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Appendix A

Legislation and policy

A.1 Planning and Environment Act 1987

The Victorian *Planning and Environment Act 1987* establishes a framework for planning the use, development and protection of land in Victoria. It sets out procedures for preparing and amending the Victoria Planning Provisions (VPPs), Municipal Planning Strategy and applying zones, overlays, particular and general provisions.

Section 6 (2)(e) of the Act enables Planning Schemes to 'regulate or prohibit any use or development in hazardous areas, or areas likely to become hazardous'. They contain policy and provisions relating to flood risk that need to be considered in any land use decisions.

A.1.1 VICTORIA PLANNING PROVISIONS

A.1.1.1 Clause 12.03-1S – River and riparian corridors, waterways, lakes, wetlands and billabongs

This Clause seeks to protect and enhance waterway systems, including river and riparian corridors, waterways, lakes, wetlands and billabongs. There are various strategies to achieve, but those relevant to this assessment are:

- Protect geomorphology, bank stability and flood management capacity to strengthen the environmental value and health of waterway systems by retaining, enhancing and re-establishing riparian vegetation and habitat
- Enhance a sense of place and landscape by protecting Aboriginal cultural heritage significance, vegetation and topographic features
- Retain and enhance the recreation and amenity values along waterway systems
- Design and site development to maintain and enhance the natural environment of waterway systems

Key policy guidance requires locating development a minimum of 30 metres from the banks of waterway systems and obtaining the views of floodplain and waterway managers.

A.1.1.2 Clause 13.03-1S – Floodplain management

This Clause seeks to assist the protection of life, property and community infrastructure from flood hazard (riverine or overland flows). It recognises that planning needs to assist in the protection of the natural flood carrying capacity of rivers, streams and floodways, as well as the flood storage function of land and floodplain, and areas of environmental significance in conjunction with Clause 13.03-1S. Key strategies include:

- Identifying the land affected by flooding
- Avoiding intensifying flooding
- Planning for cumulative impacts
- Locating sensitive land uses away from floodplains (emergency and community facilities).

A.1.1.3 Clause 19.03-3S – Integrated water management and Clause 53.18 – Stormwater management in urban development

This Clause seeks to ensure that stormwater generated from all forms of urban development is managed in an integrated way to reduce the impacts of stormwater runoff on the environment, property and public safety, and to provide cooling, local habitat and amenity benefits. It requires an integrated approach to the planning, design and assessment of new developments which brings the elements of the water cycle together, including sewage

management, water supply, stormwater management and water treatment, to maximise community and environmental benefits. The policy is implemented through Clause 53.18 – Stormwater management in urban development. This seeks to ensure that stormwater in urban development, including retention and reuse, is managed to reduce the impacts of stormwater on the environment, property and public safety, and to provide cooling, local habitat and amenity benefits.

Clause 53.18-5 – Stormwater management objectives for buildings and works (Standard W2) include:

- To encourage stormwater management that maximises the retention and reuse of stormwater.
- To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.
- To encourage stormwater management that contributes to cooling, local habitat improvements and provision of attractive and enjoyable spaces.
- To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.

Standard W2 also requires the design of a stormwater management system to meet the *Urban Stormwater–-Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999).

Clause 53.18-6 – Site management objectives (Standard W3) include:

- To protect drainage infrastructure and receiving waters from sedimentation and contamination
- To protect the site and surrounding area from environmental degradation prior to and during construction of subdivision works.

Standard W3 requires an application to describe how the site will be managed prior to and during the construction period.

The decision guidelines at Clause 53.18-7 guide the assessment of applications against the objectives.

A.1.1.4 Clause 55 – Two or more dwellings on a lot

Clause 55 applies to the construction or extension of two or more dwellings on a lot and residential buildings (of less than five storeys) within the Neighbourhood Residential Zone, General Residential Zone, Residential Growth Zone, Mixed Use Zone or Township Zone. The Clause includes objectives, standards and decision guidelines applying to the above-mentioned developments. A standard includes requirements to meet the objective and should be met. However, if a responsible authority is satisfied than an application for an alternative design solution meets the objective, the alternative design solution may be considered.

55.03-4 (Permeability and stormwater management objectives) seeks:

- To reduce the impact of increased stormwater run-off on the drainage system.
- To facilitate on-site stormwater infiltration.
- To encourage stormwater management that maximises the retention and reuse of stormwater.

Standard B9 identifies that the site area covered by pervious services should be at least the minimum area specified in the schedule to the zone or 20 per cent of the site (if no minimum area is specified in the Schedule to the applicable zone). Furthermore, this Clause states that the stormwater management system should:

- Meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999).

- Contribute to cooling, improving local habitat and providing attractive and enjoyable spaces.

Clause 55.07-5 (Integrated water and stormwater management) applies to apartment developments of four storeys or less (excluding a basement). Standard B39 identifies that buildings should be designed to collect rainwater for non-potable purposes and that buildings should be connected to a non-potable dual pipe reticulated water supply (where available from the water authority). Further, the stormwater management system should be:

- Designed to meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999).

- Designed to maximise infiltration of stormwater, water and drainage of residual flows into permeable surfaces, tree pits and treatment areas.

A.1.1.5 Clause 58 – Apartment developments

The provisions of Clause 58 apply to a planning application to construct or extend an apartment development, or construct or extend a dwelling that forms part of an apartment building if:

- The apartment development is five or more storeys (excluding basement) and is within the General Residential Zone, Residential Growth Zone, Mixed Use Zone or Township Zone

- The apartment development is within the Commercial 1 Zone, Commercial 3 Zone, Special Use Zone, Comprehensive Development Zone, Capital City Zone, Docklands Zone, Priority Development Zone or Activity Centre Zone.

Clause 58.03-8 (Integrated water and stormwater management) seeks:

- To encourage the use of alternative water sources such as rainwater, stormwater and recycled water

- To facilitate stormwater collection, utilisation and infiltration within the development

- To encourage development that reduces the impact of stormwater run-off on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.

Standard D13 outlines discretionary requirements, including:

Buildings should be designed to collect rainwater for non-drinking purposes such as flushing toilets, laundry appliances and garden use

Buildings should be connected to a non-potable dual pipe reticulated water supply, where available from the water authority.

Furthermore, this Standard states that any stormwater management system should be designed to meet the current best practice performance objectives for stormwater quality in accordance with the Urban Stormwater - Best Practice Environmental Management Guidelines and *designed to maximise infiltration of stormwater, water and drainage of residual flows into permeable surfaces, tree pits and treatment areas.*

A.1.1.6 Planning Practice Note 12 – Applying the flood provisions in Planning Schemes

Planning Practice Note 12: *Applying the flood provisions in planning schemes* provides guidance about applying the flood provisions in Planning Schemes including the preparation of policy, identifying land affected by flooding, preparing a local floodplain development plan and the application and operation of the flood provisions, including the preparation of schedules.

A.1.2 RELEVANT ZONES AND OVERLAYS

There are four types of flood provisions in the VPPs which are derived from the type of flooding and the potential risk to life and property. The level of planning control is commensurate with the flood risk, with the Urban Floodway Zone (UFZ) being the most restrictive, prohibiting use and development in areas where a high potential flood risk exists, with exceptions for recreation. The UFZ also includes application requirements which requires an assessment against the local floodplain development plan, or an accompanying flood risk report. The Floodway Overlay (FO), Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO) are used to identify the 1 % AEP event as well as the type of flooding. LSIO applies to fluvial flooding and SBO applied to pluvial flooding in urban areas only. There is no FO in the SRL East Structure Plan Areas. The application of flood provisions is detailed in *Planning Practice Note 12 – Applying the Flood Provisions in Planning Schemes* (DELWP 2015).

A permit is required to construct or carry out any works in an area covered by any of these overlays. All permits in such overlay must be referred to the relevant floodplain management authority, which for the SRL East Structure Plan Areas is Melbourne Water. Melbourne Water are a determining referral authority under Section 55 of the *Planning and Environment Act 1987*. Melbourne Water, as the floodplain management authority, assess applications on best available information in line with the Guidelines for Development in Flood Affected Areas (DELWP 2019).

A.2 Flood Management Strategy for Port Phillip and Westernport 2021–2031

The Flood Management Strategy has been prepared by all organisations with flood management responsibilities, including the Victorian Government, local governments, water authorities, and emergency services. Flooding in the region is rapidly changing, and the Flood Management Strategy reflects a commitment to increase community resilience and a holistic approach to integrated water management. It is a 10-year Strategy to enhance the flood resilience of the region, providing a greater emphasis on managing climate change.

The Flood Management Strategy is one part of a framework of legislation, policies and strategies that aim to reduce the risk posed by flooding, including to community safety. It will never be possible to entirely remove flood risk from our region, but we can work together to better manage it into the future.

The vision of the Flood Management Strategy is: *together we are aware, responsive and resilient. Communities, business and government understand flooding, plan collaboratively for challenges and take action to manage risks and optimise opportunities, for now and the future.*

The three key objectives to achieve this vision are:

1. The right information is available at the right time to the people who need it.

2. Flood risks and opportunities are managed to reduce impacts and get the best social, economic and environmental outcomes.

3. Land, water and emergency agencies work together to manage flooding effectively.

A.3 Healthy Waterways Strategy

The Healthy Waterways Strategy (Melbourne Water, 2018) is the overarching planning document (driven by a single regional 50-year vision) for the management of rivers, wetlands and estuaries in the Port Phillip and Westernport region aiming to ensure their value to the community is protected and improved, taking a 50-year outlook. The strategy is a reference document under Clause 12.03 – Water bodies and wetlands.

The Strategy provides an understanding of the existing conditions to overall health of waterways within the SRL East Structure Plan Areas.

The SRL East Structure Plan Areas are not located within the Stormwater or Vegetation priority Healthy Waterway Strategy 2018 areas as identified by Melbourne Water.

A.4 Integrated Water Management Framework for Victoria

The Integrated Water Management (IWM) Framework for Victoria (DELWP 2017) provides guidance for government, the water sector, and the community to work together to better plan and deliver solutions for water management across Victoria's towns and cities. Flooding is one element of the water cycle and IWM moves to a wholistic view of the issues and opportunities for flooding and water management. It provides the opportunity to reduce flooding, helping to maintain amenity, defer upgrades in the drainage network and reduce insurance liabilities through place-based outcomes.

The IWM Framework supports the establishment of IWM Forums in each water catchment region to coordinate delivery of IWM. The Forums have been successful in their collaboration between agencies to lead, plan and deliver on IWM projects throughout the metropolitan region. All organisations with a water management responsibility (Melbourne Water, South East Water, Yarra Valley Water, local governments) are Forum members. SRLA is not a Forum member.

SRL East Structure Plan Areas are located in the Dandenong and the Yarra water catchments. The catchment-scale IWM Plans drive an integrated approach to water management that deliver clear outcomes for each catchment. The Strategic Directions Statement released for each catchment in September 2018 includes targets and projects that were collaboratively developed by the IWM Forum to bring local community views, values, and priorities into practice. The structure plan objectives strongly align with the IWM targets.

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Appendix B

SES flood maps

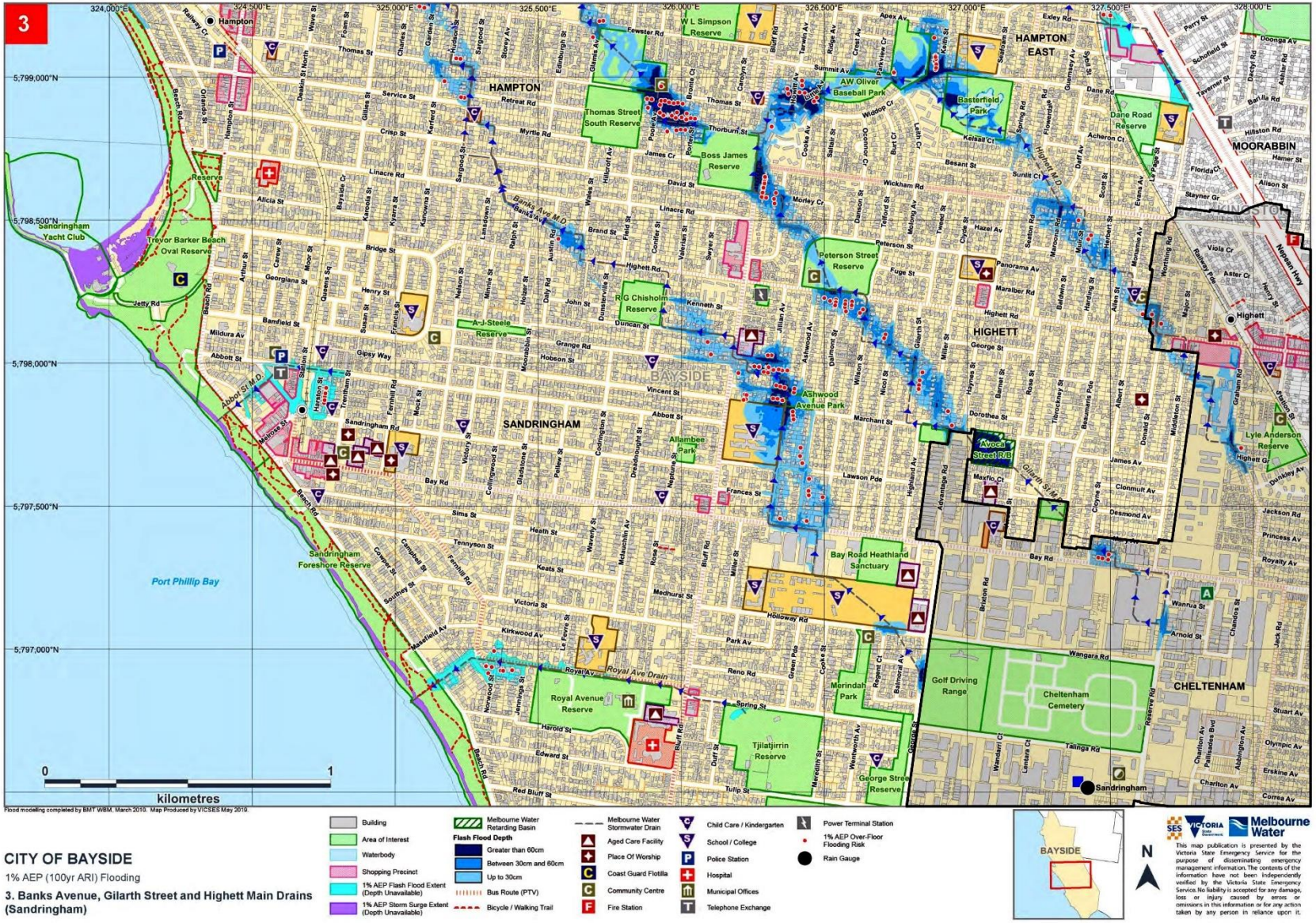

FIGURE B-1 BANKS, GILARTH AND HIGHETT MAIN DRAIN 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF BAYSIDE FLOOD EMERGENCY PLAN (SES 2019))

Flood Extent Maps (sourced Melbourne Water GIS)

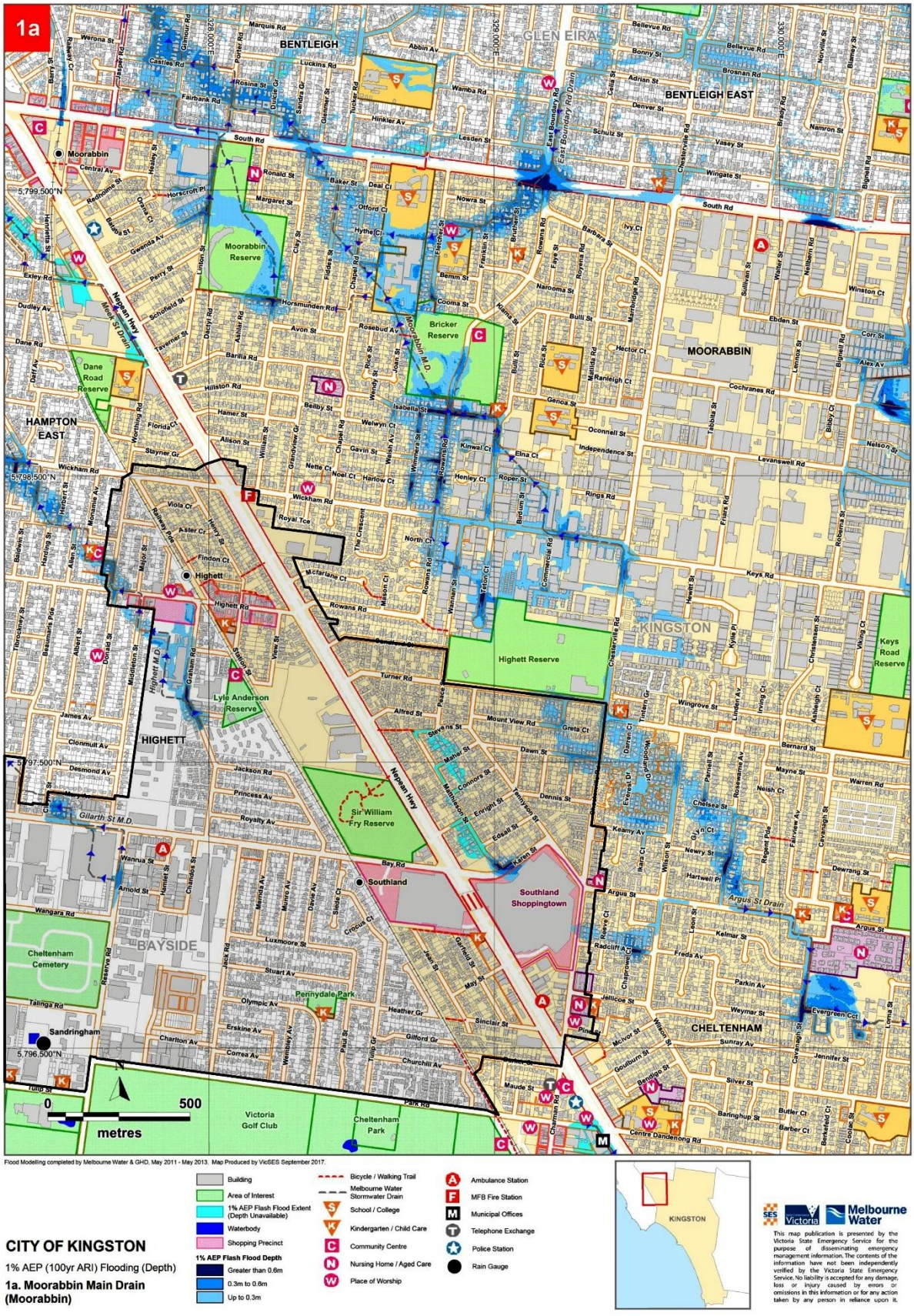

FIGURE B-2 MOORABBIN MAIN DRAIN 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF KINGSTON FLOOD EMERGENCY PLAN (SES, 2017)))

