BTN 007
Noise Attenuation Walls

4 May 2023
Version 2.0

Department of Transport and Planning

1. Scope and Application

Bridge Technical Note (BTN) 007 – Noise Attenuation Walls – states the Department of Transport and Planning's (DTP) requirements for structural and context sensitive design of noise attenuation walls (noise walls) for DTP assets.

Bridge Technical Notes are a Code of Practice. Compliance with Bridge Technical Notes is mandatory.

BTN 007 is to be read in conjunction with DTP Standard Specifications:

- Section 204
- Section 680
- Section 765
- Section V676

Other than as stated in this BTN and the relevant DTP standard specifications, the provisions of AS 5100:2017 must apply. Where this document differs from AS 5100:2017, the BTN's requirements override those of AS 5100:2017.

The acoustic specification, type (reflective or absorptive), material (timber, concrete, steel, plastic, or other composite materials) and location (including height and length dimensions) of noise walls are determined by others prior to the structural design.

DTP was formerly known as Department of Transport (DoT) and VicRoads. DTP documents that must be complied with include all relevant DoT and VicRoads documents.

2. Definitions

Noise Attenuation Walls (Noise Walls) – engineered exterior structures that are used to reduce the impact of noise. They include:

- noise walls which are manufactured from any suitable materials including aluminium, concrete, composite, masonry, plastic, polymer, steel, wood, gabion, etc.; and
- earth mounds created for noise attenuation purposes.

Plastic Noise Walls – noise walls using plastic panels, including those manufactured with recycled plastic.

Transparent – providing views through. Transparent panels are generally made from acrylic (PMMA) or polycarbonate (PC).

Translucent – permitting light to pass through but diffusing it so that persons, objects, etc. on the opposite side are not clearly visible.

Opaque – not able to be seen through.

3. General

Noise walls must be designed to have the minimum design life as in AS 5100.2 Clause 25.2 and as specified in Section 765.

The design life of anchorages for noise walls, noise panels and their fasteners and fixings must be at a minimum:

i.	anchorages on bridges, culverts and major retaining walls	100 years
ii.	anchorages on other applications	50 years
iii.	posts and other structural components	50 years
iv.	panels, panel fixings and fasteners	30 years

Designs that include materials outside of the scope of AS 5100 must be in accordance with the relevant Australian Standards and the DTP's requirements. Where DTP does not have specified requirements for a particular material, then DTP is to be provided with all technical information (including full details of the strength, durability, acoustic properties, appearance, other physical properties, etc.) in relation to the material being proposed for its review and approval.

Where the noise walls are also acting as protection screens or public safety barriers, the requirements for each must be incorporated and the most conservative requirements are to take precedence and adopted.

4. Structural Design

4.1. General Design Requirements

Noise walls must be designed in accordance with AS 5100 together with additional criteria for wind loading specified in Section 4.3 of this BTN and for load effects due to earthquakes, thermal expansion and handling.

The protection barrier of the noise walls must comply with the protection requirements stated in Road Design Note (RDN) 06-13 Guidelines for the Protection of Gantry and Cantilever Sign Supports for the specific Risk Category of the noise walls, as well as Austroads Guide to Road Design (AGRD) Part 6 (2022) and the corresponding DTP Supplement. The design of the protection barrier must comply with the requirements of BTN 001 where applicable.

Noise walls adjacent to or over rail, road, or pedestrian/shared user path must:

- Comply with the working widths allowance of Austroads Guide to Road Design (AGRD) Part 6 (2022) and the corresponding DTP Supplement.
- Be designed to prevent fragmentation and/or shattering of panels in the event of impact.
- Consider impact of debris, stones and bird strikes.

Noise walls must not include components that could snag or penetrate an impacting vehicle.

Noise wall materials must be resistant to impact damage caused by vandalism and the components must be readily replaceable.

Timber is not the preferred material due to the durability and high maintenance requirements. The design can incorporate timber components in the panels only.

The design must account for the effects of temperature, differential temperature, moisture, differential moisture, warping, twisting, and bowing.

- All structural support systems (including flexible edge seals) must be designed to effectively seal against noise and restrain the panels, accounting for the movements associated with any loads.
- Where the noise wall height is built up from vertically stacked panels, the load on panels must account for bowing of panels. The design must be based on the assumption that the panels will be stacked with bowing of adjacent panels such that the load distribution produces the worst load effects.
- The design must consider that the bottom edge of the noise wall panel is restrained for bowing and warping due to temperature, differential temperature and differential moisture.

