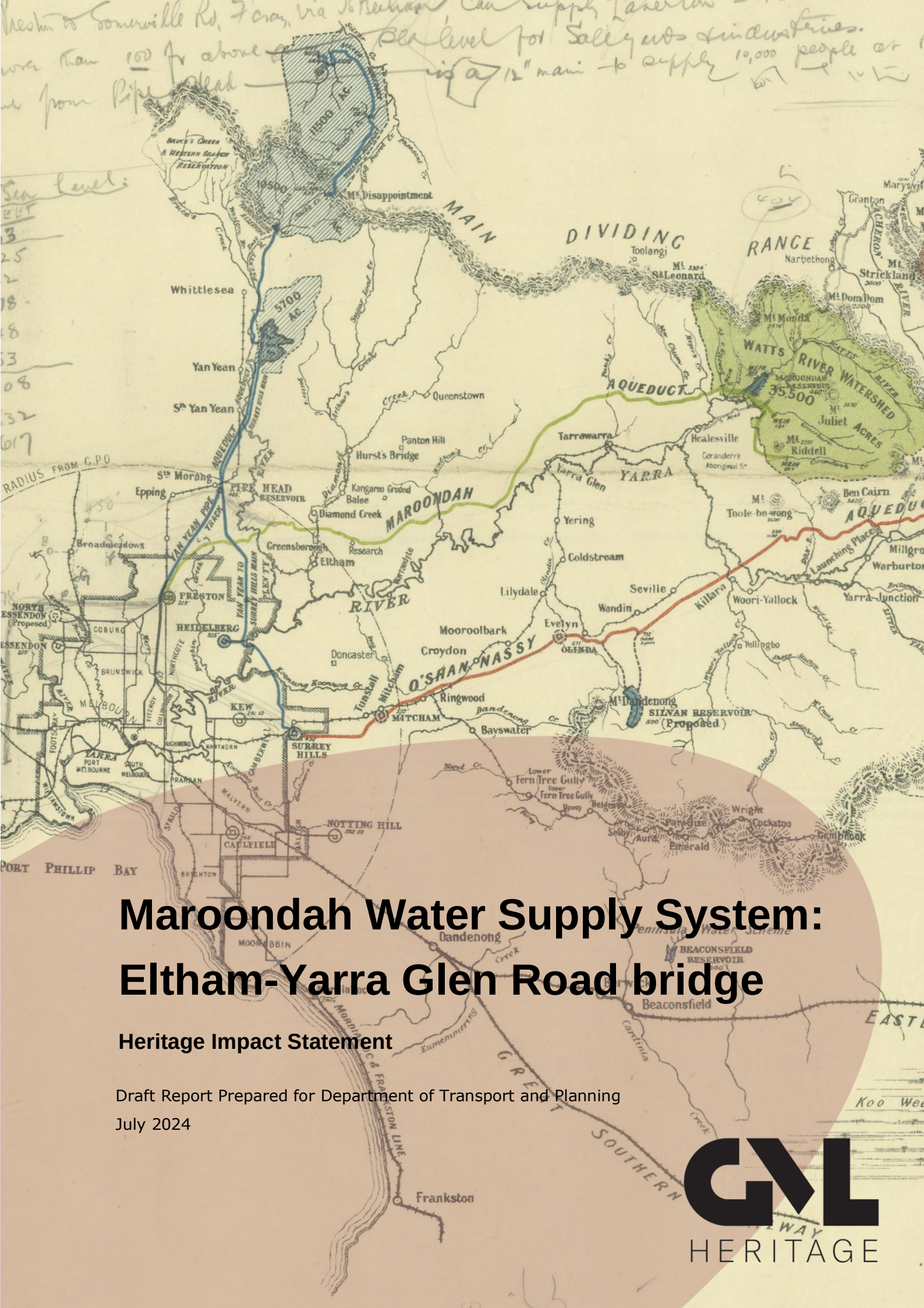

Maroondah Water Supply System: Eltham-Yarra Glen Road bridge

Heritage Impact Statement

Draft Report Prepared for Department of Transport and Planning

July 2024

GML HERITAGE

Acknowledgement of Country

We respect and acknowledge the Wurundjeri Woi Wurrung people, their lands and waterways, their rich cultural heritage and their deep connection to Country, and we acknowledge their Elders past and present. We are committed to truth-telling and to engaging with Wurundjeri Woi Wurrung people to support the protection of their culture and heritage. We strongly advocate social and cultural justice and support the Uluru Statement from the Heart.

GML HERITAGE

Report register

The following report register documents the development of this report, in accordance with GML's Quality Management System.

Project	Issue No.	Notes/Description	Issue Date
3389	1	Draft Report	28 May 2024
3389	2	Updated	30 July 2024

Quality management

The report has been reviewed and approved for issue in accordance with the GML quality management policy and procedures.

It aligns with best-practice heritage conservation and management, *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance, 2013* and heritage and environmental legislation and guidelines relevant to the subject place.

Cover image

Plan showing the Yan Yean, Maroondah and O'Shannassy systems. Melbourne and Metropolitan Board of Works, Water Supply Division, 1922. (Source: State Library Victoria, Record ID 996698813607636)

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Contents

1 Introduction

1.1 Purpose of this report

The Department of Transport and Planning (DTP) engaged GML Heritage (GML) in August 2023 to provide preliminary heritage advice regarding the proposed strengthening and/or replacement of the Eltham-Yarra Glen Road bridge over the Maroondah Water Supply System. The Maroondah Water Supply System (Upper and Central Sections) is included in the Victorian Heritage Register (VHR) (H2381).

GML recommended that repair and/or strengthening of the bridge should be prioritised over replacement, as the bridge is of aesthetic significance within H2381. GML also recommended that the bridge should be assessed by a suitable qualified heritage engineer to determine its structural integrity and options for achieving stabilisation—and a detailed methodology for achieving stabilisation should be prepared to guide the works to avoid potential impacts on H2381.