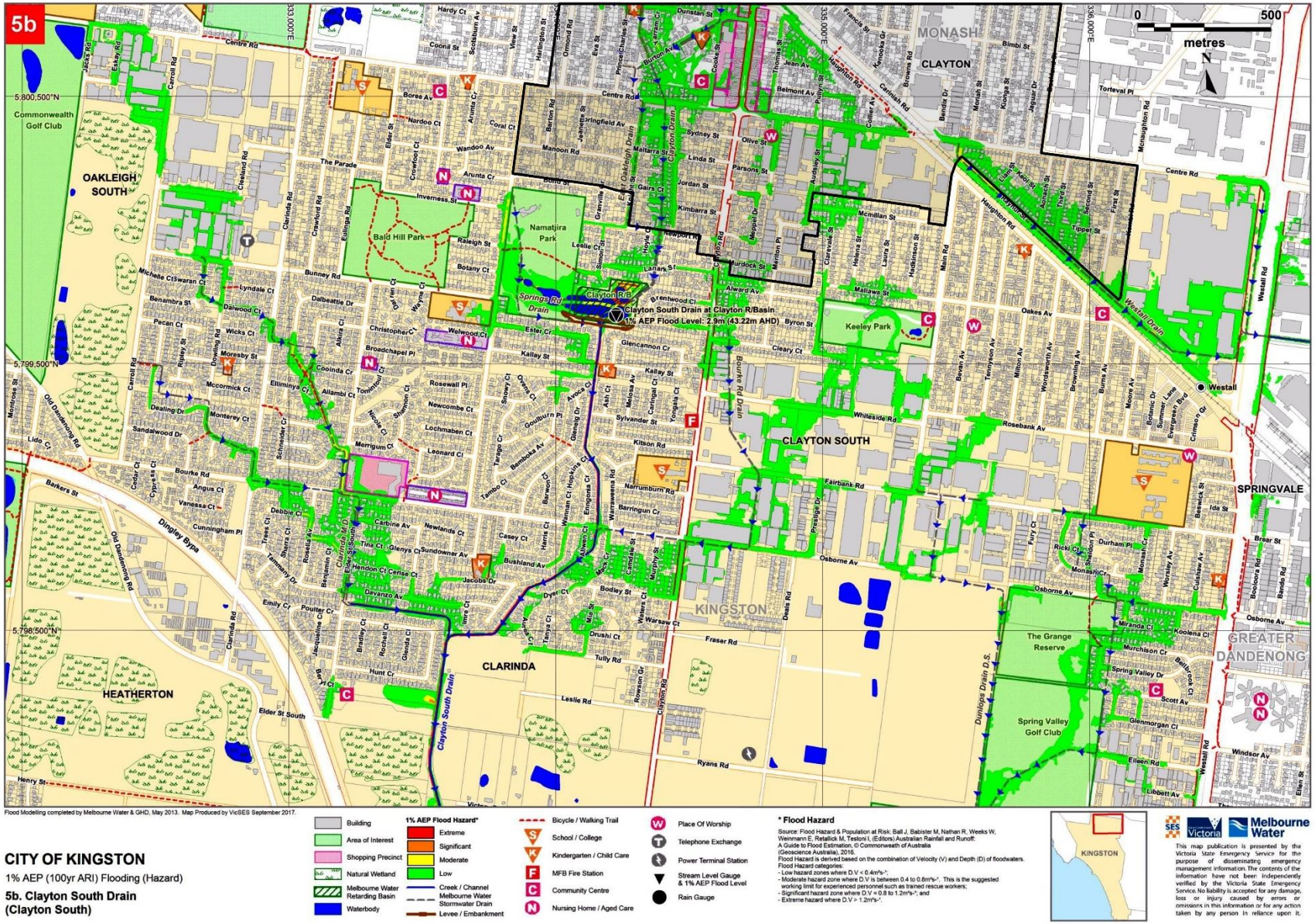

FIGURE B-3 CLAYTON SOUTH DRAIN HAZARD MAP FOR THE 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF KINGSTON FLOOD EMERGENCY PLAN (SES, 2017))

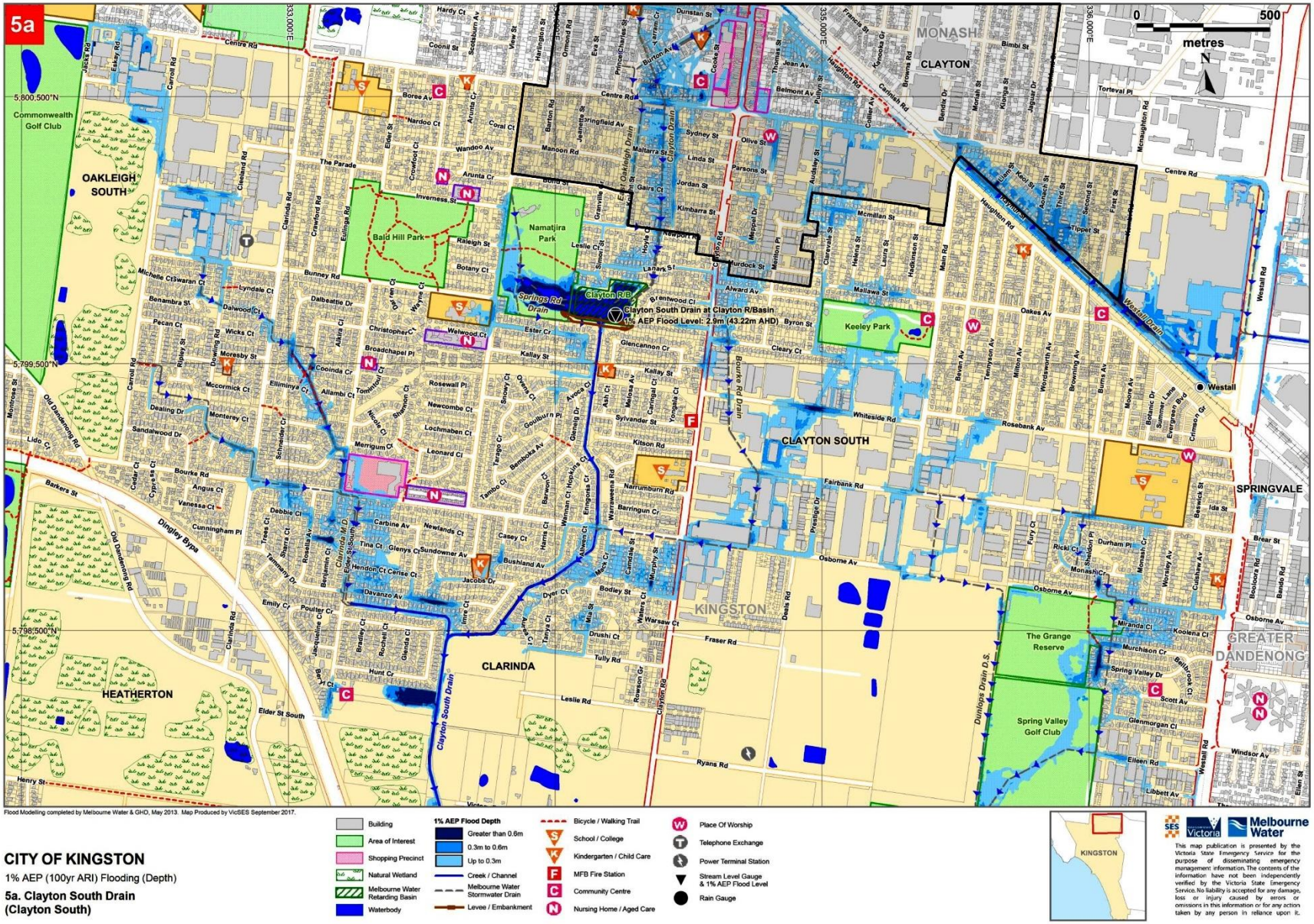

FIGURE B-4 CLAYTON SOUTH DRAIN 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF KINGSTON FLOOD EMERGENCY PLAN (SES, 2017))

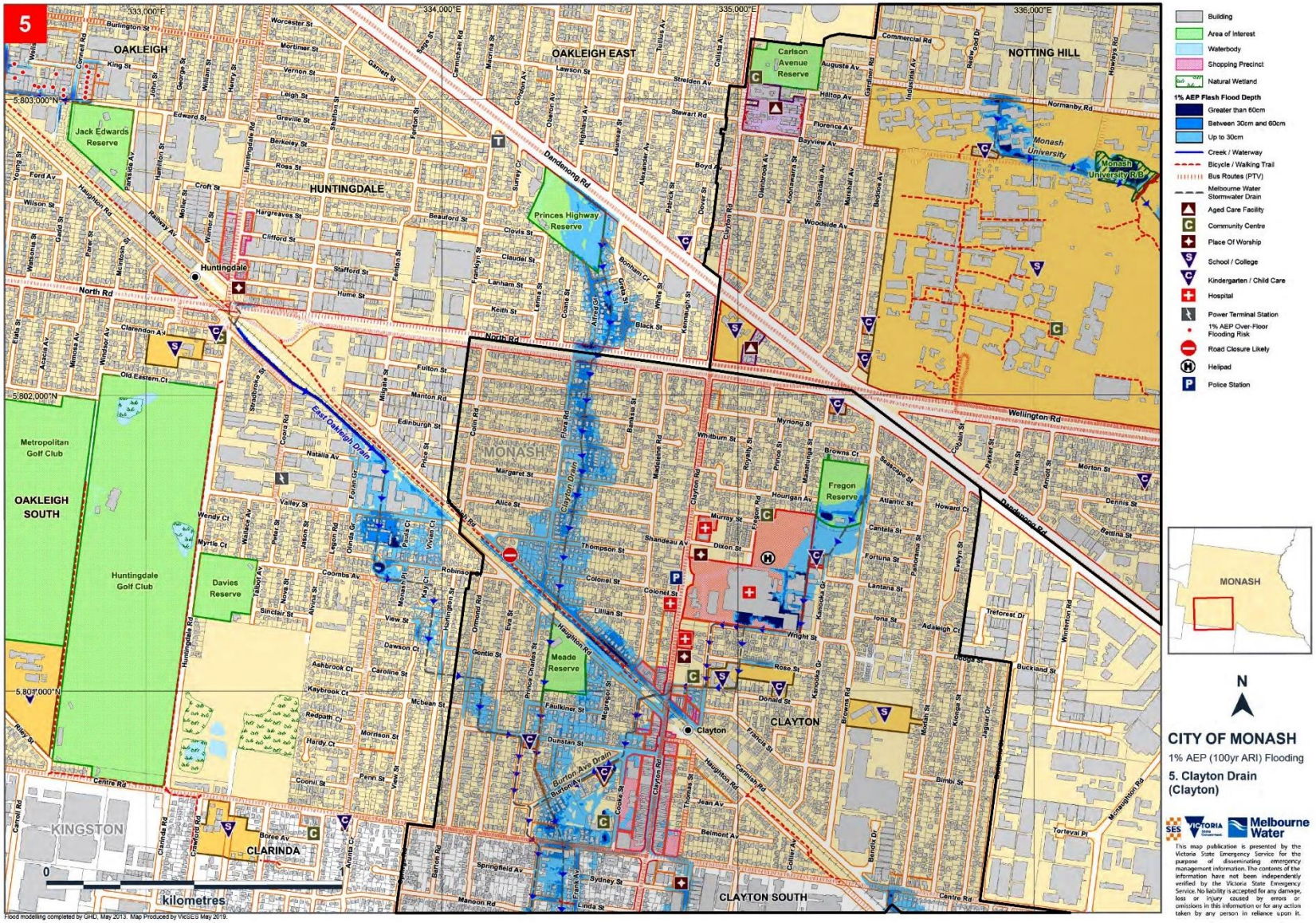

FIGURE B.5 CLAYTON DRAIN 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF KINGSTON FLOOD EMERGENCY PLAN (SES, 2019))

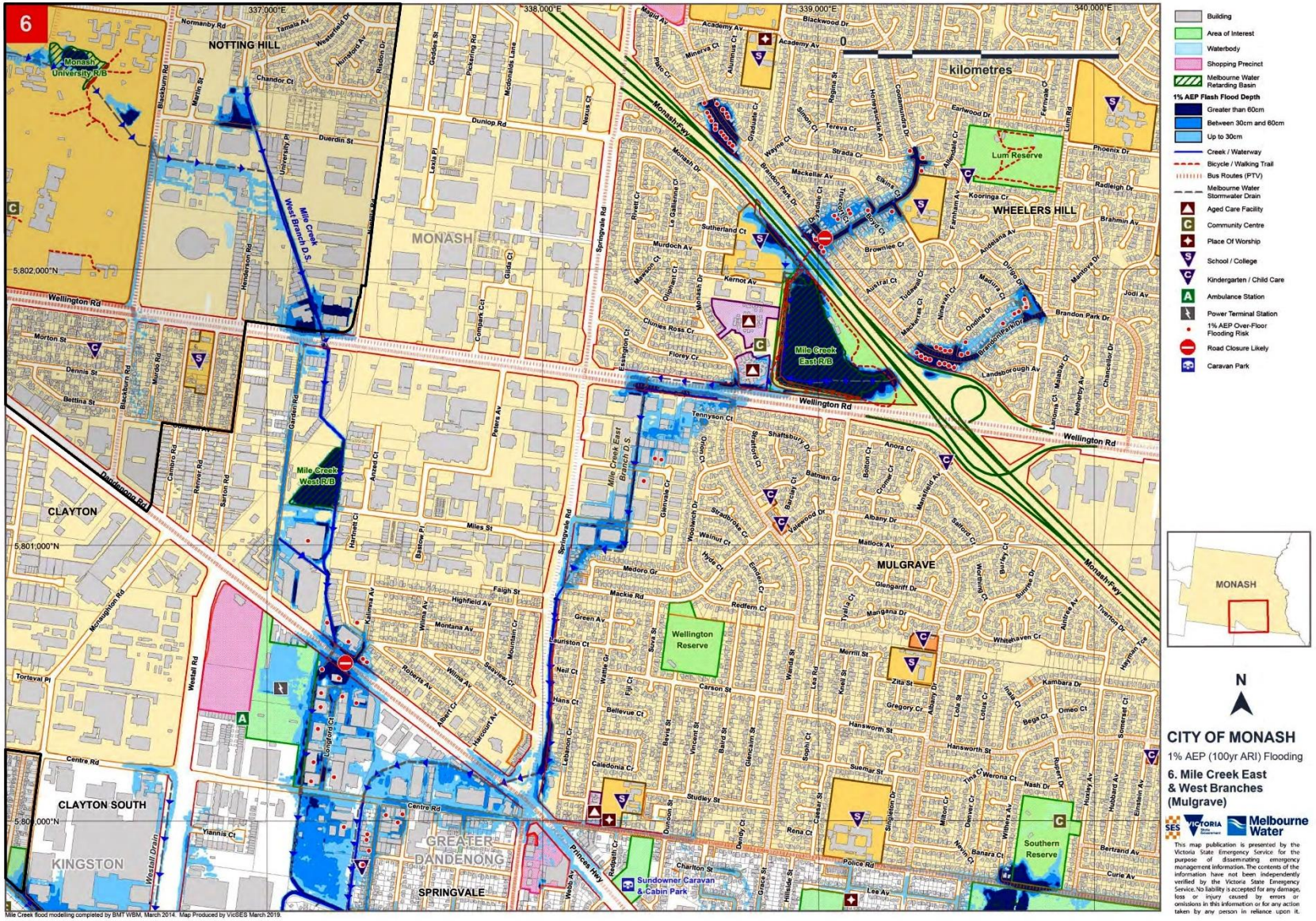

FIGURE B-6 MILE CREEK 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF MONASH FLOOD EMERGENCY PLAN (SES, 2019B))

