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Rebuilding Kaiapoi – The next instalment

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Abstract

Following the 2010 and 2011 Canterbury earthquakes the town of Kaiapoi and the nearby beach settlements were left with extensively damaged infrastructure. The Waimakariri District Council embraced the opportunities that the rebuild offered; these included revitalising residential streets to achieve better urban design and transport outcomes. The subsequent consultation and resulting street designs were outlined at the 2011 IPENZ Transportation Conference. Later that year, with contractors ready to commence work, approximately 1000 properties in Kaiapoi and Pines Beach-Kairaki were zoned 'Red' by the Canterbury Earthquake Recovery Authority (CERA). CERA deemed it was not economic to rebuild on this land in the short to medium term.

The land rezoning meant that existing road access options and proposed street designs required reconsideration. A revised strategy was developed considering the needs of the residents adjacent to the Red Zone in terms of access and 'sense of community'. The strategy also needed to address major uncertainties such as the future use of the Red Zone land, and funding. The result was a number of new street designs and, in two of the rebuild areas, new road alignment options have been developed for consultation.

This paper continues the story of the Kaiapoi rebuild and the ever-changing challenges facing the team dedicated to helping this community become stronger and safer through smarter design.

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1. INTRODUCTION

This paper discusses a new challenge to engineers, other disciplines, councils, the Government and most importantly the community. The challenge is dealing with the mass decommissioning of land in an urban area following a natural disaster. Not only does this create the issue of what the land will be used for but also ensuring residents in remaining properties on the fringe of red zones are not left stranded in terms of community cohesion, i.e. belonging to a community.

At the 2011 IPENZ Transportation Conference, Ward *et al* (2011) discussed the longer term recovery that the Waimakariri District Council (WDC) was facing after the 2010 and 2011 earthquakes in Canterbury. The WDC had taken the opportunity to achieve better community outcomes through redesigning the residential streets to meet current best practice. The paper outlined a pragmatic approach to scheme design on the scale experienced in Kaiapoi and the associated consultation.

Later in 2011, with contractors ready to commence work on the infrastructure rebuild and the residential land about to be progressively remediated, approximately 1000 properties in Kaiapoi and Pines Beach-Kairaki were zoned 'Red' by the Canterbury Earthquake Recovery Authority (CERA). It is considered by CERA that red zoned land is not economically viable to rebuild on in the short to medium term. For the WDC the largest area of red zone was in Kaiapoi East.

Approximately 8,000 properties were also red zoned in Christchurch. The red zoned properties are progressively being cleared of their buildings and grass areas being created in their wake. Figure 1 shows a typical scene of cleared sections with some debris still present and this case a lone home gym sits abandoned. The future of the red zones is currently being discussed with the community through the 'Canvas' process in the Waimakariri District.

This paper outlines the next instalment in the rebuild of Kaiapoi. The team needed to rethink the road designs and even whether the roads were in the right place. As with the earlier work following the earthquakes, they needed to be sensitive to the emotions of the residents, who once again are facing a total upheaval.

Figure 1: Cleared sections on Courtenay Drive, Kaiapoi

2. LIFE BEFORE THE RED ZONES

Within weeks of the 4 September 2010 earthquake an Infrastructure Recovery Unit (IRU) was established to facilitate the medium to long term recovery. This unit is made up of four teams focusing on core activities and was generally comprised of consultants and new staff on 12 month contracts. The authors were key members of the 'Streetscape Team', one of the key deliverables being the Streetscape Plans for the recovery areas. The Streetscape Team included engineers, planners, landscape architects and urban designers.

Key recovery areas were defined for the rebuild project; these are shown in Figure 2. Full descriptions of each area are included in the 2011 paper.

