

BCEC SUBMISSION

Measuring Low-Stress Cycling Connectivity

Response to the City of Belmont Draft Sustainable Transport Strategy 2026-2031

Prepared by Belmont Community Environmental Champions Inc. | 16 August 2026

RECOMMENDATION

Add low-stress cycling network connectivity and destination access to the STS performance framework; establish a verified Bicycle Network Analysis baseline in Year 1; return the baseline and a measurable 2031 target to Council for endorsement; and publish an identifiable annual action-status and progress report.

Executive summary

Belmont Community Environmental Champions Inc. supports the draft Strategy's aim of a well-connected, safe and environmentally responsible transport network. The draft identifies connectivity as a priority, but its performance table does not directly measure whether residents can reach everyday destinations through a connected, low-stress cycling network.

A recognised, repeatable method is available. The PeopleForBikes Bicycle Network Analysis (BNA), run locally through the open-source Brokenspoke Analyzer, assesses traffic stress and low-stress access to people and common destinations. It produces overall and category scores for a defined area.

BCEC's preliminary City-wide run scored 48.0. Only 26.8% of the modelled network was classified low stress and 73.2% high stress. Separate suburb runs generally returned higher overall scores. Read with the stress maps, this supports BCEC's observation that

local pockets can work reasonably well while high-stress roads and crossings fragment travel across the City.

The City's own engagement evidence points to the same problem and to substantial latent demand. Among the self-selected Belmont Connect survey respondents, 60.1% selected cycling, including e-bikes, as a preferred mode if traffic, accessibility and safety barriers were removed. In 173 responses about what would encourage more riding or micromobility use, the leading themes were safe protected infrastructure, better-connected continuous routes and safer crossings of major roads.

These results are a proof of concept, not the proposed formal baseline. The network appears sufficiently complete to demonstrate the method, but important destination categories and some network attributes require verification. BCEC offers to help the City complete that work and establish a defensible baseline.

BCEC's five requests

1. Add low-stress cycling network connectivity and destination access as an STS performance measure.
2. Complete a City-supported audit of relevant OpenStreetMap and City-held data before adopting the official baseline.
3. Publish the verified baseline and data-quality statement, then present a measurable 2031 target to Council for endorsement.
4. Publish a summary implementation schedule and report action status and outcome progress to Council and the community each year.
5. Work with BCEC on data verification, community mapping, officer knowledge transfer and repeat analysis.

1. The missing network-performance measure

The draft says that infrastructure will prioritise closing gaps in accessibility and connectivity and that progress will be reported through the Corporate Business Plan and annual reporting. Page 31 lists measures of usage, private-vehicle dependency, crashes, participation, satisfaction, emerging mobility, cycling activity and funding effectiveness. Each is useful, but none measures whether the network itself enables low-stress access.

Current evidence	What it shows	Question still unanswered
Mode share and counts	How much people currently ride	Can useful destinations be reached on a continuous low-stress route?
Crash data	Where reported harm occurred	Where stress suppresses cycling before a crash occurs
Community surveys	Perceptions and priorities	Which links create the greatest network barrier
Infrastructure length	How much has been provided	Whether individual facilities form a useful network
BNA	Low-stress access to people and destinations	Complements rather than replaces the other evidence

Table 1. BNA fills a network-outcome gap; it does not replace counts, crash analysis, surveys or engineering assessment.

1.1 What the engagement evidence adds

The Engagement Report records 199 survey responses from 158 contributors.

Respondents could select multiple modes, and the sample was self-selected, so the results should not be treated as a representative City-wide mode-share estimate. They are nevertheless direct evidence of the priorities expressed by people who participated in the City's process.

Engagement finding	Reported result	Relevance to this submission
Typical-day cycling, including e-bike	38.3% of survey selections	Shows cycling already forms part of travel for many respondents; not a population mode share.
Preferred cycling if all traffic, accessibility and safety barriers were removed	60.1% of survey selections	Shows a substantial preference gap associated with barriers.
What would encourage more riding or micromobility use	173 responses	Top three themes: protected infrastructure; connected, direct and continuous routes; safer major-road crossings.
Interactive mapping	128 pins from 59 contributors	Identifies specific barriers that can be tested against stress and connectivity outputs.

Table 2. City of Belmont Engagement Report, July 2026. Survey questions allowed multiple selections; results describe respondents, not all residents.

2. What BNA measures

PeopleForBikes describes the BNA as a four-stage process: data collection, traffic-stress analysis, destination-access analysis and score aggregation. Its low-stress standard broadly corresponds to Levels of Traffic Stress 1 and 2 and is intended to reflect the comfort of a typical adult who is interested in cycling but concerned about motor-vehicle interactions.