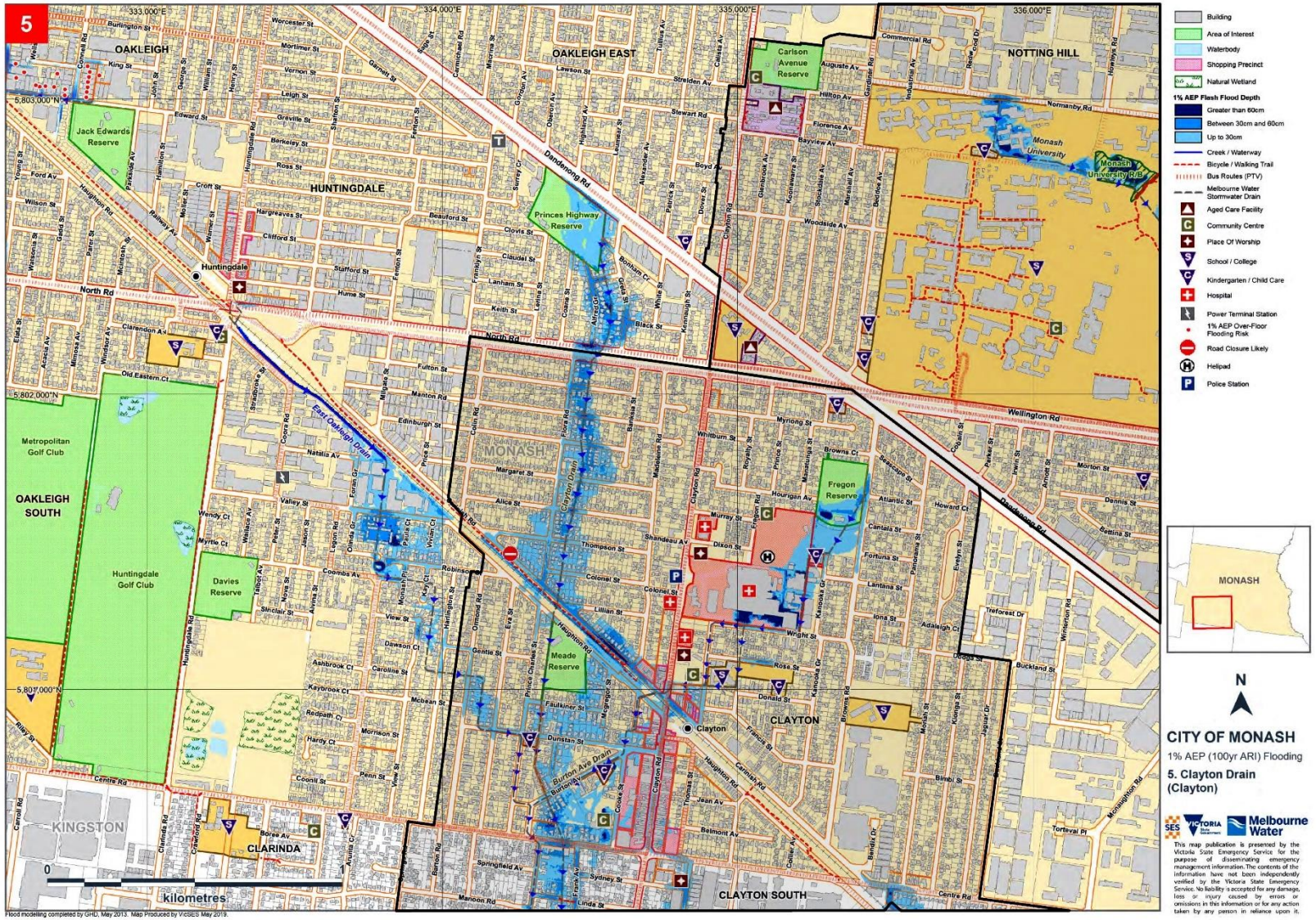

FIGURE B-7 CLAYTON DRAIN 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF MONASH FLOOD EMERGENCY PLAN (SES, 2019B))

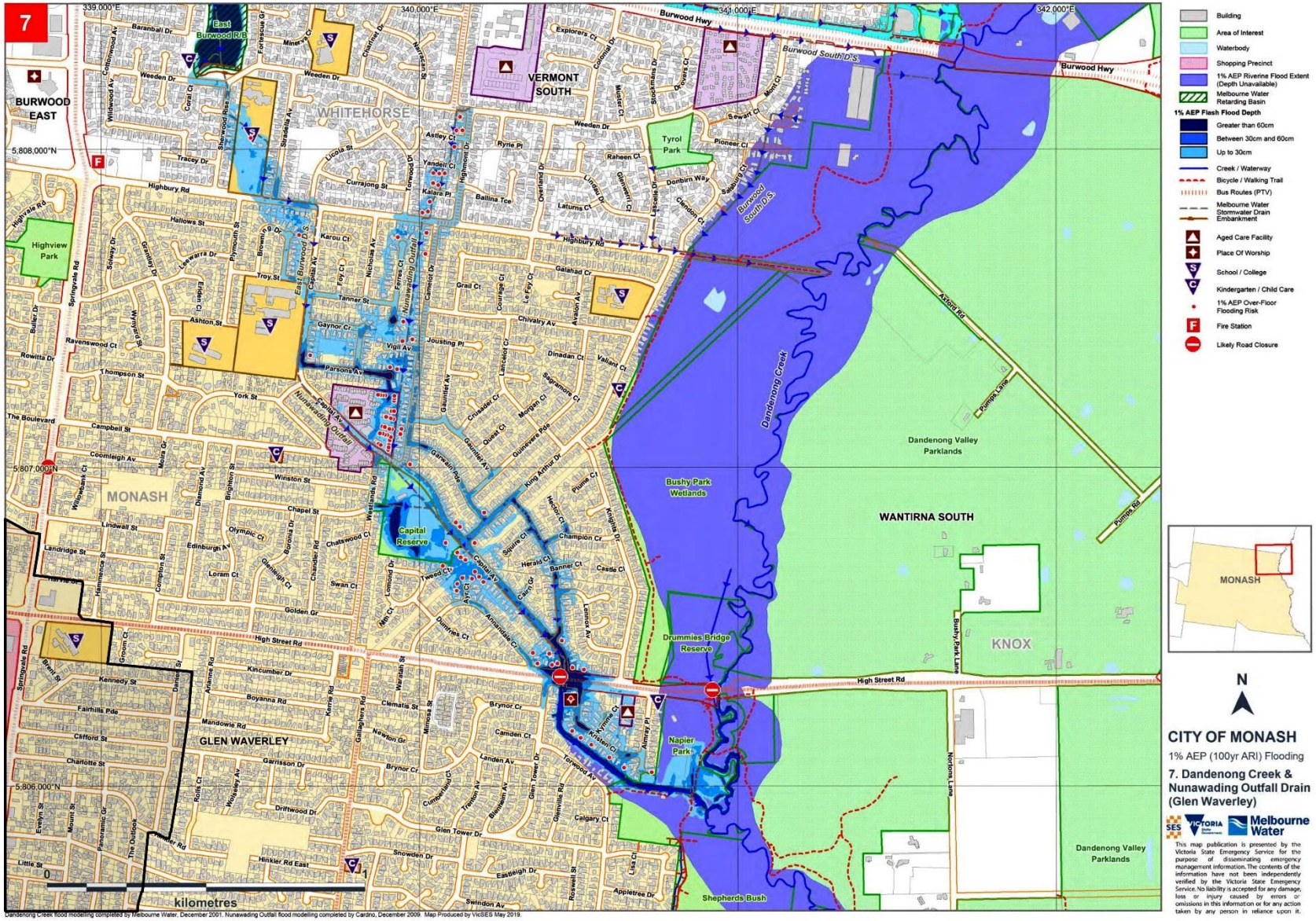

FIGURE B-8 **1 % AEP FLOOD EXTENT AT DANDENONG CREEK AND NUNAWADING OUTFALL DRAIN (ADAPTED FROM CITY OF MONASH FLOOD EMERGENCY PLAN (SES, 2019B))**

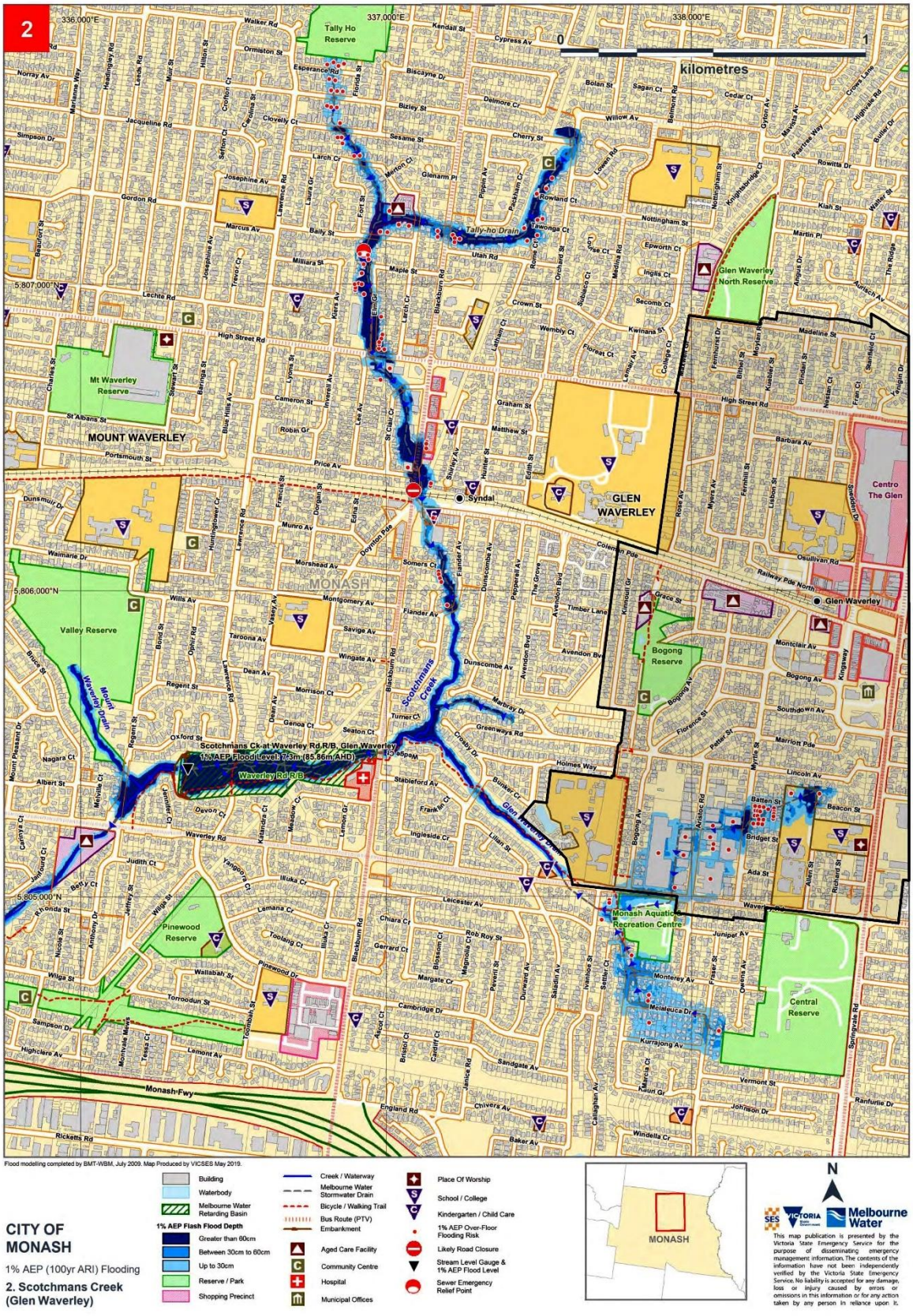

FIGURE B-9 PROPERTIES AT RISK TO OVERFLOOD FLOODING FOR THE 1 % AEP FLOOD EXTENT AT GLEN WAVERLEY DRAIN (ADAPTED FROM CITY OF MONASH FLOOD EMERGENCY PLAN (SES, 2019B))

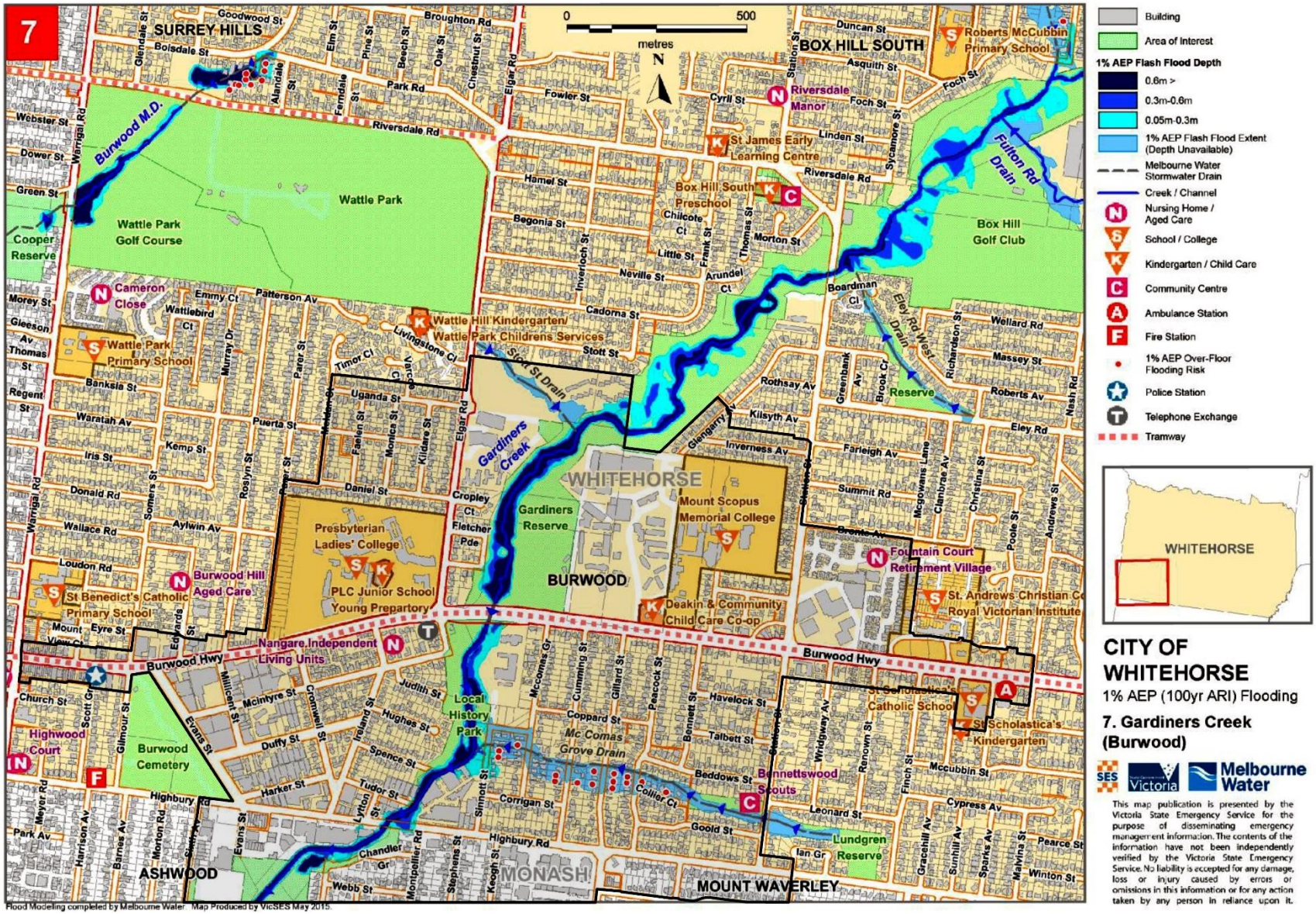

FIGURE B-10 BURWOOD 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF WHITEHORSE FLOOD EMERGENCY PLAN (SES 2016))

FIGURE B-11 BOX HILL SOUTH 1 % AEP FLOOD EXTENT (ADAPTED FROM WHITEHORSE FLOOD EMERGENCY PLAN (SES, 2016))