This heritage impact statement (HIS) has been prepared to assess whether the proposed strengthening works constitute an acceptable heritage impact to the heritage significance of H2381, in accordance with the requirements of the *Heritage Act 2017* (Vic).

1.2 Background

The following background information follows the template provided in *Heritage Victoria Guidelines for preparing heritage impact statements* (June 2021).

Heritage Impact Statement for:

The Maroondah Water Supply System (Upper and Central Sections).

Victorian Heritage Register number:

H2381.

Pre-application meeting number:

P38033.

Address and location description:

The subject site is the Eltham-Yarra Glen Road bridge over the Maroondah Water Supply System (Figure 1.1 and Figure 1.2).

Prepared by:

Freya Keam and Mark Huntersmith, of GML Heritage Victoria.

Prepared for:

Department of Transport and Planning.

Date:

May 2024.

1.3 Subject site

The subject site is the Eltham-Yarra Glen Road bridge, located approximately 2 kilometres west of Yarra Glen's town centre.

The bridge spans the Maroondah Aqueduct. Melbourne Water's Yarra Glen Treatment Plant is located immediately north of the bridge.

Figure 1.1 Aerial view of the Eltham-Yarra Glen Road bridge (denoted by red outline). (Source: Nearmap April 2024, with GML overlay)

Figure 1.2 Aerial view of the Eltham-Yarra Glen Road bridge (denoted by red outline). Source: Nearmap April 2024, with GML overlay)

1.4 Statutory heritage controls

1.4.1 Victorian Heritage Register

The Maroondah Water Supply System (Upper and Central Sections) is included in the VHR (H2381) (Figure 1.3).

The Eltham-Yarra Glen Road bridge is considered to be included within the extent of registration for H2381. The relevant excerpt from the published extent of registration is reproduced below:

> **Parts of the road reserves** for Allendale Road, Maroong Drive, Ingrams Road, Main Road and Bells Hill Road, Research, Bellbird Lane, Kangaroo Ground-Warrandyte Road, Henley Road, Nicholas Lane and Calwell Road, Kangaroo Ground, Skyline Road, Bend of Islands, Skyline Road, Christmas Hills, Yarraview Road, King Street, **Yarra Glen-Eltham Road**, Steels Creek Road, Gulf Road, Melba Highway and Bleases Lane, Yarra Glen, Bleases Lane and Pauls Lane, Dixons Creek, Long Gully Road, Myers Creek Road and Maroondah Highway, Healesville, Chaffer Street and Healesville-Kinglake Road, Chum Creek, Maroondah Highway and Road 24 Fernshaw and Badger Weir Road, Badger Creek being the footprint of the concrete junction basin, a 5 metre curtilage from the Plenty River pipe bridge and a curtilage of 5 metres either side of the centre line of the aqueduct, tunnels and inverted siphons. [GML's emphasis]