Noise wall panels or components must not become detached from their supports or fixings both in the horizontal and vertical planes when subjected to the ultimate wind load and the highest combination of allowable forces during the design life.

The design of the panels must take the following into account:

- The creep deformation or rupture over the design life at the service conditions.
- The plastic panels must be sufficiently ductile to provide for deformation at the supports or flexible seals may be used.

4.2. Mounting on Structures

Noise walls mounted on structures must comply with the requirements of AS 5100.1 Clause 17 for bridge-mounted noise walls and the following additional requirements.

Where a noise wall interacts with other structures (retaining walls, bridges, culverts, road safety barriers, etc):

- The design analysis of the supporting structures must account for all the forces imposed by the noise wall on the structure.

- The addition of the noise wall must not compromise or affect the specific function of the supporting structures.
- The noise wall must be angled away from the carriageway to provide adequate working width in accordance with AGRD Part 6 (2022) and the corresponding DTP Supplement.
- The bridge must be assessed for the effects of the noise wall addition, including load redistribution due to deck edge stiffening.
- Noise walls must only be mounted on concrete components of traffic barriers where the height of the concrete barrier is greater than 1300 mm above the finished road surface. Traffic barriers supporting noise walls must also comply with the requirements of BTN 001.
- Where noise walls are located on bridges over a rail, road or pedestrian/shared user path, the design of the noise wall and supporting structure must prevent panels or fragments of panels from falling on to traffic or pedestrians as a result of vehicle impact. The design must incorporate a system that will prevent any component of the noise wall from falling onto the adjacent land, e.g., a continuous stainless-steel cable may be used to connect or support the panels.

4.2.1. Bonded and Mechanical Anchors

Noise wall connection with a new structure must be made with cast-in bolts.

For existing structures, noise walls must be attached by means of a positive connection. Where a positive connection cannot be achieved, bonded anchors may be considered. The use of bonded anchors must be in accordance with the requirements of BTN 006 Bonded Anchors and Section 680 - Bonded Anchors. Mechanical anchors (fasteners) are not permitted.

4.3. Design Loads

Where noise wall panels are vertically stacked, underlying panels must not deform more than 1/360 of span of panels when exposed to a load of 1.35 times of the overlaying self-weight of the panels.

4.3.1. Wind Loading

Wind loads must be derived from AS 5100.2 Clause 25 (with additional reference to AS/NZS 1170.2) using the net design wind pressure for ultimate limit states and serviceability.

Site conditions leading to the highest design wind pressure must be used in the design, e.g., the sheltering effect of buildings and trees in the vicinity of the noise wall must be ignored. Terrains both along the road and across the road must be evaluated and the more adverse of the two terrain categories must be adopted for the computation of wind forces.

The design must allow for the increased wind load near the ends of the noise walls in accordance with Section D2 of AS/NZS 1170.2.

Under the action of serviceability wind-loading, the maximum deflection must be as follows:

- The maximum horizontal deflection of a noise wall post must be limited to 1/125 of the post height.
- The maximum horizontal deflection of the panel must be limited to:
  - 1/130 of span of panels for plastic or polymer noise wall panels.
  - 1/65 of span of panels for timber noise wall panels.
  - 1/150 of span of panels for all other noise wall panels.

4.4. Fatigue Design

4.4.1. Steel Components

The fatigue design of steel components and connections for noise walls must comply with the fatigue requirements stated in BTN 014 Road Sign and Lighting Structures for wind gusting with the wind speed at 5 m/s and for 100 million cycles.

Anchor bolts must be Grade 4.6 and comply with the requirements for road sign and lighting structures in AS 5100 and BTN 014.

4.4.2. Fasteners

The fasteners must be designed for fatigue using a wind speed of 20 m/s and 200,000 cycles.

4.4.3. Other Components

The designer must also carry out a fatigue design of other components to the relevant code depending on the material being assessed.

4.5. Foundation Design

The foundation design must meet the requirements of AS 5100.3 and BTN 023. The foundations must not impede natural drainage flow paths. Where the natural drainage flow is affected then the Designer must design an alternative drainage flow.

Noise walls foundations must be checked for both serviceability and ultimate limit states and designed to limit deflections to specified tolerances based on the requirements stated below.