- **Traffic stress:** classifies streets and paths using available road, speed, lane, parking, cycling-facility and intersection attributes.
- **Destination access:** tests whether people and common destinations can be connected through the low-stress network within the analysis trip distance.
- **Score aggregation:** combines access outcomes into an overall score and category scores from 0 to 100.
- **Repeatability:** allows the same boundary, dataset and tool version to be rerun after network changes.

Low-stress share and overall score are different. The share describes how much of the modelled network is low stress. The overall score describes low-stress access to people and destinations. A small but well-placed local network can therefore support a relatively high score even when much of the total road network remains high stress.

3. Preliminary City-wide result

48.0 Overall score	26.8% Low-stress share	73.2% High-stress share	43,278 Modelled population
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The preliminary City-wide analysis indicates that high-stress segments dominate the modelled network. Parks and retail are the strongest category scores, while transit is the lowest. Transit and core services are also among the categories most affected by sparse destination mapping and must be verified before target-setting.

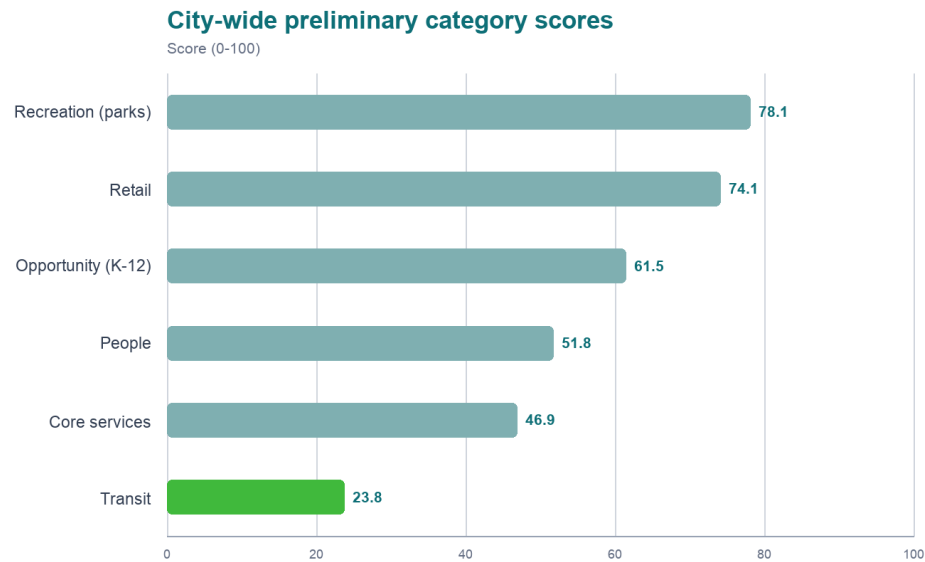


Figure 1. City-wide preliminary category scores. Indicative only; source: BCEC BNA outputs dated 15 August 2026.

Category	Score	Interpretation at this stage
People	51.8	Moderate modelled access to nearby people.
Opportunity (K-12)	61.5	Moderate access to mapped schools.
Core services	46.9	Treat cautiously: health and social-service POIs are sparse.
Retail	74.1	Relatively strong access to mapped retail.
Recreation (parks)	78.1	Strongest category in this run.
Transit	23.8	Lowest category; mapped transit coverage requires verification.

Table 3. Preliminary category scores. These are not proposed as the formal baseline.

4. City and suburb pattern

Separate runs were completed for Rivervale, Cloverdale, Redcliffe, Belmont, Kewdale, Ascot and Perth Airport. All residential suburb runs returned a higher overall score than the City-wide run. This does not mean every suburb street is low stress: the suburb low-stress shares range from 15.4% to 47.4%, while the overall score also reflects the placement of people and mapped destinations.