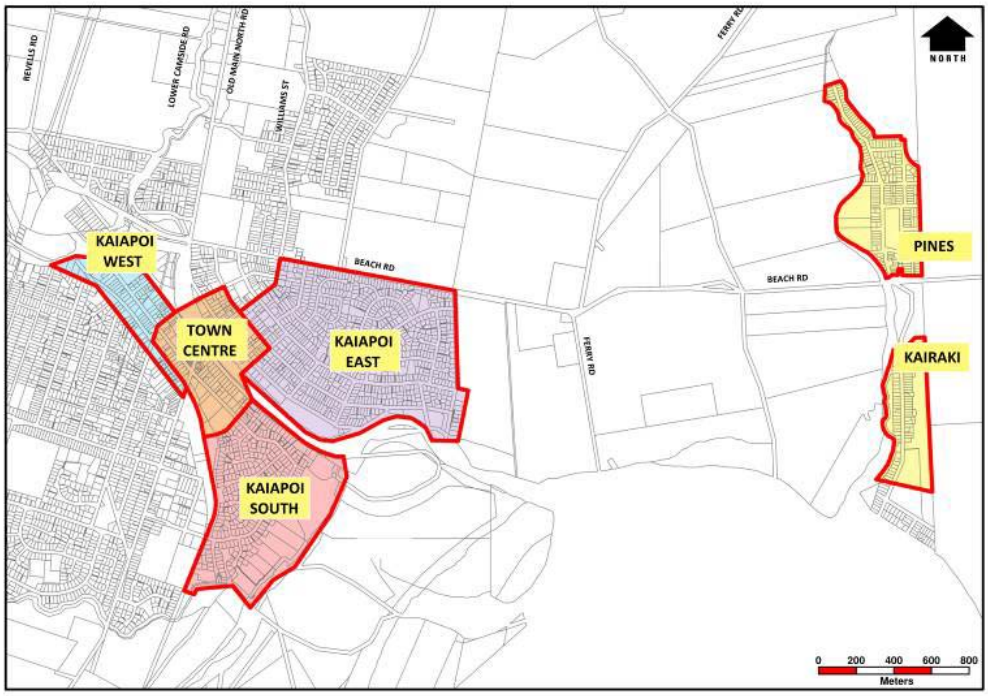


Figure 2: Earthquake recovery areas

The damaged streets needed to be repaired to achieve an acceptable level of service (as expected by the community and from an asset management perspective). Doing nothing was considered not to be an acceptable option. The opportunity to enhance the streets and to bring them up to current standards was considered early in the process in comparison to the do-minimum option of replacing like for like.

The key design outcomes of the 2010/2011 redesign process was the establishment of a new residential street hierarchy and design templates for each type of street within the hierarchy.

The street types used in the design process are described below; intersection designs would also reinforce the hierarchy:

- **Spine road:** A street, known as a 'collector road' in the District Plan, that provides predominantly a movement function for the wider local area but also an access function for residents in the street.
- **Local area street:** A street that provides both a movement function for people in the local area and an access function for residents in the street.
- **Neighbourhood street:** A street that provides both a movement function for people in the more defined neighbourhood and an access function for residents in the street.
- **Residents' street:** A street that purely provides access for residents (or visitors) in the street.

This hierarchical approach worked best for Kaiapoi East given the larger scale of the area and the classic C-type[1] hierarchy (Marshall, 2005). The Kaiapoi South and Kaiapoi West areas are of a smaller scale and less network focused. The Kaiapoi East network is shown below in Figure 3.

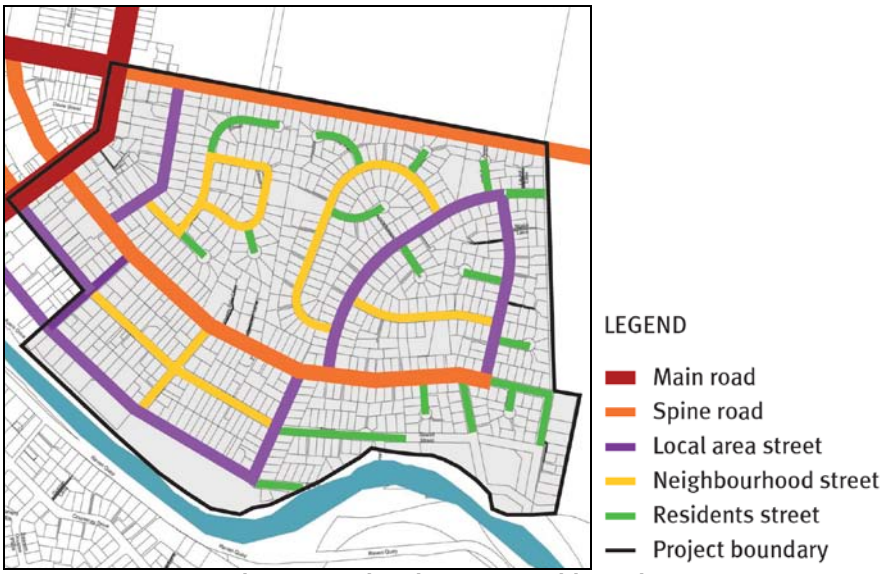
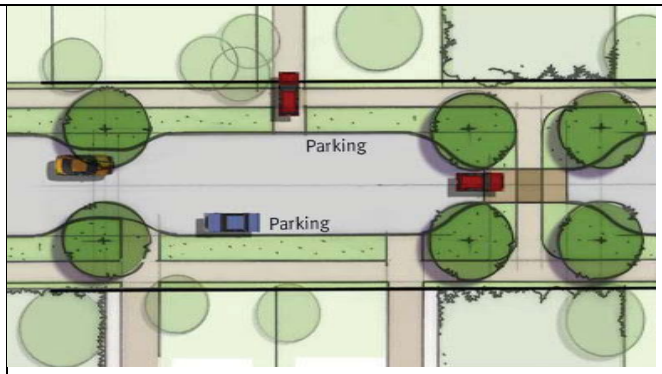


Figure 3: Kaiapoi East street hierarchy

An example of one of the design templates is included below.