Noise walls on earth mounds or batters must have a horizontal surface on both sides of the noise wall and must be clear from any obstructions on top, for a minimum width of 1.0 m for the noise walls in the Metropolitan Regions, and 1.5 m for noise walls in the Rural Regions, to:

- Provide access for construction and maintenance.
- Ensure foundation stability (sliding, toppling and overturning).
- Protect the foundation.
- Prevent undermining below the noise wall.

Spread or strip foundations in earth mounds must be a minimum of 1.5 m from the edge of the filled batter.

A concrete maintenance strip must be provided for noise panels to protect the panel edge from water ingress. Concrete maintenance strips must meet the following requirements:

- 20 MPa strength concrete or 20 MPa geopolymer binder-based concrete.
- Extend a minimum 200 mm in width on both sides of the noise wall and have a thickness of 75 mm, placed on 75mm compacted Class 4 crushed rock.
- A minimum 5% crossfall with a preferred crossfall direction away from the noise wall.
- A minimum of 50 mm above the natural ground level.
- Incorporate provisions for expansion and contraction placed at intervals not exceeding 10 m.

Fill material for earth mounds must, as a minimum, comprise Type B fill material placed and compacted to a minimum dry density of 98% standard compaction in accordance with Section 204.

Noise walls on disturbed material must be provided with a piled foundation which must be designed for the site conditions using appropriate soil parameters.

The effects of long-term settlement and lateral movement of the noise wall due to embankment consolidation must be considered in the design.

Foundation design for noise walls near the edge of embankments must consider potential embankment movement.

The required construction tolerances are stated in Section 765.

5. Context Sensitive Design

5.1. Landscape/Environmental Design

The design of noise walls must consider landscape design requirements including existing and proposed tree planting adjacent to noise walls. Where trees are proposed in close proximity to noise walls then those walls need to be designed to accommodate tree planting (e.g., tree roots and abnormal soil moisture changes may affect the integrity of noise walls and impact its design life). Preferably, the planting of medium to large trees must be avoided within close proximity of noise walls (e.g., 3 m from the noise walls). Generally a medium to large tree is considered to be one with a mature form that is 8-15 or more metres tall by 8-15 or more metres wide.

The form/construction type of the noise wall will need to be adjusted to accommodate tree planting where it may be necessary to:

- Screen views of noise walls from local properties.

- Mitigate graffiti.
- Improve amenity of transport corridors.
- Reduce urban heat.

The designer must ensure that landscape requirements are considered in conjunction with safe and efficient maintenance access and graffiti mitigation measures.

The alignment of the noise wall must avoid the removal of existing trees. In addition, where the noise wall alignment cannot avoid tree protection zones (TPZ), a ground beam to avoid roots, or piles placed around existing roots using non-destructive digging methods must be considered (refer to Figures 1 & 2).

5.2. Architectural Design

The noise wall design, alignment, material, texture, and colour must respect the existing site context, architectural design intent and theme of the transport corridor.

Noise walls mounted on bridges and elevated structures are preferred to be constructed of transparent/ translucent or opaque plastic to reduce the visual bulk of the structure (subject to overlooking requirements, refer to Section 6.3.2).

Transparent noise wall materials must also be provided to capture significant views and vistas from the road.

The noise wall alignment and design must apply the Crime Prevention Through Environmental Design (CPTED) principles.

6. Design for Inspection and Maintenance

6.1. General

To provide for the inspection, maintenance, repair and emergency access, the noise wall must be easily accessible from both sides.

Noise walls, when placed on or in front of a structure, must not obstruct the inspection and maintenance of the structure.

Where the full drivable access along the entire length of the noise wall is not available, openings to enable access for inspection and/or small maintenance machinery must be provided at a maximum 400 m spacing along the noise walls with the following considerations:

- Where openings must be provided, they must be by overlapping the noise wall and the overlap must not be visible by road users in the direction of travel. The overlap must be designed according to the site specific access requirement (e.g., 1.0 m wide for on foot inspection, 2.0 m for grass mowing or 3.0 m for vehicle/machinery access) (refer to Figures 3 & 4).
- Openings must include a minimum 2.4 m high, locked, weld mesh gate. In exceptional circumstances where an overlap cannot be provided, an architecturally designed door that matches the wall material, texture and colour must be incorporated in the design of the door. The design and installation of doors must be in accordance with Section 765 (refer to Figure 5).
- Openings should be co-located with other assets that require inspection and maintenance access. (e.g. access to ITS assets and landscape maintenance).
- Openings should be considered where transitions/changes of wall height, material or alignment of noise walls occur.
- Provision for parking must be considered for inspection and maintenance activities. Parking locations should be co-located with other asset maintenance parking.
- The designer must ensure the noise wall, components and fixings are simplified as much as practicable. Fixings must be concealed where possible, and the number of fixings must be reduced on the roadside face of the wall to improve aesthetics, reduce ongoing maintenance and inspection of design elements.

