Lower Speed Limits and Speed Environments in Redcliffs



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Research Question

"In what ways would reducing the speeds on residential roads impact the Redcliffs community and how could this best be achieved?"

• Context of Research

With temporary closures of the main arterial route from Sumner to the city, Main Road, traffic was diverted through the Redcliffs residential area along Beachville Road and Celia Street. This saw a substantial increase in the traffic from under 1000 vehicles to 12,000 vehicles per day. During the diversion the speed limit was reduced to 30km/h at the request of some residents in the area. Some residents believed that the 30km/h should become permanent. This research project looked at the potential impacts of reducing the speed limit on the local community and the various methods of implementing these changes.

Methods

Primary and secondary data sources were used. Secondary data provided essential background information on speed reduction measures and was primarily sourced during assignment one focusing on domestic and international cases. Primary data was gathered by using qualitative and quantitative research taking traffic speed data and delivering a survey to Redcliffs residents.

• Key Findings

- On Celia Street the majority of vehicles went above the 30km/h temporary speed limit, while outside the diversion most of the cars went 30km/h or below, well below the speed limit of 50km/h. However some vehicles went excessively above the speed limit going 70km/h in a 50km/h zone.
- Residents had varying opinions on the speed being reduced, with overall a slim majority were against a speed reduction. Although Celia Street was 54.5% in favour, while Beachville Road was only 35% in favour.
- However, some reasons in favour of against are more valid than others, and so need to be evaluated on practicality.
- Persuasive road measures like speed bumps and suggestive measures such as road surface change or road narrowing are one possibility to implement a speed reduction effectively.

Limitations

The traffic speed data collections were only done for one hour on four occasions which may not have been representative of all vehicles using the streets, and the traffic congestion on one of those collections decreased the speeds in which the cars could physically go. A very low response rate with the surveys also potentially limited how applicable the opinions could be to the whole community. This also prevented us from asking the residents how they felt about the different speed reduction measures in a focus group; instead having to rely on the findings of past studies and literature on the topic.

• Future research

Future research could try survey all the residents and collect more extensive speed data to accurately gauge whether a speed reduction is wanted and needed.

Introduction

Redcliff's Background:

The 2010 and 2011 Canterbury Earthquakes caused widespread damage throughout the Canterbury region affecting in many cases the roading network. Main Road is the main arterial route and thoroughfare connecting Christchurch with Redcliffs and Sumner. In wake of the earthquakes, Main Road has been subject to a number of temporary road closures due to ongoing repairs. As a result of these road closures, full traffic diversions were set up through the residential streets of Celia St and Beachville Road, (Figure 1). This saw a substantial increase in traffic along the quiet residential roads. Approximately 12,000 cars per day were diverted from Main Road along Celia St and Beachville Road that had become accustomed to an average of a few hundred cars normally.

The diversions had a temporary speed limit of 30 km/h. During this period of time a number of residents suggested that the 30km/h speed limit should become



permanent. From this suggestion and in collaboration with Darren Fidler a representative from the Redcliffs Residents Association, our research project has focused on, the potential impacts of reducing the speed limit on the local community and the various methods of implementing these changes.

Celia St and Beachville Road were used as the control roads for the larger Redcliffs' Community.

Research Question

"In what ways would reducing the speed on residential roads impact the Redcliffs community, and how could this best be achieved?"

In order to focus the research, a number of objectives and corresponding methods were established to ensure what was being conducted was relevant to the question at hand and performed in an efficient way (Figure 2).



Figure 2: Objectives of project and Methods of answering objectives

Area Observation

The control roads of Celia St and Beachville Rd are usually quiet residential Roads.

Celia Street

At the northern end of the Celia St is Redcliffs Park, a recreational space including sports grounds and playground. This provides a location for many activities that may in other places be conducted on or near the road (Area shown in Figure 1).

Celia Street is quite narrow only being 8.5m (metres) wide and has a number of current traffic calming measures in place. These include Street narrowing with wide berms and two traffic island chicanes which narrow the road to 3.5m either side of the chicanes. However, the effectiveness of these current measures is debateable and discussed further in the project.