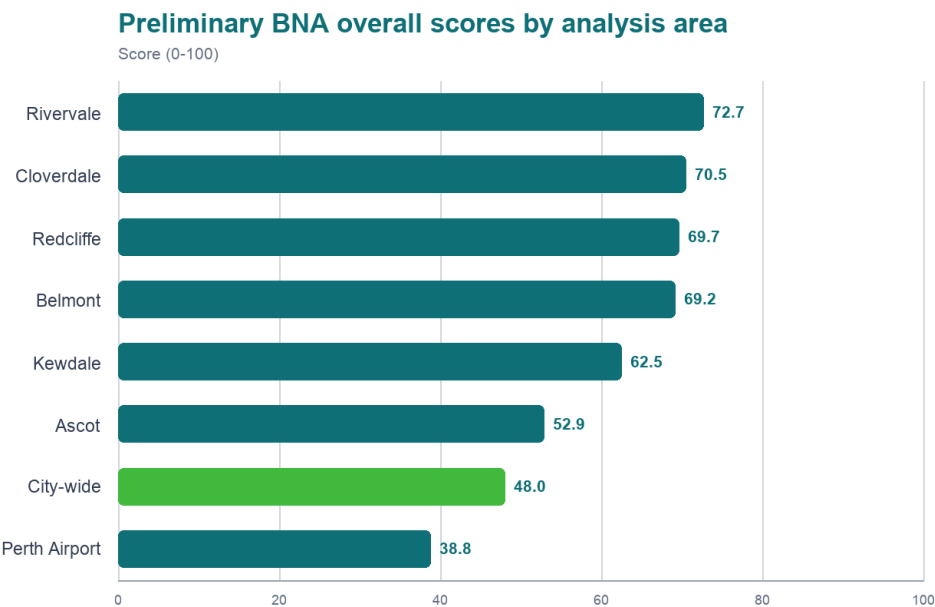


Figure 2. Preliminary overall scores from separately analysed areas. The results are diagnostic and are not additive.

Area	Overall	Low-stress share	Population
Rivervale	72.7	21.9%	9,109
Cloverdale	70.5	15.4%	8,857
Redcliffe	69.7	19.9%	4,265
Belmont	69.2	24.1%	7,935
Kewdale	62.5	29.7%	7,761
Ascot	52.9	47.4%	3,563
Perth Airport	38.8	28.9%	1,743

Table 4. Separate boundary runs use their own analysis context and should not be summed.

Connected pockets, disconnected city

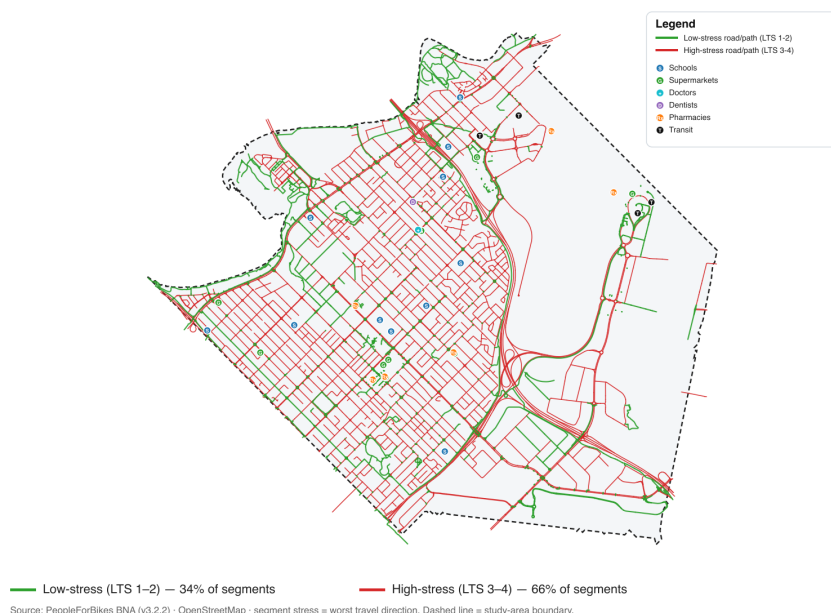
The score pattern and the supplied stress maps are consistent with BCEC's practical observation: local streets and paths can support useful movement within suburb pockets, while high-stress arterial roads and difficult crossings interrupt travel between suburbs and to regional destinations. The City-wide result is therefore the strategic indicator; suburb and grid results are supporting diagnostics that help locate barriers and equity gaps.

Community evidence identifies the same seams

The engagement mapping identified difficult or unsafe walking and cycling conditions on the corridors that divide or constrain cross-City movement. Great Eastern Highway attracted 10 State-road responses about crossings and access; Orrong Road attracted eight about heavy traffic, unsafe cycling and poor connectivity; and two responses identified the Leach Highway Principal Shared Path termination and poor connection to Orrong Road. On local roads, respondents also identified barriers on Kooyong Road, Surrey Road, Abernethy Road, Epsom Avenue, Wright Street and Stanton Road. These are not statistically representative counts, but they are geographically specific community evidence that can be compared with the traffic-stress map and used to prioritise validation and engineering investigation.

City of Belmont — whole LGA

Bicycle network — Level of Traffic Stress - BNA score 48.0/100



5. Data quality and limitations

IMPORTANT

The current score must not be adopted as the formal baseline. The results are suitable to demonstrate the method, but destination layers and selected network attributes require verification.