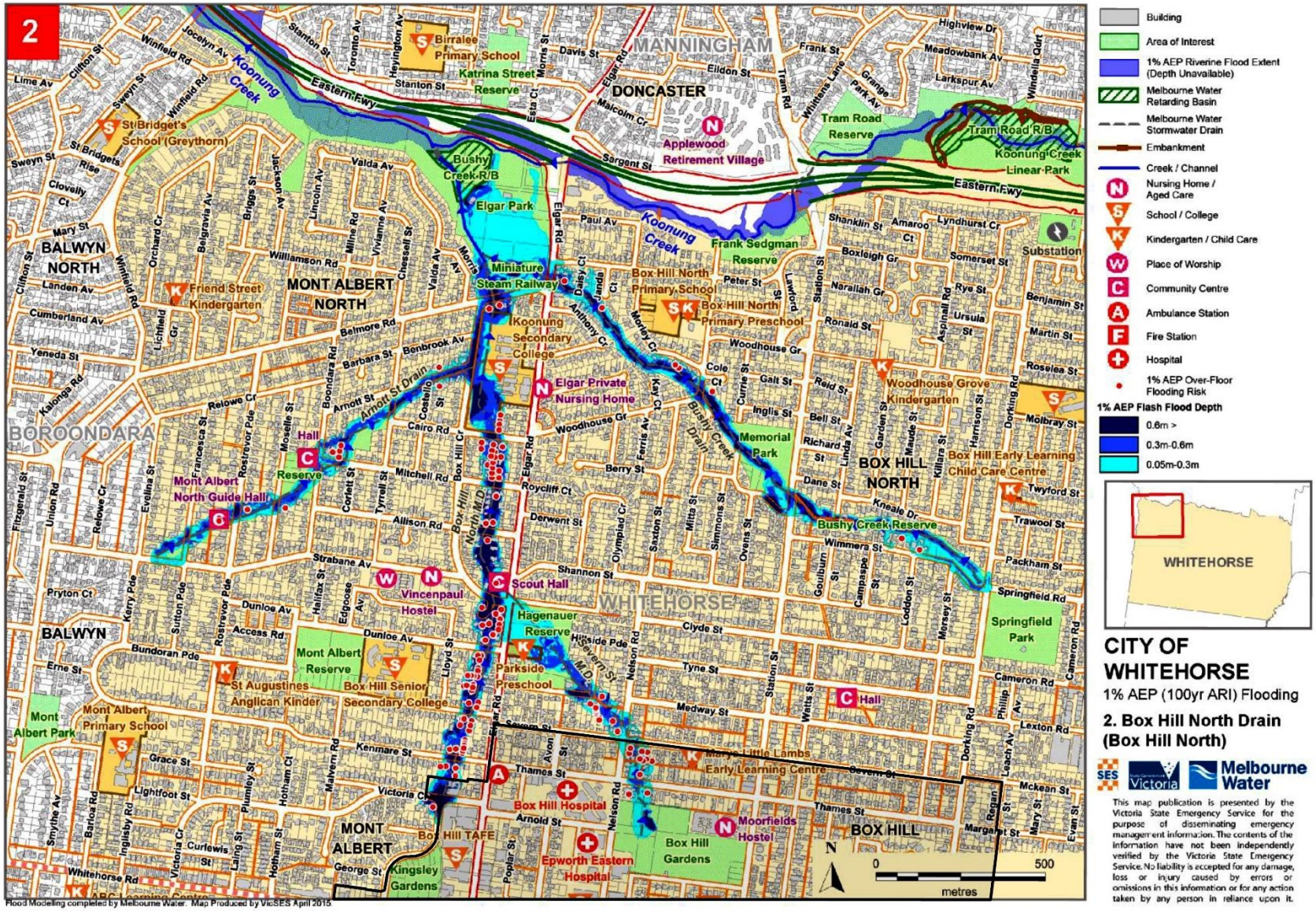

FIGURE B-12 BOX HILL 1 % AEP FLOOD EXTENT (ADAPTED FROM CITY OF WHITEHORSE FLOOD EMERGENCY PLAN (SES 2016))

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Appendix C

Flood safety criteria

The Guidelines for Development in Flood Affected Areas (DELWP 2019) state that site and access safely must not be compromised. It should be noted that a conservative approach was employed to determine the safety of the site, with the maximum flood hazard rating for each parcel used in the assessment. To determine whether a site has safe, constrained or unsafe access, a visual assessment was undertaken on each property to determine how many access pathways for the site were within or lower than the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed) based on the flood hazards outputs. Flood Hazard Classifications are provided in Figure 2.1.

Given the safety classification applies to developable land being residential and commercial development, not all land zones have been assessed.

Australian Rainfall and Runoff (ARR) Guidelines (2019) define six flood hazard classifications to inform vulnerability and risk shown in Figure D-1

Safety classifications

- **Safe site** – when all or nearly all the site is within or lower than the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed).

- **Safe access** – when there is no reduction in the number of access pathways for the site within or lower than the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed).

- **Constrained access** – when there is a reduction in the number of access pathways for the site within or lower than the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed), but there is still at least one access pathway within or lower than the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed).

- **Unsafe site** – when all or a portion of the site exceeds the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed).

- **Unsafe access** – when there are no access pathways for the site within or lower than the H1 hazard category (residential) and H2 hazard category (Commercial, industrial and mixed).

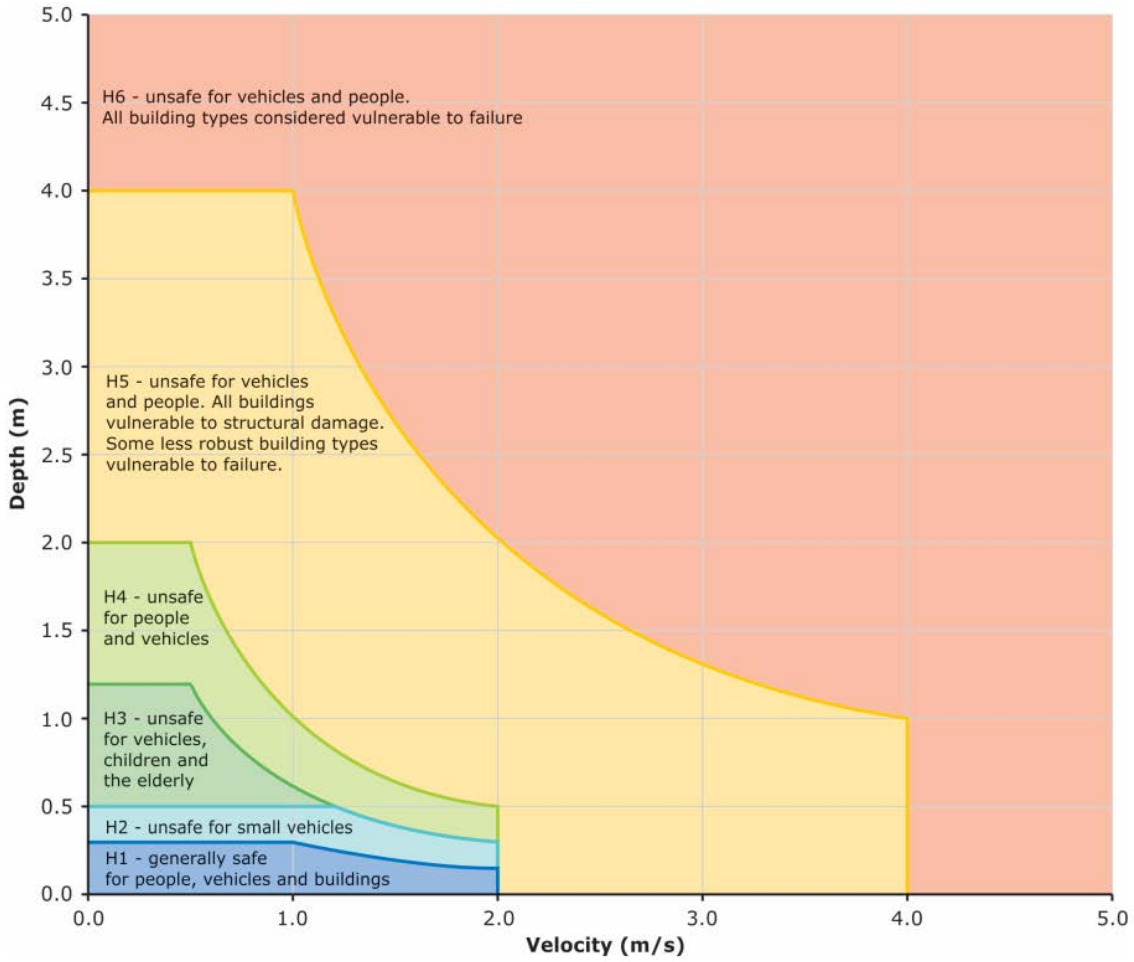

FIGURE C-1 HAZARD CLASSIFICATIONS – VULNERABILITY THRESHOLDS (FIGURE 6.7.9 FROM BOOK 6 OF AUSTRALIAN RAINFALL AND RUNOFF, 2019)

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Appendix D

Burwood preliminary flood impact assessment

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Technical Note

Preliminary Burwood Structure Plan Flood Impact Assessment

1 Executive Summary

As part of the Suburban Rail Loop East (SRL East) project, Structure Plans are being prepared for the neighbourhoods surrounding the new underground stations at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill. The Structure Plans will set a vision and framework to guide growth and change of the neighbourhoods around the SRL stations. Urban redevelopment typically increases density through built form changes generally causes a reduction in pervious areas, flood storage, and results in changes to the existing flow regime. To assess the change in existing hydraulic conditions resulting from urban growth and development changes that may occur as a result of the Structure Plan, a preliminary flood impact assessment for the Burwood and Box Hill Structure Plan was undertaken.

For this assessment, *Melbourne Water AM STA 6100 Infrastructure Projects in Flood-Prone Areas (June 2022)* were used to identify applicable hydraulic performance criteria. Historically a change in peak water surface elevation between existing and design conditions of +/- 10 mm was considered to constitute 'No Change'. However, more recently Melbourne Water requires N 0 mm afflux for residual impacts, for the purpose of this project +/- 1 mm has been adopted. For this reason, two analysis was undertaken using the two impact criteria.

The flood impact assessment indicated the following:

- Using the +/- 10 mm criteria, the extent of unacceptable flood impacts is limited to where Gardiner's Creek passes under Highbury Road.
- Using the +/- 1 mm, impact was observed along most of Gardiner's Creek downstream of the new Burwood Station is considered unacceptable, along with the modelled length of McComas Grove Drain, surface flow across Deakin University and other localised extents across the precinct.

These results should be considered an indicator of potential residual impacts resulting from the Burwood Structure Plan Area. Noting that, this hydraulic model (TUFLOW) does not yet incorporate all elements of the ultimate urban form and other changes such as lot consolidation which may impact the overall flood conditions. Further modelling is recommended to understand the effects of lot consolidation, changes to public open space and other changes across each of the Structure Plan Areas as well as to develop mitigation strategies to minimise, or avoid, residual impacts.

2 Introduction

2.1 Overview

Suburban Rail Loop (SRL) is a transformational project that will help shape Melbourne's growth in the decades ahead. It will better connect Victorians to jobs, retail, education, health services and each other – and help Melbourne evolve into a 'city of centres'. SRL East from Cheltenham to Box Hill will connect major employment, health, education and retail destinations in Melbourne's east and south east. Twin 26-kilometre tunnels will link priority growth suburbs in the municipalities of Bayside, Kingston, Monash and Whitehorse. SRL East Structure Plan Areas will surround the six new underground stations at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill.

A Precinct Vision has been developed in consultation with the community and stakeholders for the Structure Plan Area and surrounds. Structure Plans have been prepared for defined areas surrounding the new SRL East stations to help deliver the Precinct Vision developed for each SRL East neighbourhood. The Structure Plans cover defined Structure Plan Areas that can support the most growth and change. Urban redevelopment typically increases density through built form changes and generally reduces pervious areas, flood storage, and results in changes to the existing flow regime.

This technical note includes a preliminary flood impact assessment for the Burwood Structure Plan Area to assess expected urban growth and development changes. Urban development typically results in an increase in impervious area which can be assessed using inputs into existing hydraulic flood model.

The Burwood flood hydraulic model developed for the SRL East EES (AJM-JV 2021) covers approximately 90 per cent of the Burwood Structure Plan Area and was granted 'No Objection' status[1] by Melbourne Water as part of the EES. This model has been adapted for this assessment, with proposed future development informed by the the population and employment projections, as presented in the SRL East Draft Structure Plan - Urban Design Report – Burwood (AJM-JV, 2025).

We note that the Structure Plan is subject to future approval and no development has been proposed or approved in this area, so this assessment is preliminary in nature and prepared for the purpose of informing the SRL East - Burwood Structure Plans.

2.2 Assumptions and limitations

The assumptions and limitations that apply to this assessment are:

- Total Impervious Area (TIA) values and land use were assumed from the population and employment projections, consistent with the Business and Investment Case (BIC) prepared for the Suburban Rail Loop (August 2021), for the Structure Plan Area as presented in the SRL East Draft Structure Plan - Urban Design Report – Burwood (AJM-JV, 2025).
- The Structure Plan Areas does not account for the ultimate urban form including, for example, earthworks, building layouts, and lot consolidation.
- For further details on the model used for this assessment, refer to the SRL East Environment Effects Statement Technical Appendix Q.1 Surface Water Existing Conditions & Appendix Q.2 Surface Water Impact Assessment.
- Adopted flood model assumed to be fit-for purpose for this preliminary assessment.
- Updated flood model used as part of this assessment has not been reviewed by Melbourne Water.
- SRL East Rail and Infrastructure (Rail Day 1) have been assumed to be built so form part of the existing flood conditions that the Structure Plan development is being compared to.
- This assessment does not account for hydraulic changes as a result of naturalisation of Gardiners Creek.

3 Catchment description

The Burwood Structure Plan Area is located in the Gardiners Creek catchment as shown in Figure 3-1. Water flows from east and west into Gardiners Creek, after which flow travels south outside the Structure Plan Area and alter discharges into the Yarra River. Overland flow paths within the Structure Plan Area are represented by the blue arrows in Figure 3-1. Existing flood related planning controls cover portions of the site as presented in Figure 3-2. Figure 5-3 shows the Structure Plan Area in relation to the overall Gardiners Creek catchment.

Upstream of Burwood Highway, Gardiners Creek is predominantly a natural channel with some realignment and modification and the adjacent floodplain primarily consists of public open space. Between Burwood Highway and Warrigal Road, Gardiners Creek is a concrete-lined channel with numerous drop structures. The channel is lined with a narrow green floodplain reserve which is generally skirted by residential, commercial and industrial land. Downstream of Warrigal Road, Gardiners Creek channel is predominantly a natural channel with some realignment and modification. Gardiners Creek supports highly valued active and passive recreational opportunities as well as water and biodiversity values. Gardiners Creek is subject to a Land Subject to Inundation Overlay (LSIO) as well as Urban Floodway Zone (UFZ).

[1] Modelled flood conditions of reference design are accepted by Melbourne Water.

At the approved SRL station at Burwood, the station design will include naturalisation of Gardiners Creek between Burwood Highway and the Sinnott Street Pedestrian Bridge. Recommendations have been made in the Structure Plan to continue this naturalisation through the entire Structure Plan Area to Zodiac Street.

Most of the Structure Plan Area drains into Gardiners Creek in the local drainage network with excess flow as overland flow, as illustrated by the arrows in Figure 3-2. Other existing drains in the Structure Plan Area include the Stott Street Drain, running from the north-western end of the Structure Plan Area at Wattle Park into Gardiners Creek, the McComas Grove Drain, running in a westward direction from Lundgren Reserve into Gardiners Creek, and the Brockhoffs Main Drain connecting into Gardiners Creek south of the Structure Plan Area. Many of these drains including Brockhoffs and McComas Main Drains have a Special Building Overlay (SBO) - see Figure 3-2.

