of evidence of Robert (Bob) Christopher Wilson

¹⁶ Paragraph 138 and 139 of evidence of Robert (Bob) Christopher Wilson

¹⁷ Paragraph 93 of evidence of Robert (Bob) Christopher Wilson

Scenario	Location	Distance to KAC (km) one-way	Work+Education Travel Distances (km) one-way
Reference	Nominal	4	19.95
Rangiora	Rangiora	2	14.23
Ohoka	Ohoka	8	21.66
Pegasus	Pegasus	3	24.52
Momentum Proposal	North Kaiapoi	2.5	19.39

Figure 4-1: Location Distances¹⁸ used for comparison assessment

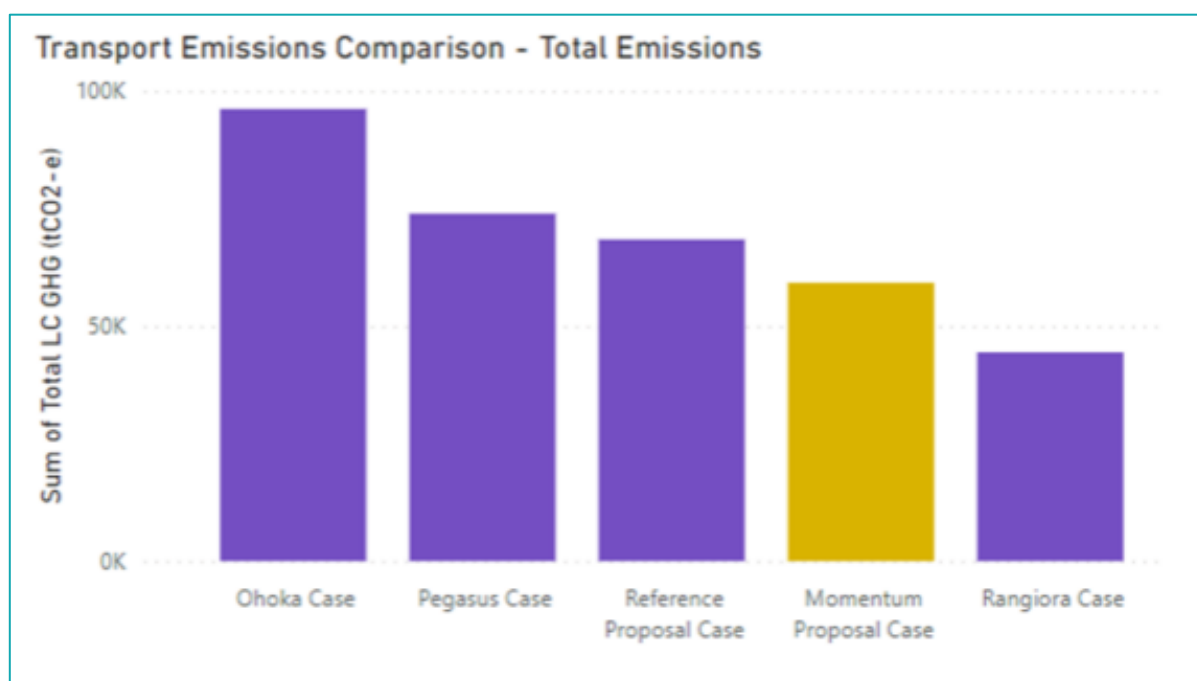


Figure 4-2: Transport Emissions Comparison for 30 year period¹⁹

By way of comparison, using the submitter's data, we have undertaken a similar exercise. To estimate the likely trip length and enabled emissions, the strategic transport model (Christchurch Transportation Model V21a) is used. That model estimates future travel patterns in response to land use and transport inputs. It differs from Mr Wilson's assessment as it does not specifically break down the trip type and length instead the trip length represents all trip types²⁰.

The following map shows the daily average trip length from light vehicles, estimated by the model for 2028, from sites located in the vicinity of North Kaiapoi or locations with similar rural-settlement context.

¹⁸ Paragraph 20 of evidence of Robert (Bob) Christopher Wilson

¹⁹ Paragraph 22 of evidence of Robert (Bob) Christopher Wilson

²⁰ The length used from the strategic transport model is the weight average of all trip types.