5.1 Sparse destination layers

The City-wide output contains one doctor, one dentist, no hospitals, six pharmacies, no social services and four transit points. Most suburb outputs contain no mapped doctors, dentists or transit points. A zero can represent a genuine absence, a facility outside the analysis boundary, or an unmapped or unrecognised OSM tag. Rivervale's strict polygon check found no in-boundary health-service features under the queried tags but did find three IGA supermarket features, illustrating that category completeness varies.

Area	Doctors	Dentists	Pharmacies
City of Belmont	1	1	6
Rivervale	0	0	0
Cloverdale	0	0	3
Redcliffe	0	0	0
Belmont	1	1	1
Kewdale	0	0	0
Ascot	0	0	0
Perth Airport	0	0	2

Table 5. Selected destination counts. Hospitals and social services are zero in every listed output.

5.2 Speed units and stress classification

The speed treatment is consistent with the mapped result. Prepare logs report a city default of 30 km/h, but the stress rules compare speeds in mph after conversion in speed_limit.sql. A tagged 30 km/h road is about 20 mph, not 30 mph, and the mapped 30 km/h road appears low stress. Tagged 50 km/h roads convert to about 31 mph and remain high stress under the current segment rules. Defaults matter most where explicit maxspeed tags are missing, so posted speeds should form part of the validation audit.

5.3 Other known issues

- Alexander Road, Wright St, Oats St painted cycle lanes are known to be untagged in OSM for this analysis context, although painted cycle lanes still rank as high stress paths.
- Some apparent missing destinations are boundary effects; a nearby Chemist Warehouse found through a bounding-box search was outside the Rivervale polygon.
- City-wide and suburb population results are modelled independently and should not be summed or treated as statutory population estimates.
- The local OSM extract file was modified on 15 August 2026 and contains object edits through 24 July 2026, but its header does not record a clear replication timestamp.
- The run used Brokenspoke Analyzer 3.2.2, a custom City boundary and WorldPop 2026 population data. Those inputs and settings should be retained with the baseline.

6. From proof of concept to formal baseline

- **Agree the data specification.** Document the road, path, speed, lane, parking, cycling-facility, intersection, crossing and destination attributes required for Belmont.
- **Reconcile City and OSM data.** Compare City asset, posted-speed, crossing, transit and community-facility data with OSM, recording discrepancies.
- **Verify high-impact features.** Prioritise attributes likely to change stress classifications and destination categories with zeros or implausibly low counts.
- **Use community mapping.** BCEC can coordinate local knowledge, field checks and structured OSM mapping parties under City-approved quality assurance.
- **Freeze the baseline dataset.** Archive the boundary, OSM extract, population data, speed inputs, tool version, run commands, settings and data-quality register.
- **Run quality checks.** Review signed speed zones and outliers and validate samples of low- and high-stress segments against known conditions.
- **Publish the baseline.** Report the City-wide score, category scores, stress share, maps and limitations, supported by suburb diagnostics.
- **Set the 2031 target.** Select a numeric improvement target only after the verified baseline is complete.

7. Target and reporting framework

BCEC does not recommend setting a numeric target from the current run. Once validated, the public STS performance framework should link a City-wide outcome target with diagnostic measures and project evaluation.

Role	Indicator	Proposed use
Primary outcome	Verified City-wide overall BNA score	Baseline in Year 1; numeric 2031 improvement target
Network condition	Low- and high-stress share	Report change, including priority LTCN routes
Destination access	Verified category scores	Set targets only after data-completeness checks
Equity diagnostic	Suburb and grid results	Identify lowest-performing areas and whether gaps narrow
Project evaluation	Before-and-after BNA comparison	Apply to major links, crossings and corridors

Table 6. Suggested hierarchy for the target and supporting indicators.

Council and public oversight

The draft provides some oversight, but not enough over the decisions that define success. It states that progress will be reported through the Corporate Business Plan and annual reporting processes, and significant expenditure will still be considered through Council budgets. The Engagement Report, however, describes the five-year Implementation Plan as an internal working document. Neither document expressly requires the completed plan, the baseline, the 2031 target or material changes to return to Council.

Recommended balance. BCEC does not ask Council to manage technical reruns or every operational adjustment. Officers can maintain the detailed working plan. Council and the public should nevertheless receive a published summary of actions, lead roles, indicative timing and dependencies; Council should endorse the baseline and target that define success; and material changes to the target, method or priority action set should be disclosed through an identifiable public report.