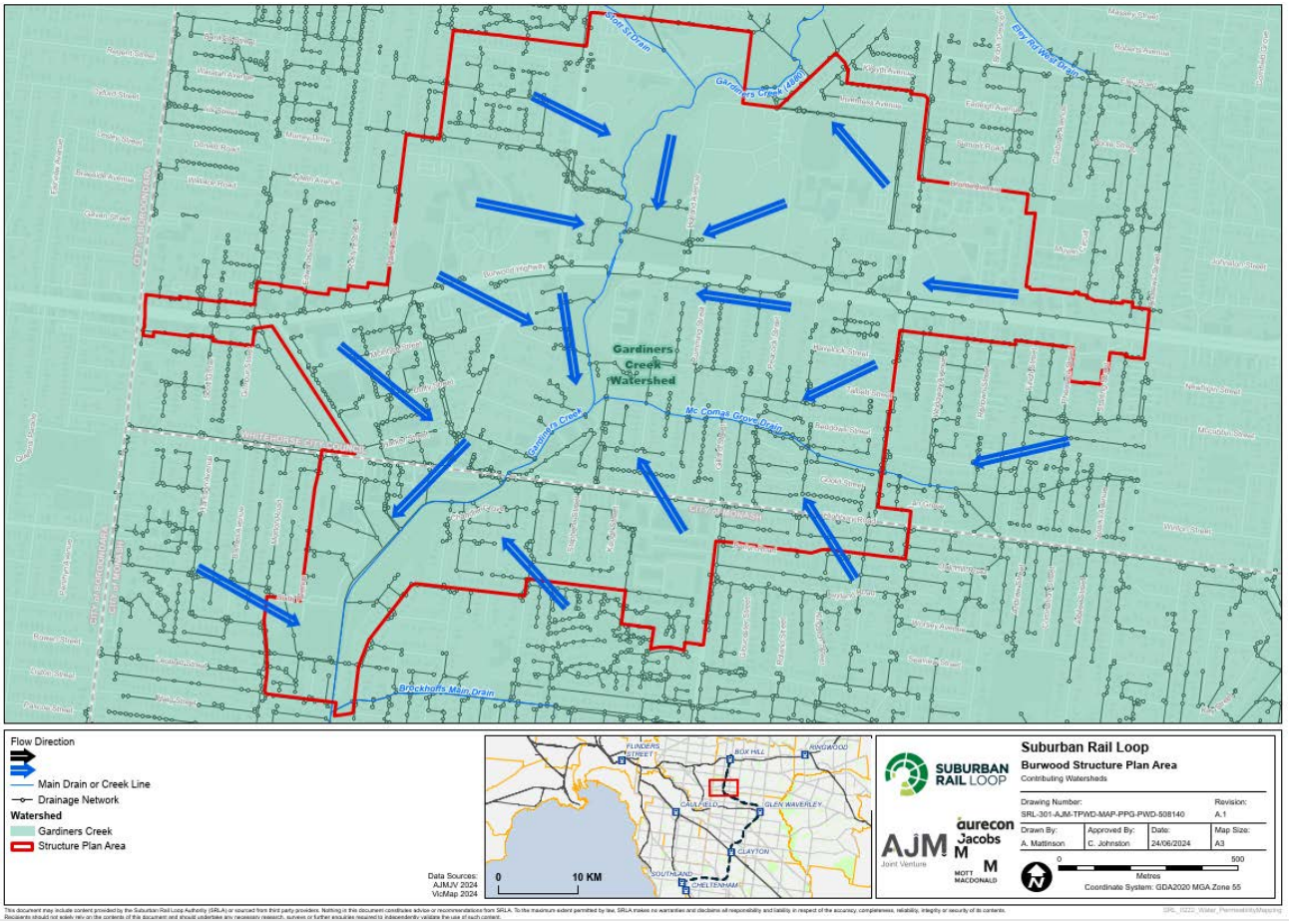

FIGURE 3-1 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS IN BURWOOD STRUCTURE PLAN AREA

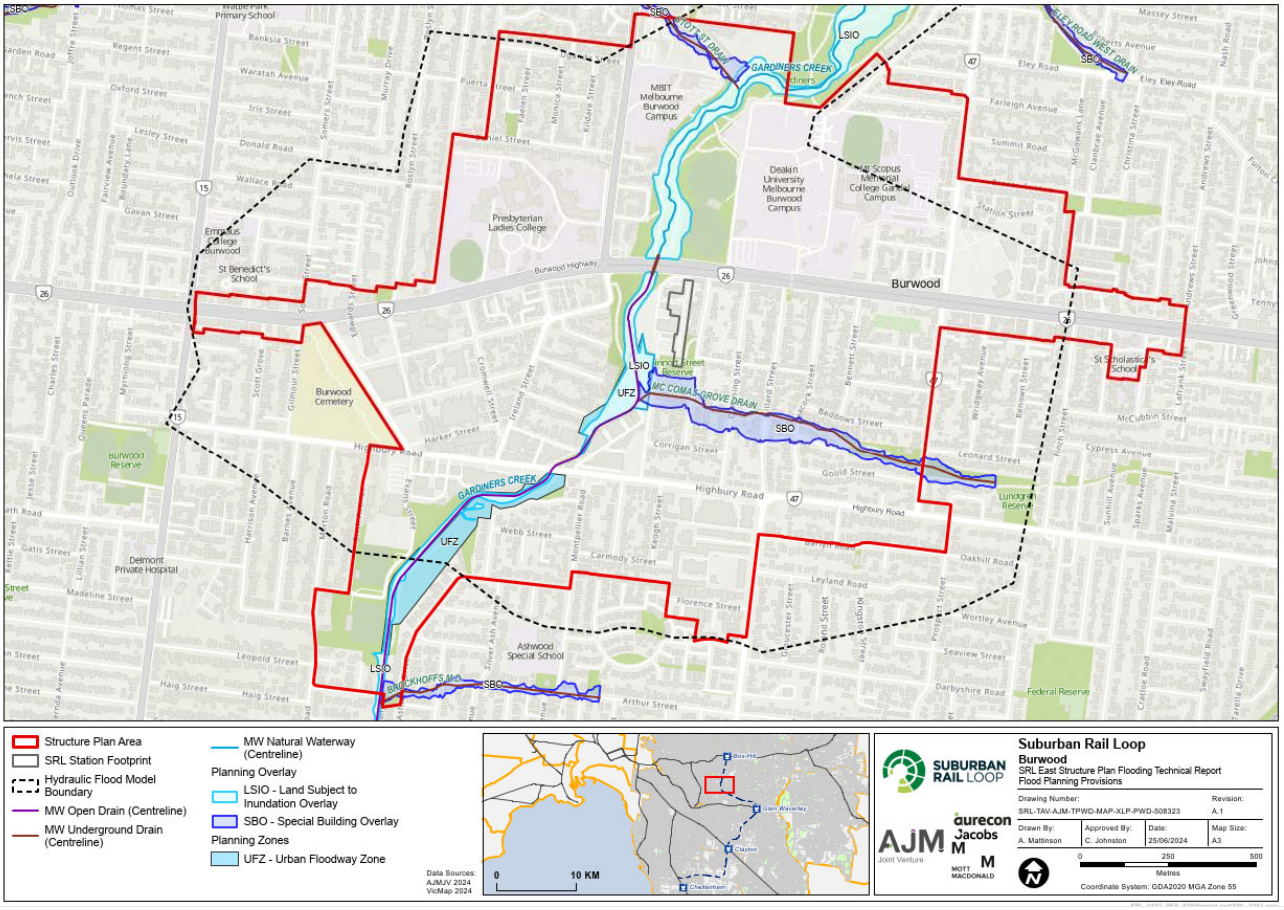

FIGURE 3-2 FLOOD PLANNING CONTROLS IN BURWOOD STRUCTURE PLAN AREA

4 Proposed Burwood and Box Hill Structure Plan

A structure plan is being prepared to shape the growth and development of the area around the new station, with the aim of realising the emerging vision for the precinct. Urban design recommendation are being proposed to be incorporated within the Burwood Structure Plan Area to deliver the precinct vision. This includes reconciling the provision of growth with the creation of high-quality amenity and identifying the public realm interventions necessary to support this growth for Burwood.

As part of the Urban Design work, an Urban Form Framework, Design Directions and Strategies is being developed that seek to deliver a range of distinct, higher density neighbourhoods and high-quality development for living and working in response to the increased accessibility brought about by the SRL. This includes proposals for:

- The types, and forms intensity and land use of new buildings in each part of the Structure Plan Area.
- Specific locations within each area where greater or lesser building scale is appropriate. The further design of key interfaces between built form and public realm.

The Urban Design work, defined urban development typologies that propose the percentage of deep soil or each area. Table 4-1 presents the percentage of deep soil for each urban development typology for Burwood and Box Hill Structure Plan. This was used to inform the total impervious area for Burwood and Box Hill which is presented later in Section 0.

The Box Hill Structure Plan Area is upstream of the Burwood Structure Plan Area so preliminary changes to this area have been considered in this modelling exercise.

TABLE 4-1 DEEP SOIL AREA FOR EACH URBAN DEVELOPMENT TYPE FOR BOX HILL AND BURWOOD

URBAN DEVELOPMENT TYPE	BOX HILL DEEP SOIL AREA (%)	BURWOOD DEEP SOIL AREA (%)
Central Core	0	0
Central Flanks	10	NA
Key Movement Corridors and Urban Neighbourhoods	15	15
Main Streets	NA	0
Strategic Sites – Category 1	25	
Industrial Areas	NA	5-10
Residential Neighbourhoods	15-35	

5 Flood impact assessment methodology

This section outlines the design inputs, performance criteria, existing flood conditions that has informed the flood impact assessment for the Burwood Structure Plan Area.

5.1 Design and Inputs

The reference material reviewed as part of the flood impact assessment undertaken by AJM-JV is shown in Table 5-1.

TABLE 5-1 DESIGN INPUTS INTO FLOOD IMPACT ASSESSMENT

INPUTS	SOURCE
Australian Rainfall and Runoff 2019 (ARR2019)	Geoscience Australia
Melbourne Water AM STA 6100 Infrastructure Projects in Flood-Prone Areas (June 2022)	MW
Melbourne Water AM STA 6200 Flood Mapping Technical Specifications (August 2023)	MW
SRL-AJM-PWD-PWD-DTN-XHY-NAP-0001045Technical Advice Note (TAN): SRL station at Burwood Hydrology and Hydraulic Modelling	AJM-JV
Aerial Photography	AJM-JV
GIS Data (Structure Plan Area, waterways, cadastre)	AJM-JV, data.vic.gov.au, MW
SRL East Structure Plan - Urban Design Report - Burwood - SRL-301-AJM-P100-REP-PUD-BUW-005243	AJM-JV
SRL East Structure Plan - Urban Design Report - Box Hill - SRL-301-AJM-P100-REP-PUD-BOX-005242	AJM-JV

5.2 Performance Criteria (Melbourne Water Standards)

Melbourne Water AM STA 6100 Infrastructure Projects in Flood-Prone Areas (June 2022) nominates performance criteria for flood assessments. The relevant standards are summarised in Table 5-2 and were considered during the Flood Impact Assessment. Adherence to these standards must be achieved during the project to obtain a Letter of No Objection from Melbourne Water. This preliminary flood impact assessment has been prepared to inform structure planning and is not for the purpose of approving individual development.

TABLE 5-2 PERFORMANCE CRITERIA

CRITERION	REQUIREMENT

Hydrological Modelling	The hydrology models have been developed in accordance with ARR2019 and MW Technical Specifications 2019 and received a Letter of No Objective for the SRL EES modelling
Hydraulic Modelling	2-Dimensional hydraulic model of the Structure Plan was required. The Burwood Station TUFLOW model developed as part of the SRL EES was adopted, this model was developed in accordance with ARR2019 and *Melbourne Water AM STA 6200 Flood Mapping Technical Specification*. This model received a Letter of No Objective for in the SRL EES
Flood Level	**Private Property**: During the 1 % AEP event (existing climatic conditions) there is to be no increase in flood level on private property. Historically a change in peak water surface elevation between existing and design conditions of +/- 10 mm was considered to constitute 'No Change. ' Subject to agreement, Increases in flood level exceeding this must be agreed with impacted landholders. If agreement is reached, MW may accept higher afflux limits on the agreed private property. **Crown Land / Public Property:** No limit for permissible flood level increases 'within reason' was nominated for public land.
Flood flow	*Works or structures should not affect floodwater flow capacity.* This ensures that existing flood levels are not made worse by alterations to the flow characteristics of a floodplain or overland flow path
Flood storage	*Works or structures should not reduce floodwater storage capacity.* This prevents higher flood levels that may occur if the available storage volume is reduced.
Freeboard	*Works or Structures should not reduce minimum freeboard.* This ensures there is no adverse impact on existing property and infrastructure. For new structures Melbourne Water requires 600 mm and 300 mm freeboard for Waterway and drainage flood extents respectively; where the structure is designed for 100 years or more, climate change must be included with freeboard.
Site Safety	*Works or structures should not create new hazards or increase existing hazard.* Development will not be allowed where the depth and flow of floodwaters would create new hazards or increase existing hazards.
Access Safety	*Access safety requirements should be taken into account.* Development cannot be allowed in circumstances where the depth and flow of floodwater affecting access to the property is hazardous.
Climate Change	Works or structures must factor in climate change: • Sea-level rise – An increase of 0.8 m by the Year 2100 is the current standard for sea level rise assessments. • Increase in rainfall intensity - Rainfall intensity increase figure must be derived from either the ARR 2016 Book or the ARR Data Hub. The adopted figure must reflect the Project's asset life and the Project's flood protection technical performance requirements. As part of SRL EES this was set to 23% for Year 2150

The flood models provided for this preliminary flood assessment has the latest Burwood Station Design, which were updated from the previous EES flood modelling in order to reflect Rail Day 1 (RORB Model version GAR_022/021 and TUFLOW Model version GAR_035). It should be noted that the previous EES flood modelling undertaken by AJM-JV in 2021 of Gardiners Creek catchment (RORB Model version GAR_022/021) and the proposed Burwood Station (TUFLOW model version GAR_025) was granted 'No Objection' status by MW.

5.3 Methodology

To assess the potential flood impact from the change in pervious area within the Burwood Structure Plan Area, an assessment of the fraction imperviousness (informed by the permeability requirements under the existing zoning and accounted for in the existing hydraulic flood model) against assumed fraction impervious values for development scenarios identified in the Structure Plan Areas.

The following sections detail the modelling approach.

5.3.1 Hydrological modelling

The AJM Gardiner Creek RORB (model version GAR_021/022) was updated to reflect the change to catchment imperviousness associated with the SRL East Structure Plan - Urban Design Report – Burwood and SRL East Structure Plan - Urban Design Report - Box Hill. The lot Total Impervious Area (TIA) was interpreted from the percentage coverage of deep soil proposed in the future urban form in the SRL East

Structure Plan - Urban Design Report - Burwood (SRL-301-AJM-P100-REP-PUD-BUW-005243) (see Table 4-1), with assumed total impervious area for Burwood and Box Hill shown in Figure 5-1 and Figure 5-2. The Effective Impervious Area (EIA) was calculated using the EIA Factors in Table 5-3 and in accordance with ARR 2019 and the MW Technical Specifications (2023).

The updated lot values were overlaid with the catchment data to update the catchment impervious fraction values. This information was then fed into the RORB model and new hydrographs were produced. The percentage change in catchment imperviousness is shown in Figure 5-3, with both Box Hill and Burwood increases in imperviousness considered.

TABLE 5-3 TIA AND EIA LOT VALUES WITHIN THE BURWOOD STRUCTURE PLANNING AREA, PROPOSED DEVELOPMENT

TIA	EIA FACTOR	EIA
0.65	0.6	0.39
0.75	0.6	0.45
0.85	0.8	0.68
0.95	0.9	0.86
1.0	0.9	0.90

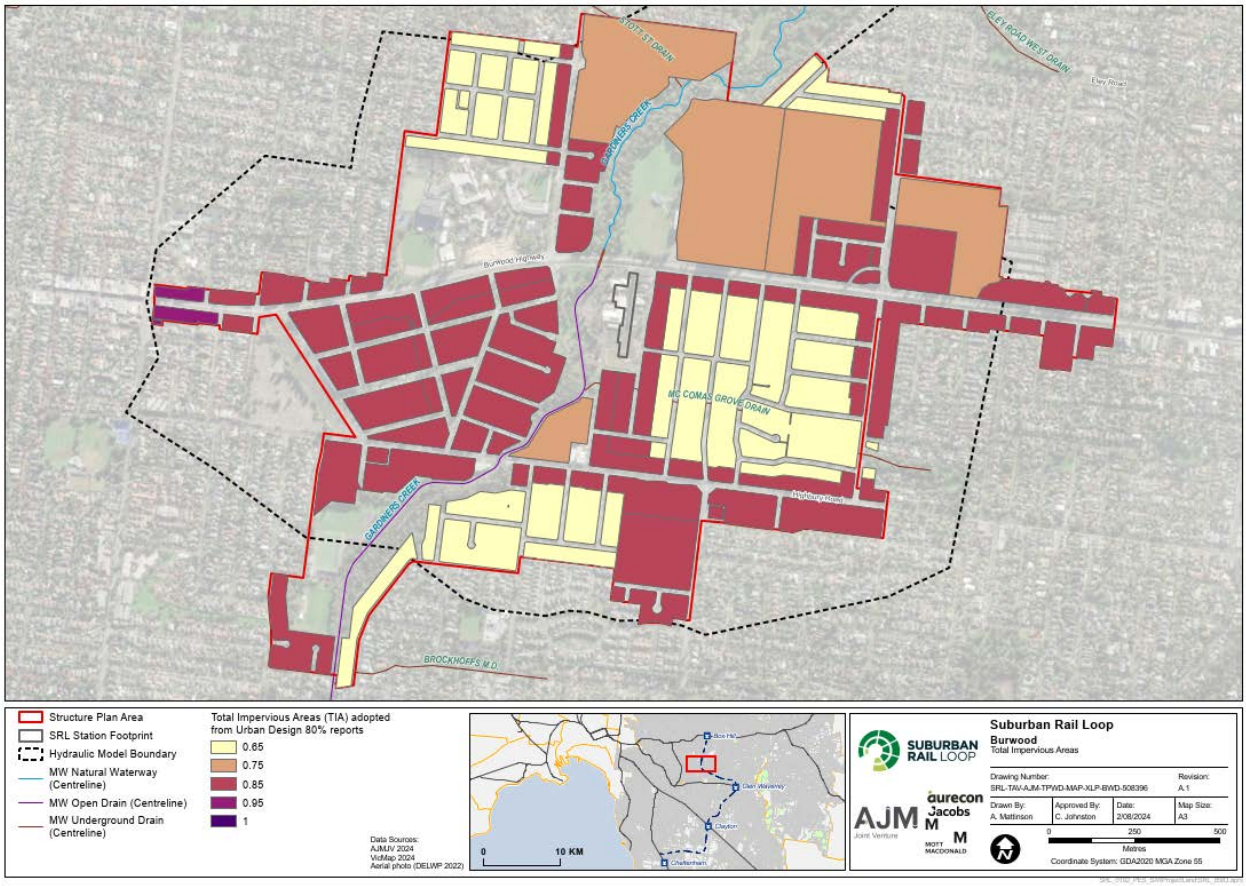

FIGURE 5-1 ADOPTED TOTAL IMPERVIOUS AREA (TIA) VALUES ADOPTED FROM SRL EAST DRAFT STRUCTURE PLAN - URBAN DESIGN REPORT - BURWOOD (AJM-JV, 2025)