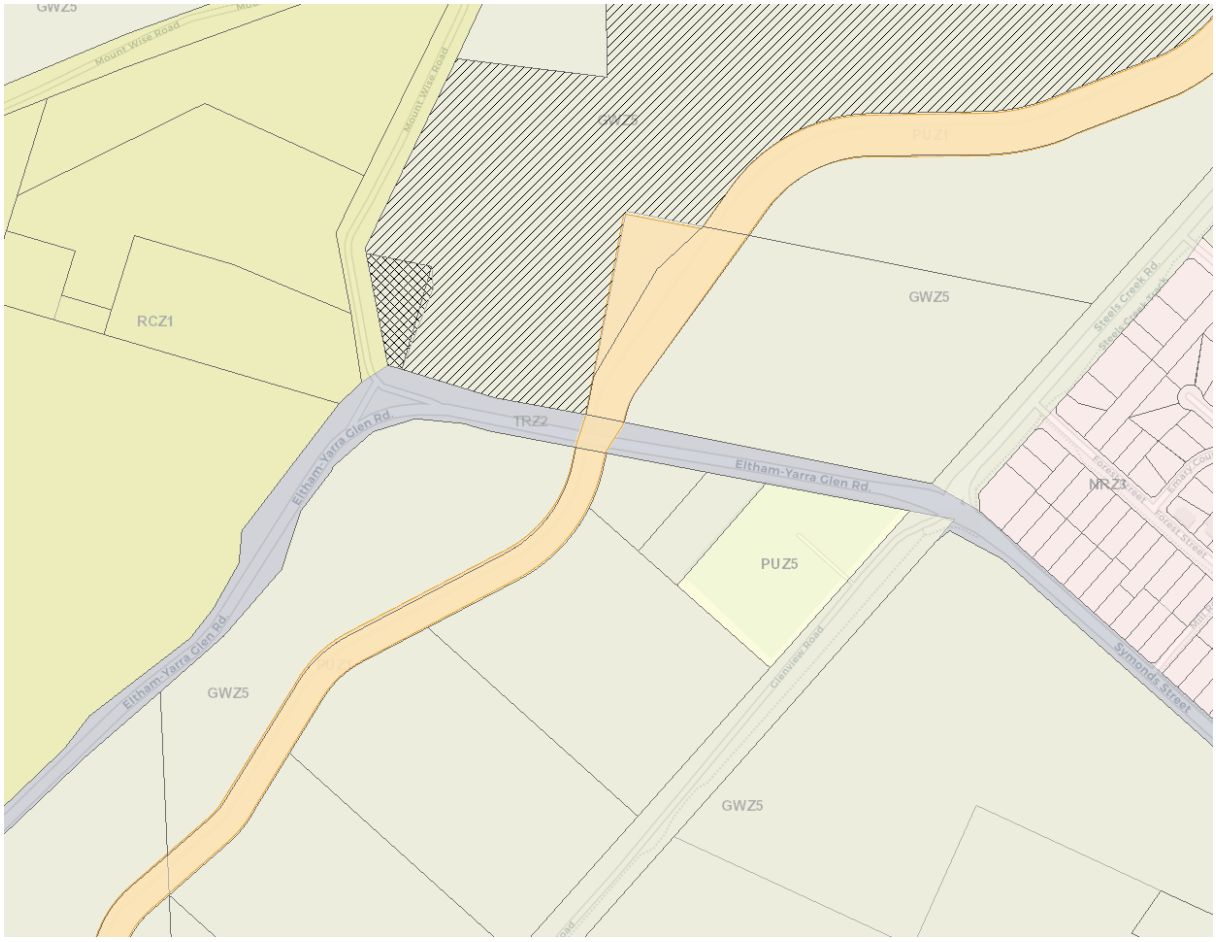

Figure 1.3 VHR curtilage, shaded cream. (Source: VicPlan 2024)

1.4.2 Victorian Heritage Inventory

The Maroondah Water Supply System (Upper and Central Sections) is not included in the Victorian Heritage Inventory (VHI).

1.4.3 Yarra Ranges Shire Council

The Maroondah Water Supply System (Upper and Central Sections) is included on the Schedule to the Heritage Overlay of the Yarra Ranges Planning Scheme: HO429 (Figure 1.4).

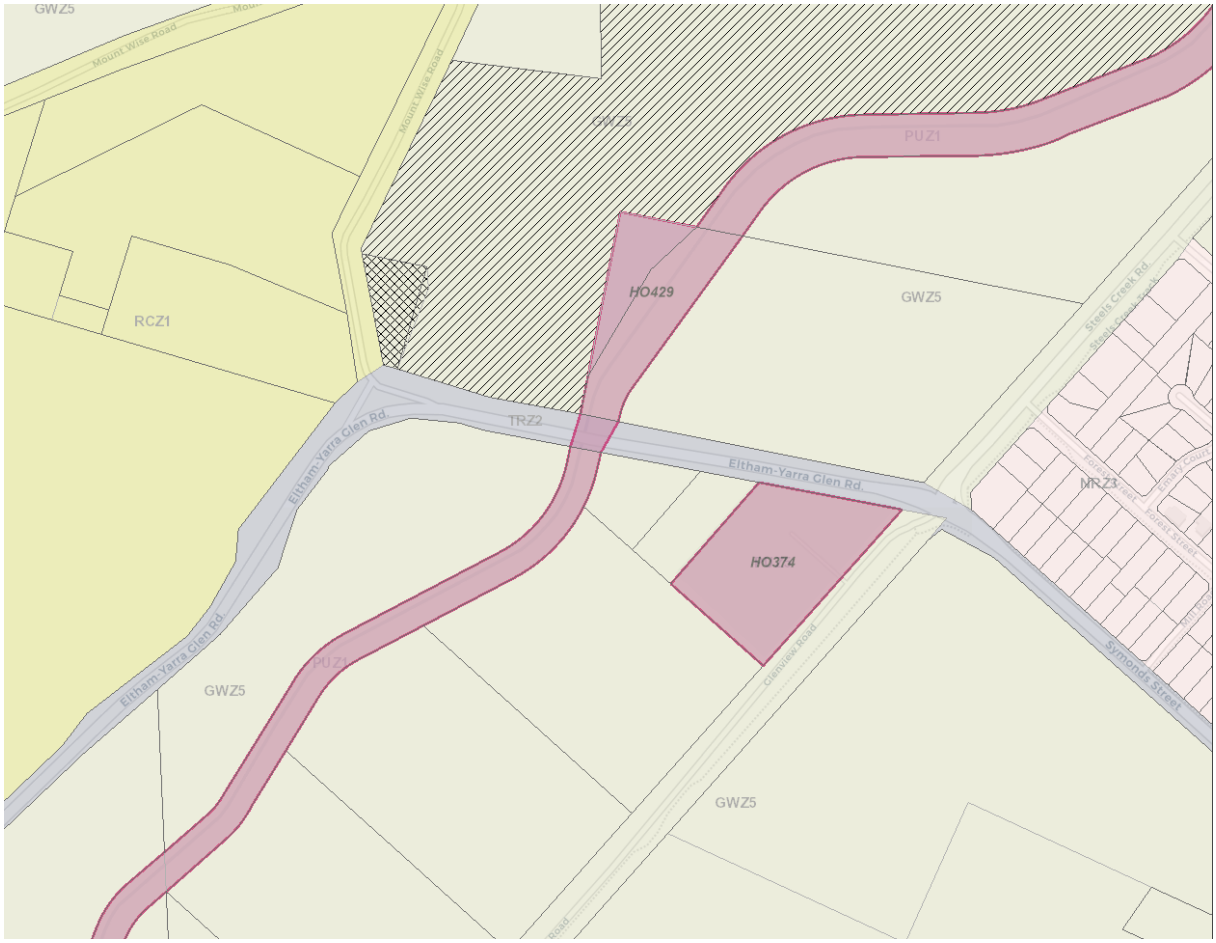

Figure 1.4 Heritage overlay curtilage for HO429 shaded dark pink. (Source: VicPlan 2024)

1.4.4 Aboriginal cultural heritage sensitivity

The Maroondah Water Supply System (Upper and Central Sections) is not included within an area of Aboriginal cultural heritage sensitivity.

1.5 Non-statutory heritage controls

1.5.1 National Trust of Australia (Victoria)

Maroondah Water Supply System (Upper and Central Sections) is not classified by the National Trust.

1.6 Methodology

This report follows the *Heritage Victoria Guidelines for preparing heritage impact statements* (June 2021) and the template provided in the same document for the development of heritage impact statements.

A site inspection was completed by GML consultants Mark Huntersmith and Freya Keam on 3 August 2023.

