SUBURBAN RAIL LOOP EAST

SRL East Draft Structure Plan

Flooding Technical Report

More Homes For Victorians

VICTORIA State Government

Suburban Rail Loop

PREPARED FOR SUBURBAN RAIL LOOP AUTHORITY

SRL EAST DRAFT STRUCTURE PLAN – FLOODING TECHNICAL REPORT

FEBRUARY 2025

REVISION 01

AJM Joint Venture

Document Control Record

Joint Venture

222 Exhibition Street, Melbourne VIC 3000
PO Box 23061, Docklands VIC 8012 Australia

DOCUMENT CONTROL			
Project Title		**Suburban Rail Loop East**	
Document Title		**SRL East Draft Structure Plan – Flooding Technical Report**	
Document ID		**Technical Report H.1**	
Rev	**Date**	**Revision details/status**	**Author**
01	February 2025	For exhibition	J. Szemis
Current revision		01	

Contents

Appendices

Glossary and abbreviations

TERM	DEFINITION
AAD	Annual Average Damage
AEP	Annual Exceedance Probability – refers to the probability of a flood event being equalled or exceeded in any given year. A 1 % AEP is the percentage of likelihood of a flood of a given size or larger occurring in a given year. If a flood has an AEP of 1 %, it has a one in 100 likelihood of occurring in any given year.
AHD	Australian Height Datum – the datum surface to which all vertical control for mapping is referred.
AJM-JV	Aurecon Jacobs Mott MacDonald Joint Venture – SRLA's technical advisor
ARI	Average Recurrence Interval – refers to the average time period between occurrences equalling or exceeding a given value.
ARR 2019	Australian Rainfall and Runoff Guidelines 2019 Edition
Blue-green infrastructure	Green infrastructure refers to key vegetation features such as street trees, parklands, grassed sports fields and vegetated walls. Blue infrastructure refers to waterways, wetlands, recreational lakes, stormwater retarding basins and other water body features. Blue-green infrastructure brings these assets together through integrated approaches to deliver community benefits.
Catchment	An area where water falling as rain is collected by the landscape, eventually flowing to a body of water such as a creek, river, dam, lake or ocean, or into a groundwater system.
Climate change	A long-term change of the earth's temperature and weather patterns, generally attributed directly or indirectly to human activities such as fossil fuel combustion and vegetation clearing and burning.
Creek corridor	The area immediately adjacent to the waterway, including the waterway (bed and banks), riparian zones and adjacent open space.
DEECA	The Department of Energy, Environment and Climate Action (DEECA) is a government department in Victoria, Australia.
DELWP	The Department of Environment, Land, Water and Planning (DELWP) is a former government department in Victoria, Australia (now referred to as DEECA or DTP).
DTP	Department of Transport and Planning
Effective imperviousness	Proportion of a catchment with impervious surfaces that are directly connected to a waterway through the stormwater drainage network.
EES	Environment Effects Statement
EPA Victoria	Environment Protection Authority Victoria
EPR	Environmental Performance Requirements
ESD	Environmentally sustainable development An approach to development that seeks to meet the needs of the present without compromising the ability of future generations to meet their own needs. It has economic, social and environmental dimensions.
Flooding (stormwater)	Inundation by local runoff. Stormwater flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing the urban stormwater drainage system to overflow.
Flow	Movement of water – the rate of water discharged from a source, given in volume with respect to time.
Fluvial flooding	When rivers and creeks break their banks and water flows out onto adjacent low-lying areas.
FO	Floodway Overlay
Freeboard	It is a factor of safety above the 1 % AEP flood level, typically used in relation to the setting of floor levels to reach the Nominal Flood Protection Level (NFPL), land levels and apex for underground carpark entrances. The freeboard is determined on a site-by-site basis and accounts for factors including wave action, localised flow effects, uncertainties in the accuracy of the 1 % AEP flood level estimate and climate change.
Hydraulic model	Software package used to determine flood levels in a waterway or drainage system based on input flows, topographic details of the waterway or drainage system, and other parameters.
Hydrological model	Software package used to determine flows in a waterway or drainage system based on input rainfall, catchment areas and other parameters.
IWM	Integrated water management

TERM	DEFINITION
km	Kilometres (unit of distance)
LiDAR	Light Detection and Radar
LSIO	Land Subject to Inundation Overlay
MW	Melbourne Water Corporation
m	Metres (unit of distance or depth)
m AHD	Metres relative to the Australian Height Datum (unit for flood levels)
m/s	Metres per second (unit for flow velocity)
m^3/s	Cubic metres per second (unit for volumetric flow)
ML/day	Megalitres per day (unit of volumetric flow)
NFPL	The Nominal Flood Protection Level (NFPL) is the 1 % AEP flood level, plus the applicable freeboard.
Over-floor flooding	Where an existing property has finished floor levels lower than the known 1 % AEP flood level and may experience over floor flooding during such a flood event.
Planning Area	The area declared by the Minister for SRL where SRLA is a planning authority under the *Planning and Environment Act 1987.*
Pluvial flooding	When the amount of rainfall exceeds the capacity of urban storm water drainage systems or the ground to absorb it. Also referred to as surface water flooding or overland flooding.
Resilience	The capacity of individuals, communities, institutions, businesses, systems and infrastructure to survive, adapt and grow, no matter what chronic stresses or shocks they encounter, used commonly in reference to climate change.
RORB	Hydrologic software package used to calculate hydrographs from rainfall and other inflow sources within a catchment.
SBO	Special Building Overlay
SES	State Emergency Service
SRL	Suburban Rail Loop
SRL East (the Project)	The first stage of SRL, with six underground stations connecting Box Hill and Cheltenham.
SRLA	Suburban Rail Loop Authority
Structure Plan Area	The extent of the land to which the Structure Plan Area applies. The Structure Plan will focus on areas near to the SRL station and locations with more significant future change. This area is smaller than the full Declared Planning Area.
WSUD	Water Sensitive Urban Design Integrating the urban water cycle into urban design to minimise environmental damage and improve recreational and aesthetic outcomes. WSUD includes the use of passive irrigation techniques, and the incorporation of WSUD infrastructure such as swales, bio-filtration systems (rain gardens), permeable paving, and wetlands into the design.
UFZ	Urban Floodway Zone
VPP	The Victoria Planning Provisions is a document that provides a comprehensive set of planning provisions for Victoria It is not a Planning Scheme and does not apply to any land. It is a statewide reference (template), used as required, to construct municipal Planning Schemes.

Executive summary

As part of the Suburban Rail Loop East (SRL East) project, Draft Structure Plans (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, while protecting and preserving the features that people love about them now.

This technical report will inform the development of the Structure Plans.

This report describes existing flooding conditions in each Structure Plan Area as well as issues and opportunities relating to flooding and development.

The report makes recommendations relating to flood management to be considered when developing the Structure Plans. This report also identifies the need to prepare a strategy with stakeholders that does not immediately inform the Structure Plan but should be considered for managing flood risks, notably preparation of an Integrated Water Management (IWM) Strategy.

FLOODING

Flooding is a natural hazard, that unlike other natural hazards, floods are to a great degree, predictable in terms of their locations, depth, and extent. This means appropriate measures can be developed to reduce flood risk and damage. Land use planning is recognised as the best means to avoid future flooding problems. Through careful planning, flood risks to life, property and community infrastructure can be minimised and the environmental significance of floodplains protected.

The assessment for this technical report identified existing flooding risk in the Structure Plan Areas. A flood safety assessment was undertaken for Burwood and Box Hill Structure Plan Areas. A flood impact assessment of the Burwood Structure Plan Area has assessed the potential change in flood conditions from future growth and development.

Risks and opportunities to consider when developing the Structure Plans were identified. This includes policy and planning controls to avoid, minimise or manage potential flood impacts, and to maximise the potential for positive change.

It should be noted that results presented herein are preliminary and have been developed to understand the likely flooding conditions, inform the preparation of structure plans and must not be used for any other purpose.

FINDINGS

The Victoria Planning Provisions (VPPs) consider the 1 % Annual Exceedance Probability (AEP) flood event (that is, a flood which has a one in 100 likelihood of occurring in any given year). Melbourne Water, as the responsible floodplain management authority for the Structure Plan Areas, factor climate change increased rainfall as per the relevant technical specifications at the time of preparing each flood studies. This assessment has considered best available information including flood studies prepared by AJM-JV for the SRL East Environment Effects Statement (Technical Appendix Q.2 Surface Water Impact Assessment (Document Number: TA Q.1 Surface Water EC, Revision 01, AJM-JV, October 2021) and supplied by Melbourne Water which have been used to assess the flood and hazard conditions of the Structure Plan Areas.

Existing 1 % AEP including climate change flood conditions in the SRL Structure Plan Areas are summarised below:

- All Structure Plan Areas are subject to existing flooding, either riverine (fluvial) or overland (pluvial) flooding. Areas of flood hazard presenting a risk to children, elderly and vehicles (to varying levels) exists within the Structure Plan Areas.

- Climate change scenario projections are not applied consistently across the various flood studies used for this report, as the applicable technical specifications and relevant climate science is updated regularly. Flood modelling outputs for the structure plan areas range in date, with some studies dating back to 2010, and so the underlying assumptions for each study may vary.

- Drainage assets are typically located where rainfall accumulates, forming overland flow paths along drainage assets, including Gilarth and Highett St Main Drain (in Cheltenham), Burton Ave and Westall Drain (in Clayton), Clayton, Monash University Drain (in Monash), Glen Waverley Drain (in Glen Waverley), Gardiners Creek and McComas Grove Drain (in Burwood), and Severn St and Box Hill South Main Drains (in Box Hill).

- There are areas of flood hazard in the Structure Plan Areas primarily located in proximity to existing overland flow paths and drainage assets, or Gardiners Creek for the case of Burwood.

- Properties in Glen Waverley, Burwood and Box Hill Structure Plan Areas have been identified to currently experience over-floor flooding during a 1 % AEP including climate change flood event.
- The 1 % AEP flood conditions are expected to be greater when the recently updated Australian Rainfall and Runoff guidelines climate change projections are adopted.

Flood impact assessment

A flood safety assessment of the Structure Plan Area was prepared for Burwood and Box Hill (only), given recent and consistent flood studies available for entire structure plan area. The results indicate that:

- Approximately 81 % in Box Hill and 78 % in Burwood of the developable land in the Structure Plan Areas is deemed as either ‘safe site’ or has ‘safe access’ during a 1 % AEP including climate change flood event. This includes area that has no flood hazard.

- 19 % of the Box Hill Structure Plan Area is deemed as constrained or having unsafe site and access. This generally applies to parcels along and near Severn St Main Drain, Box Hill South Main Drain, Collins St Main Drain and Laburnum St Main Drain.

- 22 % of the Burwood Structure Plan Area is deemed as constrained, or unsafe site and access. This generally applies to parcels along the McComas Drain and Gardiners Creek.

- These unsafe or constrained sites will need to provide flood mitigation solutions if there is a proposed increase of people within the area (i.e. high-density development or public thoroughfare) to reduce risk to people’s safety.

- Note there are large parcels deemed unsafe that only a portion of the site has high flood hazard so contribute to the higher percentage. Large parcels have the opportunity to provide alternative access from flood free land.

An assessment of potential flood impacts within the Burwood Structure Plan Area resulting from changes in land use and the associated impervious area was prepared based upon the available flood models. The results indicate increased flood impact that could be experienced and tends to concentrate along the downstream portion of Gardiners Creek, further details are presented in Section 6.1.