- **Neighbourhood street:** These streets would be 9 m wide with some kerb buildouts to allow tree planting and reinforcement of the low speed environment. Parking on both sides of the road and two way flow is still possible with this width. Some narrow points (one way flow) will allow pedestrian crossing locations. There will be footpaths on both sides (see Figure 4).

Example of existing neighbourhood street



Design template for neighbourhood streets

Figure 4: Typical neighbourhood street design

Extensive consultation was undertaken, design plans were prepared and contractors were engaged to rebuild the streets. The works were to be co-ordinated with the remediation of the land where houses were to be rebuilt. The residents were clear as to the process and the timing of the rebuild. But then life changed again!

[1] "A mixture of regularity and irregularity, streets typically of consistent width; curved or rectilinear formations meeting at right angles"

3. LIFE AFTER THE RED ZONING

In August 2011 approximately 1000 properties in Kaiapoi and Pines Beach-Kairaki were zoned red by CERA. The Government had concluded that "*rebuilding could not occur in short to medium term because the land is damaged beyond practical and timely repair, most buildings are generally rebuilds, these areas are at high risk of further damage to land and buildings from low levels of shaking (e.g. aftershocks) flooding, spring tides and infrastructure needs to be rebuilt"* (Office of the Minister of CERA, 2011). Further to this in November 2011 the 27 properties in Kaiapoi West that had been zoned orange (decision pending) were rezoned green (land suitable for rebuilding). Figure 5 is the map released in August 2011, it clearly shows the scale of the red zoning within the wider urban area. Note that the orange areas were changed to green however the CERA website has not provided updated maps.

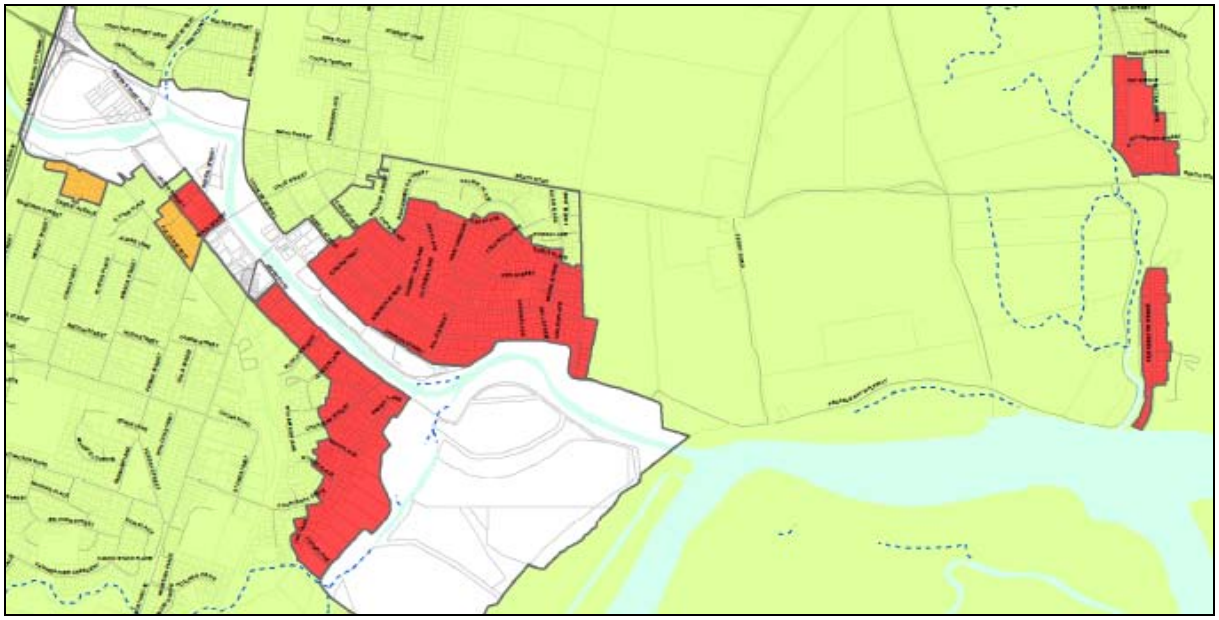


Figure 5: CERA's Red Zone Map 2011

The IRU team was disestablished following the red zoning and the work was integrated back into the Council's Project Delivery Unit (PDU) and supported by external consultants. An Earthquake Recovery Steering Group was set up to oversee the infrastructure rebuild programme, of which both authors were members.

The red zoning of the residential land meant that existing road access options and proposed street designs were mostly no longer be appropriate. It also had implications of the sewer, water, and stormwater designs. A new strategy was required for each of the infrastructure types.

The Transport Strategy needed to identify the most appropriate street rebuilding options for Kaiapoi and Pines Beach-Kairaki, assuming the land in the red zone is vacated with no houses requiring services. It was also assumed that road reserves could be disestablished if they were not required for access or underground services. Also, new road reserves could be investigated if they provided more efficient and cost effective access for green zone communities and the provision of underground services. The complicating factor was that, while the strategy was being developed, CERA informed WDC that they were not in a position to discuss these assumptions as they did not at that stage own the land. Offers had made to the red zone land owners and these offers had not expired.