The following relevant documents and databases were reviewed in the preparation of this advice:

- Eltham-Yarra Glen Rd Bridge Strengthening Design Report, prepared for the Department of Transport and Planning by Hatch, 10 April 2024 (Appendix A)
- Eltham-Yarra Glen Rd Bridge Structure Strengthening Option prepared for the Department of Transport and Planning by Hatch, 9 April 2024 (Appendix B)
- VHR citation, Maroondah Water Supply System (Upper and Central Sections), H2381
- Heritage Council Determination for Place *Maroondah Water Supply System (Upper and Central Sections),* 2017
- Maroondah Water Supply System, Conservation Management Plan (CMP) Volumes 1–5, prepared by Context Pty Ltd, February 2011
- Maroondah Aqueduct Cultural Heritage Assessment, prepared by Tardis Enterprises Pty Ltd, October 2005
- *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance, 2013*.

1.7 Author identification

This report was prepared by Freya Keam (Senior Consultant) and reviewed by Mark Huntersmith (Senior Consultant).

2 Historical context

2.1 Maroondah Water Supply System (Upper and Central Sections)

An excerpt from the VHR citation for H2381, summarising the history of the Maroondah Water Supply System (Upper and Central Sections), is reproduced below:

> The Maroondah Water Supply System was operational from 1891 and is Melbourne's second large scale water supply system. The system was built because the Yan Yean Water Supply System constructed in 1853 (VHR H2333) was no longer able to serve the growing population of Melbourne and the water quality was poor. During the early 1870s, the Watts River and its tributaries were surveyed and considered suitable for either a diversion weir or reservoir. The Watts River catchment was gazetted in 1886 and construction began on what was originally known as the Watts River System in the same year. The Watts River System comprised a weir on the Watts River east of Healesville and an aqueduct with open channels, tunnels and pipes which joined with the Yan Yean system at Junction Basin, Preston. Originally known as the 'Watts River Scheme' it was renamed the Maroondah Water Supply System when it was officially opened by the Governor of Victoria, the Earl of Hopetoun, in 1891. Water supply was increased with additional weirs and aqueducts in 1893, and again in 1909. The second stage of the scheme was completed in 1927, with the construction of the Maroondah dam and reservoir. Each stage incorporated picnic areas for the enjoyment of visitors, culminating with the construction of the Maroondah Reservoir Park in 1927. The upper section of the Maroondah Water Supply System remains operational, while the central section of the aqueduct was entirely decommissioned in the mid 2000s but remains intact.

2.2 Road bridges

The Maroondah Water Supply System CMP Volume 3a: Assessment of Significance, provides further historical context regarding the construction of road bridges along the Maroondah Water Supply System. The relevant excerpt is reproduced below:

> Twenty bridges are positioned along the length of the aqueduct on public roads, and to provide local access for abutting landowners and maintenance crews. The Tardis Enterprises assessment (2005) recorded ten different bridge designs, of which the majority take the form of a simple vaulted arch constructed in brick or concrete with side walls in the same material. These are surmounted by solid brick walls or brick or concrete pillars joined by steel rails, to some of which corrugated metal splash guards were added during the 1940s (Context 2011, Vol 3a: 18).

These bridges were built between 1886 and 1891, during the construction of the Maroondah Aqueduct (Context 2011, Vol 5: 45).

Furthermore, the report notes that the section of the system between Maroondah Reservoir to Yering Gorge—included in the VHR extent of registration—contains 17 of the bridges crossing the aqueduct, as well as 'some of the longest and most attractive sections of the open aqueduct' (Context 2011, Vol 3a: 21).

3 Heritage significance

3.1 Victorian Heritage Register

The VHR statement of significance for H2381, articulating the heritage significance of the Maroondah Water Supply System (Upper and Central Sections), is reproduced below:

What is significant

The Maroondah Water Supply System including but not limited to the Watts River catchment, the location of the former township of Fernshaw, including oak and redwood trees, the Maroondah dam and reservoir, outlet tower, two valve houses, caretakers cottage, caretakers huts, weirs and their associated picnic areas, aqueduct, tunnels, siphons, pipes, drains and scours from the south western edge of the Yarra Ranges to Diamond Creek, Junction Basin at Preston and the Plenty River Pipe Bridge at Greensborough. It also includes Maroondah Reservoir Park comprising roads and paths, two rotundas, fences and gates and extensive tree planting and gardens.

How is it significant

The Maroondah Water Supply System is of historical significance to the State of Victoria. It satisfies the following criteria for inclusion in the Victorian Heritage Register:

Criterion A: Importance to the course, or pattern, of Victoria's cultural history.

Criterion B: Possession of uncommon, rare or endangered aspects of Victoria's cultural history.

Criterion D: Importance in demonstrating the principal characteristics of a class of cultural places and objects.

Criterion H: Special association with the life or works of a person, or group of persons, of importance in Victoria's history.

Why is it significant

The Maroondah Water Supply System is significant at the State level for the following reasons:

The Maroondah Water Supply System is historically significant as one of Victoria's earliest major infrastructure projects which contributed to the continued growth and development of Melbourne and continues to provide water to Melbourne via the Sugarloaf Reservoir. The first stage of the Maroondah Water Supply System was constructed between 1886 and 1891 after it became apparent that the Yan Yean Water Supply System (VHR H2333) could no longer meet demand. The Maroondah Water Supply System harvested water from the Watts River catchment which was gazetted in 1886 as a closed catchment which ensured water purity and the reduction of water borne diseases such as typhoid. The catchment is an early example of compulsory land acquisition and required the removal of the entire township of Fernshaw. The picturesque design of the functional elements of the

system, and the landscaping of the Maroondah Reservoir Park demonstrates the Melbourne and Metropolitan Board of Works (MMBW) policy of creating large infrastructure systems which were also places of beauty and recreational activity. The Maroondah Reservoir Park contains many mature trees from the 1928 design by Hugh Linaker. [Criterion A]

