Section D Noise barriers

Design objectives

- Ensure that the design of noise barriers meets all applicable acoustic engineering requirements
- In general, make noise barriers as visually unobtrusive as possible to minimise the effect of cutting off the highway from its surroundings
- Prioritise the use of earth bunds for noise mitigation over noise walls, to reinforce the rural landscape context and minimise a sense of enclosure to the highway
- Relate walls to their context – where appropriate, use noise walls that are appropriate to the nature of uses or activities beyond the wall
- Design noise walls to be aesthetically pleasing for both road users and neighbours
- Design walls to be robust, durable and low maintenance so that they maintain an acceptable standard of appearance over time
- Integrate noise walls into the overall urban and landscape design, including with the design of retaining walls.
- Where there is a tension between retaining significant views and protecting residential amenity, use transparent noise walls (see below from the Westlink M7).

Design principles

Noise barriers can have a significant visual impact on the travel experience as well as on the immediate environment where there are other land uses in close proximity. The NZTA has recently published design guidance on noise walls, available on the website. In addition, give consideration to the following principles:

- Develop a design for walls which is consistent throughout but which avoids excessive repetition of a single wall design
- Where walls are visible from outside the corridor, give equal weight to the design of both sides: each side will have a different impact and therefore design requirement
- Except where road earthworks, corridor topography and/or boundary conditions require special positioning, make horizontal alignment of noise walls parallel to the outside edge of the adjoining carriageway
- Line up panel joints and consistently space posts
- Significant changes in horizontal alignment should be accommodated by separating and overlapping walls. Long curves or separated sections of straight wall are preferable to angled and sharp changes in direction (see below from the Westlink M7)

- Avoid stepping in the wall. Where the tops of walls and fences run parallel to the road surface they are generally much more visually acceptable than if stepped. If steps are required, ensure they are small and regular
- Although textures can defer graffiti and add interest, they should be used sparingly. Repetitive abstract patterns are preferable
- Varying the alignment of the wall at a micro scale to skirt around road structures and road furniture should be avoided
- Avoid abrupt terminations by tapering noise walls down at their ends. Consider tapering the ends of the wall into adjacent landforms
- In general, walls should be painted to reduce maintenance and enable graffiti to be painted over. Darker colours will recess the noise wall more than lighter colours and can complement the roading environment. Timber noise walls should be painted a dark grey-brown to provide a simple backdrop for planting .
- Avoid painted pictures and patterns which are difficult to maintain and draw attention to the wall
- Avoid small sections of differing material.
- Planting should be used where possible to soften the visual impact of barriers

Barrier types

Earth bunds are the predominant type of noise barrier in the project. Refer to Section F: Landform for design principles for embankments.

Noise walls are either 'one-sided' or 'double-sided' depending on their context. Noise barriers between the highway and service roads, or between the highway and houses in residential areas that are immediately adjacent to the corridor, are 'double-sided'.

The structural solutions for noise walls suitable for the project are structural pre-cast concrete panels or timber fences. Timber fences are preferred because they are appropriate both to the existing rural landscape with its (typically) post and wire fences, and to the domestic scale and appearance of garden walls and fences within the Papamoa residential area. Appropriate treatment of timber will give 35-50 years' lifespan for the noise walls.

Retaining wall and noise barrier locations

The following table and plans indicate the location and extent of all the retaining walls, bunds and noise barriers in the project.

Type 1 in the table are double sided; Type 2 are single-sided. Both types are finished to both sides but Type 1 has additional detailing on both faces, where Type 2 has detailing on the highway side only.

Type 1 walls are used in situations where they are viewed from both sides by a large number of viewers (for example by highway traffic and from busy residential areas). Type 2 walls are used where there are few opportunities for viewing from one side (for example where there is only one dwelling at a distance from the noise wall).