The strategy needed to consider the needs of the green zone residents whilst also considering the requirements of the other infrastructure types and the available funding. These considerations are discussed below.

Funding of the revised strategy

Prior to the red zoning NZTA had approved funding requests, under the Emergency Reinstatement funding category, for the reinstatement of damaged streets in the recovery areas. The scenario of this approved funding being transferred to the new road, if the road that was to be repaired was decommissioned, was put to NZTA. Initial discussions were held with NZTA and they were not in a position to provide any in-principle agreement on funding of alternative road options until there was more certainty over land ownership and future use of the land. Rebuilding or repairing any roads in the green zones or roads in the red zone required for access to the green zone would still be subsidised by NZTA. This situation added another complexity; however, WDC concluded that they would not preclude investigating alternative access options if it was considered the best overall outcome.

Community impacts

Removing a substantial part of a neighbourhood is likely to have a profound effect on the residents who remain, particularly on those who have lived there for any length of time. Their whole 'sense of place' would be disrupted. The challenge was to ensure that the remaining residents do not consider themselves to be forgotten and left behind in a desecrated or severed environment, i.e. separated by a large distance from other areas of the town. Community severance has several definitions (Quigely & Thornley, 2011). The relevant definition in this instance is the 'changes in comfort' and 'attractiveness of areas'. Identifying any remaining enclaves as 'a place' will be important.

The loss of roads and consequently the network of vehicle, cycling and pedestrian routes could decrease the connectivity of a transport network. This results in longer travel distances and can be a disincentive to walking and cycling. The revised streetscape plans for each area needed to consider this.

Changes to the road network could result in a street changing its status, for example from a quiet residential street to having more of a general access function. This could be an implication of trying to achieve greater connectivity and needs to be considered carefully. Figure 6 shows a desolate street scene where green zones residents are required to travel along.

Figure 6: A desolate street scene in the red zone

Other considerations

The integration of recovery areas with development land surrounding Kaiapoi was also considered in the strategy. There was land at subdivision stage, land at plan approval stage and land for potential residential use in the equation.

Decisions on which roads are to be disestablished will also be influenced by the access required for existing and proposed parks and reserves. The Kaiapoi River Edge Development plans were considered in the strategy; however, any potential proposals for the use of red zoned land as parks or reserves had not been developed and therefore could not be considered. This required retaining some flexibility in the long term strategy so that integration with red zoned land uses could be considered as they emerge.

The sewer and water strategies were integrated with the development of the transport strategy as they influenced the road access decisions. For example if a pipe beneath the road did not require replacement it may be difficult to justify moving the road alignment from an economic perspective. The stormwater strategy was less dependent on the road locations as there was minimal stormwater pipework in place and could be tailored to integrate with the transport strategy.

Power and telecommunications infrastructure will generally be decommissioned in the red zones and is therefore it is was not a critical consideration in the development of the strategy. However there were likely to be situations where power or telecommunication networks would still be required beneath roads in the red zones to supply adjacent green zoned properties. Relocating these networks to accommodate new roads may be cost prohibitive. Access through red zones for elements such as sub-stations would also need to be considered. In the case of new road alignments the street lighting costs would need to be factored into the considerations, as the existing street light network was by and large undamaged.

4. FIRST REVISION OF THE TRANSPORT STRATEGY

A Transport Recovery Strategy was prepared in 2012 to identify any remaining recovery work and also rebuild work that was not impacted by uncertainty over the red zone future. This enabled revised Streetscape Plans to be released for Kaiapoi West, Pines/Kairaki and Meadow Street in Kaiapoi East. For the rest of Kaiapoi East and Kaiapoi South it was considered that too much uncertainty existed and these areas were deferred until the Red Zone land offers had settled or expired. They would be the subject of a second strategy (see Section 5).

Kaiapoi West

All of the roads in Kaiapoi West are to remain, as access is required for remaining residents, for the Kaiapoi Borough School and recreational areas that are accessed from Raven Quay. Generally the designs remained as outlined in the 2011 Streetscape Plans; however, several changes were proposed. These changes assumed that transport infrastructure (e.g. cycle facilities) could not encroach on the red zone due to the risk of long term development on that land that could potentially disestablish the transport infrastructure.

The changes made to the streetscape plan are detailed below.

- The proposed cycleway on the south side of Hilton Street was moved to the north side of the road because there will be no driveways; this reduces potential conflict between cyclists and motor vehicles. If this land is ever developed it is important that the safety of the cycleway is preserved. This can be achieved by requiring vehicle access be via a rear service lane or that adjacent boundary fences are lower at the driveway to provide a visibility splay between cyclists and drivers. The cycleway would be a shared use path (as opposed to a separated facility as originally proposed

for the south side) as there will be no houses and therefore less conflict with pedestrians.