The Watts River Catchment associated with the Maroondah Water Supply System is rare in Victoria, and in Australia. It comprises 43,300 acres of bushland which was gazetted in 1886 and closed to all activity except water catchment. It represents an early and uncommon example of the compulsory acquisition of land for sanitary reasons. [Criterion B]

The Maroondah Water Supply System has a clear association with the process of water supply and demonstrates the principal characteristics of the class of place 'water supply systems', including the dam, reservoir, weirs, the various components of the aqueduct, and associated recreational areas. The Maroondah Water Supply System is a notable example of the class of 'water supply systems' and displays most if not all of the principal characteristics of such a system. The plantings and hard landscaping created from 1927 as the Maroondah Reservoir Park, as well as the valve houses, outlet tower and dam wall balustrading are a fine example of the MMBW's philosophy of combining functionality with beauty. [Criterion D]

The Maroondah Water Supply System has a clear association with William Davidson, Inspector General of Public Works and Chief Engineer of the Melbourne Water Supply who was responsible for the design and construction of the system and for the establishment of the Watts River catchment in the late nineteenth century. He was important to Victoria's history through his role in shaping Victoria's infrastructure in the late nineteenth and early twentieth century. [Criterion H]

The Maroondah Water Supply System also has a clear association with Hugh Linaker who designed numerous gardens and parks throughout Victoria. The Maroondah Reservoir Park was designed by Linaker and is a good example of his ability to use contrasting combinations of species and growth patterns to create a cohesive setting. It is one of the most intact surviving examples of his work in Victoria. [Criterion H]

3.2 Conservation Management Plan

While the statement of significance for H2381 does not explicitly reference infrastructure elements such as bridges, General Permit Condition 3 for H2381 notes that 'all works should ideally be informed by Conservation Management Plans prepared for the place' (Victorian Heritage Database 2018).

The Maroondah Water Supply System CMP Volume 3a: Assessment of Significance provides guidance on significant elements within the system—and assessed the bridges to be of **aesthetic significance**. The relevant excerpt is reproduced below:

> The built structures of the Maroondah system and related elements, **such as the many bridges**, are now a distinctive element in the cultural landscape along the length of the system from Healesville to Preston (Context 2011, Vol 3a: 49). [GML's emphasis]

The Maroondah Water Supply System CMP Volume 3a: Assessment of Significance determined that the bridges within the system are of **primary significance**. The relevant excerpt is reproduced below:

> **Primary significance**
>
> These are features and attributes that are integral to the significance of the place. They include elements that provide important evidence of its historical development and are directly associated with the key historic period of development and use from the commencement of construction in 1886 until 1927 when the Maroondah Reservoir was created. It includes features that are still in use as well as decommissioned items and archaeological sites.
>
> The elements of primary significance are those that are associated with:
>
> - The initial construction of the Watts River system which was opened in 1891, at which point it was renamed 'Maroondah', including:
>   - The Maroondah Weir, which survives despite having been submerged on creation of the later Maroondah Reservoir, and any surviving remnant of the 50" pipeline which connected it to the Maroondah Aqueduct;
>   - All surviving fabric of the original Maroondah Aqueduct channel from Echo Tunnel to Junction Basin, Cheddar Road West, which originally comprised 41kms of open channels, 12 tunnels (totalling 10kms) and 15kms of wrought iron siphons, including all contemporary engineering such as basins, scours and drains.
>   - (The pipe main from Junction Basin to Preston Reservoir, together with both of the latter, have already been included in the Yan Yean CMP (Context 2007) in which they were rated as of primary significance. This would also be the case in relation to the Maroondah system);
>   - The Graceburn Weir, relieving weir and Aqueduct, together with any surviving remnants of the wrought iron 18" Graceburn Siphon which crossed the Watts River valley to join the pipeline from the Maroondah Weir;
>   - **All surviving infrastructure associated with the original aqueduct, including surviving bridges, especially the pipe bridge across the Plenty River, and caretaker's huts; and**
>   - Archaeological sites associated with the above developments such as work camps (Context 2011, Vol 3a: 60-61). [GML's emphasis]

The Heritage Council of Victoria's *Conservation Management Plans: Managing Heritage Places, June 2010* provides the following guidance regarding heritage significance and the application of conservation management plans:

> A CMP is the principal guiding document for the conservation and management of a heritage place. It is a tool that allows owners, managers and approval authorities to make sound decisions about heritage places.
>
> A CMP identifies the heritage values – or significance – of a place, the conservation policies to be applied to protect that significance in the face of change, and a strategy through which the policies will be put into action.

The CMP prepared by Context determined that these bridges were of aesthetic significance as distinctive built elements within the cultural landscape of the open aqueduct. This significance assessment should form the basis for managing change for the Eltham-Yarra Glen Road bridge.

4 Existing condition

4.1 Site description

The subject site is the Eltham-Yarra Glen Road bridge, located approximately 2 kilometres west of Yarra Glen's town centre.

The bridge spans the Maroondah Aqueduct. Melbourne Water's Yarra Glen Treatment Plant is located immediately north of the bridge. The surrounding setting is predominantly Green Wedge Zone.

The bridge is approximately 9.5 metres long and 7.5 metres wide. It is of brick construction, featuring a prominent projecting band of contrasting brickwork along each side. It has a simple vaulted arch form with four pillars topped with pyramidal cement caps. It is aligned approximately east-west.

The roadway carries two lanes and is sealed with asphalt. Armco barriers line the entry to the bridge at each end.

Below, Figure 4.1 to Figure 4.8 show the condition of the bridge at the time of GML's site inspection on 3 August 2023.