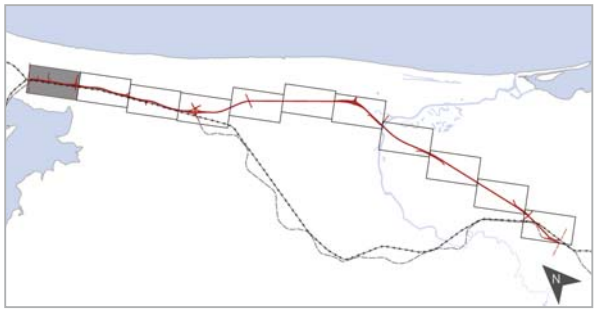
Retaining walls and barriers are shown on the same plan to explain the relationships between all wall and edge structures.

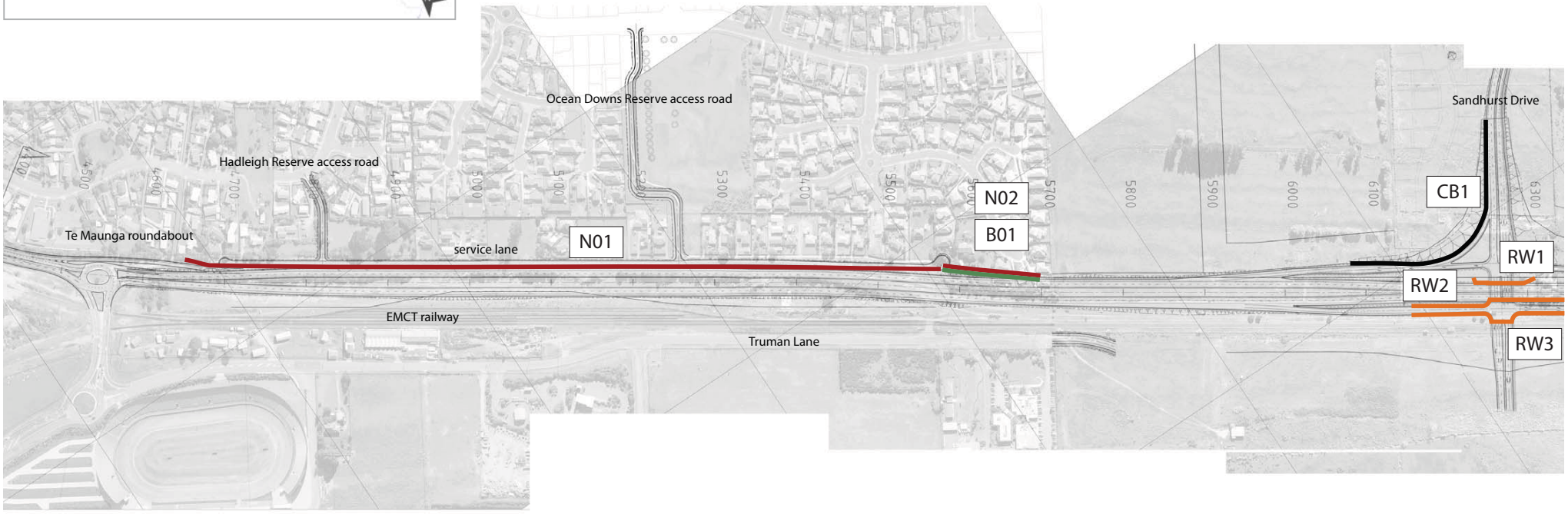
Typical details are also provided of the TEL's noise barriers.

Details of retaining walls associated with bridges are shown in Section C Bridges.