- The initial design of the Black Street/Peraki Street/Hilton Street intersection needed to be reconsidered so that it continues to cater for heavy traffic accessing the town centre. The initial streetscape plan was developed on the assumption that the redesign of the Hilton Street/Williams Street roundabout (as part of the Town Centre Project) would cater for heavy traffic and therefore remove trucks from the adjacent residential streets (Fuller Street, Peraki Street and Hilton Street). Subsequently this roundabout design was not progressed.

Pines Beach and Kairaki

The majority of the roads in Pines Beach are to remain as they provide access for residents in the green zone, the exception being Hood Ave and Clarke Ave where vehicle access is no longer required. These streets will become pedestrian and cycling links. Allowing for emergency access via Hood Ave was not considered necessary given that access is still available via Dunns Ave and Chichester Street.

The changes made to the streetscape plan are detailed below:

- The angle parking on Dunns Ave outside the Pines Oval is considered to be no longer required by the WDC Parks Team; on this basis it will not be included in the streetscape plan.
- Featherstone Ave no longer needs to be realigned given there will be no properties affected by the stormwater issue that prompted the realignment. However this is subject to the use of directly adjacent red zoned land for stormwater management and therefore requires confirmation from CERA in the near future.

5. SECOND REVISION OF THE TRANSPORT STRATEGY

During 2013 and 2014, as the land offers were expiring, the transport strategy for Kaiapoi South and Kaiapoi East were developed. This strategy outlined a series of road rebuilding options for Kaiapoi South and Kaiapoi East including, rebuilding the roads on their existing alignments and building roads on alternative alignments that use red zone land. As the use of red zone land for this purpose had not been confirmed the strategy outlined the various issues and costs associated with each option but does not make recommendations on which option should be progressed at this stage.

The strategy was adopted by Council in August 2014 and will provide a basis for the community consultation once two key aspects are resolved:

- What is the future of the red zone land?
- How would any costs above and beyond that already allowed for (i.e. to rebuild on the current alignments) be funded?

The strategy approach and access options are discussed below for each area.

Kaiapoi South

The 2012 Transport Recovery Strategy concluded that the majority of the roads in the area should remain for access to green zone areas; however, Reay Place and The Oaks could be disestablished for traffic access. The option of relocating Courtenay Drive between Reay Place and Charters Place was considered so residents in the green zone are not travelling through the red zone and that travel distances for these residents could be reduced. During the 2012 Streetscape Plan consultation a street meeting was held and the green zone residents generally supported investigating the realignment of Courtenay Drive. With regard to any realignment they were conscious of the impact on properties that would become corner properties. The urban design aspects of any new street alignment would therefore

need careful consideration. Some residents from a cul de sac in the Kaiapoi South pointed out that if a new road linked to their street the east end of the street would no longer be a quiet cul de sac and this may not be supported by all the residents.

At the request of the Community Board consideration was given to Courtenay Drive providing heavy vehicle access to the commercial areas on Hilton Street given that most of the street frontage properties have been zoned red. This would reduce the volume of heavy traffic in the town centre and in particular at the Williams Street/Hilton Street roundabout which is difficult for heavy vehicles to negotiate. However, there are 19 properties that will continue to have frontage to Courtenay Drive, and the area is likely to continue to be used for recreational walkers and cyclists, so this concept was not developed further. If the entire residential area in Kaiapoi South had been red zoned this concept would have been more likely to be viable. During the 2012 street meeting the green zone residents did not support the use of Courtenay Drive as a heavy vehicle route.

Figure 7 shows the options developed, these are then discussed in more detail. Locations *a* to *b* were used when predicting the change in traffic volumes, both in the magnitude and the percentage change to current volumes. The current volumes were determined from post-quake traffic counts and application of industry accepted household trips rates (8.2 trips per day[2]). The predicted rates were based on applying the household trip rates to the number of households between the analysis locations. This exercise was only undertaken to consider the impact of Option 3, closing the road to create two cul de sacs.

Figure 7: Kaiapoi South Options - Overview plan

[2] NZTA Trips and Parking Research Report, rate for outer suburban residential

Option 1 involves rebuilding Courtenay Drive between Reay Place and Charters Place on the current alignment. As the road though this section would not be fronting any properties there will be no on-street parking demand. This means that the rebuilt road could be narrower than it is currently, say 7m wide, with swales instead of kerb and channel. A shared use path could be constructed on one side of the road to cater for pedestrians and cyclists. Retaining the road in its current location means that very few properties would be close to the road and this isolation could encourage antisocial behaviour. To help define the interface between the rebuilt road and existing street within the green zone 'gateways' could be created. Gateways are treatments that allow road users to appreciate a change in road environment (e.g. from rural to urban). Gateways are considered best practice from both a road safety and urban design perspective.