The location of fixings and the method of inspection must consider the noise wall alignment and ability to access (i.e., noise walls located on the right-of-way or on a bridge structure with fixings on the rear of the wall may be unable to be adequately inspected). To minimise the need for specialised plant, equipment, traffic management and processes, provisions must be incorporated into the noise wall design to provide efficient access for inspection and maintenance of the fixings.

6.2. Graffiti Mitigation

6.2.1. Landscaping and Restricting Access

Landscaping is the most effective method of graffiti mitigation. Where space permits, trees and/or shrubs must be included adjacent to the noise wall to mitigate graffiti attacks (refer to Figures 6 & 7). Noise walls mounted on bridges or on top of road safety barriers are exempted.

In areas where space is constrained, vertical greening is encouraged to provide graffiti mitigation. Proposals that use climber plants (non-clinging) must include a climbing frame attached to the noise wall posts. The frame must have a minimum offset of 200 mm horizontally from the post and panel to allow for inspection of the noise wall and fixings. The climbing frame must be structurally designed and have a design life not less than 30 years (refer to Figures 8 & 9).

Self-clinging climber plants are not preferred due to the difficulty to inspect and maintain noise walls. Self-clinging climber planting proposals will require the approval of the Chief Engineer – Roads via a submission to the DTP Technical Reference Panel (TRP).

Where landscaping cannot be provided, access to the roadside of the noise wall must be restricted via a well-considered alignment, the use of fencing and locked weld mesh gates.

6.2.2. Architectural Treatment

Walls with texture, pattern or relief are the preferred architectural treatment to mitigate graffiti, with a recommended minimum 50 mm in depth/relief.

Noise walls with an entirely smooth flat surface that are not architecturally designed are not acceptable where the ability to access the wall cannot be restricted (e.g., by the alignment, fencing and landscaping).

6.3. Transparent/Translucent Plastic Panels

6.3.1. Surface Finishing

The surface finishing of the panels must:

- Have a translucent, opaque or etched surface where privacy concerns may be a factor/issue.
- Must include a neutral tint and/or colour to reduce visible dirt.
- Have an etched surface where the public access to the noise wall cannot be restricted, to reduce the visibility of the possible scratches; and
- Have an intensely coloured and etched surface or internal horizontal filament to mitigate possible birds strikes. In locations where the noise walls are adjacent to areas of bird habitat, multiple mitigation measures must be adopted (refer to Figures 10 & 11).

6.3.2. Overshadowing and Shadows

Where a noise wall will overshadow a private property, the noise wall must include a transparent upper section (refer to Figures 12 & 13) to ensure the noise wall does not reduce daylight in accordance with Understanding the Residential Development Standards (ResCode) A13 and B20, as well as A14 and B21.

The use of colour in transparent panels must be appropriate to the location. Residential properties and other sensitive land uses (e.g. child care / kindergarten facilities, hospitals / health facilities, nursing homes, recreational private open space, etc.) must be protected from the negative impacts of intensely coloured light and shadows being cast from transparent materials. Coloured panels which cast intensely coloured shadows on private property and sensitive users must not be used.

Coloured panels used at sensitive locations must be transparent and have a minimum light transmission rate of 75% tested in accordance with ASTM D1003 or DIN 5036-3 by a NATA accredited laboratory. Where aesthetic and urban design context necessitates the use of a variety of coloured panels (e.g. muted light brown, light blue or light green), the minimum light transmission rate must be 50% subject to the approval of the Chief Engineer – Roads via a submission to the DTP Technical Reference Panel (TRP).

Material colour must not detract from transport safety objectives. When transparent panels are used over, or adjacent to, a rail reserve the wall colour when viewed from the rail track must meet the requirements of the rail authority.