WALL NO.	START STATION	END STATION	LENGTH (m)	HEIGHT (m)	LAND USE CONTEXT	LOCATION	TYPE
N01	4650	5550	900	2	Residential area - rear of houses, separated by service road	east side	1
N02	5550	5700	150	3.2	Residential - very close to adjacent houses ('pinch point') and high: significant impact	east side	1
N03	13100	13400	300	2	1 rural house, wall associated with noise bund (B01) and planting	east side	2
N04	18400	18600	200	2 to 3	at Kaituna River, between the stock bank and noise bund	east side	2
N05	20600	21200	600	2 to 3	rural setting - distant buildings	east side	2
N06	20900	21300	400	2 to 3	rural setting - building at 40 metres distant	west side	2
N07	23800	24500	700	2 to 3	between two roads, wider context rural residential	east side	1
N08	23900	24500	600	2 to 3	rural residential, located on the top of the bund	west side	2
CN1	6050	6250	450		both a crash barrier and noise barrier		
B01	5550	5700	150	3.2	Residential - very close to adjacent houses ('pinch point') and high: significant impact	east side	1
B02	13100	13400	300	1 to 2	1 rural house, associated with noise wall 4	east	
B03	13800	14500	700	2 to 3	rural residential (planted on back of bund)	east side	
B04	15250	15800	550	2 to 3	rural residential approximately 100 metres away	west side	
B05	16000	16900	900	2 to 3	farm complex (packing shed / house / outbuildings)	west side	
B06	17000	17400	400	2 to 3	house close to road, partly buffered by shelter planting	east side	
B07	18600	20200	1600	2 to 3	Kaituna Wildlife Management Reserve (planting both sides)	east side	
RW 1	6200	6300	100	1.5 to 9	Sandhurst Drive Interchange	east side	
RW2	6100	6450	350	1.5 to 9	Sandhurst Drive Interchange	west side	
RW3	6100	6450	350	6	Sandhurst Drive Interchange	west side	
RW4	9000	9200	200	6	rural setting south of Kairua Road	west side	
RW5	10850	10900	150	0 to 6	Domain Road Interchange	east side	
RW6	10850	10900	150	0 to 6	Domain Road Interchange	west side	
RW7	18150	18200	50	0 to 4.5	Kaituna West underpass	north side	
RW8	18150	18200	50	0 to 4.5	Kaituna West underpass	south side	
RW9	24500	24700	200	8	rural setting	east side	
RW10	24700	24700	40	0 to 5	Maketu Road overbridge	north side	
RW11	24750	24750	40	0 to 5	Maketu Road overbridge	south side	
RW12	2500	2550	45	6.5	ECMT Maketu rail overbridge	north side	
RW13	2500	2550	45	6.5	ECMT Maketu rail overbridge	south side	
FP1	7750	9000	1250	6	rural setting - transitions from earth bund to noise wall	west side	