RECOMMENDATIONS

The existing flood planning controls will continue to have a role in the administration of flooding within the Structure Plan Areas. Development applications in the Structure Plan Areas will be assessed by Melbourne Water as the floodplain management authority to the guidelines and best available information at the time.

The following recommendations relating to flooding should be considered for the Structure Plan Areas.

Structure Planning

NO.	STRUCTURE PLAN AREA	RECOMMENDATION
1	Cheltenham	A risk-based design approach should be adopted for all new development in flood risk areas (high flood risk see Bay Road, Tulip Grove, Luxmoore Street, Davie Avenue, Southland Shopping Centre, Karen Street) to ensure that there is no increase in the existing risk to life and/or property.
2		Future redevelopment of industrial land surrounding Gilarth Street Main Drain at the western edge of the Structure Plan Area should consider additional flood storage surrounding the drain to alleviate the flood conditions through increased setback from the drain and site design.
3	Clayton	A risk-based design approach for all development in flood risk areas (high flood risk see Carinish Road, Monash Medical Centre, Yarram Crescent, Burton Avenue, Ravhur Street and surrounding streets, land along Clayton Drain) to ensure that there is no increase to the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP flood including climate change event, should be encouraged to minimise flood risk.
4		Any expansion of the Monash Medical Centre and associated health assets should implement flood management solutions to address the existing flooding condition.
5		Any public open space or works in / on land in Nicholson Street, identified for acquisition in the *SRL East Structure Plan - Transport Technical Report – Clayton* (AJM-JV, 2025) for an active transport corridor is site is subject to flooding during a 1 % AEP including climate change flood event, flowing from the north to the south, should be designed to safely manage and accommodate local flooding.
6	Monash	A risk-based design approach should be adopted for all new development in flood risk areas (high flood risk see Duredin Street, Blackburn Road, Wellington Road. Boundary Road) to ensure that there is no increased risk to life and/or property, adopting a risk-based design approach.
7		Any public open space or works associated with proposed green streets and strategic corridors (identified in the *SRL East Structure Plan - Transport Technical Report – Monash* (AJM-JV, 2025) which intersect with the 1 % AEP including climate change flood extent, should be designed to safely manage and accommodate localised flooding.
8	Glen Waverley	A risk-based design approach for all development in flood risk areas (high flood risk see Myrtle Street, Waverley Road Retention Basin, and the Aristoc site along the Glen Waverley Main Drain including Aristoc Road) to ensure that there is no increase to the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP including climate change flood event, should be encouraged to minimise flood risk.
9		Increased setbacks and flood storage to alleviate existing flood conditions are encouraged for future redevelopment of land surrounding Glen Waverley Drain at the southern edge of the Structure Plan Area.
10	Burwood	A risk-based design approach for development in flood risk areas (high flood risk see McComas Grove Drain along Lungrend Reserve and Gardiners Creek to Highbury Road, Sixth Street and Highbury Road) to ensure that there is no increase to the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP flood including climate change event.
11		New developments should be set back a minimum of 30 metres from the banks of Gardiners Creek in accordance with Clause 12.03-1S (River and riparian corridors, waterways, lakes, wetlands, and billabongs) of the Victoria Planning Provisions.
12		Any future redevelopment of the industrial land at 127 Highbury Rd (which has a flood hazard classification of H3) should incorporate flood mitigation measures to manage the flood risks identified in Figure 4.13.
13		Encourage allotment consolidation of existing properties that are currently subject to over-floor flooding and/or high flood risk along McComas Grove Drain (see Appendix B for locations) to facilitate development that can facilitate safer site and access, achieve current flood protection standards, and reduce flooding risk.
14		Proposed open space works around Sinnott Street, McComas Grove and Cumming Street (as identified in the SRL East Structure Plan – Open Space Technical Report (AJM-JV, 2025)) which overlaps with flooding associated with the McComas Grove Drain should be designed to improve flood conditions such as increased flood storage and/or slowing velocities. .

NO.	STRUCTURE PLAN AREA	RECOMMENDATION
15		Any public open spaces or works associated with the proposed active transport connection opportunity around Sinnott Street intersects with the McComas Grove Drain flood extent, should be designed to safely manage, and accommodate localised flooding.
16	Box Hill	A risk based design approach should be adopted for new development in flood risk areas (high risk areas see Nelson Road following Severn Main Drain, Kenmare Street along Box Hill North Main Drain, between Oxford Street and Albion Road along Box Hill South Main Drain and between Bass Street and Patricia Street along Collins Street Main Drain) to ensure that there is no increase in the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP flood including climate change event.
17		Encouragement of allotment consolidation for properties where there is existing over-floor flooding (Nelson Road following Severn Main Drain, Kenmare Street along Box Hill North Main Drain, between Oxford Street and Albion Road along Box Hill South Main Drain and between Bass Street and Patricia Street along Collins Street Main Drain. See Appendix B for locations) to facilitate development that can achieve current flood protection standards and reduce flooding risk.
18		Where redevelopment of existing community services or emergency facilities are proposed (i.e., expansion of Box Hill Hospital and associated health assets), flood management solutions will need to address existing flooding condition to reduce the flooding risk on community facilities.

Integrated Water Management Strategy

An IWM Strategy has been prepared for the SRL East Structure Plan (Technical Report K.1) to commence the IWM Plan by providing a high-level strategy that outlines the constraints and opportunities in each SRL East Structure Plan Areas to deliver on IWM principles. It is understood that IWM solutions may not be able to greatly reduce the 1 % AEP including climate change flood event although may be able to resolve more frequent flood events.

1 Introduction

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 will deliver a 90-kilometre rail line linking every major train service from the Frankston Line to the Werribee Line via Melbourne Airport.

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.

1.1 Purpose of this report

This technical report will inform the development of the Draft Structure Plans (Structure Plans) to guide land use planning and development in the Structure Plan Areas of SRL East.

The report describes the existing flooding conditions in each Structure Plan Area as well as associated conditions upstream and downstream.

Issues and opportunities relating to flood management that impact planning for the development of each Structure Plan Area are identified.

Recommendations to consider when developing the Structure Plans are made, with the objective to avoid, minimise or manage potential negative impacts of change, and to maximise potential for positive change. This report also identifies the need to prepare a Strategy with stakeholders that does not immediately inform the Structure Plan but should be considered for managing flood risks, notably preparation of an Integrated Water Management (IWM) Strategy.

1.2 Project context

Construction of the SRL East underground stations is underway at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill. This provides an opportunity to enhance the surrounding neighbourhoods. SRL East will support thriving and sustainable neighbourhoods and communities that offer diverse and affordable housing options, with easy access to jobs, transport networks, open space, and community facilities and services.

A vision has been developed in consultation with the community and stakeholders for the Structure Plan Area and surrounds. The Visions set out the long-term aspirations for these areas, ensuring they are ready to meet the needs of our growing population.

Figure 1.1 shows SRL East in the context of the entire SRL project and Melbourne's rail network.

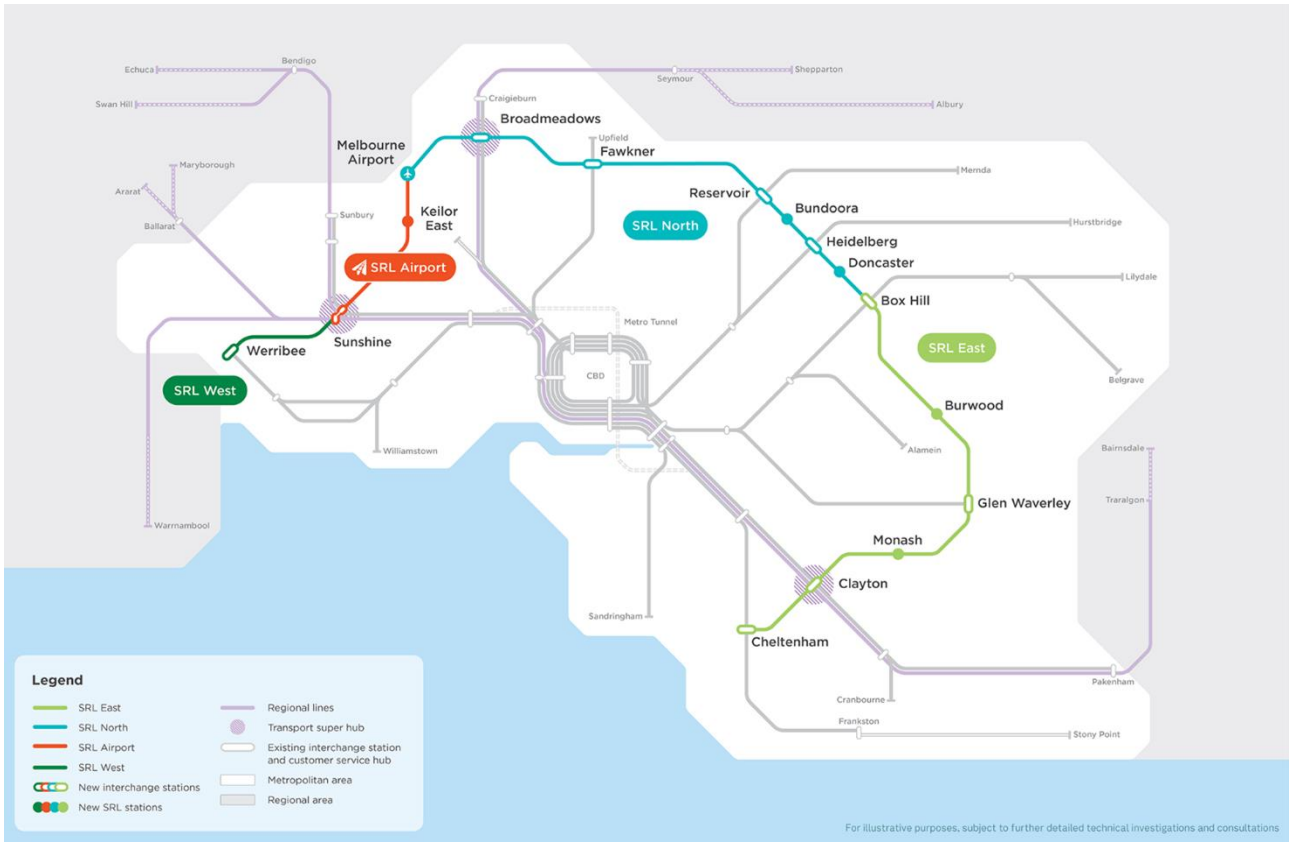

FIGURE 1.1 SRL EAST CONTEXT IN MELBOURNE'S RAIL NETWORK

1.3 Structure planning

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. These areas cover a walkable catchment that extends from the SRL station entrances. Additional places are included within each defined area as required to make planning guidance more robust and effective, and to align with each community's aspirations and current and future needs.

A Structure Plan is a blueprint to guide how an area develops and changes over a period of time. Structure Plans describe how future growth within the area will be managed in an appropriate and sustainable way to achieve social, economic and environmental objectives. The plans cover a wide range of matters, such as transport connections and car parking, housing and commercial development, community infrastructure, urban design, open space, water and energy management, climate resilience and sustainability.

By tailoring planning decisions to reflect the needs of a defined area, Structure Plans give effect to the policies and objectives set for these areas and cater for changing community needs. They also provide certainty for residents, businesses and developers by identifying the preferred locations and timing of future land uses, development and infrastructure provision.

Structure Plans take a flexible and responsive approach that enables places to evolve over time.