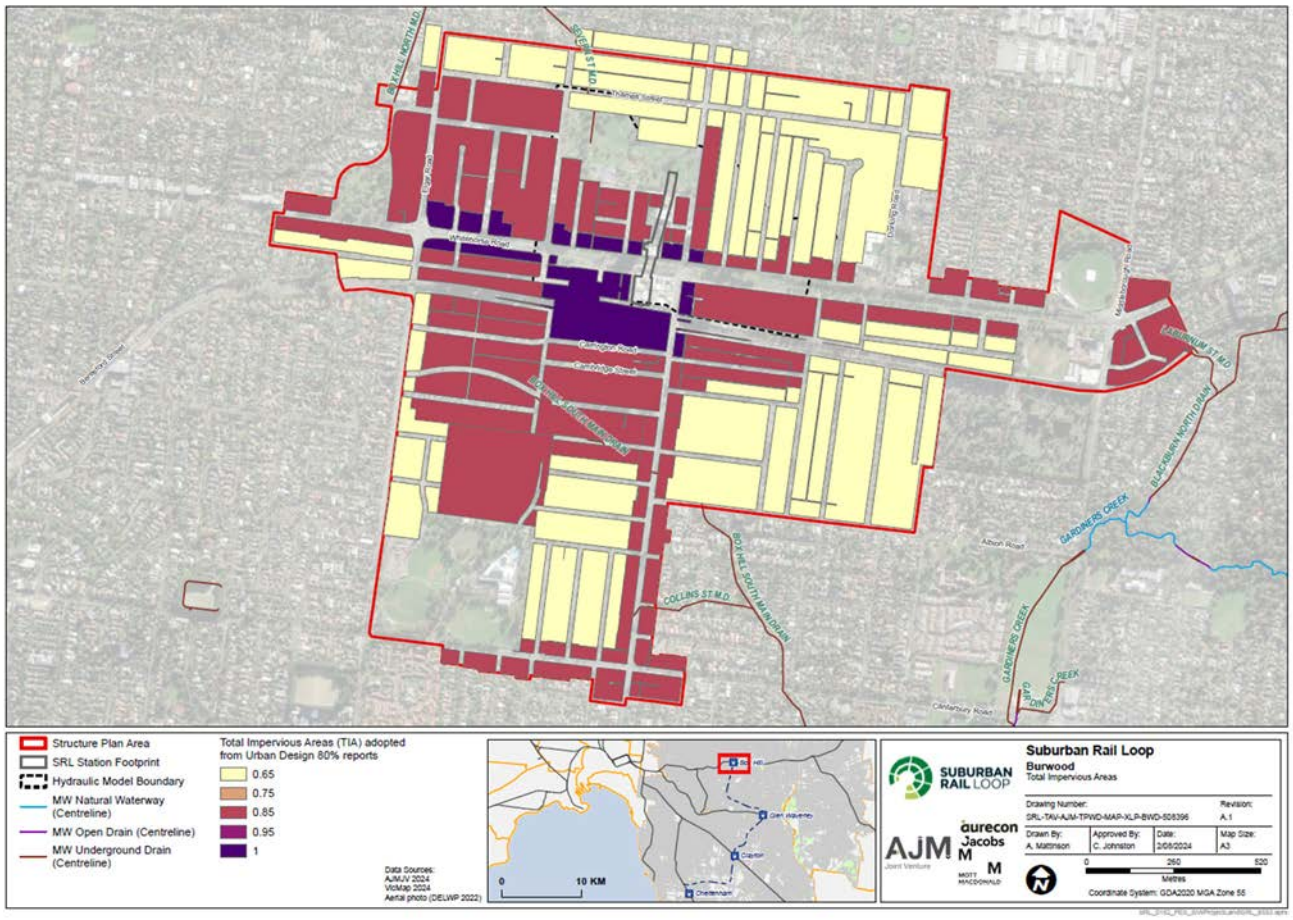

FIGURE 5-2 ADOPTED TOTAL IMPERVIOUS AREA (TIA) VALUES ADOPTED FROM SRL EAST DRAFT STRUCTURE PLAN - URBAN DESIGN REPORT - BOX HILL (AJM-JV, 2025

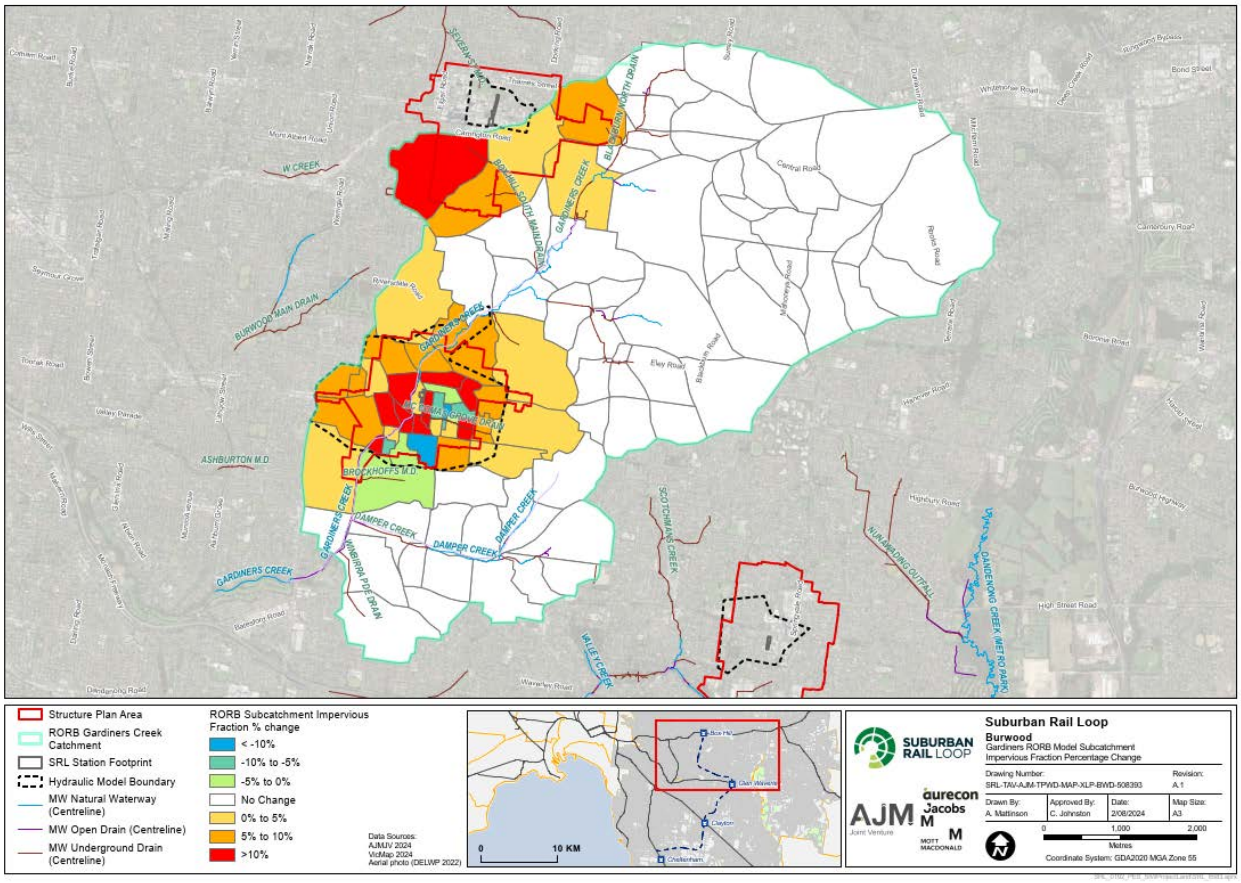

FIGURE 5-3 CHANGE IN IMPERVIOUS FRACTIONS ACROSS THE GARDENERS CREEK RORB MODEL AS A RESULT OF THE BOX HILL AND BURWOOD STRUCTURE PLAN AREAS

5.3.2 Hydraulic modelling

The TUFLOW model version provided for this assessment as GAR_035. This version of the model was updated by the SRLA Rail and Infrastructure team to reflect the latest design at the Station to reflect Rail Day 1 conditions. Details of the model set up is provided in Table 5-4.The two key scenarios available from the previous works included:

- Existing: represents present day conditions.
- Developed: represents Rail Day 1 conditions i.e., the station and Gardiners Creek naturalisation is constructed.

The Developed scenario is referred to as Rail Day 1 conditions, which will reflect conditions on Day 1 of station operations when the station works are completed (does not consider Structure Plan Area growth). Rail Day 2 is the term when the station development is complete but not relevant to this assessment. The term Day 3 is used to reflect the combined station development and Structure Plan Areas ultimate developed case, which involved running the updated hydrographs output from the hydrology model on the Rail Day 1 model set up. This technical note will focus on the Rail Day 1 with Rail Day 3 flood impacts.

The modelling of Rail Day 3 involved running the updated hydrographs output from the hydrology model on the Rail Day 1 model set up. The cumulative impact of Rail Day 3 conditions against existing conditions has not been assessed, as it is assumed the Rail Day 1 flood levels have been accepted.

Additionally, the 1 % AEP including Year 2150 climate change has been considered as part of the assessment. This was the EES design timeline of year 2150, 100 years after the construction is planned to finish.

TABLE 5-4 BURWOOD STATION (GARDINERS CREEK) TUFLOW MODEL PARAMETERS

PARAMETER	GAR_035 TUFLOW MODEL
Hydrologic modelling	RORB
Australian Rainfall & Runoff	ARR 2019
Hydraulic model software	TUFLOW Classic module with version 2018-03-AE-iSP-w64
Grid size	2 metres
2D Timesteps	1 minute
Events run (critical durations)	1 % AEP (Climate Change) 10-minute TP05 1 % AEP (Climate Change) 20-minute TP05 1 % AEP (Climate Change) 20-minute TP07 1 % AEP (Climate Change) 30-minute TP07 1 % AEP (Climate Change) 540-minute TP06 1 % AEP (Climate Change) 720-minute TP01

5.4 Existing and Rail Day 1 Flood Conditions

The design flows were calculated based upon the methodology outlines in the hydrology and hydraulic TAN (SRL-AJM-PWD-PWD-DTN-XHY-NAP-0001045), which were input into the TUFLOW model to establish existing flood conditions. The existing flood depth extent for the 1 % AEP including climate change flood extent is presented in Figure 5-4, and indicates the following:

- Water flows from the north to south along Gardiners Creek, with McComas Grove Drain and Brockhoffs Main Drain discharging into Gardiners Creek between Burwood Highway and Warrigal Road.
- The flood extents are mostly consistent with the LSIO and SBO that applies in the Structure Plan Area.
- Flooding in the Structure Plan Area is characterised by fluvial flooding along Gardiners Creek, with contributions from three major Melbourne Water drains: Stott Street Drain, McComas Grove Drain and Brockhoffs Main Drain. The flooding associated with these drains is principally shallow pluvial flooding that follows overland flow paths to Gardiners Creek, via existing park, garden or open space areas, or via road corridors.
- The main concentrated flood flow paths are along Gardiners Creek. The fluvial flooding from Gardiners Creek is generally contained to the floodplain and associated open space. The fluvial flooding does impact the southern part of the Structure Plan Area, and industrial land between Sinnott Street and Gardiners Creek is affected by flooding.
- Peak flood depths reach 1 metre due to bypass flows along the McComas Grove Main Drain alignment that drains to Gardiners Creek., while adjacent to the SRL station depths reach 3 metres. Shallow sheet flow less than 0.1 metre flows along Burwood Highway.

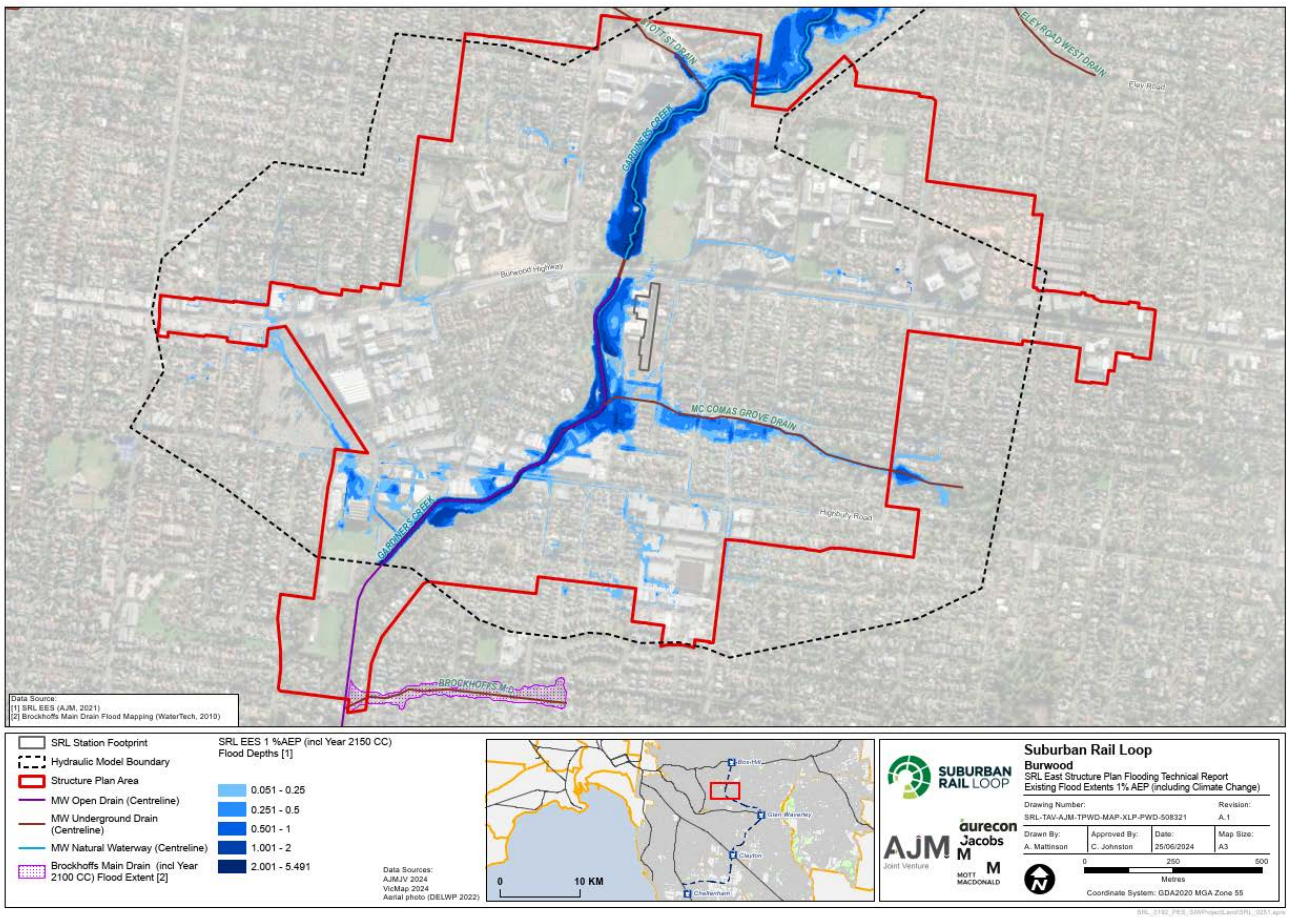

FIGURE 5-4 EXISTING 1 %AEP INCLUDING CLIMATE CHANGE FLOOD EXTENT FOR BURWOOD STRUCTURE PLAN AREA

The Rail Day 1 flood depth for the 1 % AEP including climate change extent is also presented in Figure 5-5. I