Section D Noise barriers





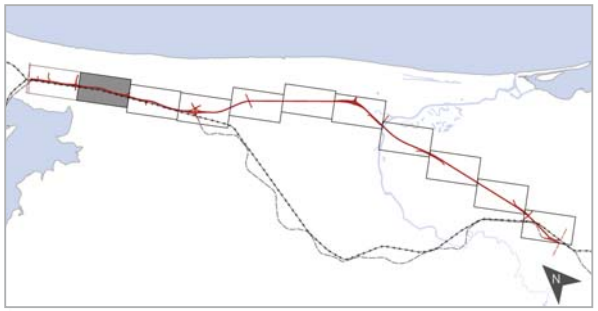
KEY

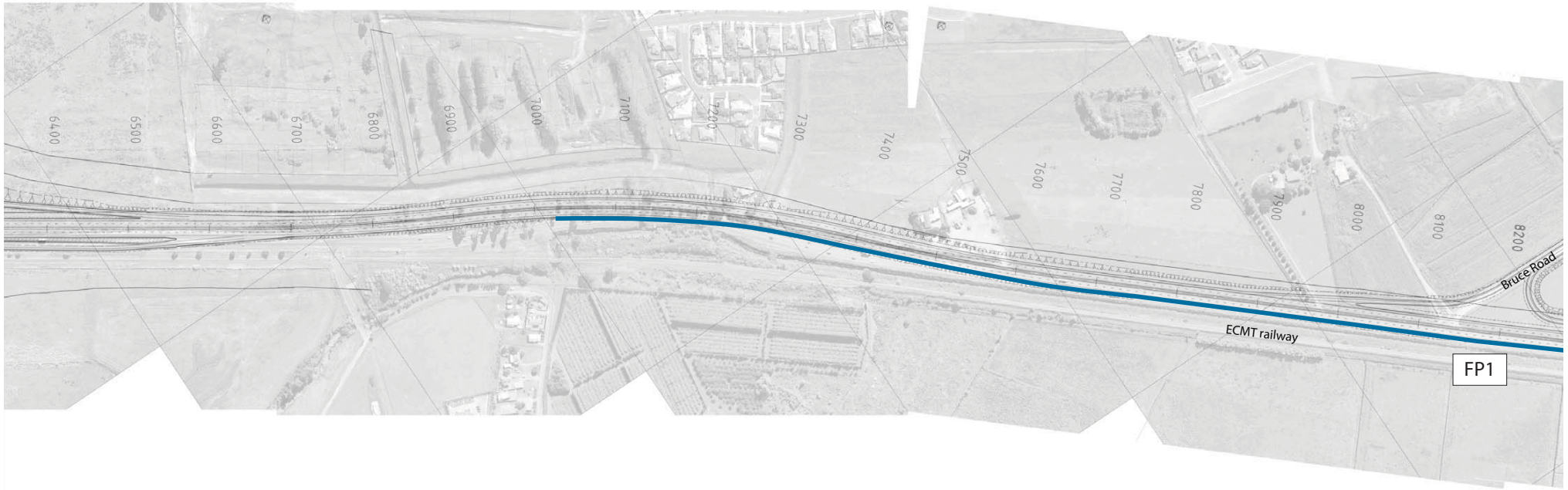
- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 1

0 50 100 150 200 250m

N





KEY

- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 2

0 50 100 150 200 250m

N

Section D Noise barriers

KEY

- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 3

0 50 100 150 200 250m

N

KEY

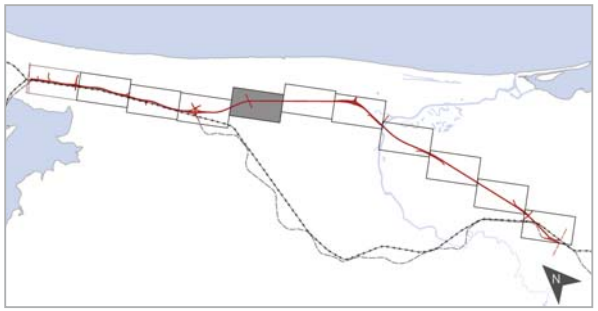
- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 4