Figure 4.1 Eastern approach to the Eltham-Yarra Glen Road bridge. (Source: GML August 2023)

Figure 4.2 Northern side of the bridge, showing its simple vaulted arch form. (Source: GML August 2023)

Figure 4.3 Northern side of the bridge. (Source: GML August 2023)

Figure 4.4 View of the northern side of the bridge from a footbridge over the Maroondah Aqueduct. (Source: GML August 2023)

Figure 4.5 View of the northern side of the bridge. (Source: GML August 2023)

Figure 4.6 View of Maroondah Aqueduct looking north. (Source: GML August 2023)

Figure 4.7 Western approach to the Eltham-Yarra Glen Road bridge. (Source: GML August 2023)

Figure 4.8 View of the southern side of the bridge. (Source: GML August 2023)

4.2 Constraints and opportunities resulting from the significance of the place

The following provides an overview of the constraints and opportunities arising from the significance of the place, informed by Section 2 and 3 of this HIS, including the need to:

- retain all elements associated with the process of water supply which demonstrate the principal characteristics of the place, including the dam, reservoir, weirs, the various components of the aqueduct, and associated recreational areas;
- retain the related elements of the Maroondah Water Supply System, including the many road bridges, which are a distinctive element in the landscape and contribute to the aesthetic significance of the place; and
- maintain the setting of the open aqueduct.

Consideration of these factors has directly informed the proposed works outlined in Section 5.

5 Proposal

DTP engaged Hatch (Consultant Engineers) to undertake an engineering inspection and load rating assessment of the Eltham-Yarra Glen Road bridge.

The load rating assessment identified the need for strengthening of the bridge in order to satisfy the current Australian standard loading requirements for both existing and future road vehicles.

5.1 Outline of works

This section of the report describes the proposed bridge strengthening works. It is based on review of the following documents:

- Eltham-Yarra Glen Rd Bridge Strengthening Design Report prepared for the Department of Transport and Planning by Hatch (10 April 2024) (Appendix A).
- Eltham-Yarra Glen Rd Bridge Structure Strengthening Option prepared for the Department of Transport and Planning by Hatch (9 April 2024) (Appendix B).
- H372089-STR01-230-251 (Rev C) Structural drawings prepared by HATCH dated 26/06/2024
- H372089-STR-DRG-001 to 004 (rev A) Eltham Yarra-Glen Defect Repairs Sketches prepared by HATCH dated 18/06/2024

Broadly, the proposed works involves strengthening/rehabilitation of the bridge by way of:

- The installation of four bored piles of 600mm diameter. The piles will be a minimum of 10m long and will have a steel casing around them for the top 2m length (Figure 5.1 Extract of Drawing number H372089-STR01-230-251-1006. (Source: Hatch 2024)
  Refer structural drawings H372089-STR01-230-251

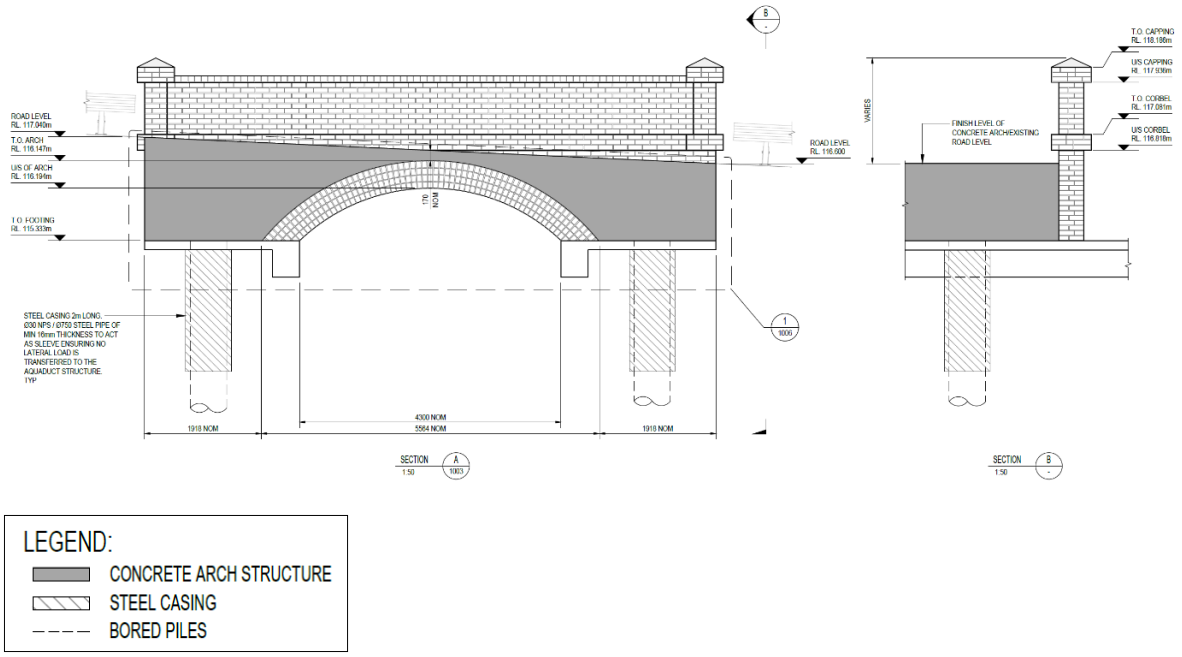

Figure 5.1 Extract of Drawing number H372089-STR01-230-251-1006. (Source: Hatch 2024)

- Removing the existing road fill and pavement that sits over the top of the existing brick arch of the bridge, and casting a new reinforced concrete arch on top of the exposed brick arch (in situ) and a reinforced concrete deck spanning the width of the existing bridge. (Figure 5.1)
  - The new arch structure is approximately 1.7m deep on one side and 1.3m deep at the other with a thickness of 150mm at the crown. The arch structure is reinforced with grade 500 N bars.
  - This approach is known as 'Saddling'.
- Refer structural drawings H372089-STR01-230-251 SeriesUpon completion of all works the road and pavement will be reinstated with no change proposed to the existing appearance of the bridge.