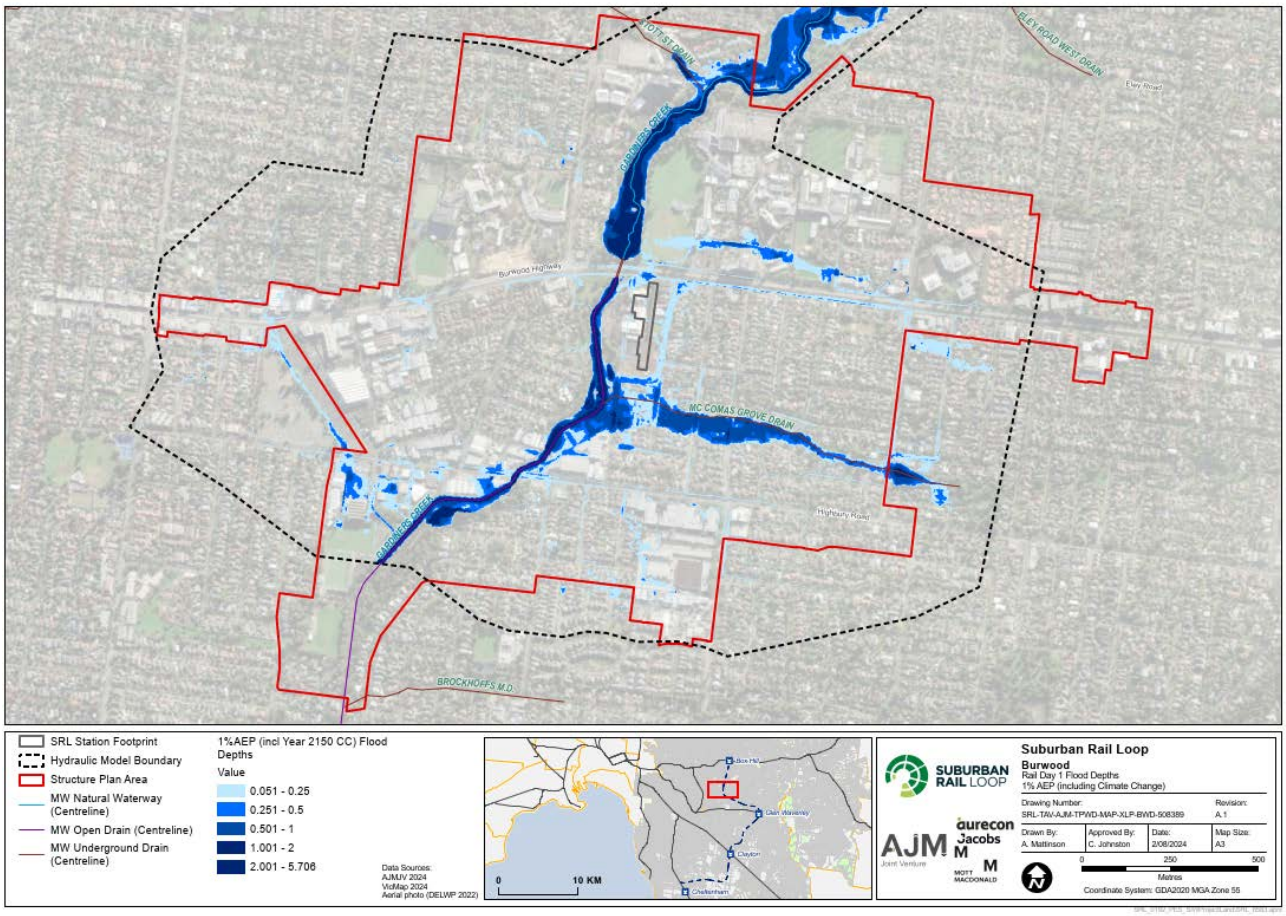

FIGURE 5-5 RAIL DAY 1 %AEP INCLUDING CLIMATE CHANGE FLOOD EXTENT FOR BURWOOD STRUCTURE PLAN AREA

5.5 Flood impact

The increase impervious areas resulting from the Structure Plans have the potential to impact flooding conditions in the Burwood Structure Plan Area. A flood impact assessment has been undertaken and findings are discussed in the following subsections.

5.5.1 Rail Day 3 Flood Conditions

The Rail Day 3 flood depth for the 1 % AEP including climate change extent is presented in Figure 5-6 and identifies:

- Overland flow behaviour is generally similar to Rail Day 1 flood conditions with marginal change resulting from the implementation of the respective Structure Plans. with the exception at the station where overland flow is diverted as a result of the station construction and implemented mitigation measures.Minor reduction of water level upstream of Burwood Highway.
- Minor increase in water level downstream of Burwood Highway.

The Rail Day 3 flood impact map for the 1 % AEP Climate Change event is presented in Figure 5-7 and Figure 5-8 using two different colour palettes to highlight the magnitude of impacts.

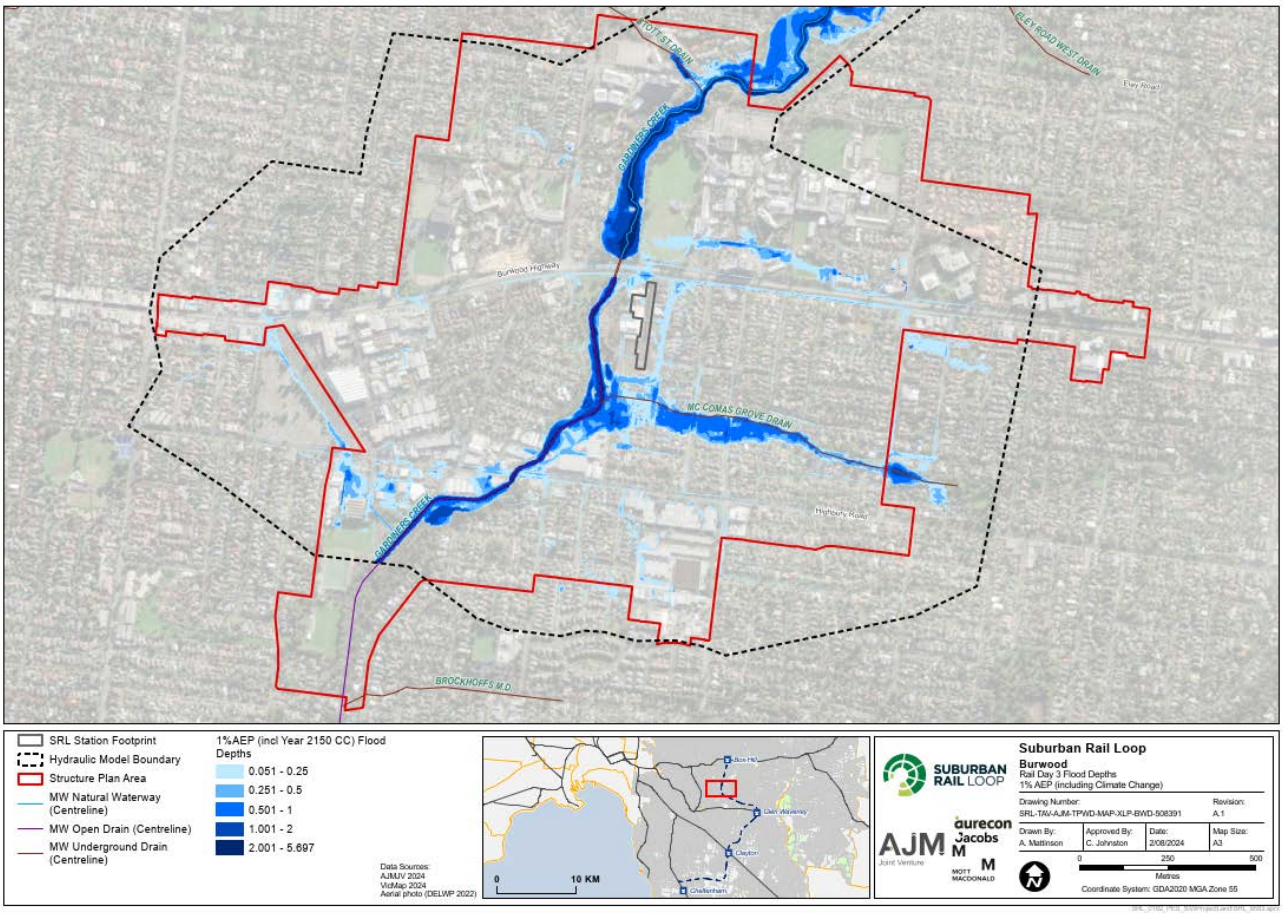

FIGURE 5-6 RAIL DAY 3%AEP INCLUDING CLIMATE CHANGE FLOOD EXTENT FOR BURWOOD STRUCTURE PLAN AREA

5.5.2 Scenario +/- 10 mm flood impact

The standard range that represents no impacts is between +/- 10 mm, as this range historically has been accepted as No Change. Figure 5-7 shows that the extent of unacceptable flood impacts is primarily limited to the vicinity of the Highbury Road crossing along Gardiners Creek, plus some minor localised patches of new inundation across the precinct, particularly on commercial properties near Highbury Road.

5.5.3 Scenario +/- 1 mm flood impact

In recent more projects Melbourne Water have been considering changes to flood levels within a range of +/- 1 mm as having no impact on private properties. Note on previous project, MW have not objected to reasonable residual impact on public land provided that the managing authority accepts the residual risk. Figure 5-8 shows the flood impacts under the +/- 1 mm scenario. Under this stricter flood impact range, the flood impact along most of Gardner's Creek downstream of the new Burwood Station is considered unacceptable, along with the modelled length of McComas Grove Drain, surface flow across Deakin University and other localised extents across the precinct.

It is recommended to engage with Melbourne Water to understand what level of residual impact they would accept.

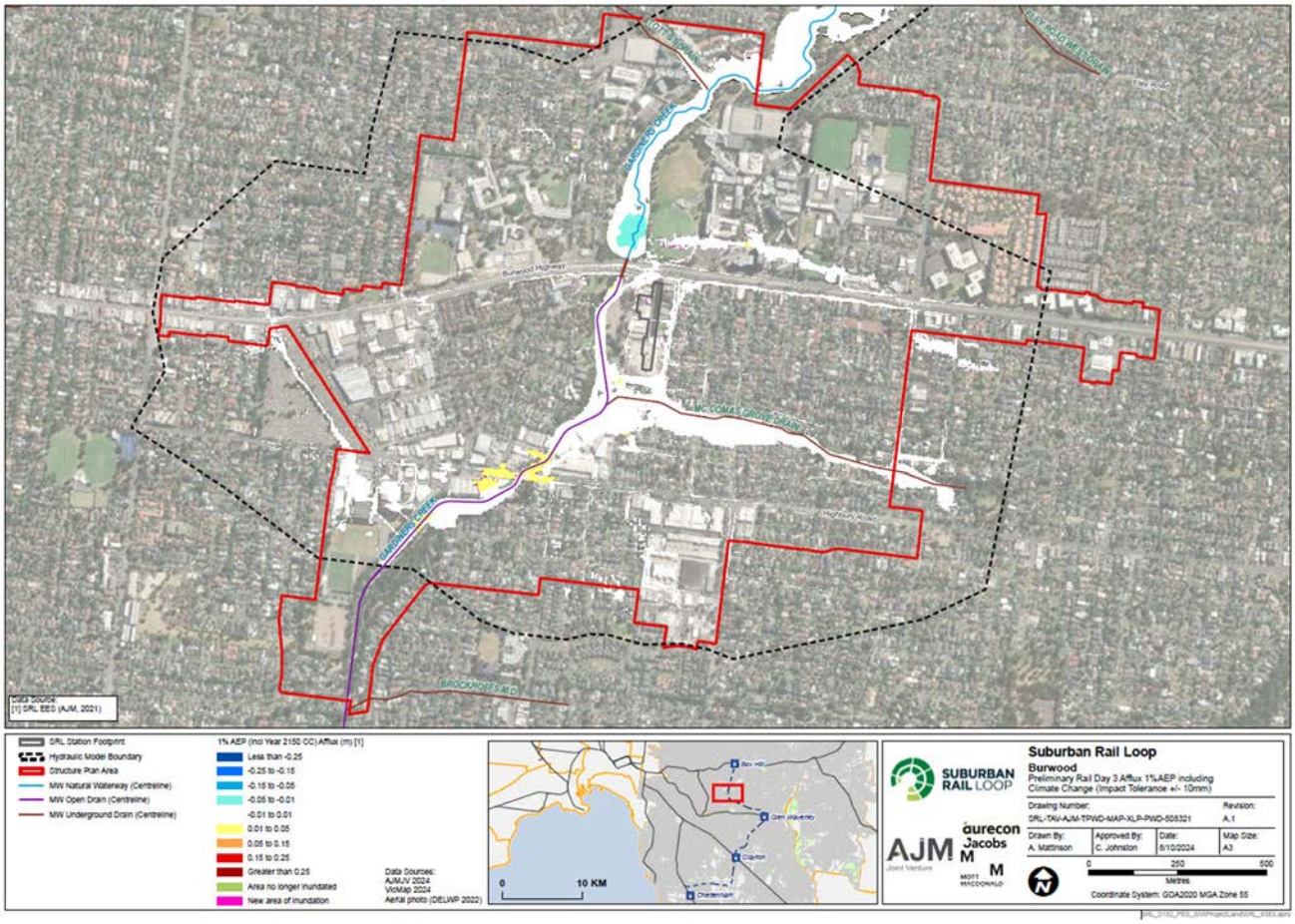

FIGURE 5-7 RAIL DAY 3 IMPACT ON 1 % AEP + CLIMATE CHANGE RAIL DAY 1 FLOOD LEVELS (STANDARD IMPACT RANGE I.E., +/- 10 MM ACCEPTABLE IMPACT)

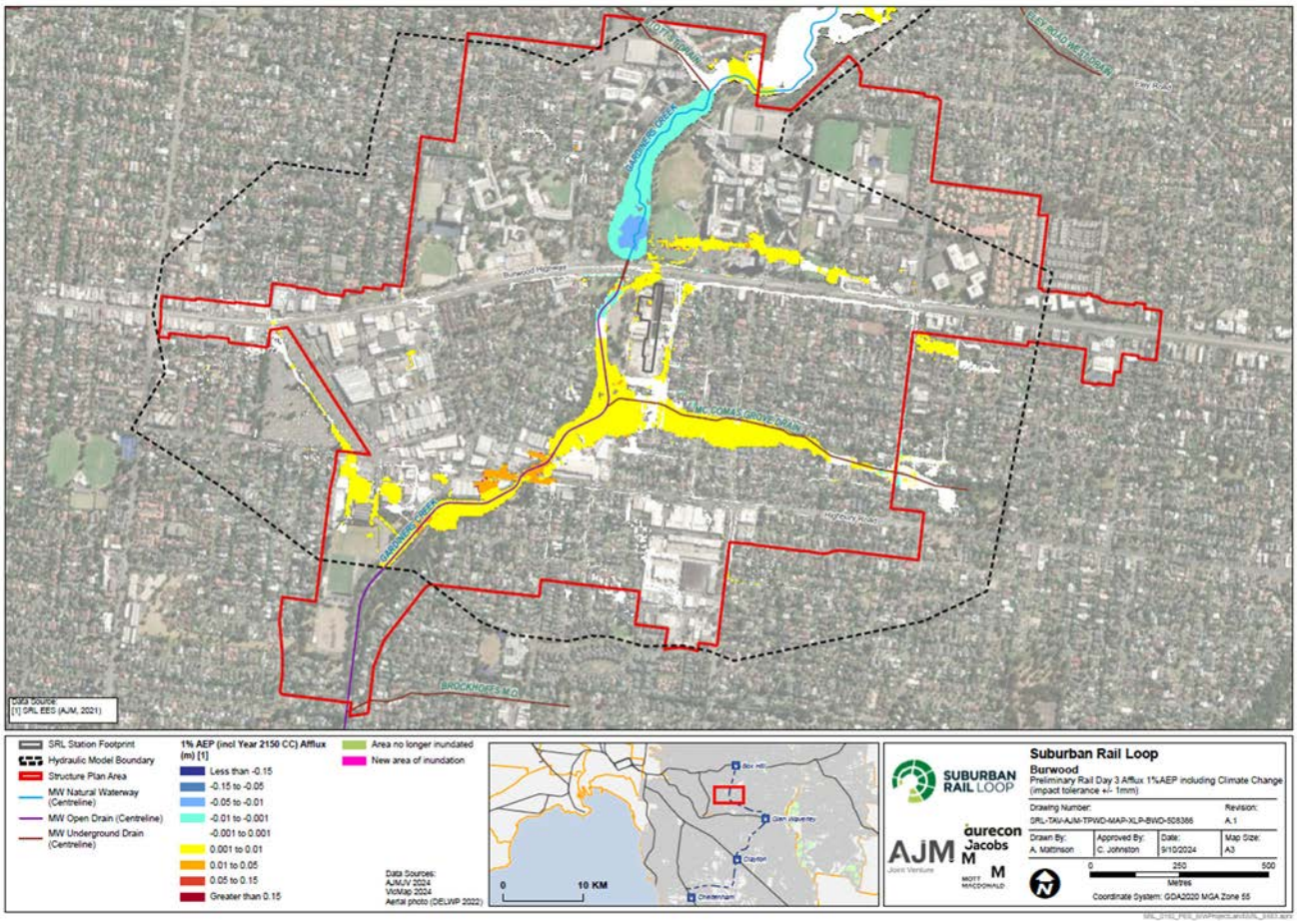

FIGURE 5-8 RAIL DAY 3 IMPACT ON 1 % AEP + CLIMATE CHANGE RAIL DAY 1 FLOOD LEVELS (STRICT IMPACT RANGE I.E., +/- 1 MM ACCEPTABLE IMPACT)

6 Conclusions and recommendations

The Burwood flood model has been used for a preliminary impact assessment to understand the potential change in flood conditions in response to the likely increase of impermeable surfaces for the developed case proposed by the SRL East Burwood Structure Plan.

The high-level nature of this assessment is limited to the flood modelling studies and desktop assessment available to inform this stage of the SRL East structure planning process and should be read in conjunction with the assumptions and limitations listed in 2.2

These results should be considered an indicator of what may be expected under the SRL East Structure Plan Area urban form with respect to floodplain imperviousness. However, this model does not yet build in all elements of the ultimate urban form and other changes such as lot consolidation which may impact the overall flood conditions. As a result, it is too early in the design to test mitigation strategies. If the impacts presented in Figure 5-7 (+/- 10 mm) are all that need to be mitigated, changes to floodplain roughness, capacity of the Highbury Road bridge, and lot acquisition are all mitigation strategies that could be investigated. Figure 5-8 (+/- 1 mm) illustrates the extent of impacts to be mitigated, the previous strategies could also be investigated but it would be much more difficult to fully mitigate the extent of residual impacts across the whole of the precinct. In this instance, it would also be recommended to build additional resolution into the model to understand the effects of lot consolidation, changes to public open space and other changes across the precinct.