0 50 100 150 200 250m

N

Section D Noise barriers



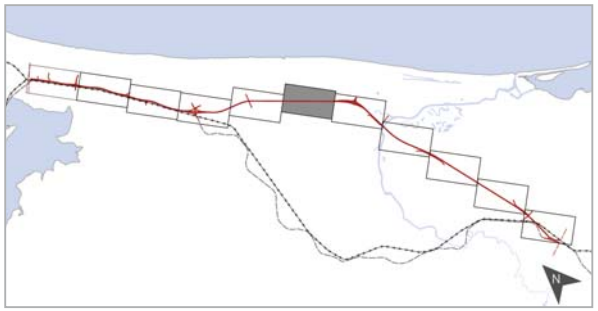
KEY

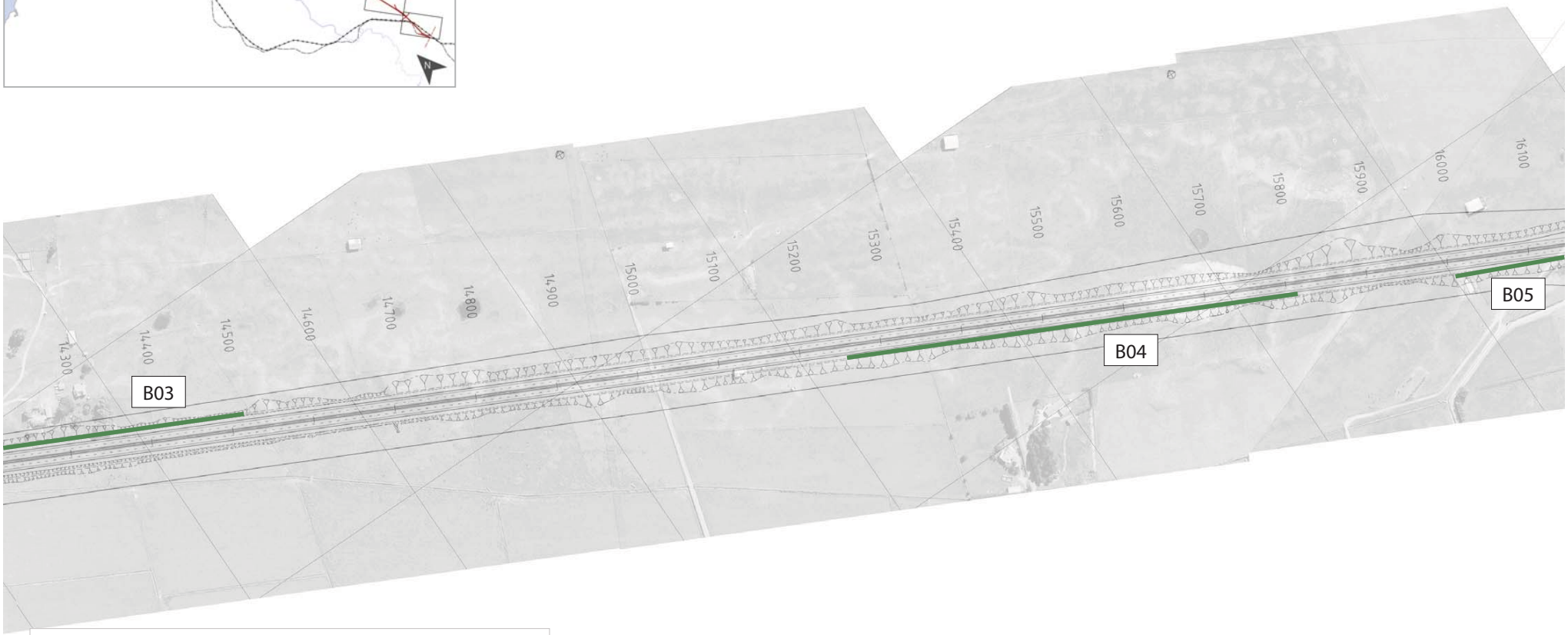
- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 5