Beachville Road

Beachville Road runs parallel with the estuary. This was important when discussing the objective, "Is speed an issue to locals?" In a number of cases the focus on traffic control was not the main concern for the residents, rather children and water safety. However the scope of this study is only looking at the speed on the roads.

Beachville has wide berms and some street narrowing being 11.5m wide along Redcliffs Park and narrowing to 8m around the corner sometimes getting down to 5m in places. However on observation, the narrow road seems to have little effect.

Literature review

In light of the research question "In what ways would reducing the speed on residential roads impact the Redcliff's community, and how could this best be achieved?" Group members researched relevant cases of speed reduction methods in domestic and international contexts to see what impacts they directly observed when the speed was lowered, and how effective each method was. Some of these measures included the Woonerf concept, road separation vertical measures, and horizontal measures.

Tranter (2010) suggested some beneficial impacts of reducing speed limits on roads. These impacts included a lower chance of a fatality in road accidents dropping from a 5% chance of death at 30km/h compared to 45% at 50km/h and 85% at 65km/h. Reducing the speed would also benefit the environment by decreasing the amount of pollutants such as CO2 released by vehicles while being more economical by consuming less fuel. An interesting theory was also suggested in that the faster the mode of travel the more time it would take. The rationale behind this theory was that the faster modes of travel require more maintenance and fuel costs than their slower alternatives, and so taking more time with people working extra hours to afford the transport. This links into our research by indicating some of the impacts that reducing the speed limit would have on the community, and what speed may be appropriate.

In reducing the speeds on residential roads one method utilised effectively in Europe is the Woonerf concept, this is an integration of pedestrians, cyclists and motorists (Collarte, 2012). The integration is achieved by roads, pathways and signs are removed and in the road surface changed to bricks or cobbled stones. This encourages drivers to be more aware of their surroundings due to the lack of defined road markings. This is enhanced by pedestrians and cyclists having priority, or right of way, over motorists and the speed reduced down to walking speed to reflect this (Ben-Joseph, 1995). The advantages of this concept are the reduced driving speed which increases the level of safety, increasing socialization and activities as it allows children make use of the space as the street is for everyone not just cars. The disadvantages of this concept are the cost of implementing, delay in response in emergency services, lack of parking, and occasional traffic congestion. The Woonerf concept is concerned with the social opportunities that such a road space can present. A completely opposite approach to road integration, which has been employed in Sweden, is the principle of road separation. Road separation is where pedestrians and cyclists are completely separate from motorists, most often achieved through erecting some form of barrier, such as a small concrete wall or metal guard rail. This increases the safety of pedestrians and cyclists by minimising their contact with vehicles, and where they do meet like on pedestrian crossings speed bumps and flashing light are installed or pedestrian bridges built to bypass their meeting altogether (The Economist, 2014). While road separation does increase safety it can be quite costly to install barriers and requires a substantial amount of space.

Due to the high cost of total road integration or separation other road engineering methods were also investigated. A study in the Netherlands (Vis, Dijkstra, & Slop, 1992) looked at the effectiveness of non-woonerf methods such as speed humps, elongated hump or raised junction, mini roundabout, traffic island, turning bans, and 30km/h sign only. These measures come under different branches of methods of reducing road speed. There are informative measures which like speed signs which tell people to slow down, suggestive measures like road narrowing or surface change that subconsciously urge people to slow down, persuasive measures like speed humps which make it in their best interest to slow down, and obstructive measures which make it physically impossible for them to speed.

The results from this study show that reduced speed signs alone was 0% effective, humps, road narrowing, elongated humps, (partial) barricades and entrance constructions made 85% of cars go at or below the desired 30km/h speed limit. Persuasive measures, especially speed humps were found to be the most effective with suggestive measures also being somewhat effective, however, obstructive measures such as road narrowing which only allows one car to go through at a time were not as effective on quiet roads. Vis, Dijkstra & Slop (1992) also found that the residents felt safer with the reduced speed and volume of traffic in the area.