7 References

AJM-JV (2021) SRL East Environment Effects Statement Technical Appendix Q.1 Surface Water Existing Conditions (Document Number: TA Q.1 Surface Water EC), Revision 01 October 2021).

AJM
Joint Venture

Appendix E

Peer review report

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

Peer Review of Hydrology, Flooding and Integrated Water Management Strategy

Suburban Rail Loop East Precinct Planning

Suburban Rail Loop Authority

Project Details

Project Name	Suburban Rail Loop East Precinct Planning
Client	Suburban Rail Loop Authority
Authors	Warwick Bishop
Document Number	24010166_R01v01a.docx

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ACKNOWLEDGEMENT OF COUNTRY

The Board and employees of Water Technology acknowledge and respect the Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of Country throughout Australia. We specifically acknowledge the Traditional Custodians of the land on which our offices reside and where we undertake our work.

We respect the knowledge, skills and lived experiences of Aboriginal and Torres Strait Islander Peoples, who we continue to learn from and collaborate with. We also extend our respect to all First Nations Peoples, their cultures and to their Elders, past and present.

Artwork by Maurice Goolagong 2023. This piece was commissioned by Water Technology and visualises the important connections we have to water, and the cultural significance of journeys taken by traditional custodians of our land to meeting places, where communities connect with each other around waterways.

The symbolism in the artwork includes:

- *Seven circles representing each of the States and Territories in Australia where we do our work*
- *Blue dots between each circle representing the waterways that connect us*
- *The animals that rely on healthy waterways for their home*
- *Black and white dots representing all the different communities that we visit in our work*
- *Hands that are for the people we help on our journey*

CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 The Project

The Suburban Rail Loop Authority (SRLA) is a statutory authority within Victorian that is responsible for the planning and delivery of the Suburban Rail Loop (SRL) project. This is a large rail infrastructure project which will ultimately provide an orbital rail loop connecting the existing radial system of railway lines that extend outwards from the Melbourne CBD. The first stage of this project is SRL East, that runs from Cheltenham to Box Hill.

The SRL East project includes 6 underground stations that will provide access to the line. In addition to responsibility for the infrastructure delivery, SRLA is a planning authority under the Planning and Environment Act 1987. In this capacity the SRLA is overseeing the development of Structure Plans for precincts associated with each of the SRL East stations.

There are a range of investigations that have been undertaken to support the precinct planning process. Work that specifically relates to surface water management (including flooding) includes the following two studies:

- SRL East Structure Plan - Flooding Technical Report
- SRL East Structure Plan - Integrated Water Management Strategy

The final version of these reports are “SRL East Structure Plan - Flooding Technical Report” Revision 1 February 2025, AJM Joint Venture and “SRL East Draft Structure Plan – Integrated Water Management Strategy” Revision 1 February 2025, AJM Joint Venture.

1.2 Peer Review

In October 2023 I was engaged on behalf of the SRLA to undertake independent peer review of the flooding and water management technical reports for the SRL East precincts.

Through the course of the peer review I have been engaged in conferences with the technical project teams undertaking the investigations. This was primarily related to the scoping of the investigations and discussion of broad approaches, methods and assumptions. Subsequently I have incrementally provided review and comments on progressive drafts of the reports through their development phase.

2 SCOPE AND METHOD

The scope and nature of my review has been to assess the overall method and approach for each report, along with the assumptions and limitations. I have addressed each section and provided feedback during the document development phase.

While reviewing the material I have been conscious of the context of the technical reports that are intended to inform the overall planning process and constructively contribute to the consideration of each precinct.

Specifically, I have been asked to address the following matters:

- The scope of my role in reviewing the Flooding Technical Report and IWMS;
- The appropriateness of the methodology, assumptions and limitations in the Flooding Technical Report and IWMS; and
- Whether the findings, assessment outcomes and recommendations in the Flooding Technical Report and IWMS are appropriate in the context of the structure planning process for the SRL East Structure Plan Areas.

3 FLOODING TECHNICAL REPORT

3.1 Method

The method applied for the investigation consisted of:

- A desktop review of the legislative and policy framework around flood management in the urban context for Melbourne.
- Identification of existing flooding conditions in the Structure Plan Areas.
- Assessment of risks and opportunities relating to flooding and development in the Structure Plan Areas (based on existing flood models and data), which included:
  - A flood safety assessment for the Burwood and Box Hill Structure Plan Areas, and
  - A flood impact assessment of the Burwood Structure Plan Area
- Recommendations responding to the identified flood conditions

Section 2.7 of the report addresses assumptions and limitations that have been applied to the investigation. They principally recognise the reliance of the work on existing flood and other information available at present. I consider these assumptions to be reasonable and appropriate.

The use of current hazard classifications (based on Australian Rainfall and Runoff, 2019) and latest Melbourne Water Technical Specifications for Flood Mapping is appropriate for the assessment. I note that the older Melbourne Water street safety classification has also been applied; only to the flood study data sets that pre-date the more contemporary flood information. This is considered a reasonable approach as it makes best use of the available information to provide the maximum coverage of area potentially impacted by flooding.

The precincts are all within well established urban areas that have formal, defined surface water drainage systems and urban built form. This includes the various land uses and major infrastructure such as roads and water/power networks.

This means that the context and needs of precinct planning in these areas is very different to that for greenfield precincts in urban growth areas. In greenfield areas the drainage infrastructure is not established yet and a significant effort is required to define and optimise the proposed drainage services. For the precinct planning areas I understand there is not proposed to be any significant reconfiguration of the overall development footprint such as the location of major roads and drainage infrastructure (acknowledging there may be some consolidation of existing lots).

No new hydrologic or hydraulic models have been established for the purposes of this investigation and the analysis utilised existing model data. One existing model was re-run for the preliminary flood impact assessment at Burwood.

The time and resource investment to develop six, new and detailed hydrologic and hydraulic models for this project would be difficult to justify and may not add significant value to the precinct planning process. It is noted in the report that Melbourne Water (together with Councils) are currently developing new flood information across Melbourne. I expect this newly generated Melbourne Water data will inform future flood assessments of any proposed developments under the precinct plans. Hence this would be likely to supersede any project specific modelling undertaken for this investigation. It is also reasonable to expect that some aspects of the technical guidelines around flooding are likely to continue to evolve over time, particularly with respect to climate change.

Hence, I consider the overall method proposed for the flooding report is appropriate for the purposes of precinct planning in the context of the SRL East project.

3.2 Legislative and policy context

Section 4 of the report addresses the relevant planning and policy documents, along with a listing of the relevant regulatory authorities with respect to flooding. This section covers all the areas I would expect to see in such a review and that in my experience are pertinent to the flood risk assessment and planning area.

3.3 Flooding Assessment

Section 5 of the report details, based on available flood studies and data, the existing flood risk across each of the 6 precincts. The description of flood risk in terms of inundation extent, depth and hazard (where available) is clear and well described. Efforts have been made to identify what could be defined as “hot spots” or areas of specific local increased flood risk, which is useful from a planning perspective as this identifies both where areas of flood related constraint are located, along with the areas of potential opportunity to contribute to future mitigation of flood impacts.

The information is focussed on the 1% Annual Exceedence Probability (AEP) plus climate change (reflected through increased rainfall intensity scenarios). Whilst this provides a snapshot of the most severe flood profile within the available flood information, I consider this is appropriate for planning purposes. In a strategic planning sense this is the key piece of information and adding large amounts of additional information on more frequent flooding could overly complicate the report and take focus from the principal area of interest.

It is interesting to note that, apart from Burwood, the other precinct locations tend to be at the upper end of urban stormwater catchments or on a ridge between two or more catchments. This is a key finding and has significant implications for future consideration of flood risk as, apart from Burwood, there is little requirement for the consideration of external catchment flows for the precinct areas. The report figures demonstrate this clearly which will be an important input to the precinct planning process going forward.

It is also pointed out that there is only one recognised waterway (Gardiners Creek in Burwood) that is directly impacted by any of the precincts. This is useful to the consideration of flooding and waterway issues as it significantly reduces the range of issues that need to be addressed from a flooding perspective for most of the precinct areas.

3.4 Risks and Opportunities

Section 6 of the report addresses risks in the Burwood and Box Hill Structure Plan Areas. The additional analysis in these two areas has been driven by the availability of information to underpin the additional analysis. I consider the additional analysis undertaken for these two areas provides significant value to the overall report.

The way in which the properties have been classified (for example Figure 6-1) is instructive and informs the planning process with a clear visual guide to flood risk and access safety. The breakdown of percentage areas that are flood “safe” or “constrained” is particularly useful and the consistency between the two areas provides an insight into the likely results for other areas. It would be helpful as future flood information becomes available for this analysis to be extended to other Structure Plan areas.

The flood impact assessment for the Burwood Structure Plan area provides insight regarding what future flood impact studies may reveal in relation to the proposed level of redevelopment in the Structure Plan areas. Whilst it is recognised that these results are preliminary, the overall trends can be considered reasonable and can be used as to guide further development and implementation of the structure plans.

Section 6.2 notes states that “Melbourne Water will remain the floodplain management authority for the SRL East Structure Plan Areas”. Whilst this is true it is important to also recognise that Councils are also likely to have some responsibility for flood referrals in council controlled stormwater catchments with overland flow.

Current Melbourne Water flood mapping projects that are generally undertaken commonly produce overlays which trigger Council referrals within the planning framework. Future planning scheme amendments that implement flood-related controls may separate out SBO into Melbourne Water (SBO1) and Council (SBO2) drainage areas.

Under section 6.2.2 I note that, while it is true that the present state planning provisions strictly only require the consideration of the existing 1% AEP design flood, it is becoming more common for floodplain authorities to require the 1% AEP with climate change scenario to be applied as the planning standard for development assessment (for example see amendment C384 for City of Melbourne Planning Scheme). I note that the material presented in this report has, where data is available, taken climate change into consideration.

I note in the last paragraph of section 6.2.2 that mitigation options in open space or on public land associated with developments are flagged. It is important to recognise that such solutions are difficult to achieve in the context of a standard planning permit for development. Such mitigation options would more likely need to be driven by Melbourne Water and/or Councils, separate to the development application process. Potentially a re-development charge scheme or some other mechanism would be required to facilitate this (outside Melbourne Water's normal flood mitigation works program). The report does raise the Urban Renewal Cost Recovery Scheme (URCRS) scheme being investigated in the Arden-Macaulay Precinct. A similar scheme would involve a complex process and something that would require significant effort establish. Apart from Burwood (with Gardiners Creek) there is no single source of flooding that could be readily mitigated in most of the Structure Plan areas.

3.5 Recommendations

The study recommendations are considered reasonable and appropriate.

Under section 7.1.5 (11) a 30 m minimum setback is recommended. This is in line with the planning provisions, although it is important to recognise that in some existing areas this is not always achievable within historic lot boundaries. It may be that in some areas, as with flooding hazard, lot consolidation may be necessary to overcome these constraints. I consider that some level of flexibility is always desirable when dealing with planning matters related to natural systems such as waterways and floodplains.

It is recommended for most of the areas that lot consolidation can be a practical way of addressing safety access issues. I agree with this approach and it may be that at some point in the future, areas where optimal consolidation may be required could be identified. This would provide maximum transparency to potential developers and improve the potential for optimised outcomes from a flood risk management perspective.

Throughout Section 7 I support the recommendation of a risk-based design approach and consider this to be an appropriate response to infill development.

4 INTEGRATED WATER MANAGEMENT STRATEGY

4.1 Method

The approach to the IWMS is described as high level and is consistent with the current stage in the overall process of planning for the precincts. The IWMS includes a review of the current policy framework and then goes on to explore high-level IWM opportunities for the precinct areas using a standard hydrologic modelling approach (MUSIC). I consider the approach and level of detail provided in the report to be appropriate for the high-level planning requirements of the Structure Plans.

The modelling methodology is primarily based on hydrologic modelling (water balance analysis). I note the following:

- A water demand analysis has been undertaken to determine impacts on potable water supply:
  - This water balance modelling is based on the population projections provided by the Housing Needs Assessment for each Structure Plan Area. This is a reasonable basis for establishing demand. The study is clearly preliminary in nature and seeks to establish opportunities for IWM that can be pursued in later, more detailed investigations (individual precinct IWM plans).
  - There will be some discrepancies between the baseline assumptions and likely ultimate Precinct outcomes (e.g., adopted land use assumptions have not been reconciled with the transport zones used to provide the population and jobs data), the approach provides a fit-for-purpose overall assessment of current and future demands.
- A MUSIC analysis has been undertaken, to assess Mean Annual Runoff Volume (MARV), impact of Precinct development on the receiving environment and quantify possible benefits from WSUD assets and other IWM solutions (e.g., stormwater harvesting):
  - Results were compared against Best Environmental Practice Management (BPEM) quantitative performance objectives for urban stormwater and the EPA 1739.1: Urban Stormwater Management Guidance.

Details of the modelling methodology and process are outlined in Appendix A. This provides an appropriate level of detail regarding the parameters and assumptions used to inform the modelling process. It is acknowledged that a number of simplifying assumptions were made that are considered reasonable for this exercise. A standard 1-hectare MUSIC model catchment was utilised and then scaled up for different catchment areas. This is an acceptable approach.

Whilst custom rainfall templates for each locality could have been developed, which may lead to some small variations in model outputs, it is recognised that the improvement in reliability of the results would be minor and for the demonstrative purposes of modelling exercise was not warranted. The report at Appendix A1 states that “This assumption may overestimate the stormflow generated for the Cheltenham Structure Plan Area but is not expected to affect the strategic insights”. I agree with this assessment.

Overall, I consider the methods applied in the determination of IWM opportunities to be satisfactory and appropriate for this investigation.

4.2 Policy, frameworks and guidelines

Section 4 in the report (along with Appendix B) provides a detailed review of the over-arching policies, framework and guidelines that impact IWM in Melbourne and Victoria and are of relevance to the SRL East Precincts.

This section is effective in linking the key drivers from policy with the stakeholders that will are engaged in the process. IWM is a complex area with (compared to say the flood management area) a less well defined set of performance requirements and less clear accountabilities, along with a distributed regulatory framework.

The report is clear in highlighting the areas within the overall IWM framework that are of relevance to the SRL East Precincts (for example Table 4.3).

In section 4.7 the report states that "While the objectives of EPA Victoria Publication 1739.1 are not currently enforced by the planning schemes, this IWM Strategy adopts these performance objectives as the benchmark for IWM opportunities to achieve best practice stormwater management". I support this approach as I consider it is likely that over time these objectives will become more strongly embedded in planning policy.

The report identifies relevant potential/future IWM schemes within each Precinct and relevant catchment objectives from the IWM Framework for Victoria. It is appropriate to refer to the state IWM framework. As identified in the IWMS, the future IWM plans will benefit by aligning with works by other relevant stakeholders (e.g., South East Water regarding likely future opportunity for recycled water).

4.3 IWM Assessment

This section provides a high-level options assessment for each Precinct. Each precinct has been considered in a similar manner, including:

- Identifying roads where passively irrigated street trees could be incorporated;
- Assessing possible reductions to future water demand, based on IWM solutions including:
  - Rainwater tanks;
  - Recycled water re-use;
  - Alternative water (stormwater harvesting or recycled water) for irrigation of active and passive open space.
- Mitigation of Mean Annual Runoff Volume (MARV) and pollution using the above IWM solutions.
  - MARV and overall water quality treatment performance are reported and compared against Best Environmental Practice Management (BPEM) quantitative performance objectives for urban stormwater and the EPA 1739.1: Urban Stormwater Management Guidance.

Whilst the water balance modelling is based on generic assumptions for each overall precinct area, there are specific opportunities identified within each area (for example stormwater harvesting in a particular reserve). This gives a more tangible level of opportunity assessment and provides a starting point for future detailed IWM plans for each precinct.

I note that the assumed water tank sizes are large if considering standard residential lots, however it is recognised that the future scenarios will involve higher density developments that may accommodate more substantial IWM measures and that this is a conceptual analysis to demonstrate the potential level of system performance. As such I consider the assumptions around rainwater tanks and the water balance to be acceptable.

The proposed approach aligns with Melbourne Water's recommendations that an integrated water management process should be considered for the whole precinct. I consider this is an appropriate way to address IWM opportunities.

4.4 Recommendations

The recommendations are considered concise, targeted and appropriate for this type of strategic level investigation. There overall strategy is demonstrated to have the potential to significantly reduce potable water demand and work towards quality and quantity objectives.

5 CONCLUSIONS

The Flooding Technical Report and Integrated Water Management Report for the SRL East Structure Plan have been reviewed for their technical approach and the outputs that have been generated.

Through the course of this review I have considered the assumptions behind each report and the suitability of the approach and outputs for the intended purpose of informing the strategic planning process.

Overall, I consider that the methodology, assumptions and limitations in the Flooding Technical Report and IWMS are appropriate.

I am also of the view that the findings, assessment outcomes and recommendations in the Flooding Technical Report and IWMS are appropriate in the context of the structure planning process for the SRL East Structure Plan Areas.

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