During the works the following will need to occur:

- Removal of the four existing safety barriers attached to the extent of the bridge, these will be reinstated at the completion of the works.

Figure 5.2 Location of four existing safety barriers to be removed during construction (Source: DTP)

Figure 5.3 Existing safety barriers to be removed during construction (south side) (source: DTP)

Figure 5.4 Existing safety barriers to be removed during construction (north side) (source: DTP)

- Construction and installation of a temporary supporting structure beneath the bridge during construction. Temporary works are based on the constructor's work method and will be provided during preconstruction. Temporary supports will be removed, and locations of fixing will be reinstated. All temporary works will be beneath the arch bridge and out of sight.

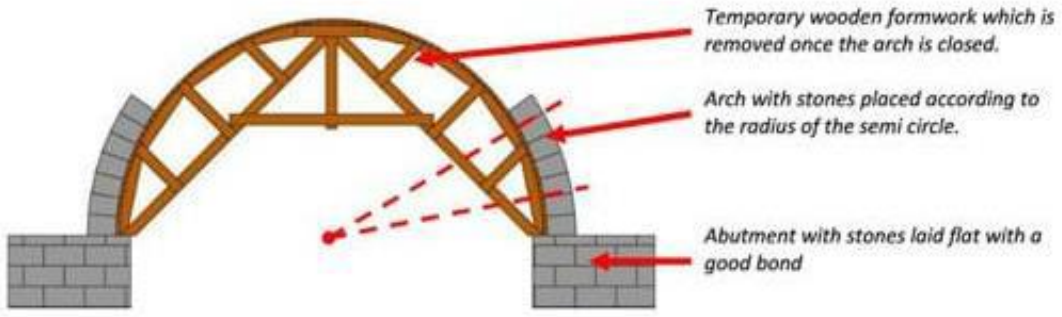

Figure 5.5 Indicative temporary support system to be constructed and installed to support bridge during construction phase

Following completion of the above rehabilitation works to the bridge conservation works (defect repair works) will be undertaken. These will include crack injection, concrete patch repairing, and mortar repointing as required.

Refer H372089-STR-DRG-001 to 004 Eltham Yarra-Glen Defect Repairs Sketches

5.2 Indicative construction methodology

Hatch identified the following construction considerations for the proposed works, which are reproduced below (with GML editorial amendments):

Stage 1—Pile Casting

1. Construct piles P1 to P4
2. Piles to be constructed one at a time to avoid full closure of the Structure for traffic movement
3. At a pile location
   - Install the steel casing
   - Make a bore for the pile to required depth in the presence of a suitably qualified geotechnical engineer
   - Install pile reinforcement
   - Cast pile
4. Either backfill or cover the pile location with temporary road plates

Stage 2—Backfill Removal

1. Remove the existing backfill from top of the existing arch structure
2. Install pile embedment bars above the existing concrete foundation using couplers
3. Confirm a minimum thickness of 150mm is available at crown of the arch for the new structure

Stage 3—Casting of concrete arch structure

1. Install reinforcement for new arch structure
2. Pour concrete in maximum 500mm LIFTS. A construction method statement shall be provided by the contractor for pouring and handling mass concrete to achieve a durable concrete structure.
3. If sufficient depth is available over the arch crown, construct asphalt layer.

Note: During construction the four existing safety barriers will need to be removed and a temporary supporting structure installed under the bridge (refer Section 5.1 above)

5.3 Options considered

5.3.1 Design options

In preparing the bridge strengthening design, Hatch investigated **four** design options.

These were informed by a number of identified site constraints, which are reproduced below (with GML editorial amendments):

- The bridge had a longitudinal slope from the west end towards its east end. This slope and road level needs to be maintained.
- The depth of the fill over the arch of the bridge was assessed to be 170mm max. Hence, there is a limitation to the depth that could be provided for the strengthening over the crown.
- **The existing masonry arch structure is a heritage listed structure. Its visual modification, removal or replacement is not possible**. [GML emphasis added]
- The bridge structure is located over a Melbourne water aqueduct and any strengthening works need to ensure that the MW asset does not get affected in any way.
- The bridge is on the main Yarra Glen Road and has a traffic volume of approx. 3000 vehicles per day. Hence the solution needs to ensure minimum disruption to traffic.

A summary of the four design options outlined by Hatch is reproduced below:

1. Replacing the existing fill with treated cementitious material and repairing the defects of the existing masonry arch structure. The main idea of this option was to ensure the

presence of good fill material that would spread the load better and would result in lesser stress on the arch. This option was discarded as our load rating assessment indicated the critical failure section to be close to the crown. The effect of fill in spreading the live load was thus not a critical criterion contributing to the failure.

2. Removing the existing fill and constructing a steel arch structure on top of the existing masonry arch. The option was discarded because of requiring steel sections deeper than 150mm over the crown of the existing arch. Additionally, the structure was requiring a slab on top for composite action at the section over the existing arch crown, which was resulting in a very significant increase in the height of the road level making the option an expensive and undesirable one. The steel structure was to be supported on piles acting independent of the existing structure.
3. Removing the existing fill and using precast planks to make new structure spanning over the existing masonry. This option was again discarded as it was requiring min 500mm deep prestressed planks requiring raising the road level significantly.
4. Removing the existing fill and casting a concrete arch on top of the existing masonry arch. The masonry arch will act as permanent formwork for casting of the concrete arch structure supported on piles. The new structure would not be connected to the masonry arch and would not act compositely with it. The existing masonry arch has been confirmed to have lime as mortar and thus has a very low shear strength. The option was thus investigated independent of the masonry arch.