Option 2 involves relocating Courtenay Drive between Wyber Place and Charters Place has the benefit of residents in the green zone not having to travel through the red zone to the same extent as Option 1 and travel distances being reduced (by 160 m). This closer proximity to the houses means that the road is better integrated with the local community. It also means that the road is 'overlooked' in several locations along the route where it is close to houses and therefore the likelihood of undesirable road behavior is reduced.

The area shown between the new road alignment and the green zone would ensure a buffer exists between the houses, which become corner properties, and the road. These areas could be grassed with some trees. The details of the design would need to be established in conjunction with the green zone residents.

The main issue with this option is the existing underground services. The sewer pipes in Courtenay Drive require renewal, the new pipes and associated pump stations could be located within the new road alignment with low cost implications. The water and stormwater infrastructure does not require renewal so would incur a cost to the road realignment project if moved to the new location. If all services were retained in their current locations easements would be required through that land and limits flexibility for use of that land in the future.

Option 3 involves terminating Courtenay Drive at Wyber Place, so Wyber Place becomes the end of the road in the southern direction, and terminating Courtenay Drive at Charters Street, so Charters Street becomes the end of the road in the northern direction. This option reduces the length of road required to be rebuilt which offers a cost benefit however significantly reduces transport access options for Kaiapoi South residents. It is unlikely that this option would be supported by the community. The access to a local Park would still be required via a single lane access road. An easement between the roads would be required for the existing services.

Kaiapoi East

A significant proportion of Kaiapoi East was zoned red as shown below in Figure 9. The boundary between the green zone and red zone runs along roads in some places and along the backs or sides of property boundaries in others. The Gray Crescent Reserve has been identified as being just within the red zone however it is likely to remain.

Approximately one quarter of the residential area of Kaiapoi East will remain. This portion is the northern part of the neighbourhood, located immediately south of Beach Road. Approximately half of these properties can only be accessed by travelling through the Red Zone.

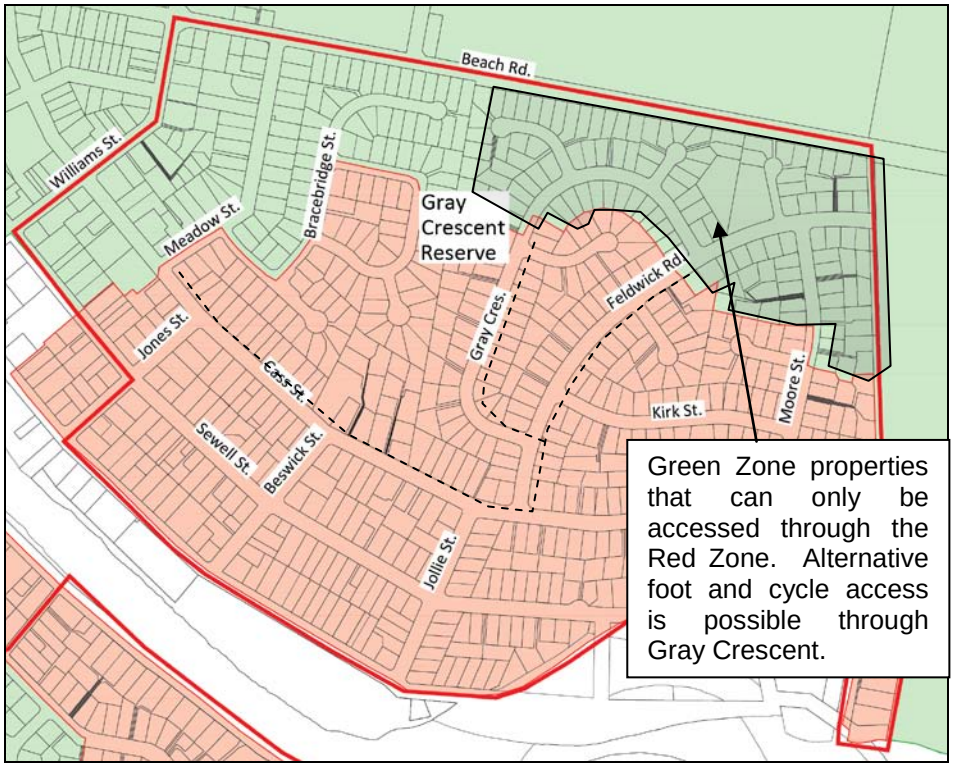


Figure 8: Kaiapoi East Land Zone Map

A major impact of the Red Zoning in Kaiapoi East will be the loss of roads and consequently the network of vehicle, cycling and pedestrian routes. Cass Street is currently the spine road through the area. As shown in Figure 8 above the area north of Cass Street is essentially divided into two remaining residential areas by the road network, the western area accessed off Meadow Street and the eastern area currently accessed off the Feldwick Drive/Gray Crescent. Pedestrian/cyclist links are possible between the two areas via Gray Crescent Reserve.

