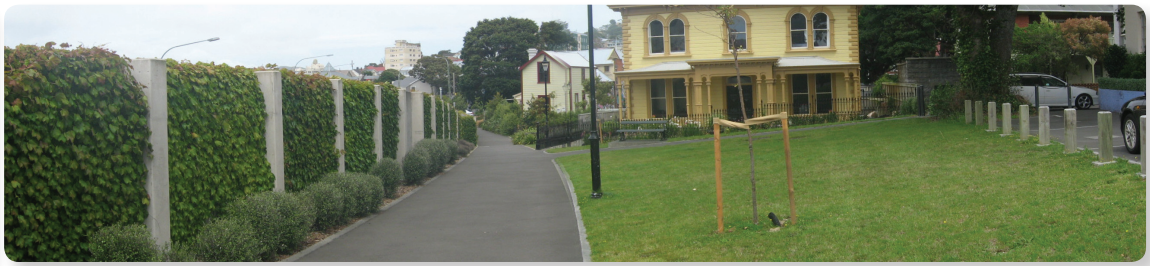
NZ TRANSPORT AGENCY
WAKA KOTAHI

Noise Barrier

CASE STUDY 2 :
Urban design



The visual effects for both road users and walkway/cycleway users was considered when designing the final form of the trenched Tonks precinct noise barriers

Wellington Inner City Bypass

The Wellington Inner City Bypass project (2007) entailed a new and improved section of SH1 re-routed across central Wellington to ease congestion and to create a more direct route for east-west traffic across the city. The bypass was designed as a two-lane one-way system utilising existing streets, along with a 700 metre section of new road. The new road included an open trenched section below the surrounding ground levels to meet with the existing Terrace Tunnel road level. The trenched section passed through an area of detached character villas, multistorey apartments, and a multistorey education facility.

The new sections of road at street level bisected an existing heritage precinct of the city (upper Cuba Street and Tonks Lane), which included shops with apartments above. Several of the oldest wooden dwellings in Upper Cuba Street were listed as heritage buildings and were relocated nearby along the trenched section of the route as part of the project. Many of the properties along the route had been under a Transit designation for close to 30 years prior to construction.

District Plan and designation conditions for the new Inner City Bypass required compliance with noise levels specified within the Transit Guidelines (now superseded by NZS 6806). Ambient noise measurements were undertaken, and noise levels predicted using acoustics modelling software. Elevated noise levels were predicted beside the new section of road as it passed through the inner portion of several city blocks. The buildings around the edges of these blocks screened the inner portion from existing city noise, so the new road was therefore introducing traffic noise into relatively quiet areas.

The noise mitigation design was primarily based on roadside noise barriers. However in some locations barriers were not viable, so building-modification mitigation was considered, such as improving the seal of windows and doors, and through new glazing and ventilation. A twin layer open graded porous asphalt road surface was also used as part of the overall noise mitigation design.

This noise barrier case study discusses the importance of urban design, in particular the consideration of the character of the existing environment when designing noise barriers.

To facilitate the urban design process, noise modelling identified the parameters of the noise barriers with respect to height, length and placement, and the minimum material requirements. The urban designers then used these parameters to develop the final design.

Urban design

Noise barriers were required on the project where the new section of road passed through the (relocated) heritage precinct and where existing dwellings were affected by the change in traffic noise levels. The noise barriers consisted of a combination of solid concrete walls and corrugated steel fences with timber trim.

An important consideration when designing the appearance of the noise barriers was fitting with the surrounding urban and architectural context. This was particularly important in the heritage precinct where a noise barrier was required close to existing timber cottages. In this instance the noise barrier was designed to match existing elements and materials found within the area. A corrugated steel fence with timber trim was used, painted in traditional heritage style colours. At another location although cost and safety issues restricted the use of real bricks (considered too expensive and also unsafe if hit by a heavy vehicle), a solid concrete plastered noise barrier with capping and piers was designed to emulate the form of an old brick wall.

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Noise barriers have been designed specifically for each precinct to tie into their surroundings. In this case a solid concrete plastered noise barrier with capping and piers has been designed to emulate the form of an old brick wall

Noise barriers have been designed to blend into their surrounding urban context. At this location a corrugated steel noise barrier has been constructed using timber trim and painted in traditional heritage style colours

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Where the new road was located within a trench, noise barriers between 2 and 3 metres in height were required along both sides and were designed as an extension of the trench walls. The noise barriers also doubled as safety barriers to the road below, so needed to be high enough to deter climbing. The barriers were formed from fluted, pre-cast, reinforced concrete panels. The fluted, or ribbed, side of the panels faces the new bypass, giving an interesting, but not overpowering, visual effect to road users.

The outer faces have been used to form the backdrop for new public and private spaces along the route, including a new walk/cycleway installed as part of the project's urban design. The visual effects of the concrete noise barrier as seen from the nearby dwellings were mitigated with climbing plants and hedges at the base of the barriers. Recesses were included in the design of the barriers where pillars were required. Trees were also planted to assist in reducing the apparent scale of the barriers in the longer term. Planting of climbers on long stretches of concrete barrier had the effect of both visual enhancement and graffiti deterrence. Ongoing maintenance considerations included plant pruning and vegetation removal alongside noise barriers to maintain access. If required painting of the corrugated steel fences and plastered concrete walls will be undertaken for graffiti removal and also for longer-term maintenance.

From a design perspective, the main objective was to blend the noise barriers into their surrounding urban context so they appeared less as 'barriers', and more as an element of the urban fabric that would be seen elsewhere in the city. To this end the walls were designed specifically for each section or precinct to tie into their surroundings to good effect, with fences and planting designed to be similar to other elements found in the vicinity. When viewed from the residential areas, the barriers blend in successfully without appearing out of scale or proportion to their surrounding urban context. Additionally, the design of noise barriers and materials used were also selected with consideration of their relative ease of construction and availability – concrete blocks, standard cappings etc.

Lessons learnt

The final result of the project noise barriers has been successful in fulfilling the urban design objectives for the project.

Lessons learnt from the project include:

- **Consideration of the specific habitat requirements of plant species** - Planting of climbing rata at the base of the Cuba St plastered block wall was not successful due to the small size of the planter possible in the footpath and lack of available surface water. Irrigation was not an option in this location.
- **Local authority collaboration** - Extensive consultation with the Wellington City Council Urban Designer and project Landscape Architect was undertaken. Collaboration with the local authority throughout the design process was constructive, with good design outcomes achieved and an efficient approval process.
- **Handover of public areas** - Handover of public areas to the local authority for maintenance could be improved for future projects. Earlier liaison in the contract period is important to make councils aware of what they are taking on as well as giving them the opportunity to have input if possible.
- **Availability of illustrative material** – The availability of good illustrative material throughout the planning process was important to give the affected parties a good understanding of the appearance of structures in both the short and longer term.

Illustrative material is important to give affected parties an understanding of the context of structures

Contact details

Rob Hannaby
NZTA, Principal Environmental Specialist
Telephone: 09 928 8761 - rob.hannaby@nzta.govt.nz