Recommended reporting cycle

- Within 12 months of adoption: validate the data and present the baseline, data-quality statement and proposed 2031 target to Council for endorsement and publication.
- Annually: provide Council and the community with an identifiable STS action-status report, refresh key data, rerun the analysis and explain material delays or changes.
- After major projects: undertake a before-and-after comparison where connectivity should change.
- Mid-term and 2031: complete full data revalidation and report progress against the Council-endorsed target.
- If the methodology, target or priority action set changes materially: document the change publicly; return policy-level changes to Council; and rerun the historical baseline where necessary to preserve comparability.

8. Requested amendments

Performance measure

SUGGESTED WORDING

Low-stress cycling network connectivity and access to everyday destinations. Data method: Bicycle Network Analysis using verified OpenStreetMap and City-held data; baseline established in Year 1; results reported City-wide and supported by suburb-level diagnostics using a documented, repeatable methodology.

Infrastructure action 1.10

SUGGESTED WORDING

Establish and maintain a verified low-stress cycling network connectivity baseline, measurable 2031 target and project-evaluation process, with results informing network priorities and funding submissions.

Partnership action 2.7

SUGGESTED WORDING

Partner with community cycling and mapping groups to validate network and destination data, support community mapping activities and strengthen transparent active-transport reporting.

Delivery and reporting

SUGGESTED WORDING

Within 12 months of adoption, present the verified baseline, data-quality statement and proposed 2031 target to Council for endorsement and publication. Thereafter, publish annual progress through an identifiable STS action-status report as part of, or clearly linked from, the Corporate Business Plan and annual reporting process.

Governance and change control

SUGGESTED WORDING

Publish a summary implementation schedule identifying actions, lead roles, indicative timing and external dependencies. Technical updates may be managed administratively; material changes to the Council-endorsed target, measurement method or priority action set must be disclosed and returned to Council where they alter the Strategy's intended outcomes.

9. About BCEC and its offer

BCEC is Belmont Community Environmental Champions, a locally founded volunteer group established by residents in 2023. Its record of organising volunteers and community environmental action gives it relevant local knowledge and reach for structured mapping parties and field verification.

Under City-approved data standards and quality assurance, BCEC can help reduce establishment effort and build officer capability by:

6. coordinating structured OSM mapping parties, local field checks and destination and network-feature verification;
7. sharing the documented Analyzer workflow and supporting reproducible reruns; and
8. helping interpret maps and scores and review identified barriers with the community.

Conclusion

The City does not need to choose between an administratively workable Implementation Plan and meaningful public accountability. Its existing indicators should be complemented by a direct measure of low-stress network connectivity. With a verified dataset, a Council-endorsed baseline and target, a public action schedule and annual status reporting, Council and the community will be able to see whether Belmont's cycling network is becoming safer, more connected and more useful over the life of the Strategy.

Appendix A - Detailed preliminary scores

A dash indicates that a category value was not present in the suburb output row. A value of 0.0 may represent either genuine absence or an incomplete destination layer. Separate runs should be interpreted diagnostically.

Area	Overall	People	K-12	Core services
Rivervale	72.7	88.4	64.1	77.3
Cloverdale	70.5	82.4	75.9	79.5
Redcliffe	69.7	91.1	88.8	-
Belmont	69.2	80.0	48.4	85.1
Kewdale	62.5	86.9	62.1	-
Ascot	52.9	74.0	27.8	-
Perth Airport	38.8	83.1	0.0	40.1

Table A1. Overall, People, K-12 and Core services scores.