0 50 100 150 200 250m

N





KEY

- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 6

0 50 100 150 200 250m

N

Section D Noise barriers

KEY

- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

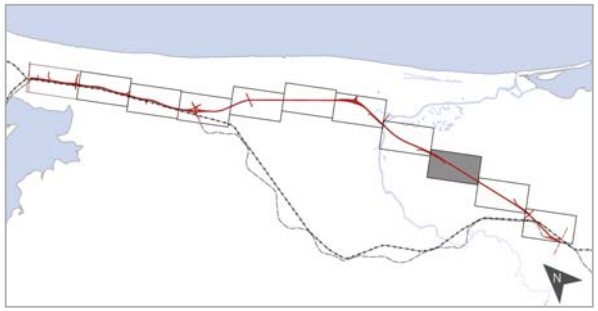
NOISE BARRIER 7

0 50 100 150 200 250m

N

NOISE BARRIER PLAN 8

Section D Noise barriers



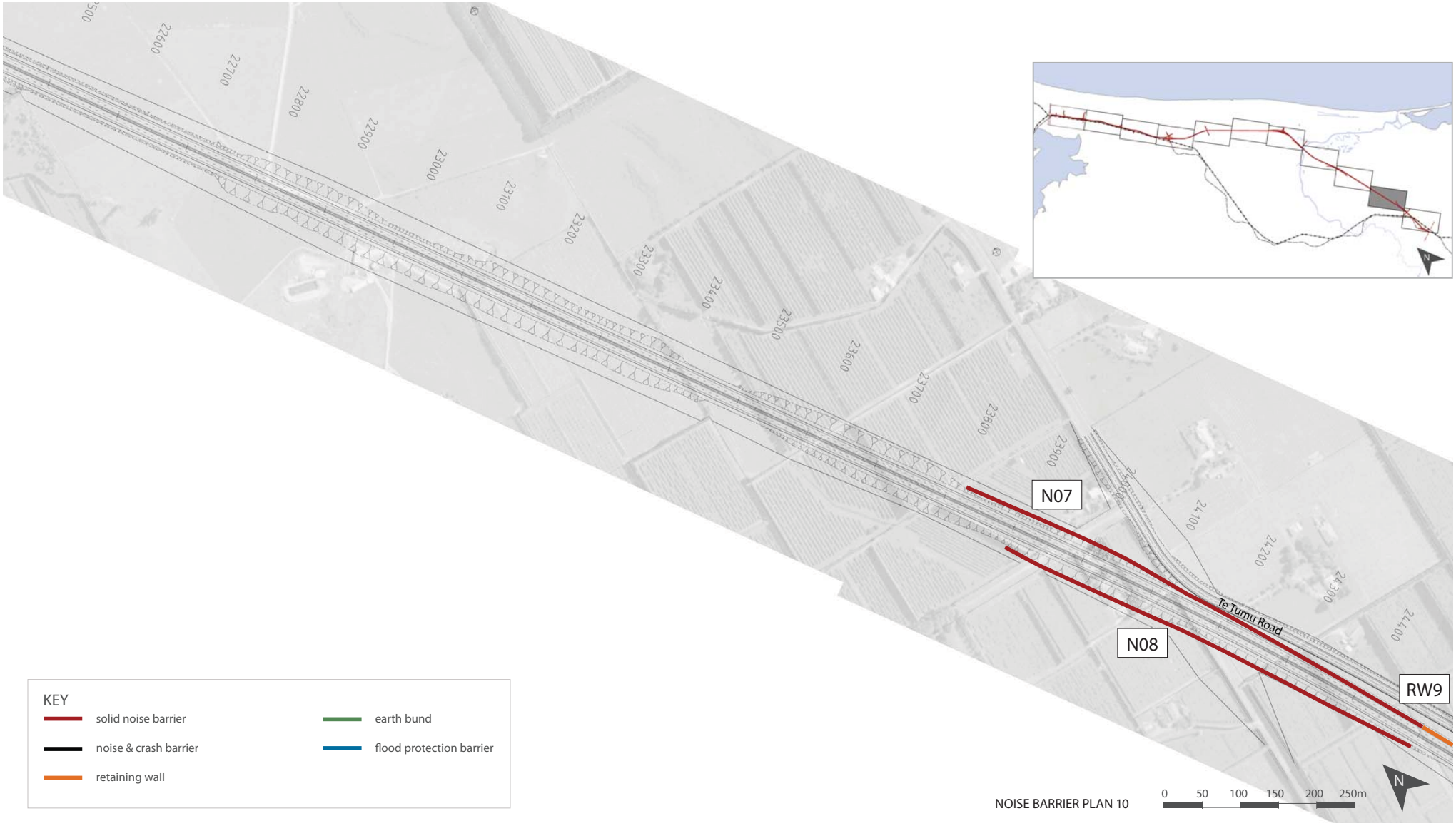
KEY

- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

NOISE BARRIER PLAN 9

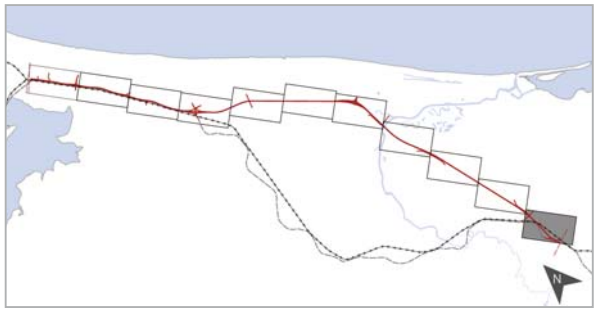
0 50 100 150 200 250m

N



NOISE BARRIER PLAN 10

Section D Noise barriers



RW9
RW10
RW11
RW12
RW13
Maketu Road
ECMT railway
ECMT railway
Paengaroa roundabout
SH2
SH33