A study conducted by the Christchurch City Council (2013) also looked at the effectiveness of traffic calming measures, and looked at the effectiveness of vertical measures which consisted of speed bumps and horizontal measures which were traffic islands/chicanes. The different measures did not influence average speeds however, they did influence the extreme speeds; speed bumps were the most effective by curbing

the maximum speed at 78 compared to horizontal measures at 88. Road width was also found to have a significant effect on speeds up until 9 metres then there was no influence by road width. However, some vehicles still went very fast down narrow streets with someone going 130km/h down a 9.5m street. This refers back to our research question when taking speeds into consideration as Beachville Road and Celia Street road width varies with Beachville road being 11.5m at its' widest 5m at its' narrowest while Celia was 8.5m and 3.5m at either side of the chicanes.

Methods

The group used a systematic approach to identify the methods which would be of most benefit to achieve our aims. From this, we analysed our objectives and came up with methods to relate and address each of them. This consisted of a mix of primary and secondary data sourced from our own and previous research. Our objectives included addressing whether or not people are speeding, if speed is an issue to the locals and the most effective methods of reducing speeds. It was important that the methodologies that we chose provided us with appropriate research to fulfil the rest of our project.

The group initially focused on secondary data sources. These provided us with essential background information for the project and were primarily sourced during assignment one. This secondary data enabled us to address the objective of how reducing speeds may best be achieved. Previous studies from local and international sources were analysed and compared. Local data sets were of particular significance as they had much more importance to our project. Data sets obtained from the Christchurch City Council reviewed the effectiveness of traffic calming measures, the connection between road widths and speeding and also the link between speed and pedestrian fatalities during a collision. Comparing such data with the conditions in our area of interest enabled the group to make informed conclusions of the most appropriate calming measures to put in place if needed. We also aimed to ask the residents how they felt about traffic calming examples employed in domestic and international cases.

Our group decided that a mixed method research approach would be the most appropriate for achieving our research aims. A mixed method approach involves combining quantitative and qualitative research methods allowing the overall strength of the study to be greater than just using one of the mentioned methods on its own (Creswell, 2008).

Quantitative research can be described as research which is explaining phenomena by collecting numerical data that can be analysed using mathematical based methods. It is often suited to answer a particular question (Aliaga & Gunderson, 2010). In the instance of our research, we used quantitative data to answer the objective of whether or not people are currently speeding in the area. Within the group it was discussed that this data would be collected during two parts of the day using a traffic speed gun, ensuring a

high quality of data. Due to the large increase of traffic volumes during the diversion, the group also recognised the importance of obtaining data both while this was and was not in place. Also, because the speed limit was temporarily reduced during the diversion to 30km/h, it presented the opportunity for an observational analysis to whether or not drivers pay attention to the speed limit signs.

The quantitative data we obtained during the traffic speed recording sessions was processed and analysed using Excel software. We were able to gain mean traffic speeds and also produce statistical graphs which presented the data in a way which was appropriate for further analysis.

Unlike quantitative research, qualitative research provides the means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2008). The majority of quantitative data is text based and this text has been described by Schutt (2014) as a way to get behind the numbers that are recorded in quantitative analysis. A semi-structured structured questionnaire was developed to address the objective of whether or not speed was an issue to the local residents of Celia Street and Beachville Road. This semi-structure meant that it was comprised of a mixture of open and closed questions, enabling a mix of qualitative and quantitative information to be gathered. The survey covered a range of questions involving household demographics, how members of the household currently use the street, their point of view on a reduced speed limit and how they viewed the street in a safety perspective. Once returned, the results of the surveys were carefully tabulated again in Excel software. Questions which had quantitative answers were statistically analysed, producing percentages, data tables and graphs. While the qualitative data was analysed by reviewing the text answers written by residents and identifying recurring comments and themes expressed. These open answered questions helped to make interpretations of the meaning of the statistical data.

Speed data

On Beachville Road during the 30km/h diversion 924 vehicles were observed using Beachville Road with 296 of their speeds being recorded. The speed data was collected from 17:00 to 18:00 in the evening to capture the speeds of those coming back from work in the city. The speed data was then put into categories of 5km/h each for example 0-4, 5-9, 10-14 up until 70-74 and was plotted as a bar graph to show the distribution of speeds. The results for the Beachville Road diversion on one evening are shown in Figure 3. The maximum speed recorded was 37km/h while the minimum was 5km/h and the average was 23.6km/h. Because of the 926 vehicles the traffic was bumper to bumper for stretches of time during the recording. This limited the speeds that cars could physically go and may not have been an accurate representation of whether people would adhere to the 30km/h speed limit, as they had no physical way to exceed it. This is shown by only 11% of vehicles exceeding the 30km/h limit