The main consideration for Kaiapoi East was the provision of access to the remaining green zone residents in the north eastern area currently accessed off the Feldwick Drive/Grey Crescent. As the majority of underground utilities are not required within the Red Zone roads there is an opportunity to improve access arrangements.

A road connection between Feldwick Drive and Moore Street to the south of the remaining houses, forming a loop, was investigated for all options. This road would run through a cleared area and would need to be landscaped on both sides. It was concluded that connecting Feldwick Drive and Moore Street would appear to be of minimal benefit for the residents as it does not reduce the travel distance greatly and traffic volumes are very low at this end of the area. It was therefore not developed further in this strategy.

Figure 9 shows the options developed in the 2014 strategy. Note that the Jones Street realignment as shown on this figure is not directly related to the red zone access, it was investigated at the request of elected members.

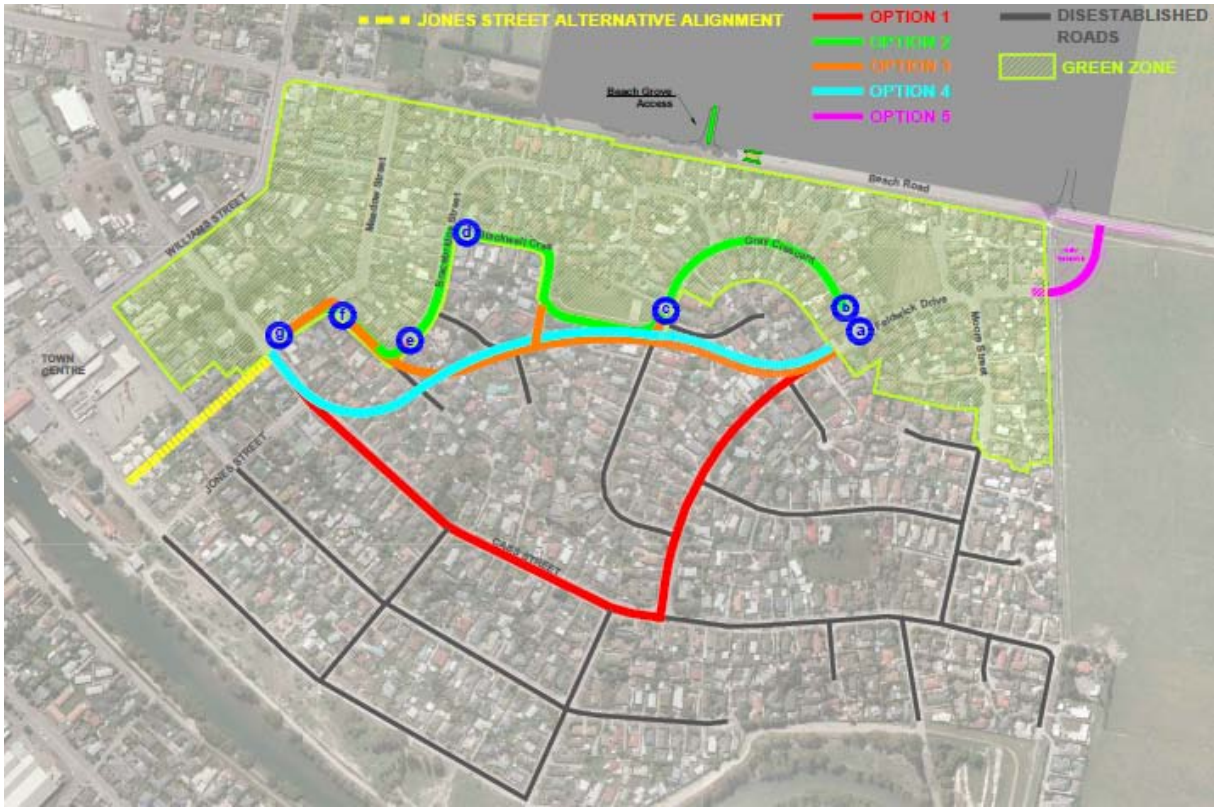


Figure 9: Kaiapoi East options – Overview plan

Locations *a* to *g* were used when predicting the change in traffic volumes, both in the magnitude and the percentage change to current volumes. The current volumes were determined from post-quake traffic counts and application of industry accepted household trips rates (8.2 trips per day[3]). The predicted rates were based on applying the household trip rates to the number of households between the analysis locations. This exercise was undertaken to assess the impacts of Option 2 and 3 given the diversion of traffic onto existing streets.

Option 1 retains Cass Street (between Jones Street and Feldwick Drive) and Feldwick Drive (between Cass Street and Gray Crescent – north end). Utilising the existing road network means that residents are required to travel through an area that may be sitting empty and disused for many years to come. This is a not considered a desirable outcome, and as discussed in the Kaiapoi South options, retaining the roads in their current location means that very few properties are close to the road and this limits surveillance of activities occurring on the road, potentially resulting in antisocial behaviour.