Planning scheme amendments will be required to implement the Structure Plans into the planning schemes of the cities of Bayside, Kingston, Monash and Whitehorse.

1.4 Structure of this report

- **Section 1** provides the background and context of the technical assessment.
- **Section 2** explains the methodology for the technical assessment.
- **Section 3** defines the six Structure Plan Areas.
- **Section 4** summarises legislation, policies and other documents relevant to the assessment.
- **Section 5** describes the flooding conditions in each Structure Plan Area.
- **Section 6** assesses the flood safety of Burwood and Box Hill Structure Plan Areas and the flood impact of Burwood given the available information. It identifies the risks and opportunities relating to flood conditions that will impact land use planning and development in the relevant Structure Plan Areas.
- **Section 7** sets out the recommendations to consider when developing the Structure Plans.

2. Methodology

The methodology for this flooding technical assessment involved:

- Establishment of Structure Plan Areas for the assessment (see Section 3)
- Review of legislation, policies and other relevant documents relating to flooding (see Section 3.2)
- Identification of existing flooding conditions in the Structure Plan Areas (see Section 3) below for more information on the methodology, and Section 5 for the existing conditions assessments)
- Assessment of risks and opportunities relating to flooding and development in the Structure Plan Area (see Section 6). A flood safety assessment for the Burwood and Box Hill Structure Plan Area has been prepared with available information, to inform this assessment. A flood impact assessment of the Burwood Structure Plan Area has assessed the potential change in flood conditions from future growth and development.
- Recommendations were made to respond to the flood conditions when developing the Structure Plans (see Section 7).

2.1 Assessing existing flooding conditions

The following information was reviewed to assess the existing conditions in the Structure Plan Areas:

- **Planning controls** – flood planning controls applied to each Structure Plan Area
- **SRL East Environment Effects Statement (EES) flood modelling** – hydraulic and hydrologic modelling developed to assess the potential impacts of SRL East on surface water.
- **Melbourne Water flood information** – flood extent and flood hazard outputs of regional flood studies was obtained from Melbourne Water for each Structure Plan Area. A summary of the flood studies and source is provided in Section 5.
- **Municipal Flood Emergency Management Plans** – municipal plans and local guides developed by the State Emergency Service (SES) to inform local governments and emergency services in planning and responding to flood events.
- **Climate change –** A summary of the flood studies and how each study accounted for increased rainfall from climate change is provided in Section 5.

2.2 Assessment of flood hazards

Flood hazard conditions are typically reported using the following information: flood depths (m), peak flood levels (m AHD), flood flows (cubic metres per second (m^3/s)), inundation extents, velocities (metres per second (m/s)), flood hazard classification as outlined in the Australian Rainfall and Runoff Guidelines, 2019 and unique to Melbourne Water, Safety Road Risk.

The flood conditions in Section 5, presents the flood hazard conditions within each Structure Plan Area to define locations where flooding may be a risk to life and/or property.

The high-level nature of this assessment is limited to the flood studies and modelling available and desktop assessment to inform this stage of the structure planning process and should be read in conjunction with the assumptions and limitations listed in Section 2.7.

Section 2.2.1 and Section 2.2.2 describe the Safety Road Risk and flood hazard classification in more detail.

2.2.1 FLOOD HAZARD

The Australian Rainfall and Runoff (ARR) Guidelines (2019) define six flood hazard classifications to inform vulnerability and risk, shown in Figure 2.1.

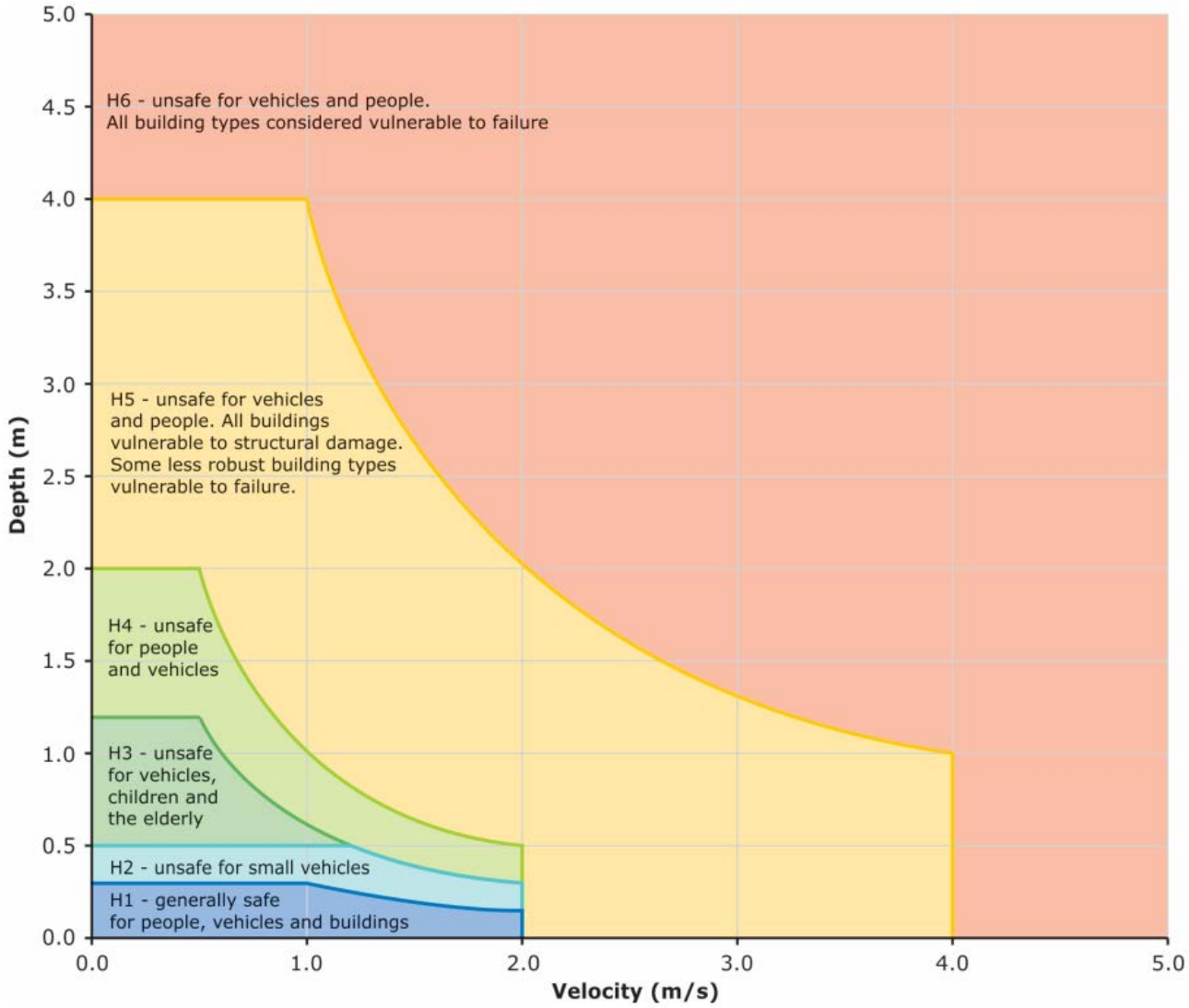

FIGURE 2.1 HAZARD CLASSIFICATIONS – VULNERABILITY THRESHOLDS (FIGURE 6.7.9 FROM BOOK 6 OF AUSTRALIAN RAINFALL AND RUNOFF, 2019)

2.2.2 SAFETY ROAD RISK

Safety Risks in Road was previously created by Melbourne Water to assess the safety risk in roads, as part of Melbourne Water Flood Mapping Projects undertaken before 2019. This flood data can be used to inform the flood hazard sites where flood hazard classification is not available, which is only available for projects undertaken after 2019.

The Safety Road Risk is determined in the road reserve and is defined by Melbourne Water terms of velocity and depth for the 1 % AEP flood extent. Categories are classified in Table 2.1. The higher the 'velocity x depth' and 'depth' criteria determines the Safety Road Risk.

TABLE 2.1 SAFETY ROAD RISK CATEGORY CRITERIA

SAFETY ROAD RISK CATEGORY	CATEGORY CRITERIA
Low	velocity x depth < 0.2 m^2/s, or depth < 0.2 m
Low to Moderate	0.2 m^2/s <= velocity x depth < 0.4 m^2/s, or 0.2 m < depth < 0.4 m
Moderate	0.4 m^2/s <= velocity x depth < 0.6 m^2/s, or 0.4 m < depth < 0.6 m
Moderate to High	0.6 m^2/s <= velocity x depth < 0.84 m^2/s, or 0.6 m < depth < 0.84 m
High	velocity x depth >= 0.84 m^2/s, or depth >= 0.84 m

2.3 Safety and flood impact assessment

2.3.1 BURWOOD STRUCTURE PLAN AREA

The Burwood flood hydraulic model developed for the SRL East EES Surface Water Impact Assessment (AJM-JV 2021b) covers approximately 90 per cent of the Burwood Structure Plan Area which was granted 'No Objection' status[1] by Melbourne Water as part of the EES. The Burwood flood model has been used for a preliminary impact and safety 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 draft SRL East Burwood Structure Plan (dated March 2025), and a flood safety risk for parcels within the Structure Plan Area (See Section 6.1.2).

The impact assessment is limited to:

1. A flood impact assessment to assess the changes of impervious areas proposed by the Structure Plans (Day 3 Scenario) compared with Developed conditions which assumes the station is built (Day 1 Scenario) [2].

2. A flood safety assessment, which categorises developable land based on ARR 2019 Safety Criteria and the Guidelines for Development in Flood Affected Areas (DELWP 2019) (see Section 4.2), being:

    a. Residential – any area exceeding the H1 flood hazard classification is considered unsafe (above 300 millimetres depth and 2 m/s velocity).

    b. Commercial – any area exceeding the H2 flood hazard classification considered unsafe (above 500 millimetres depth and 2 m/s velocity). This is relevant to the thresholds for on-accommodation uses and excludes sensitive areas.

The high-level nature of this assessment is limited to the flood studies and modelling available and desktop assessment to inform this stage of the structure planning process and should be read in conjunction with the assumptions and limitations listed in Section 2.7.

[1] Modelled flood conditions of the EES existing conditions and reference design was accepted by Melbourne Water.

[2] Rail Day 1 is the modelled flood conditions when the SRL East station is built. Rail Day 2 is the modelled flood conditions when the over station development and adjacent station development is built, not used in this assessment. Rail Day 3 is the scenario that assumes the complete built form proposed by the structure plan.

2.3.2 BOX HILL STRUCTURE PLAN AREA

Recent Melbourne Water flood mapping outputs for Whitehorse LGA (Engeny, 2021 & W4G, 2023) was made available for Box Hill Structure Plan Area enabling an assessment of safety risk. Consequently, a flood safety assessment categorises developable land based on ARR 2019 Safety Criteria, and the Guidelines for Development in Flood Affected Areas (DELWP 2019) was undertaken. For further information on the categories and assumptions see Section 2.3.1 and 2.7.

2.3.3 OTHER STRUCTURE PLAN AREAS

The remaining Structure Plan Areas do not have Structure Plan Area scale flood models. For this reason, impact and safety assessments were not undertaken.

2.4 Stakeholder engagement

This technical report builds on previous consultation undertaken for the feasibility, design development and environmental and planning approval phases of SRL East. The structure planning process has involved comprehensive and robust conversations with the community, councils, key institutions and other stakeholders on the proposed visions and key directions for the SRL East Structure Plan Areas and surrounds. For further information please refer to the SRL Structure Planning Engagement Reports available on the SRLA website[3].