Figure 3: Beachville Road speed data during diversion

Recording speeds outside of the diversion was done again at 17:00 to 18:00 at night and the speed limit had gone back up to 50km/h. This time only 32 vehicles came down the street; far fewer than during the diversion. Because of this it was a far more representative sample of what speeds people choose to go on the road as they were not hindered by traffic congestion. The speed recordings for this time are shown in Figure 4. The speeds were higher than during the diversion, however, even though the speed limit was back up to 50km/h the majority went below it with the majority travelling in the 35-39

or 40-44 ranges the minimum being 31km/h, and the average being 44.1km/h. However, 21% of vehicles exceeded the 50km/h limit with some going excessively fast down the road. The highest speed was 70km/h, which is 20km/h over the limit, and the second highest was going 61km/h, but doing so on the wrong side of the road.



Figure 4: Beachville Road speed data after diversion

The speed data for Celia Street were recorded at 08:00 to 09:00 to catch the morning rush traffic into the city due to the diversion. Celia Street during the diversion had a total of 628 vehicles and 206 of their speeds were recorded. Unlike Beachville Road this volume of traffic allowed the cars to come in waves and so the speeds were not as affected by the increased volume of cars like Beachville Road was. The speeds for Celia Street during the diversion are shown in Figure 5. Even though the diversion had a speed limit of 30km/h the minimum was 26km/h with the average being 35.1km/h and the maximum being 54km/h. As shown in Figure 3, 82% of vehicles recorded went above the dictated speed limit of 30km/h, with 50% of vehicles going above the legal 5km/h tolerance for speed. This supports the findings of the Christchurch City Council (2013) where some drivers will always travel at excessive speeds.



Figure 5: Celia Street speed data during diversion

Outside the diversion on Celia Street, 16 vehicles came down the street with all of their speeds being recorded. The speed recordings for this time are shown in Figure 6. The majority of vehicles after the diversion went well below the 50km/h speed limit with 75% of those recorded going below 34km/h with only 12.5% going above it; as shown in Figure 4. The average speed was 30.8km/h with the minimum being 17km/h and the maximum being 58km/h. However, the maximum speed of 58km/h was recorded from a large truck. The scarcity of vehicles at this time period down Celia Street may have limited the trend that could have been achieved is only one snapshot into what speed people choose to travel down this street.



Figure 6: Celia Street speed data after diversion

In relation to our research question the speed data shows that in general most vehicles go below the 50km/h speed limit which indicates that vehicle speeds may not be a major

concern for locals. However, those who were travelling at excessively high speeds represent a slim majority of drivers who will always exceed the speed limit no matter the systems in place to reduce speed, and hence pose a risk. Often it was also found that some who were speeding were trades vehicles, who are assumed to not live in the area and are just passing through. The opinion that those who speed are non-residents, and hence do not care for the safety and wellbeing of the area and its people, was suggested by one of the residents as a concern in their survey.

We identified three main limitations to the speed data. The volume of vehicles during the diversion made it impossible to see whether people would adhere to the 30km/h speed as they could not physically travel freely. The speed data was also only collected over one hour on one day which may not be an accurate representation of what all vehicles travel down the street. Finally there were some technical limitations with the speed gun. The speed gun sometimes did not capture a vehicle's speed quick enough before the vehicle was out of range.

Survey

The survey was used to gauge the opinion of residents on reducing the speed limit and how it would possibly affect them. The full survey as given to the residents can be found in Appendix 1. The surveys were distributed by going door to door and asking the residents to fill out the survey and return it to the address of our community contact on Celia Street. If no one was home or at least did not answer the door the survey was left in their letter box with the instructions to drop it off at the Celia Street address. Using this method, of the 154 surveys that were handed out 26 were returned 15 from Beachville road and 11 from Celia Street. One survey had to be excluded from analysis as no questions had been filled in and in large lettering across the page "A bias survey to whose advantage?" was written in black permanent marker.