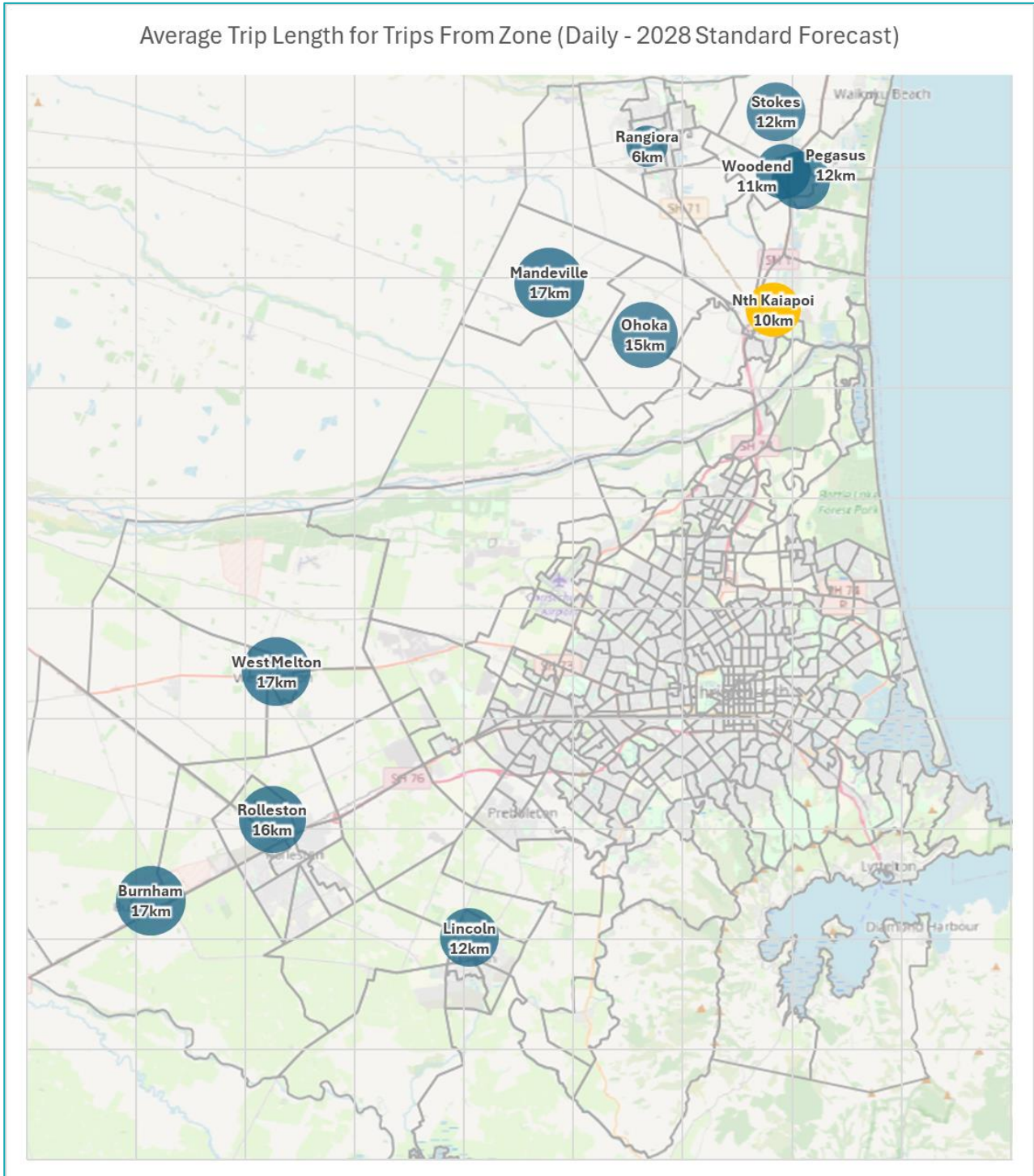


Figure 4-3 – Daily Average Trip Length from Zone around Greater Christchurch Region (based on 2028 modelled results)

As indicated by the map, the average trip length, although different to that considered by Mr Wilson, is similar in pattern i.e the well-established township of Rangiora has the shortest trip length with North Kaiapoi following behind and the outer settlements of Pegasus and Ohoka having greater distances.

Using the trip length data and adopting the same trip generation rate of 6 trip per day and transport emission factor of 0.208 kgCO₂e/km the following graphs depict the expected annual enabled emissions for a number of sites in Waimakariri and Selwyn District.