Table 2.2 summarises the stakeholder engagement conducted and how it has informed the preparation of this technical report. Feedback on the technical advice of this report was obtained through targeted consultation including direct engagement, face to face meetings or technical workshops.

TABLE 2.2 STAKEHOLDER ENGAGEMENT

STAKEHOLDER	DATE	MATTERS DISCUSSED / ISSUES RAISED	OUTCOME
All SRL East Structure Plan Areas			
Melbourne Water	14 September 2023	EES to structure planning Structure Planning timeline – discussion paper Structure planning and sustainability MW IWM approach Working relationship – roles and responsibilities	Building relationship and sharing approach on structure planning
	16 November 2023	Introduction to SRL precinct planning program Melbourne Water precinct discussion paper inputs Roles and responsibilities Sharing flood modelling for structure planning Extent of land use change MW keen to co-design help lead IWM planning	Strategic planning alignment Progressing data sharing for flood conditions
	14 December 2023	MW presented Water Oriented design approach and IWM process as the preferred process SRL East Visions Flood risk assessment IWM Strategy	Ongoing strategic planning alignment
	12 March 2024	Water Oriented Precinct Planning MW vision feedback Alignment on IWM inputs SRL deliverables for structure planning	Ongoing strategic planning alignment – update on MW's Water Oriented Precinct Planning
	20 June 2024	IWM Strategy progress MW role in IWM Strategy review	Alignment on timeframes for review

[3] https://bigbuild.vic.gov.au/library/suburban-rail-loop/reports/engagement-reports

The best available flood information from Melbourne Water has been considered in the preparation of this report, and collaboration with Melbourne Water is key to any future amendments to appropriately plan for the SRL East Structure Plan Areas.

Melbourne Water is the responsible floodplain management authority and administer the existing flood related planning controls in the SRL East Structure Plan Areas. The existing flood planning controls continue to have a role in the administration of flood management within the SRL East Structure Plan Areas. Development applications in the SRL East Structure Plan Area will be assessed by Melbourne Water as the floodplain management authority to the guidelines at the time. Section 6.2 considers these requirements to inform the Structure Plans.

2.5 Structure Plan recommendations

To align with the delivery of Structure Plans, recommendations have been prepared for each SRL East Structure Plan Area, responding to the flooding context, risks and opportunities the Structure Plans are seeking to resolve through the planning process.

2.6 Data register

2.6.1 FLOOD TECHNICAL SPECIFICATIONS AND GUIDELINES

A list of technical specifications and guidelines are provided below in Table 2.3.

TABLE 2.3 REFERENCE MATERIAL REGISTER

REFERENCE MATERIAL	SOURCE	NOTE
Australian Rainfall and Runoff 2016	Geoscience Australia	Provides national standards for estimating design flood characteristics to ensure the safe and sustainable infrastructure and community planning
Guidelines for Development in Flood Affected Areas	DELWP, 2019	See Section 4.2.
AM STA 6100 Infrastructure Projects in Flood-Prone Areas	MW	Informs any development works that have the potential to change the characteristics of the floodplain
AM STA 6200 Flood Mapping Project Specifications	MW	Informs the flood modelling that supports the appropriate planning and development advice

2.6.2 FLOOD STUDIES

A detailed list of flood studies relevant to each Structure Plan Area in this report is provided in Section 5.

2.6.3 ADDITIONAL DATA

The data that has been reviewed and used to inform this report is detailed in Table 2.4.

TABLE 2.4 DATA REGISTER

DATA	SOURCE	IMPLEMENTATION
Planning overlays and zones	data.vic.gov.au	Identification of areas with planning and/or constraints Identification of Floodway, Land Subject to Inundation and Special Building Overlays (FO, LSIO and SBO) to inform flooding risk

DATA	SOURCE	IMPLEMENTATION
Watercourses	data.vic.gov.au	Identification areas subject of inundations and designated waterways
Victorian Flood Database	data.vic.gov.au	Identification of the 1 % AEP flood extents
Metro contours	data.vic.gov.au	Used to understand overland flow behaviour
Drainage data (e.g. pit and pipe, retention basins, MW Main Drains) and drainage catchments	Melbourne Water	Understanding of overland flow behaviour Identification of land areas subject to inundation/flooding to inform design solution Identification and/or mitigation of council drainage assets
Flood modelling	See Section 5 for relevant flood study details.	Used to understand overland flow and flooding behaviour 1 % AEP flood extent under current climate and climate change conditions and inform flooding risk
Aerial photography	AJM-JV	Used to examine existing conditions and temporal changes in the catchment to understand flooding in the context of the Structure Plan Areas.
Municipal Emergency Flood Management Plans	https://www.ses.vic.gov.au/plan-and-stay-safe/flood-guides	Identification of the 1 % AEP flood extents and over-floor flooding under the 1 % AEP flood event.
SRLA GIS (incl, structure plans, LiDAR, SRL EES flood information)	https://srla-gis.esriaustraliaonline.com.au/	Used to examine overland flow behaviour within the structure plans

Maps with relevant planning overlays and Melbourne Water flood extents are provided throughout this report and are referenced as such. The date and methodology of each flood model should be reviewed to understand the limitations and assumptions associated with each model.

2.7 Assumptions and limitations

The assumptions and limitations that apply to this report are:

- The flood modelling studies have been provided by Melbourne Water to understand the likely general flood conditions and hazard locations for the purposes of SRL East structure planning and should not be relied upon for extracting specific results.
- Flood modelling studies provided from third parties to inform this assessment have been adopted as is for the purpose of this report. AJM-JV assume no responsibility for any errors associated with these studies or model outputs.
- Flood modelling outputs as provided by Melbourne Water have been filtered to remove shallow inundation flood extents where the depth of inundation is less than or equal to, 0.050 metres as consistent with the Melbourne Water AM STA 6200 Flood Mapping Project Specifications Standard August 2023 ‘Technical Specifications'.
- The SRL East EES flood modelling used for the desktop assessment in Section 6. The purpose of the model was to inform the station development impact assessment and not designed for the purpose of structure planning, so the outputs are considered indicative only. The flood study does not encompass the entire extent of the Structure Plan Area so is limited in its application.
- Flood modelling studies used in this assessment has been based on methods and data relevant at the time of the assessment and are subject to future change. Relevant Australian Rainfall and Runoff (ARR) Guidelines, Melbourne Water Guidelines and Technical Specifications used for each flood study are detailed in Section 2.6.1.

- Climate change scenario projections are not applied consistently across the various flood studies used for this assessment, as the applicable technical specifications have updated over time due to advances in climate change science and technology. Flood modelling outputs for these areas range in date, with some dating back to 2010, and so the underlying assumptions for each model may vary. It is likely that such flooding conditions will change over the life of the structure plans.
- Flood assessment techniques, policy and development guidelines are all subject to change by the relevant regulatory authorities. This report is based on existing modelling, policy and guidelines current at the time the contributing reports were prepared. It is likely that such conditions will change over the life of the structure plan.
- The best available assessment methods have been utilised at the desktop stage of the report. Limited flood modelling and no on-site assessments were undertaken for this report. Results presented for the assessment are preliminary and have been developed to inform the preparation of Structure Plans and must not be used for any other purpose.
- Where planning controls do not cover the flooding conditions identified in the Structure Plan Area, it is assumed that this will be updated in a timely manner by Melbourne Water and Councils flood mapping program.
- Publicly available information used for this assessment was assumed to be correct and accurate.

2.8 Peer Review Report

This technical report has been independently peer reviewed by Warwick Bishop of Water Technology Pty Ltd. The peer review report is attached as **Appendix E** of this report, which sets out the peer reviewer's opinion on the SRL East Draft Structure Plan – Flooding Technical Report.

3. SRL East Structure Plan Areas

This section defines the Structure Plan Area in each SRL East neighbourhood.

3.1 Cheltenham Structure Plan Area

The Cheltenham Structure Plan Area surrounds the SRL station at Cheltenham in the City of Kingston and City of Bayside.

The Structure Plan Area is generally bordered by residential land north of Stayner Grove and Alison Street to the north, residential land east of Chesterville Road to the east, Park Road to the south and Middleton Street and Worthing Road to the west.

The Structure Plan Area is intersected by the Nepean Highway and the Frankston Line.

The Cheltenham Structure Plan Area is shown in Figure 3.1.

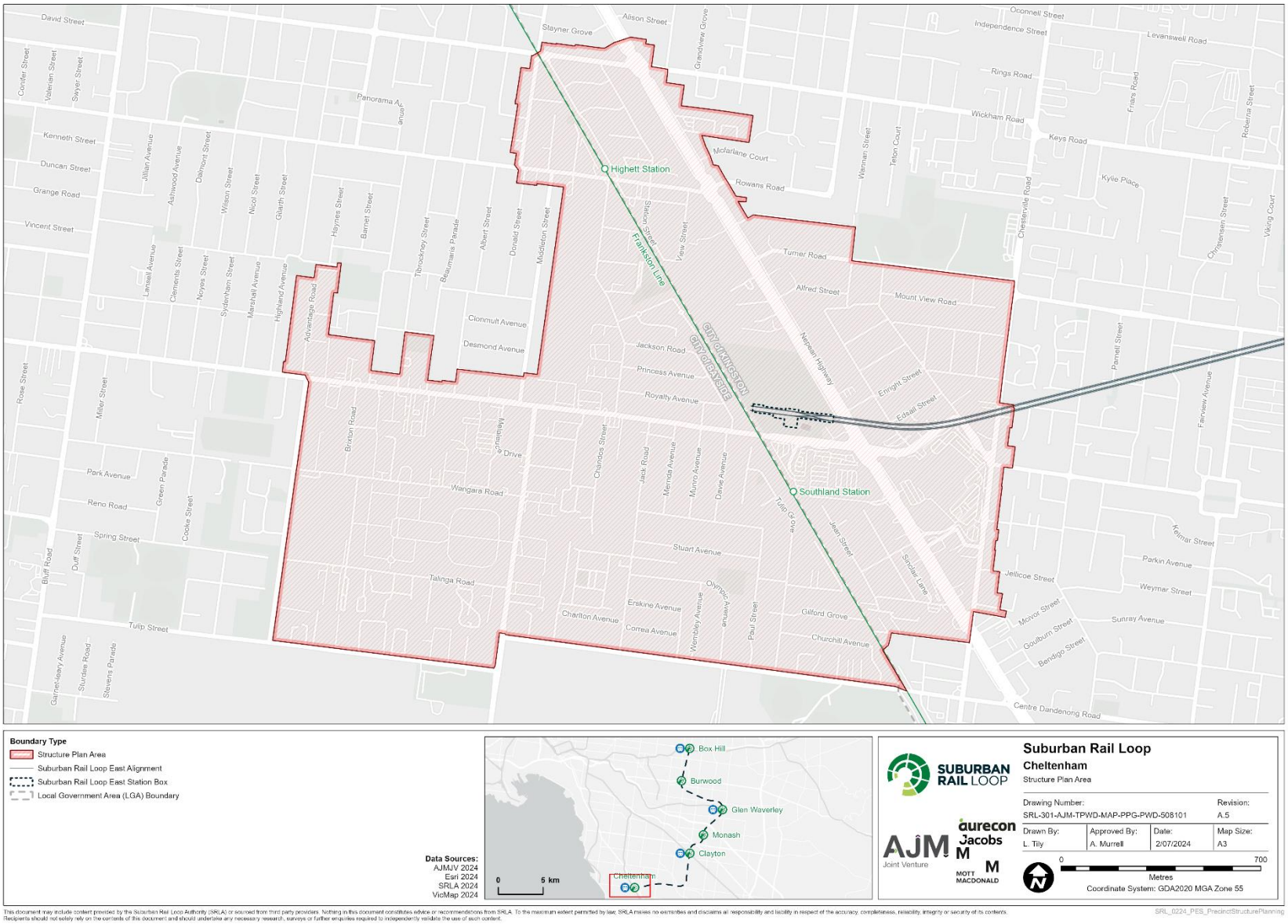

FIGURE 3.1 CHELTENHAM STRUCTURE PLAN AREA

3.2 Clayton Structure Plan Area

The Clayton Structure Plan Area surrounds the SRL station at Clayton in the City of Monash and City of Kingston.