The first question asked as to how many people who lived in the household were in certain age ranges. The results are plotted on the column graph in Figure 7. This question revealed that the majority of those who answered our survey were in the age range of 40-64 closely followed by the 65+ age range. This was planned to examine whether the age of the people in the dwelling would affect any of the following questions

asked about the speed limit or the safety of the street. However, in general it was the older age ranges that actually responded to our survey.



Figure 7: Ages of residents in households surveyed

The second question asked whether they would favour a permanent reduction in the speed limit from 50km/h down to 30km/h, and why this could be. Overall it was found that of the 11 (44%) were in favour of the speed reduction while 14 (56%) were against the speed limit shown in Figure 8. However, as shown in Figure 9, looking at the streets individually 6 of the the residents down Celia Street (54.5%) were in favour of the speed reduction while 5 (45.5%) were against it, and down Beachville Road 5 (35%) were in favour of the speed reduction while 9 (65%) were against it.



Figure 8: Overall opinion on speed reduction



Figure 9: Streets' opinion on speed reduction

Many different reasons were given as to why residents held the opinion they did about reducing the speed limit. Some of the reasons in favour of reducing the speed limit were that:

- Cars are travelling too fast down the street
- It is not a main arterial route and so shouldn't be 50km/h
- There are young children who live in the area and so would make it safer for them
- Children also play in Redcliff park and on the esplanade so would make it safer
- Would reduce the vibrations caused by trucks and other heavy vehicles
- The layout of Celia with chicanes and the narrow road makes it unsuitable for the current speed limit.
- High density of walkers
- Sunday sightseers unfamiliar with area and not focused which poses risks
- Chicanes on Celia Street make it into a Slalom course

Reasons against the speed reduction were:

- It's been fine for 10 years so why change now
- It is too fast for trucks and heavy vehicles
- The chicanes in place on Celia are sufficient at dropping speeds
- Inability to enforce new slower speed
- Not affected due to long driveways
- People are careful enough
- 30km/h too slow

- 50km/h is safe enough
- Not many cars travel down streets so safe enough
- No reason why the streets should differ from the rest of New Zealand
- Slowing down would make it more dangerous as frustrated drivers would accelerate to get past slower drivers
- There will always be someone who will go excessively over the speed limit, the limit would not help

The residents' responses to whether they favoured a possible reduction in the speed limit were mixed with reasonable explanations why they were in favour or against the speed reduction. While all of the responses were taken into consideration some responses were seen as more valid than others. While the number residents in favour and opposed to a permanent speed reduction can be a useful indicator as to whether changes should be made, each of the reasons need to be evaluated on their legitimacy and practicality. For example a reason against a speed reduction was that 30km/h would be too slow. However, the length of Beachville Road is approximately 1000m with Celia Street being about 500m, meaning that the time lost travelling at 30km/h versus 50km/h would be negligible. Some Celia Street residents also thought that the chicanes were sufficient at reducing speeds, while others thought they were a nightmare for parking and encouraging people to speed through them like an obstacle course.

Question 3 then asked residents how they used the streets. The responses were varied with residents reporting using the street for:

- Walking
- Driving
- Skateboarding
- Cycling
- Playing (kicking a ball)
- Fitness (Running)
- Mobility scooter
- Walking dogs
- Transporting kayaks and yachts to water
- Walking to Water and Park

This theme was followed up with question 6 asking whether a reduced speed limit would change the way they used the street. The results are shown in Figure 10. 70% reported that it would not change how they used the street with only 15% saying it would and the other 15% not responding, however, many said that they would feel safer and it would be a more pleasant and comfortable environment.



Figure 10: Speed reduction changing usage of street

These results found that residents use the streets in many ways and show that they expect to share the streets with drivers. However when asked if this usage would change if the speed was reduced to 30km/h the majority said that it would not alter how they use the street. This highlights that although reducing the speed would not change their usage of the street it would make what they currently use it for more safe and enjoyable.

Question 4 & 5 asked at what age residents thought it was safe for children to either play on walk unaccompanied on the streets at 50km/h and at 30km/h. A total of 7 residents responded down Celia Street as to what age they thought it would be safe to walk unaccompanied and 5 responded to the question about playing on the street. Meanwhile on Beachville Road 9 responded to the walking unaccompanied question while 7 replied to the playing on the street question. These results have been summed up in Figure 11 which shows whether residents thought a reduced speed would make the street safer for children. Children were considered to be those below the age of 14. However, instead of putting an age that was considered safe many of the no responses thought that it was never safe for a child to play on the street at any speed, and that the park is close by where children can safely play.