6.3.3. Resilience

Panels must be resistant to scratching, weathering from UV exposure and discolouration (yellowing) with age.

Transparent/Translucent noise walls used adjacent to the road mounted on top of road safety barriers are recommended to be angled outwards, by a minimum of 7 degrees to ensure they reduce direct headlight reflection and provide for natural cleaning of dirt off the panel surface (refer to Figure 14).

6.4. Non-transparent Plastic Panels

Plastic noise wall panels (rotationally moulded or injected moulded) must have an architecturally designed finish or patterns on both the front and rear faces of the noise wall. The panel must have a minimum of 50 mm depth of texture/relief over at least 50% of the panel surface to reduce the likelihood of graffiti and improve the appearance (refer to Figure 15).

Plastic noise wall panels must not have a smooth finish, as it creates excessive shine, which emphasises imperfections in the panel surface caused by thermal expansion and contraction. Figure 16 illustrates the visible imperfections in the panel with a sparsely textured surface.

7. Design Documentation

The design documentation (including a Design Report and the Drawings) must specify all requirements necessary to enable the noise wall to be manufactured and installed in accordance with the Specification. The Design Report must include design decisions and any other relevant information not included in the Drawings. Calculations may be requested by the Superintendent and they must be provided for review within five business days of the request date.

8. Design and Proof Engineering

The design of the noise walls and associated components must be conducted by an engineering consultancy that is prequalified in accordance with DTP's Prequalification for Road & Bridge Design in either the Structures – Simple (SS) or Structures – Complex (CS) category.

The noise walls and associated components must be Proof Engineered by a Proof Engineer prequalified in accordance with DTP's Prequalification Scheme.

Contact Details

For further information please contact:

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Bridge Technical Notes are subject to periodic review and may be superseded.

Document Control

This document is subject to periodic review and may be superseded. The revision date is listed in this BTN.

Note that for projects tendered prior to the revision date of this document, there are no retrospective implications of this document unless agreed otherwise with DTP.

Version	Description	Revision	Approved by
1.1	General Amendments	June 2018	Principal Bridge Engineer
2.0	Updated DoT to DTP. Definitions added in Section 2. Revision of Section 3 to transfer acoustic design requirements to Section 765 and urban design requirements to other sections. Revision of Section 4 to include: • Additional structural design requirements. • Additional requirements for mounting on structures and bonded anchors. • Additional requirement for design loads and deflection. Section 5 added for context sensitive design. Section 6 added for design requirements of inspection and maintenance, and additional requirements for plastic noise walls. Section 7 added for design documentation requirements. Section 8 added for design prequalification requirements.	4 May 2023	Senior Manager Roads Engineering

Appendix A: Noise Walls

Table of Figures

Context Sensitive Design

Design for Inspection and Maintenance

Additional Requirements for Plastic Noise Walls

Context Sensitive Design

Tree Protection

Figure 1 - Noise wall solution for constructing noise walls within the TPZ - extended wall spans

Chandler Highway, Alphington, Victoria

Noise wall span strengthened and extended to avoid piling foundations within the Tree Protection Zone (TPZ).

Figure 2 - Noise wall solution for constructing noise walls within the TPZ - altered wall alignment

Western Freeway (Thornhill Park), Rockbank, Victoria

Noise wall alignment altered to avoid piling foundations within the Tree Protection Zone (TPZ).

Overlapping

Figure 3 - Overlaps in noise wall design allow for easy and efficient maintenance access

Deer Park Bypass, Derrimut, Victoria

Architecturally designed noise wall overlaps with 3.0 m wide access provided in the noise wall alignment for maintenance access and inspection (safety fence to be provided in accordance with Section 765).

Figure 4 - Well resolved overlaps in noise wall hide the opening and access gate from the adjacent traffic

M80 Sydney to Edgars, Thomastown, Victoria

Well resolved and integrated 1.5 m wide maintenance access provided for inspection of adjacent pedestrian bridge. The overlap is located where the gate can't be seen from the adjacent traffic.

Doors for Inspection

Figure 5 - Poorly integrated inspection doors within the noise wall infrastructure

Princess Highway, Point Cook, Victoria

Doors have been provided within the noise wall panel to facilitate grass mowing in the freeway reserve. These doors are poorly integrated and have not been architecturally refined as either the colour, materiality and texture does not match the adjacent noise wall panels.