The Structure Plan Area is generally bordered by North Road / Wellington Road to the north, Ormond Road to the west, residential lots between Alward Avenue and Murdock Street, and parts of the Cranbourne / Pakenham Line to the south, and Kombi Road and Buckland Street to the east.

Dandenong Road is a major road, running in a north-west to south-east alignment through the edge of the Structure Plan Area. The existing Cranbourne / Pakenham Line intersects the Structure Plan Area in an east-west alignment.

The Clayton Structure Plan Area is shown in Figure 3.2.

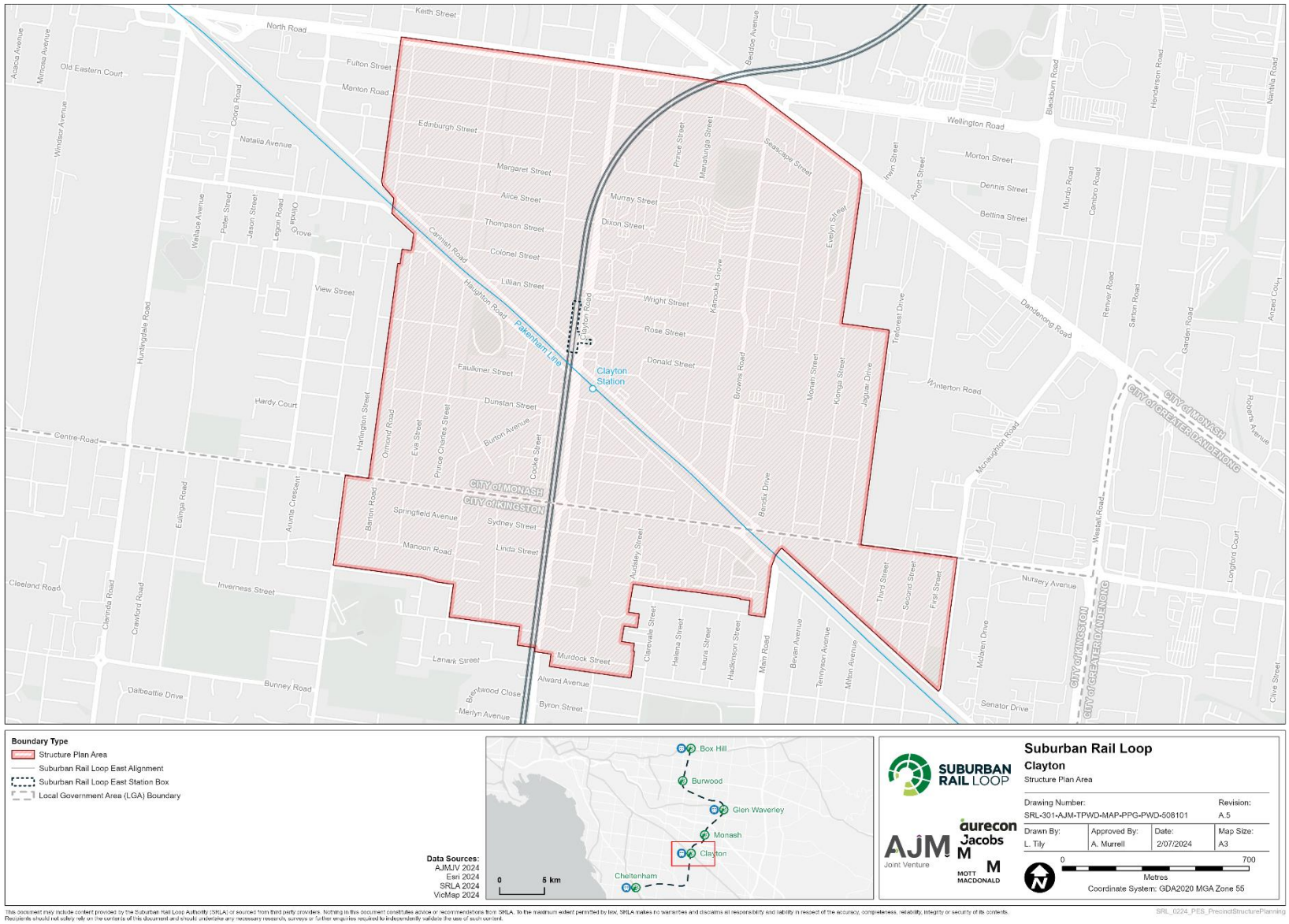

FIGURE 3.2 CLAYTON STRUCTURE PLAN AREA

3.3 Monash Structure Plan Area

The Monash Structure Plan Area surrounds the SRL station at Monash in the City of Monash.

It is generally bordered by Wellington Road and Princes Highway to the south, Gardiner Road and residential properties between Clayton Road and Dover Street to the west, land north of Ferntree Gully Road to the north and a reservation for a future road, which forms a natural barrier to properties to the east.

Monash University Clayton campus is located in the Monash Structure Plan Area.

The Monash Structure Plan Area is shown in Figure 3.3.

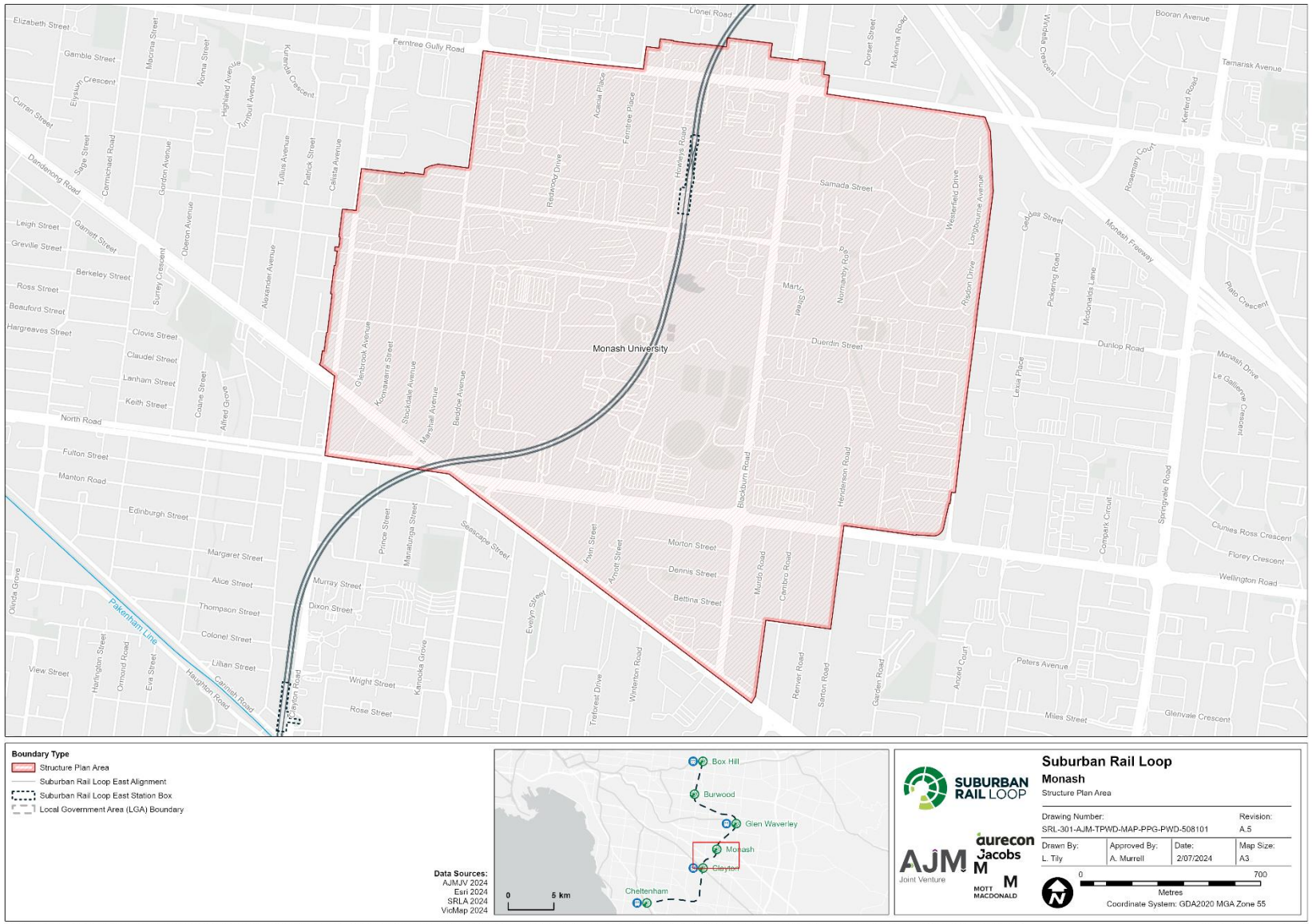

FIGURE 3.3 MONASH STRUCTURE PLAN AREA

3.4 Glen Waverley Structure Plan Area

The Glen Waverley Structure Plan Area surrounds the SRL station at Glen Waverley in the City of Monash.

It is generally bordered by residential properties along Madeline Street to the north, Danien Street and The Outlook to the east, Waverley Road to the south and Kinnoull Grove and Rose Avenue to the west.

Coleman Parade and the existing Glen Waverley Line intersect the centre of the Structure Plan Area in an east-west alignment.

Key arterial roads include Springvale Road which intersects the Structure Plan Area in a north-south alignment, and High Street Road and Waverley Road.

The Glen Waverley Structure Plan Area is shown in Figure 3.4.

.