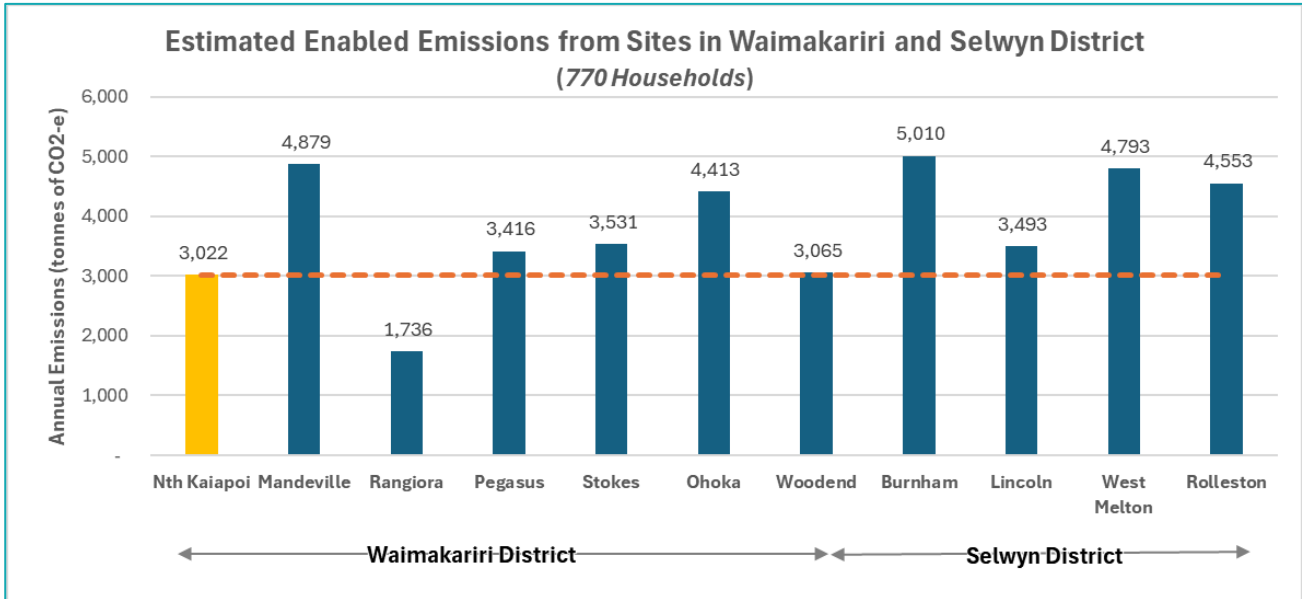


Figure 4-4 – Estimated emissions based on 2028 modelled daily average trip length – ordered by distance to the Christchurch CBD

As shown in the figure, the estimated emission for the proposed development at North Kaiapoi is estimated to be 3,022 tonnes per annum. This is lower than all other sites except for Rangiora. This demonstrates that planned growth within North Kaiapoi is likely to reduce GHG emissions when compared against a similar site elsewhere. This is in line with what has been presented by Mr Wilson.

While development in Rangiora will likely generate the least enabled emissions, it is unlikely to accommodate all the growth in the area. It is therefore reasonable to assume that other locations are needed to support. In this context, North Kaiapoi will reflect a reduction in GHG emissions if growth in Rangiora reaches capacity and development has to occur elsewhere.

It is also noted the 0.208 kgCO₂e/km is an average estimated emission between 2025 to 2050. In reality, EV uptake over time is expected to reduce the CO₂ emission rate and eventually reach zero emissions. However, this assumption will be applicable for any development at any location.

5 Conclusion

The specific conclusions of this analysis are as follows:

- The submitters GHG assessment compares the proposal against two baseline scenarios, namely:
 - **Baseline 1:** The same type and scale of development at alternative sites (AS) but without proposed design features that would support the reduction of GHG emissions (e.g. provision of cycling facilities, improved public transport services); and
 - **Baseline 2:** The same type and scale of development at AS elsewhere in Waimakariri or Selwyn Districts.
- Baseline 1 is not considered suitable for the purposes of land use planning decisions of the development itself as the NPS-UD requires good accessibility via public transport and active modes. These features will be key elements in design considerations for developments. Baseline 2 is considered a relevant baseline scenario;
- In general, we agree with the GHG assessment methodology for embodied and operational emissions assessment undertaken by the submitter;

- The submitters proposal for cycle facilities and public transport provisions are considered useful in terms of recreational use, amenity use and general accessibility for the site and will encourage its uptake. However, it is unlikely to attract sufficient regular usage to make a material difference to vehicle use of its residents;
- The submitters adopted net vehicle trip rate is considered suitable for use in estimating comparative GHG transport emissions, with no further reductions needed to reflect the proposed cycle facilities or public transport provisions;
- The enabled vehicle emissions associated with the development are estimated to be in the order of 3,022 tonnes per annum;
- Comparisons with the same scale of development in other locations suggest the vehicle emissions for this location would be lower than other locations in the Waimakariri and Selwyn District, except for Rangiora, due to its close proximity to Kaiapoi Town Centre; and
- Although the methodology of the proponents' assessment of Baseline 2 differs slightly, the underlying principle remains the same and leads to the same conclusion.

This review indicates that the GHG emissions associated with this proposal would likely be lower than a development elsewhere that is further away from established centres. Only when compared against similar development in areas more established would this site be likely to have greater GHG emissions. While development in Rangiora will likely generate the least enabled emissions, it is unlikely to accommodate all the growth in the area. It is therefore reasonable to assume that other locations are needed to support the growth. In this context, North Kaiapoi will reflect a reduction in GHG emissions if growth in Rangiora reaches capacity and development has to occur elsewhere.