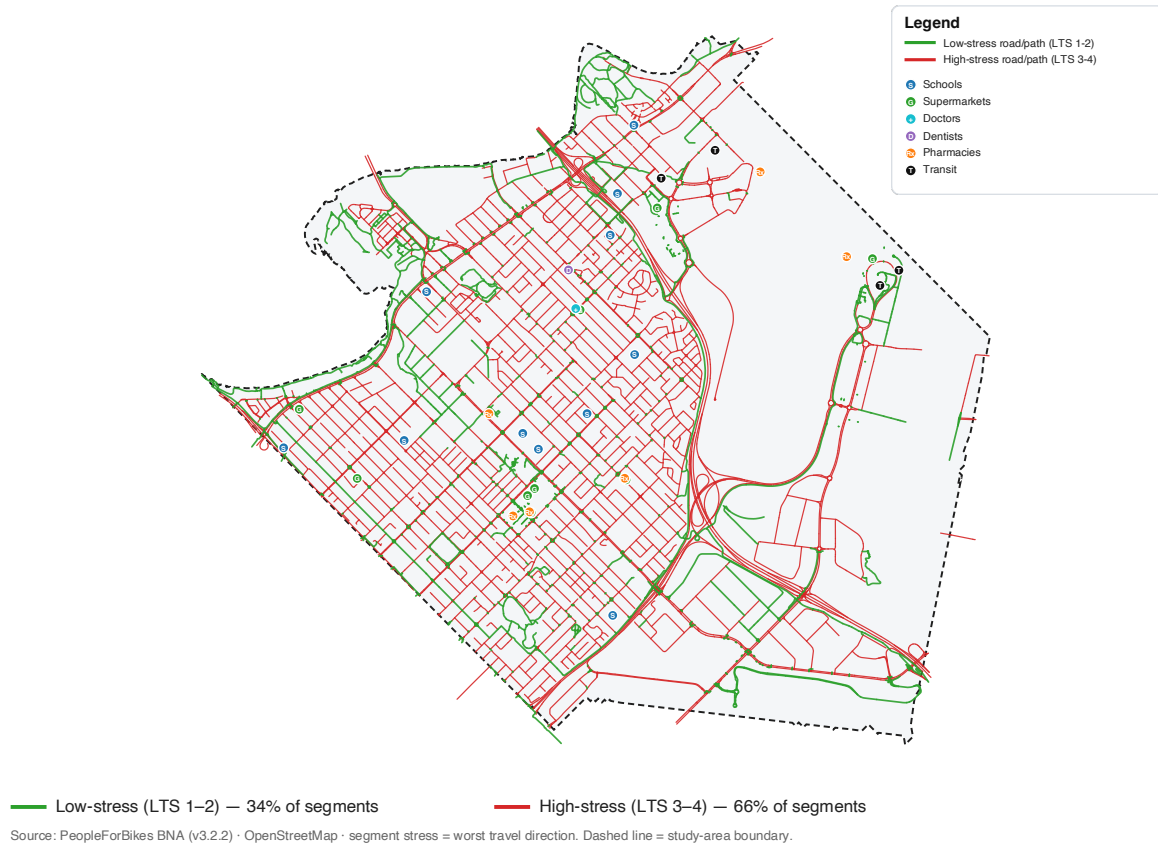
Area	Retail	Parks	Transit
Rivervale	85.4	92.5	0.0
Cloverdale	73.9	86.6	0.0
Redcliffe	42.7	91.8	88.8
Belmont	84.2	82.2	0.0
Kewdale	52.9	89.4	0.0
Ascot	71.7	58.4	0.0
Perth Airport	36.5	23.2	8.0

Table A2. Retail, parks and transit scores.

Appendix B - Map annex

City of Belmont — whole LGA

Bicycle network — Level of Traffic Stress · BNA score 48.0/100



Rivervale

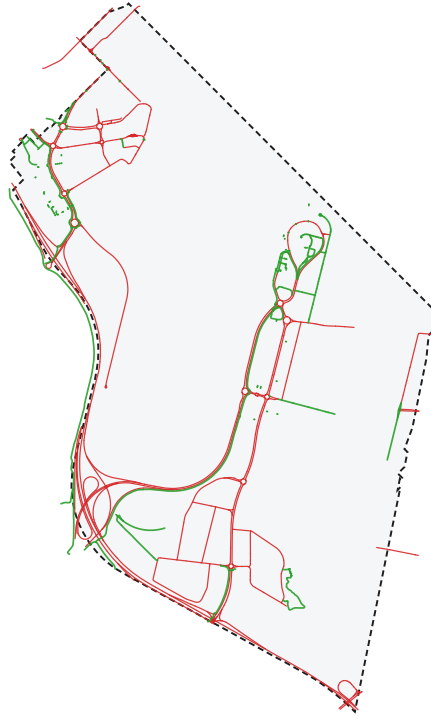
Bicycle network — Level of Traffic Stress · BNA score 72.7/100



Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.