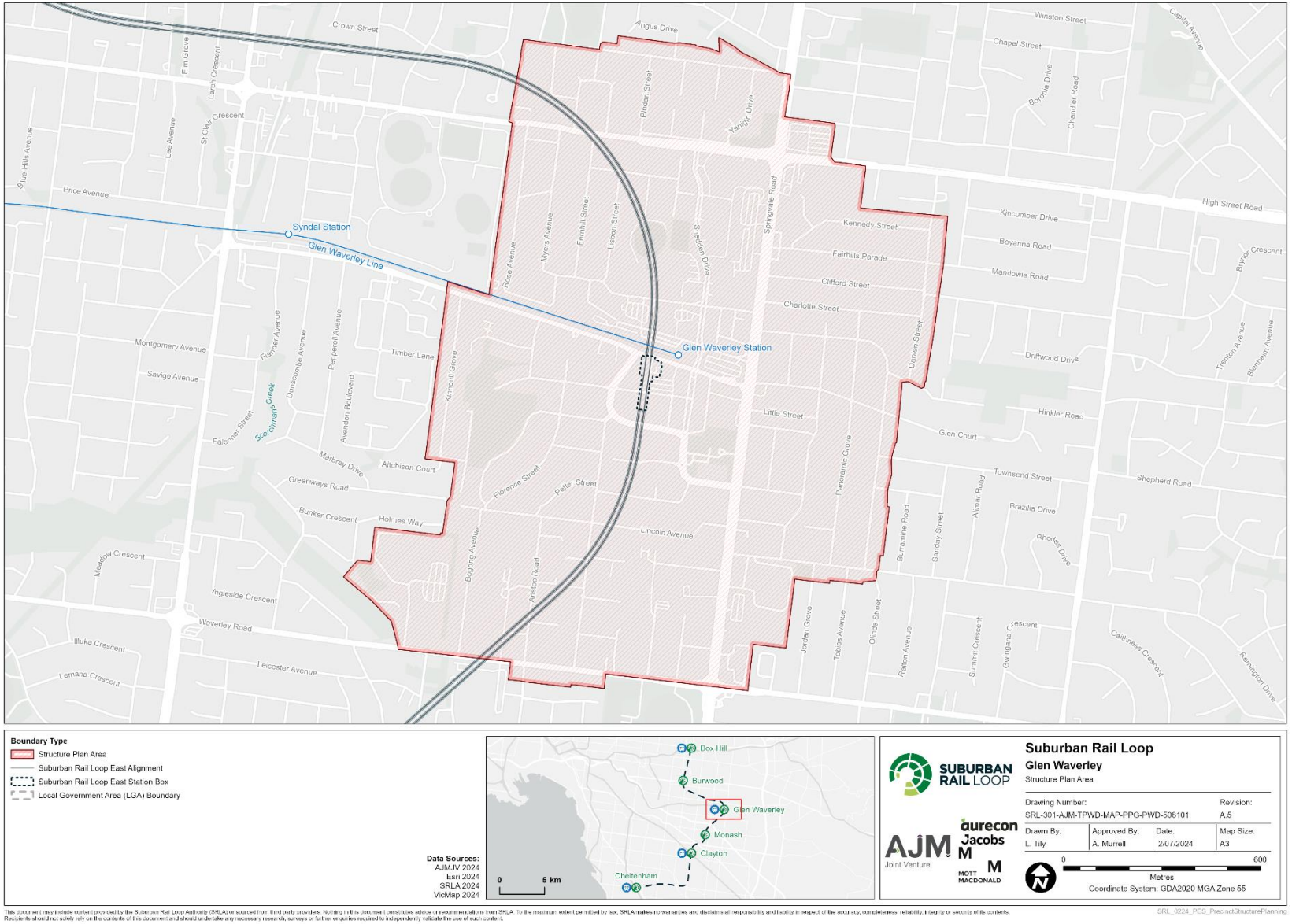

FIGURE 3.4 GLEN WAVERLEY STRUCTURE PLAN AREA

3.5 Burwood Structure Plan Area

The Burwood Structure Plan Area surrounds the SRL station at Burwood. The Structure Plan Area is mainly located in the City of Whitehorse, with the southern portion south of Highbury Road extending into the City of Monash.

The Structure Plan Area is generally bounded by Uganda Street, Deakin University, Inverness Avenue, Bronte Avenue and Yarra Bing Crescent to the north, Andrews Street, Wridgway Avenue, Prospect Street and Huntingdale Road to the east, Zodiac Street, Ashwood Drive, Carmody Street and Barlyn Road to the south and Sixth Avenue, Evans Street, Warrigal Road, Parer Street and Meldan Street to the west.

Burwood Highway intersects the centre of the Structure Plan Area in an east-west alignment.

Deakin University Burwood campus is located in the Structure Plan Area.

The Burwood Structure Plan Area is shown in Figure 3.5.

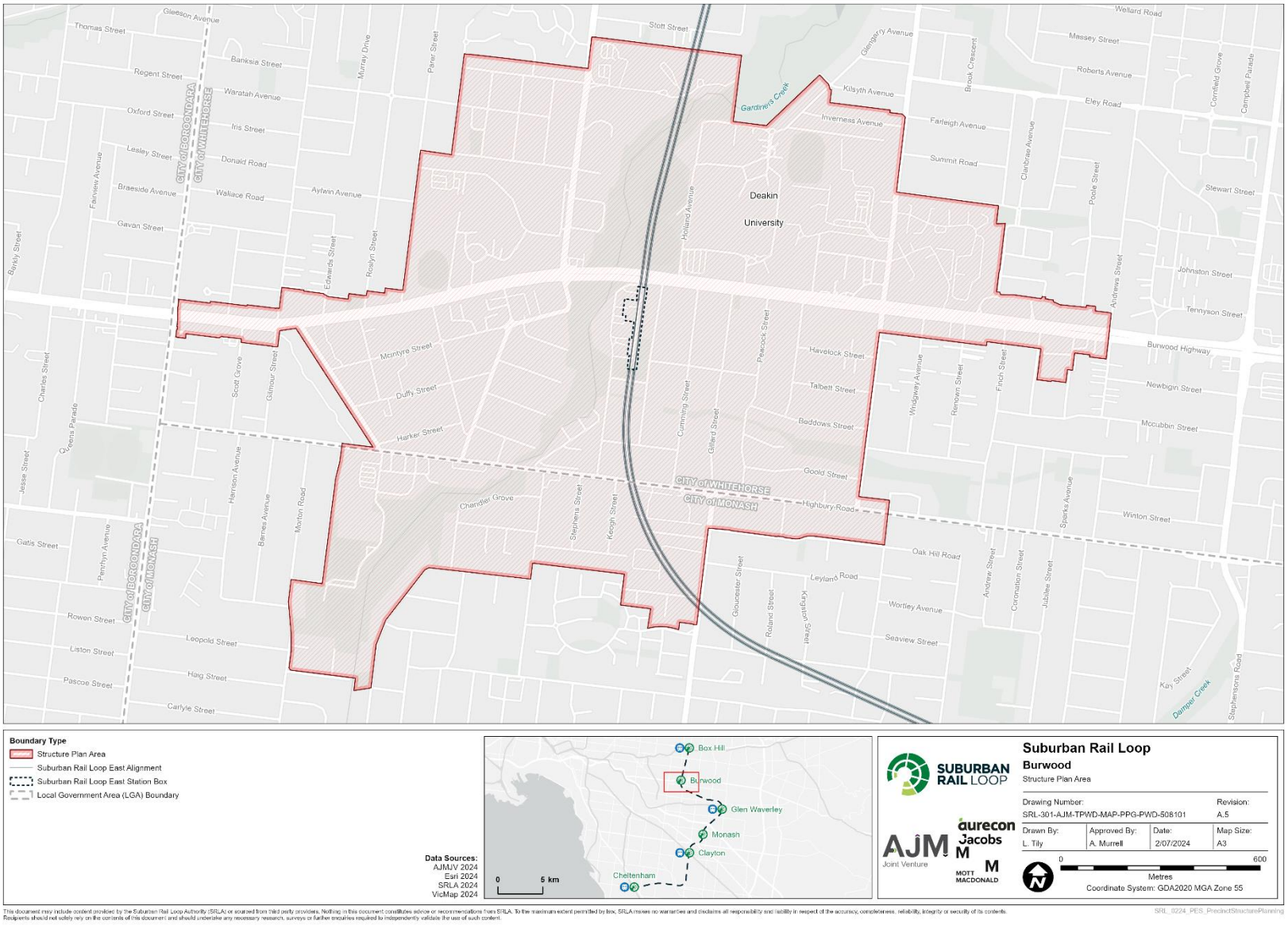

FIGURE 3.5 BURWOOD STRUCTURE PLAN AREA

3.6 Box Hill Structure Plan Area

The Box Hill Structure Plan Area surrounds the SRL station at Box Hill in the City of Whitehorse.

It is generally bordered by Severn Street and McKean Street to the north, Clota Avenue and Laburnum Street to the east, slightly west of Elgar Road to the west and Canterbury Road to the south.

Whitehorse Road / Maroondah Highway and the existing Belgrave / Lilydale Line intersect the centre of the Structure Plan Area in an east-west alignment. The main road corridors include Whitehorse Road, Elgar Road and Station Street.

The Box Hill Structure Plan Area is shown in Figure 3.6.

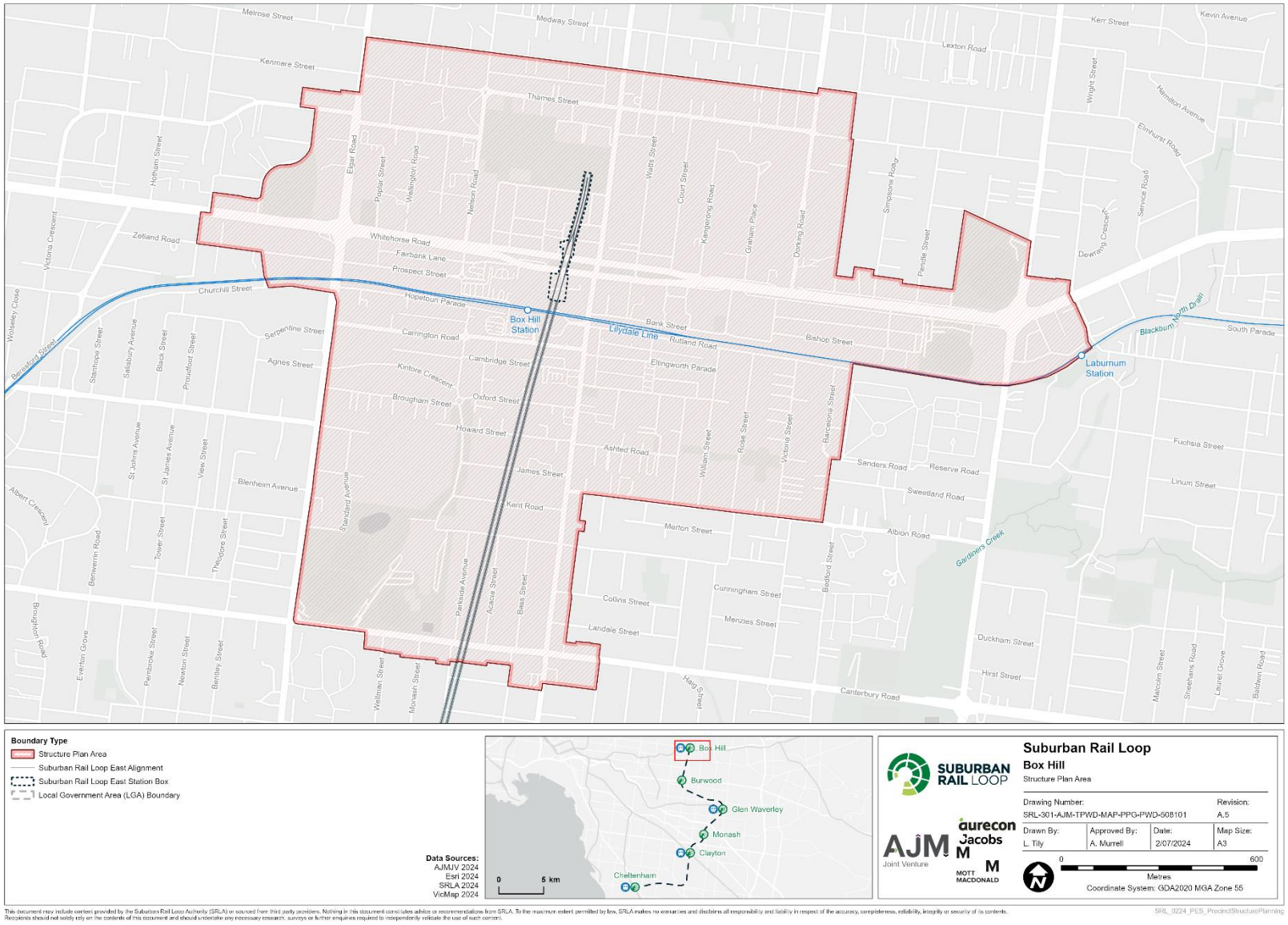

FIGURE 3.6 BOX HILL STRUCTURE PLAN AREA

4. Legislative and policy context

This section summarises the roles and responsibilities relevant to the flooding technical assessment.