Option 2 creates a new link road between Blackwell Crescent and Gray Crescent, adjacent to the Gray Crescent Reserve and therefore connects the west and east areas. If this new road is located along the southern edge of the reserve this will be less disruptive for the residents living along the northern boundary of the reserve and preserve their outlook onto a park. Although this option has a low cost it results in a road alignment that is somewhat contorted and creates higher traffic volumes on Oram Place, Bracebridge Street, Blackwell Crescent affecting the quiet nature of the current residential environment. Despite this increase, which would most likely be noticeable to residents initially, it is noted that the

[3] NZTA Trips and Parking Research Report, rate for outer suburban residential.

magnitude of traffic is still low and considered within the generally acceptable bounds for a local road (less than 2000 vehicles per day). This option was estimated to cost significantly less than Option1.

Option 3 creates a new 560 m long road between Oram Place and Feldwick Drive. The road would provide a spine road function and enable most streets to retain their current low traffic ambience. However part of Meadow Street and the remaining length of Oram Place would experience higher traffic volumes. Links to Blackwell Crescent and Gray Crescent from the spine road would improve connectivity. This option would allow consistency with the hierarchical design approach taken prior to the red zoning. The road design would need to ensure that speed does not become an issue given the curvilinear nature of the alignment (i.e. with the use of vertical deflections). This road would encompass a sizeable tract of cleared land which would need to be made reserve or other uses compatible with the residential neighbourhood. This option was estimated to cost less than Option 1.

Option 4 creates a new 680 m long road between Cass Street and Feldwick Drive. The road would provide a spine road function and enable all residential streets to retain their current low traffic ambience. Links to Blackwell Crescent and Gray Crescent from the spine road would improve connectivity. A gateway could be created at the Jones Street intersection to recognise the revised neighbourhood entry. The road design would need to ensure that speed does not become an issue given the curvilinear nature of the alignment (e.g. with the use of traffic calming). The appropriate speed limit would require consideration. This road would encompass a sizeable tract of cleared land which would need to be made reserve or other uses compatible with the residential neighbourhood. This option was estimated to cost less than Option 1.

Option 5 creates a new access road off Beach Road onto Feldwick Drive to access the eastern area. This requires the purchase of privately owned land and therefore has an element of uncertainty. The height difference between Beach Road and Feldwick Drive means that an embankment would be required to form the road. The western residential area retains access from Meadow Street; however the two areas remain linked for walking and cycling by the Gray Crescent Reserve. This option ensures that all streets would retain their low traffic volumes. This option was estimated to cost less than Option1.

If this option was combined with Option 2 the two residential areas could be linked and given the contorted nature of the streets between Beach Road and Meadow Street, it would generally not be used as a rat run by others.

6. CURRENT STATUS OF STRATEGY

The revised Transport Strategy was adopted by Council in August 2014 and will provide a basis for the community consultation on access options. The consultation is likely to commence in 2015 now that the CERA led consultation regarding the Red Zone future has been complete. However any decisions on the future use of the land are yet to be made.

The CERA consultation process was named ‘Canvas: Your thinking for the red zones’ and was launched in July 2014. The engagement process was organised CERA, with support from Waimakariri District Council and other strategic partners – Te Rūnanga o Ngāi Tahu, Environment Canterbury, Christchurch City Council and Selwyn District Council. The aim of the campaign was to give people the opportunity to talk about their vision for the approximately one square kilometre of land (total) that has been zoned red in the Waimakariri District (in Kaiapoi and Pines/Kairaki Beaches). The engagement ran for six weeks and during that time, nearly 600 people contributed their vision, from which more than 2750 ideas and values were identified for the future use of the Waimakariri red zones. A summary of the findings is publically available (CERA, 2014).

7. CONCLUSIONS

Very rarely does an opportunity occur to rebuild streets to current standards and best practise on such a large scale. The 2010/11 design and consultation process in Kaiapoi had resulted in good outcomes in terms of community buy-in and funding approvals. The subsequent red zoning of residential land created another challenge to the Earthquake Recovery Steering Group. This included dealing with issues that were a first for New Zealand. There is still uncertainty over what will eventuate in Kaiapoi South and Kaiapoi East as the potential uses for the red zones are still being considered; however, there are robust options that can feed into the process when the time comes.

The conclusions drawn from this next instalment of the Kaiapoi rebuild are.

- Red zoning was not an identified risk to the project at the outset so was not consciously planned for, however the design process lent itself well to amending designs and developing new road alignment options.
- Alternative access options for Kaiapoi South that maybe supported by the community are estimated to cost more than rebuild of Courtenay Drive on its current alignment (Option 1).
- All alternative access options for Kaiapoi East are estimated to cost less or no more than the cost of rebuilding the existing access route (Option 1).
- Retaining an on-going and open dialogue with NZTA will assist in progressing the scenario of transferring funds from a repair to a new road.
- The community appear to have remained positive despite the red zoning. The authors look forward to discussing the access options with them because as engineers we can only predict what the community want but they may ultimately tell us otherwise!

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