Perth Airport — City of Belmont portion

Bicycle network — Level of Traffic Stress · BNA score 38.8/100



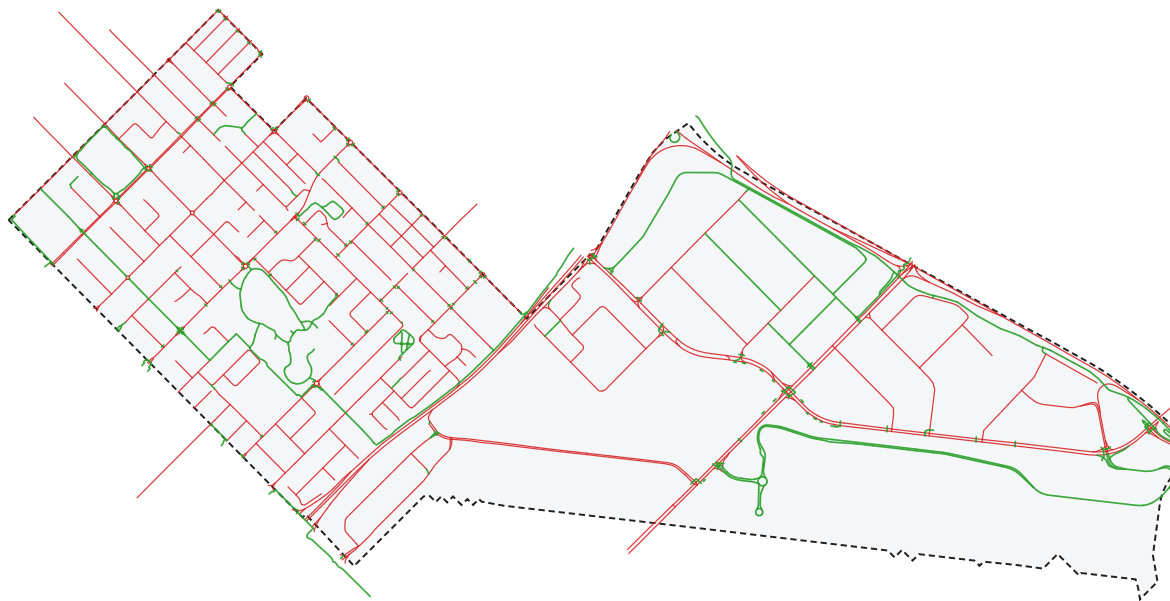
— Low-stress (LTS 1–2) — 36% of segments

— High-stress (LTS 3–4) — 64% of segments

Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.

Kewdale — City of Belmont portion

Bicycle network — Level of Traffic Stress · BNA score 62.5/100



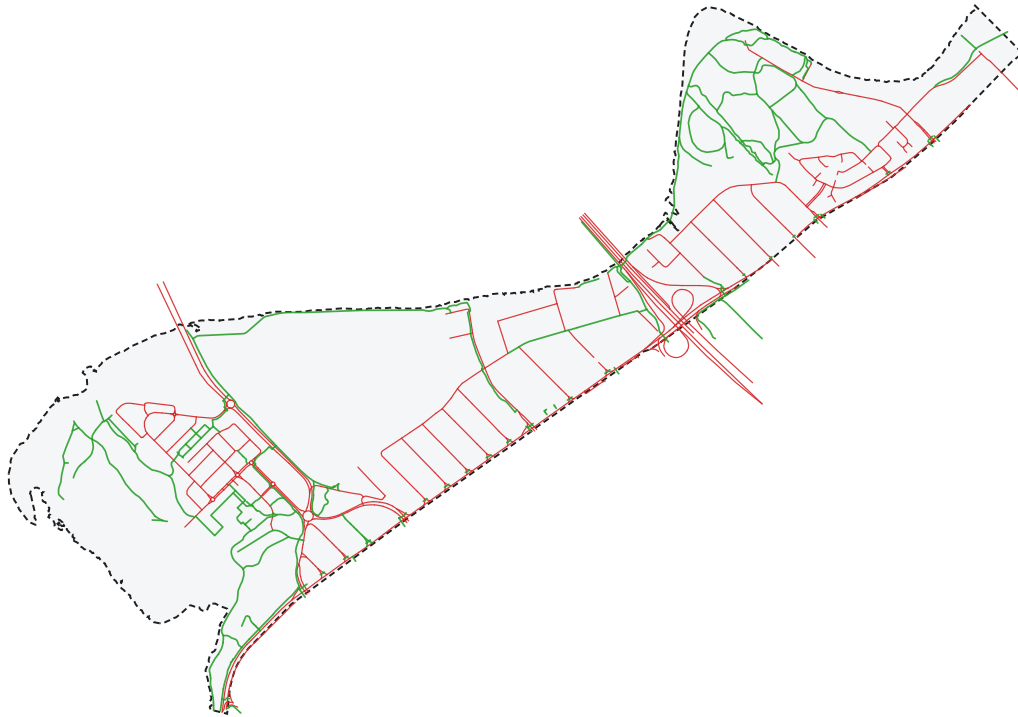
— Low-stress (LTS 1–2) — 39% of segments

— High-stress (LTS 3–4) — 61% of segments

Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.