The Guidelines for Development in Flood Affected Areas (DELWP 2019) are the primary guidelines relevant to this assessment and are summarised in Section 4.2.

Additional legislative and policy context is summarised in Appendix A.

4.1 Roles and responsibilities in flooding

The role and responsibilities of regulatory authorities related to flooding are summarised in Table 4.1.

TABLE 4.1 ROLES AND RESPONSIBILITIES IN FLOODING

ROLE	RESPONSIBILITY	ACT	REQUIREMENTS
Regional drainage and floodplain management authority and waterway manager	Melbourne Water	Section 202(2) of the *Water Act 1989*	The functions of Melbourne Water in water management are to: • Assess how far floodwaters are likely to extend and rise • Declare flood levels and flood fringe levels • Declare building lines • Develop and implement flood management plans and take action necessary to minimise flooding and flood damage • Control developments that have occurred or that may be proposed for land adjoining waterways • Advise local governments about flooding and controls.
		Section 204 of the *Water Act 1989*	Adopt a flood level, flood fringe area or a building line which in its assessment, is the best estimate based on available evidence, of a flood event with a 1 % probability of occurring in any one year.
Relevant drainage authority	Melbourne Water and/or Council	*Planning and Environment Act 1987*	A responsible authority under the *Planning and Environment Act 1987* must have regard to the declarations relating to flood levels, flood fringe areas or building lines relating to designated waterways or designated land or works. A council or other public statutory body with power to do so must prevent land uses that are inconsistent with any identified flood hazards. Flooding associated with Council drains are included in joint flood studies to identify areas that are subject to flooding in a catchment less than 60 hectares that are typically Council responsibility. This is translated into Planning Schemes, with Melbourne Water being a determining referral authority, and the degree of flood hazard being a decision-making guideline under Clause 65 of the Victoria Planning Provisions. Council as the relevant drainage authority consider similar decision-making criteria in assessing the planning application. It is expected that where flood modelling indicates there is an existing potential flood risk that is not identified in the current planning controls, that Melbourne Water and Councils will update planning controls as part of its statutory obligations to manage flooding appropriately.
		Division 5 of the *Water Act 1989*	Fund flooding and drainage infrastructure by imposing contributions under the *Water Act 1989*.

ROLE	RESPONSIBILITY	ACT	REQUIREMENTS
		Part 3B of the *Planning and Environment Act 1987*	Fund flooding and drainage infrastructure by imposing development contributions under the *Planning & Environment Act 1987.*
		Section 18 of the *Subdivision Act 1988*	Land for drainage infrastructure or infrastructure contributions can be required through subdivision under the *Subdivision Act 1988.*
Local drainage authority	Council and/or Department of Transport & Planning (Roads)	Section 198 of the *Local Government Act 1989* Section 199 of the *Water Act 1989* *Road Management Act 2004*	Local drainage networks can be vested and under the management and control of the council or road authority that governs the municipality/location in which they are located. To provide, operate and protect drainage systems, including the drainage of water into all designated waterways and all designated land or works within its district. Council as the local drainage authority have a responsibility to manage stormwater associated with these drains.
Planning authority	SRLA	Section 12 of the *Planning and Environment Act 1987* Role of the Planning Authority	In preparing a Planning Scheme Amendment, SRLA must consider any significant effects it considers a Planning Scheme or the Amendment might have on the environment, or which it considers the environment might have on any use or development envisaged in a Planning Scheme or the Amendment.
Responsible authority	Council	Section 14 of the *Planning and Environment Act 1987*	Victoria's statutory land use planning system operates through municipal Planning Schemes, which are subordinate instruments under the *Planning and Environment Act 1987*. Section 62(e) of the Act enables Planning Schemes to 'regulate or prohibit any use or development in hazardous areas, or areas likely to become hazardous'. As a result, Planning Schemes contain land use and development controls to enable flood risk to be managed. Council must also efficiently administer and enforce these controls within the Planning Scheme.
		Regulation 148 of the *Building Regulations 2018*	A council must prepare maps for all designated special areas within its municipal district. A Designated Special Area can be applied to land liable to flooding.

4.2 Guidelines for Development in Flood Affected Areas

The Guidelines for Development in Flood Affected Areas (DELWP 2019) provide an assessment framework and method to assist decision-making on development in flood affected areas. The purpose of the guidelines is to provide clear, consistent and transparent decision-making for managing land use and development in areas affected by flooding and are relevant to the urban infill development of the SRL East Structure Plan Areas.

The principles of strategic planning relevant to SRL East Structure Plan Areas are:

- Land should not be rezoned for a higher density land use without adequate consideration of the flood risk, including the cumulative impacts, and loss of safe access during floods.
- Land that is affected by flooding should be identified by a flood overlay, unless it is zoned for flood purposes. This makes the flood risk clear to all and provides the necessary trigger for development proposals to be referred to a floodplain management authority. It also enables future purchasers of land to be informed of the flood risk through vendor disclosure statements.

- Redevelopment of existing sites can be challenging if the current use of the land permits intensifying urban development. Redevelopment often increases the area of impermeable surfaces, resulting in deteriorating water quality and increased flows in existing drainage systems. Clause 53.18 – *Stormwater management in urban development* and Clause 56.07 – *Integrated water management in planning schemes* provide guidance for how this can be addressed. Detailed modelling will usually be required to assess how development intensification affects flood behaviour.

The development guidelines applicable to all development consider four objectives outlined below.

4.2.1 FLOOD SAFETY

- **Site safety requirements** – **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 requirements** – **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.

  Appendix C provides a summary of the flood safety criteria as set out in these Guidelines.

4.2.2 FLOOD DAMAGE

- **Freeboard** – **floor levels are required to be built above the flood level.** This ensures no adverse impacts on existing property and infrastructure. This includes basement entries, associated lifts, vents and drainage systems.

4.2.3 FLOOD IMPACTS

- **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.

4.2.4 PROTECT AND ENHANCE THE ENVIRONMENTAL FEATURES OF WATERWAYS AND FLOODPLAINS

- **Waterway and floodplain condition.** Development should maintain or improve waterway and floodplain conditions.

- **Access to riparian corridors.** Development should allow access to maintain riparian corridors.

- **Water quality.** Development should maintain or improve water quality.

- **Natural function.** Development should maintain (by avoidance or offset) the natural function of floodplains and waterways in storing and conveying floodwater.

- **Amenity.** Development should retain or improve significant vistas or landscapes within the riparian corridor.

5. Existing conditions

Two types of flooding occur in the SRL East Structure Plan Areas.

- Pluvial flooding (also known as surface water or overland flooding) which occurs when a heavy rainfall exceeds the capacity of urban storm water drainage systems or the ground to absorb it, causing flooding on roadways, streets and properties. Areas where this is a risk are typically covered by a Special Building Overlay (SBO).

- Fluvial flooding (also known as riverine flooding) which occurs when rivers and creeks break their banks and water flows out onto adjacent low-lying areas. Areas where this is a risk are typically covered by an Urban Floodway Zone (UFZ), Floodway Overlay (FO) or Land Subject to Inundation Overlay (LSIO).

5.1 Waterways and catchments

Table 5.1 summarises the main waterways within or adjacent to the SRL East Structure Plan Areas and related sub-catchments. All the SRL East Structure Plan Areas are within the Yarra River catchment or the Dandenong Creek catchment, as shown in Figure 5.1.

The waterways and catchments for each Structure Plan Area are described in Section 5.

TABLE 5.1 MAIN WATERWAYS AND CORRESPONDING CATCHMENTS RELATED TO THE SRL EAST STRUCTURE PLAN AREAS

STRUCTURE PLAN AREA	RIVER CATCHMENT	SUB-CATCHMENT	MAIN WATERWAYS
Cheltenham	Dandenong	Heatherton Drain	Highett MS, Park Road Main Drain, Meek Street Drain, Argus Street Drain
Clayton	Dandenong	Mordialloc Settlement Drain	Clayton South Drain, East Oakleigh Drain, Clayton Drain, Burton Avenue Drain
Monash	Dandenong	Mile Creek	Monash University Drain
Glen Waverley	Yarra, Dandenong	Scotchmans Creek	Glen Waverley Drain, Scotchmans Creek, Damper Creek
Burwood	Yarra	Gardiners Creek	Gardiners Creek, McComas Grove Drain, Stott St Drain
Box Hill	Yarra	Koonung Creek, Gardiners Creek	Box Hill South Main Drain, Severn Street Main Drain, Box Hill North Main Drain, Bushy Creek Drain

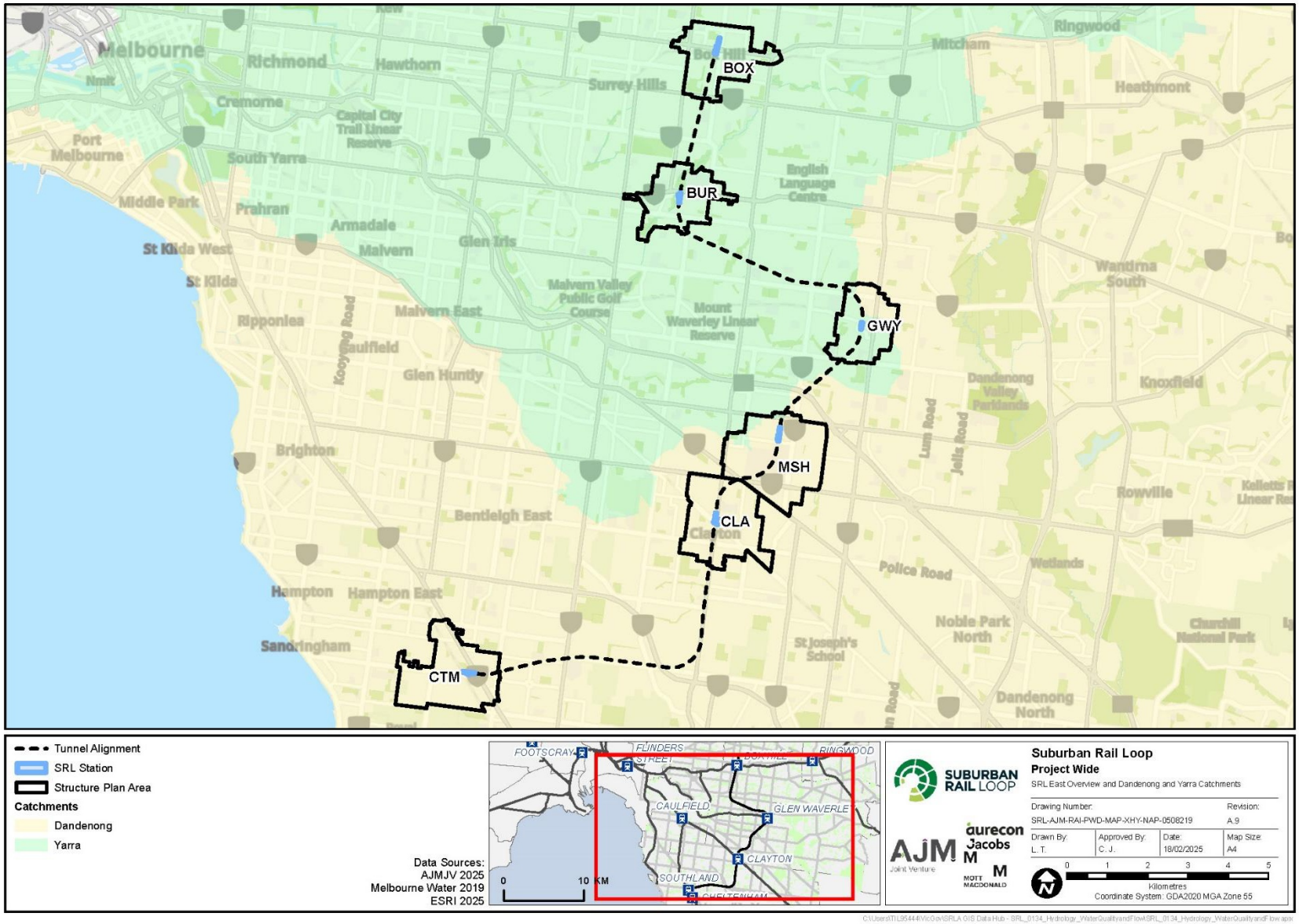

FIGURE 5.1 SRL EAST STRUCTURE PLAN CATCHMENTS

5.2 Cheltenham Structure Plan Area

The Cheltenham Structure Plan Area is located in the Elster Creek, Bay Outfall, and the Heatherton Drain catchments, as shown in Figure 5.2.