KEY
- solid noise barrier
- noise & crash barrier
- retaining wall
- earth bund
- flood protection barrier

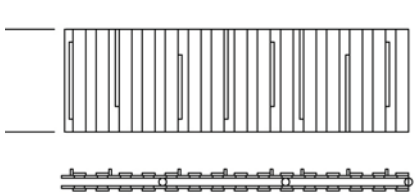
0 50 100 150 200 250m

NOISE BARRIER PLAN 11

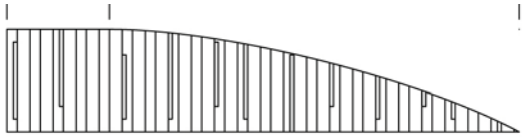
Noise wall design development

As with the bridge retaining walls, detailed design of noise walls will be carried forward into the next stage of the TEL project. The indicative design shown here reflects the design principles in the following ways:

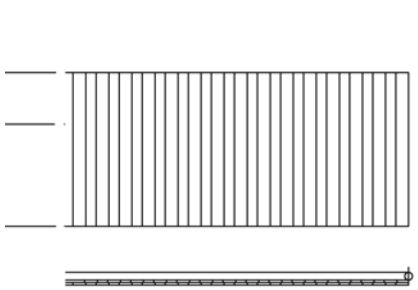
- timber is used to reflect the residential and rural context
- walls that are double sided have additional detailing on the residential side to create a finer grain in keeping with the different experience of scale and movement. On the highway side a simple vertical pattern breaks down the massing
- noise walls are sloped rather than stepped, to express the topography rather than create sharp angles at odds with the generally horizontal landscape
- at the ends of noise walls a sloped transition to the ground provides a smooth rather than an abrupt transition.



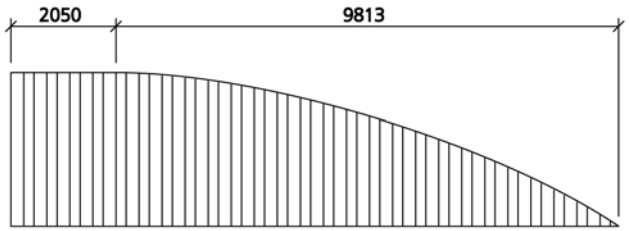
Double sided noise wall adjacent to residential area. Elevation shows finer grain detailing facing the residential area.

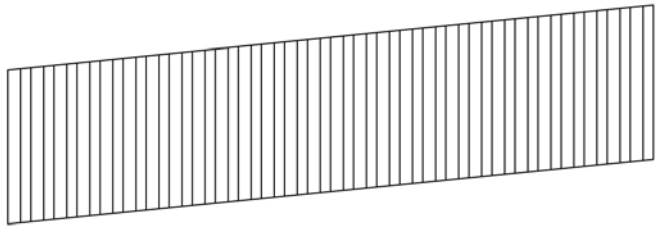


Noise wall to connect to landscape with sloped transition



Single sided noise wall on rural stretches of TEM. Panelled side facing the highway





Typical fence on 10.1 slope - line of fence to follow groundline

While of a different material than suggested for noise barriers on this project, this is a good example of softening the wall with planting when adjacent to a residential area – designing for the 'back' as well as the 'front'

A simple vertical pattern is appropriate to the local TEL context. Constructing the noise barrier in timber enables efficient shaping / curving of the top of the wall on site, where there is sloping ground or where the wall terminates