Ascot

Bicycle network — Level of Traffic Stress · BNA score 52.9/100



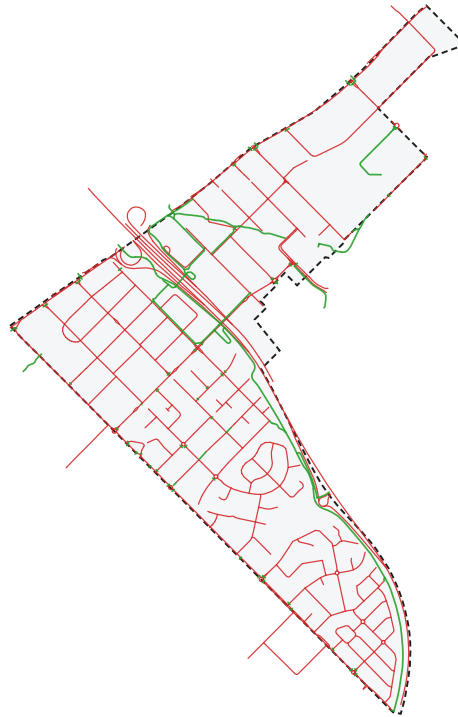
— Low-stress (LTS 1–2) — 35% of segments

— High-stress (LTS 3–4) — 65% of segments

Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.

Redcliffe

Bicycle network — Level of Traffic Stress · BNA score 69.7/100



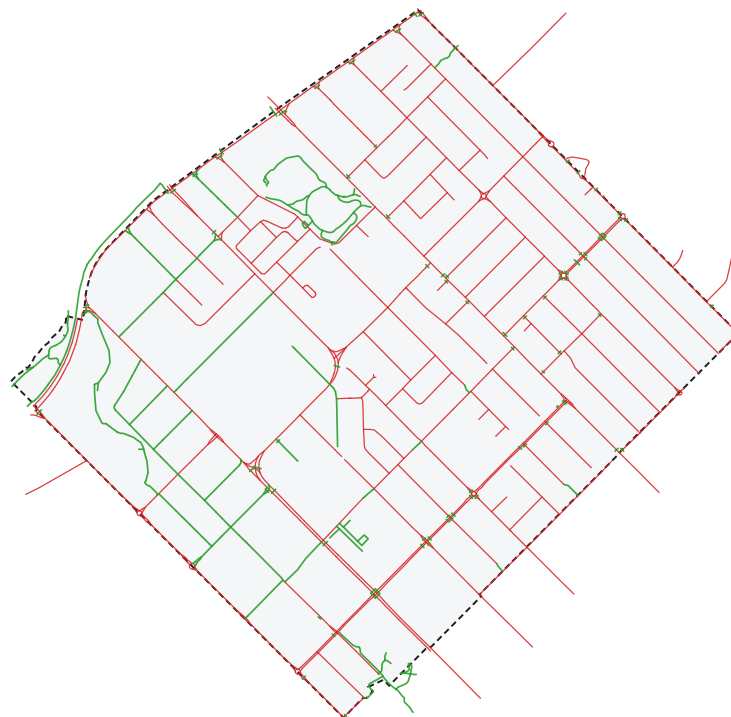
— Low-stress (LTS 1–2) — 22% of segments

— High-stress (LTS 3–4) — 78% of segments

Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.

Belmont (suburb)

Bicycle network — Level of Traffic Stress · BNA score 69.2/100



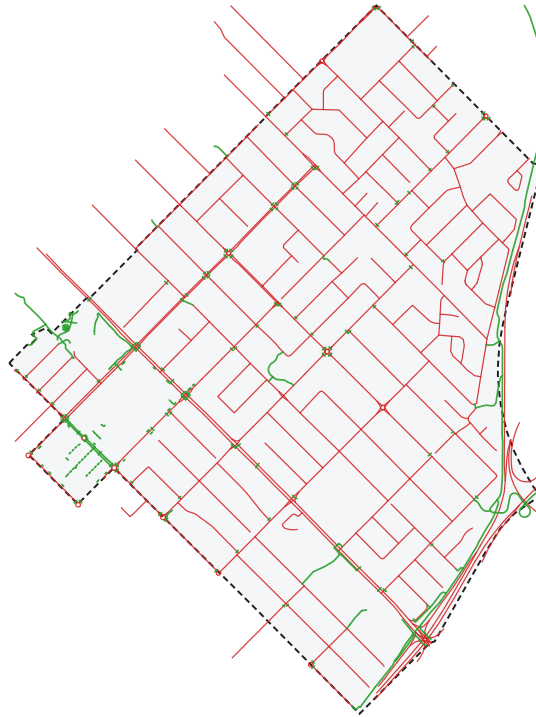
— Low-stress (LTS 1–2) — 33% of segments

— High-stress (LTS 3–4) — 67% of segments

Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.

Cloverdale

Bicycle network — Level of Traffic Stress · BNA score 70.5/100



— Low-stress (LTS 1–2) — 36% of segments

— High-stress (LTS 3–4) — 64% of segments

Source: PeopleForBikes BNA (v3.2.2) · OpenStreetMap · segment stress = worst travel direction. Dashed line = study-area boundary.