Graffiti Mitigation

Landscape Buffer

Figure 6 - Landscape buffer softens walls and reduces graffiti

M80 Freeway, Thomastown, Victoria

Landscaping is provided to soften the visual impact of the noise walls and assist in graffiti mitigation.

Figure 7 - Landscape buffer reduces scale of noise walls and soften its presence for path users

Mordialloc Freeway, Braeside, Victoria

Landscaping is provided to reduce the scale of noise walls and soften its presence for the path users.

Climbing Frames

Figure 8 - Climbing plant frames soften the visual impact of noise walls and assist with graffiti mitigation

Chandler Highway, Alphington, Victoria

Integrated climbing plant frame designed to soften the visual impact of noise walls and limit graffiti.

The frame was designed to provide sufficient space to inspect panels, posts and fixings, without the plants inhibiting visibility. If required, these frames can be unbolted and removed for noise wall maintenance.

Figure 9 - Climbing plant frames soften the visual impact of noise walls in confined spaces

Tullamarine Freeway, Moonee Ponds, Victoria

Integrated climbing plant frame designed to soften the scale and the visual impact of the utilitarian looking noise walls. If required these frames can be unbolted and removed for noise wall maintenance. This solution forms part of an architecturally designed gateway from Tullamarine to Melbourne.

Additional Requirements for Plastic Noise Walls

Transparent/Translucent Plastic Panels - Bird Protection

Figure 10 - Internal filaments, intense colours and etched patterns mitigate bird strikes

Mordialloc Freeway, Waterways, Victoria

This acrylic wall comprises of an internal filament and intensely coloured panel with an etched pattern. The combination of these design measures mitigate possible bird strikes in protected wetland. The extended post is intended to guide the bird's flight path over the height clearance of tall vehicles to mitigate possible impact. It also provides for an interesting architectural feature that breaks up the linearity of the noise wall.

Figure 11 - Intensely coloured panels with internal filaments mitigate bird strikes of transparent walls

Chandler Highway, Alphington, Victoria

Intensely coloured acrylic panels with an internal filament mitigate possible bird strikes adjacent to the Yarra River. The colour of the noise wall features three different colours of green that blend in with the surrounding landscape.

Transparent/Translucent Plastic Panels - Overshadowing and Shadows

Figure 12 - Transparent, neutrally tinted panels reduce overshadowing and shadows being cast into properties

Tullamarine Freeway, Tullamarine, Victoria

The acrylic top section reduces shadows being cast into residential properties during the winter months. The charcoal colour tint of the acrylic panel reduces visible surface dirt. Additionally, the neutral tint reduces coloured shadows bring cast into private properties.

Figure 13 - Transparent, light coloured panels reduce overshadowing and shadows being cast into properties

Westgate Freeway, Altona North, Victoria

The transparent acrylic top section reduces large shadows being cast into residential properties during the winter months. The subtle colours were chosen to reduce the intensity of coloured shadows being cast into private properties. Additionally, the wavey horizontal elevation reduces the visual height of the wall and creates for an interesting experience.

Transparent/Translucent Plastic Panels - Alignment

Figure 14 - Transparent acrylic panes constructed on an angle provide a natural cleaning of the panel surface

Eastlink, Wantirna, Victoria

Transparent acrylic panels angled away from the road provide natural cleaning of dirt off the panel surface.

Noise walls mounted on top of concrete barriers (rather than behind) are better integrated with the safety barriers as they reduce the cross-section width and consolidate attachments and foundations. The requirements in Section 4.2 must be compliant for noise walls mounted on top of traffic barriers.

Non-transparent Plastic Panels (Rotationally moulded panels)

Figure 15 - Architectural relief and texture applied to plastic panels improves their appearance

Peninsula Link, Frankston, Victoria

The panels have a deep architectural relief and texture throughout the surface, which hide any imperfections and bulging in the plastic. The landscape buffer also mitigates possible graffiti and softens the visual impact of the wall adjacent to the road.

Figure 16 - Plastic panels with a sparsely applied texture designed to match the existing noise walls

Monash Freeway, Kooyong, Victoria

The panels have an architectural relief throughout the surface. As the relief only covers approximately 10% of the panel surface, visible bulging and imperfections are visible in the plastic. The landscape buffer partially softens the visual impact of the wall adjacent to the road. However, the taller plants would be more appropriate at this location to adequately mitigate graffiti.