Figure 11: Reduced speed safer for children

These results found that the majority thought that reducing the speed limit would make the street safer for children crossing the road, walking and biking in the area. However, there was a general consensus that children should not be playing on the road itself due to the danger posed by vehicles. This result contradicts the principle of the Woonerf concept and highlights that in the Netherlands streets design is orientated around people while in New Zealand streets are designed for vehicles.

For the survey there were some limitations. The low response rate meant that we did not get an accurate representation of what all the residents thought on the issue of the speed reduction. This limited how applicable our research is in gauging the number in the area who wants a speed reduction, or those who do not. It also meant that we did not receive enough interest to hold a focus group of beneficial size. This focus group was going to ask the residents what they thought of the different speed calming measures. This line of questioning does imply that the residents would have wanted a speed reduction but due to the majority saying they did not, coupled with the low response rate meant that identifying the best way to implement a speed reduction had to be a sourced from the international and domestic cases.

Conclusion

In conclusion our results found that vehicles travelling through the area outside of the diversion generally went below the 50km/h speed limit with the odd exception going substantially above. When the speed limit was 30km/h and vehicles were not physically stopped from speeding many chose to exceed the temporary speed limit. Going by past research traffic calming measures can be effective at inhibiting excessively fast drivers. The residents of Redcliffs had differing opinions with some in favour of a speed reduction to 30km/h and some against it. Although the slim majority were against the speed reduction, their opinions as to why it should or should not be reduced need to be evaluated and weighted to see which option would benefit the most, while inconveniencing the least amount of residents in the community. In implementing a possible speed reduction speed bumps, road surface material changes and road narrowing seem to be viable strategies for reducing speed especially those who go excessively fast. However it would have been beneficial to get the residents opinions on the different speed reducing measures.

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Residential speed limit survey

We are 3rd year geography students at the University of Canterbury conducting research, with the Redcliffs Residents Associate, on driving speeds on residential roads in Redcliffs. This survey aims to reveal how locals use the road, and how they feel about the speed limits in light of the recent temporary 30km/h limit down Celia Street and Beachville Road while the Main Rd was repaired. We would like to hear the opinion of local residents about this.



Completing the survey is voluntary and you have the right to withdraw at any stage without penalty. If you are willing to take part in the study, please complete the following survey. For those who complete the survey, we will assume that you are willing for your information to be used in a confidential manner as explained below. The information from the survey will be used to inform decisions made by the Redcliffs Residents Association. The project data will be securely stored in a locked room and on a password protected computer system at the University. This project has been reviewed and approved by the Department of Geography at the University of Canterbury and University of Canterbury Human Ethics Committee. If you have any questions about this survey please contact Prof Simon Kingham Tel 364 2893.

Upon completion of the survey it may be dropped into 11B Celia Street where it will be collected.

1. In the box below, can you indicate how many people live in your household in the specified age groups

Age group	Number of residents in your household
0-5 yrs	
6-13 yrs	
14-19 yrs	
20-24 yrs	
25-39 yrs	
40-64 yrs	
65+ yrs	

2. Would you favour a permanent reduction in the speed limit on Celia Street from 50km/h to 30km/h?

Yes

No

Please explain why:

·
3. How do you and others in your household use the street? (e.g. allowing your children to play on or near the street, playing sport on the street, scenic bike ride/walk, driving)
4. At what age do you think it is safe for a child to walk down Celia Street unaccompanied with the speed limit at 50km/h? Would it be different if the speed limit were 30km/h, and if so how?
5. At what age do you think it is safe for a child to play on or near Celia Street with the speed limit at 50km/h? Would it be different if the speed limit was 30km/h, and if so how?
 If the speed limit was permanently 30km/h would it change the way you use the street, and if so how? (e.g. changing driving patterns, cycling, allowing children to play on the street)
If you have any further comments put them here:



If you would be interested in taking part in a focus group on the issue of speed limits on residential roads and the implementation of speed reducing infrastructure, our email is below and we will contact you with further information. **Email: afm52@uclive.ac.nz**