Option 4 was identified as the most feasible design approach, considering the above constraints. This approach was considered to have minimal visual impact on the existing bridge, and ensure no lateral impacts on the below Maroondah Aqueduct.

5.3.2 Precasting concrete

The option of precasting the concrete into segments was explored. The manufacturer advised, however, that due to the non-standard size of the new arch, transportation to the site would be very challenging. As such, it is proposed to cast the new arch structure in situ.

6 Assessment against the Heritage Act

6.1 Impact of the proposal on the cultural heritage significance of the place

6.1.1 New concrete arch

It is proposed to remove the existing road fill and cast a new reinforced concrete arch on top of the existing brick arch. This work is required to support the strengthening and load capacity of the existing bridge.

As outlined in Section 3 (Heritage significance), the road bridges contribute strongly to the aesthetic significance of the Maroondah Water Supply System and are a distinctive built element within the cultural landscape along the length of the system from Healesville to Preston.

It is evident that a thorough analysis of possible strengthening design options has been undertaken to inform the proposed works. An option has been selected which will have the least impact on the existing bridge, as well as the Maroondah Aqueduct—both an active Melbourne Water asset, and a place of State level heritage significance. All care is to be taken during the construction of the concrete arch including the installation of a temporary supporting structure beneath the bridge (refer section 5.1)

The new concrete arch is considered to be a minor built intervention which will not change the visual appearance of the structure. According to Hatch, the 'work is invisible once completed' (Hatch 2024: 13).

The new concrete arch is therefore not considered to have an adverse impact on the aesthetic significance of the Maroondah Water Supply System and the proposed works are acceptable from a heritage perspective.

Hatch recommends that a qualified engineer should be present onsite to supervise the works and ensure compliance with the approved construction method. GML considers this appropriate and sufficient to manage any unforeseen impacts to the Maroondah Aqueduct during the construction phase.

6.1.2 Installation of bored piles

It is proposed to install four bored piles, which are required to support the concrete arch structure.

The piles serve a structural purpose, and like the new concrete arch, will not change the visual appearance of the structure.

It is noted that the proposed works were selected because no lateral load effects will be transferred from the piles to the Maroondah Aqueduct.

The boring of the piles is not considered to have an adverse impact on the Maroondah Aqueduct. Hatch recommends that a qualified geotechnical engineer should be present onsite to supervise the works and ensure compliance with the approved construction method. GML considers this appropriate and sufficient to manage any unforeseen impacts to the Maroondah Aqueduct during the construction phase.

The bored piles are therefore not considered to have an adverse impact on the significance of the Maroondah Water Supply System and the proposed works are acceptable from a heritage perspective.

6.1.3 Conservation works

Following completion of the above rehabilitation works conservation works (defect repair works) will be undertaken. These will include crack injection, concrete patch repairing, and mortar repointing as required (refer H372089-STR-DRG-001 to 004 Eltham Yarra-Glen Defect Repairs Sketches). These works constitute a positive heritage outcome as they will improve the aesthetic appearance of the bridge enhancing the contribution the bridge makes to the Maroondah Water Supply System as a notable example of a 'water supply systems'

6.2 Information to support an assessment against sections 101(2) and 101(3) of the Heritage Act 2017

Reasonable or economic use [101(2)(b)]

Under section 101(2)(b) of the *Heritage Act 2017* (Vic), the Executive Director of Heritage Victoria must consider the extent to which the reasonable use of the registered place or object would be affected by a refusal of a permit.

The Eltham-Yarra Glen Road bridge is understood to experience an average traffic volume of 3000 vehicles per day. The maintenance of the bridge is therefore essential to ensure a safe and functioning road. The proposed works do not propose excessive or inappropriate changes that will alter the understanding or appreciation of the historical or aesthetic significance of the place, and will ensure its ongoing use.

Effect on the ability of the public authority to perform a statutory duty [s101(2)(d)]

The proposed works align broadly with DTP's responsibilities under the *Road Management Act 2004* (Vic) to, wherever possible, establish a coordinated management system for public roads that promotes safe and efficient state and local public road networks and the responsible use of our roads.

7 Conclusion

In summary, the proposed works to the Eltham-Yarra Glen Road bridge over the Maroondah Aqueduct will not have an adverse heritage impact on H2381 Maroondah Water Supply System (Upper and Central Sections).

The proposed bridge strengthening works are considered to be routine maintenance works, which are required to ensure the ongoing function and safe use of the existing Eltham-Yarra Glen Road bridge. The proposed works will maintain the heritage significance of the Maroondah Water Supply System.

References

Context Pty Ltd 2011. Maroondah Water Supply System Conservation Management Plan Volume 3a: Assessment of Significance. Prepared for Melbourne Water.

Context Pty Ltd 2011. Maroondah Water Supply System Conservation Management Plan Volume 5: Heritage place and precinct citations. Prepared for Melbourne Water.

Hatch 2024a. Eltham-Yarra Glen Rd Bridge Strengthening Design Report. Prepared for the Department of Transport and Planning.

Hatch 2024b. Eltham-Yarra Glen Rd Bridge Structure Strengthening Option. Prepared for the Department of Transport and Planning by Hatch (9 April 2024) (Appendix B)

Victorian Heritage Database 2018. 'Maroondah Water Supply System (Upper and Central Sections)'. Accessed August 2023, https://vhd.heritagecouncil.vic.gov.au/places/197552.

8 Appendices

Appendix A: Eltham-Yarra Glen Rd Bridge Strengthening Design Report

Eltham-Yarra Glen Rd Bridge Strengthening Design Report, prepared for the Department of Transport and Planning by Hatch (10 April 2024).

Appendix B: Eltham-Yarra Glen Rd Bridge Structure Strengthening Option

Eltham-Yarra Glen Rd Bridge Structure Strengthening Option prepared for the Department of Transport and Planning by Hatch (9 April 2024).