Most of the Cheltenham Structure Plan Area is in the Elster Creek catchment, covering approximately 3.1 square kilometres, and comprising mainly commercial and residential land, with some pervious area in public open green spaces.

Water in this catchment tends to flow south-east to north-west via the drainage network and overland flow and follows the Banks Avenue Drain, Gillard Street Drain, Highett Drain and the Moorabbin Drain, as shown by the black arrows in Figure 5.2. Water continues north-west until it reaches the concrete-lined Elster Creek channel approximately 6 kilometres from the Cheltenham Structure Plan Area, before draining into Port Phillip Bay.

There is also a constructed waterbody at Sir William Fry Reserve in the Elster Creek catchment immediately north of the SRL station at Cheltenham.

The Cheltenham Structure Plan Area in the Bay Outfall and the Heatherton Dain catchments covers a small, combined area of 0.5 square kilometres. Water flows from the north-east to south-west, as shown by the blue arrows in Figure 5.2. Water then flows south until it discharges into Port Phillip Bay.

5.2.1 PLANNING CONTROLS

There are four drains and relevant flood extents covered by an SBO inside or just outside the Cheltenham Structure Plan Area, as shown in Figure 5.3. These include the:

- Highett Main Drain and the Gilarth Street Main Drain, which are in the north-west section of the Cheltenham Structure Plan Area.
- Banks Avenue Main Drain, on the western border of the Cheltenham Structure Plan Area.
- Moorabbin Main Drain, approximately 200 metres north-west of the Cheltenham Structure Plan Area.

A permit is required to construct a building or to construct or carry out works on land subject to an SBO as specified by the planning scheme. As the determining referral authority, Melbourne Water assesses flood risk factors and the effect of a development redirecting or obstructing flow paths.

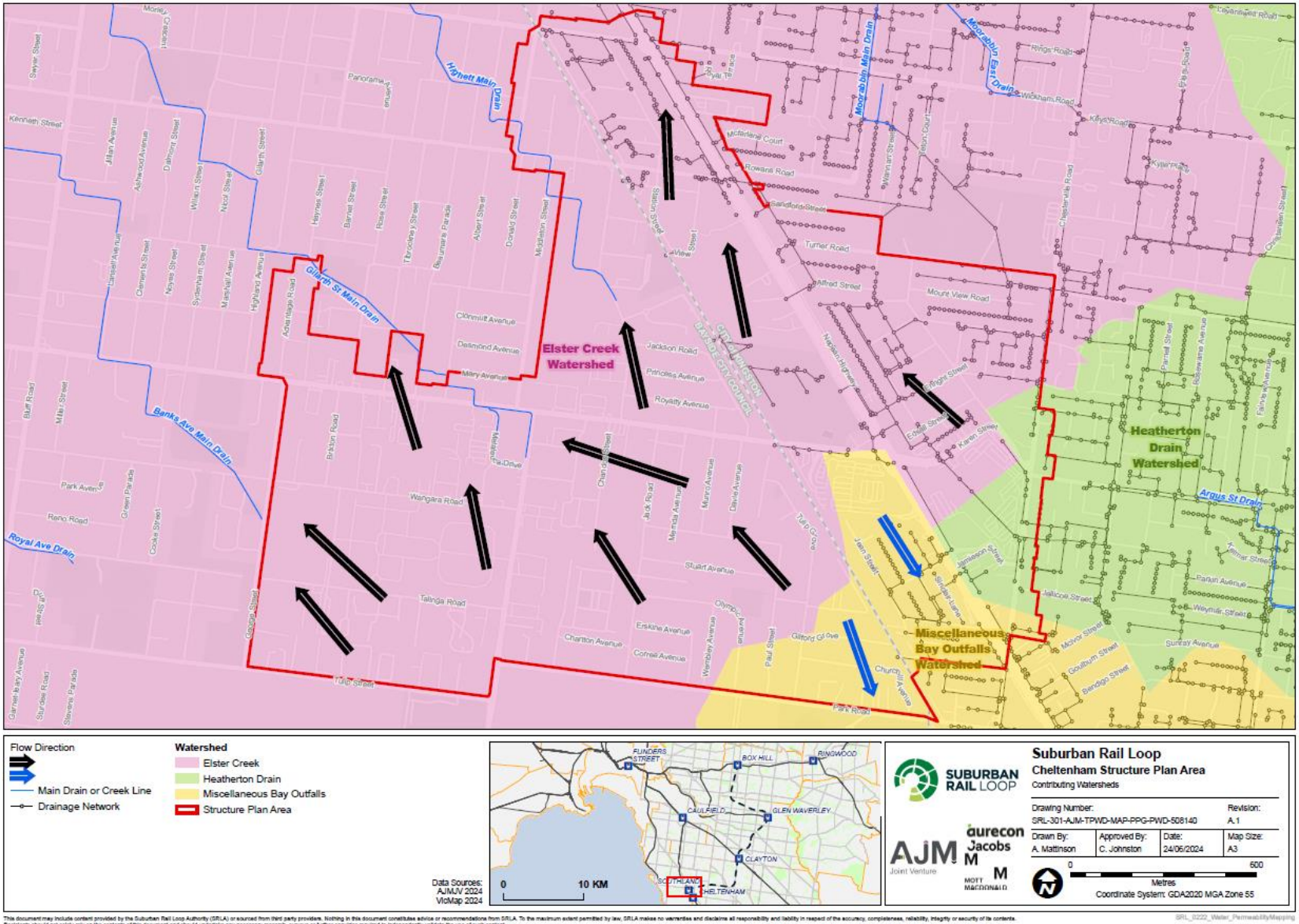

FIGURE 5.2 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS – CHELTENHAM STRUCTURE PLAN AREA

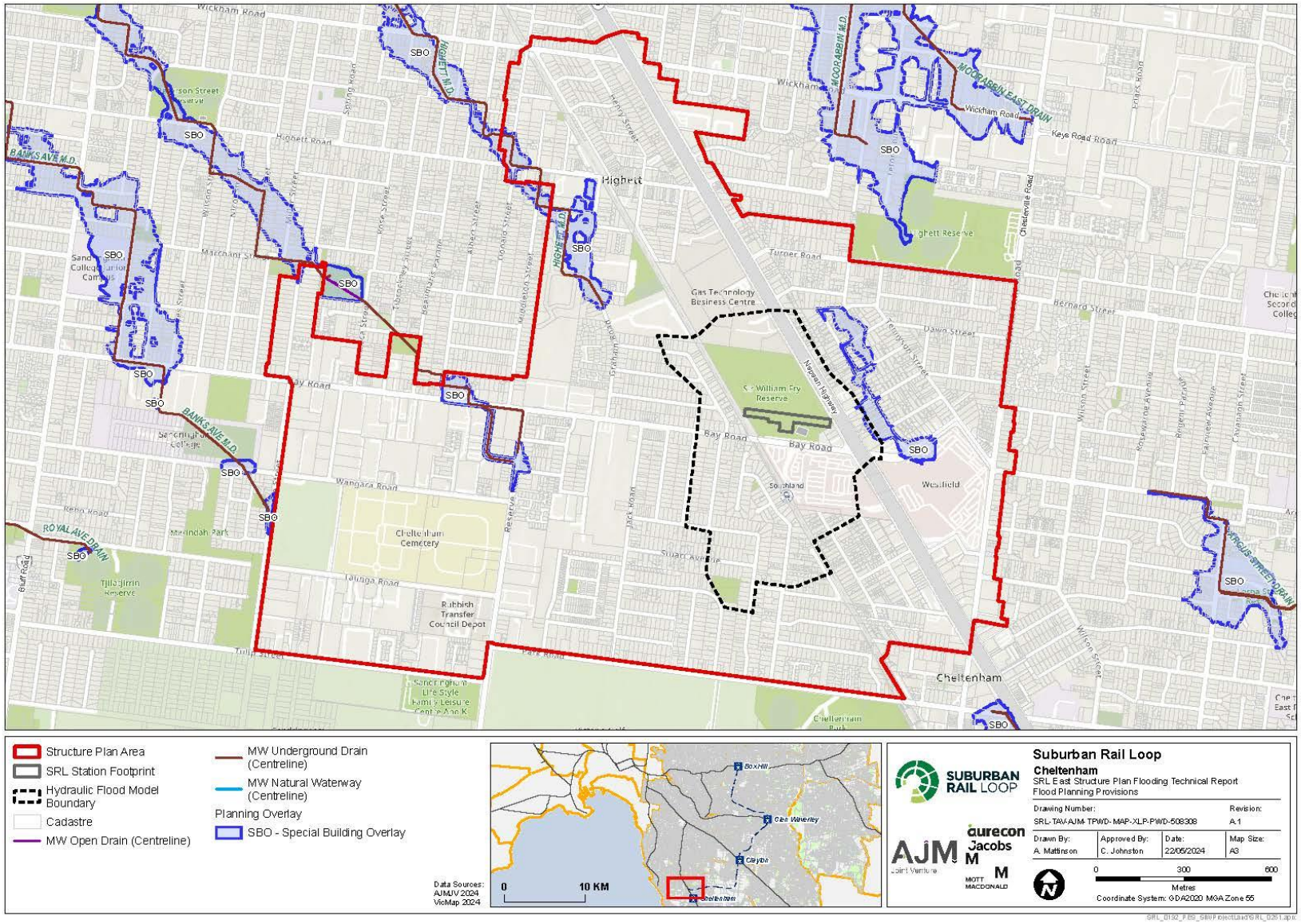

FIGURE 5.3 FLOOD PLANNING CONTROLS IN CHELTENHAM STRUCTURE PLAN AREA

5.2.2 FLOOD CONDITIONS

Flood modelling of the Cheltenham Structure Plan Area that has informed this assessment are summarised in Table 5.2.

The flood modelling developed for the SRL East EES (AJM-JV 2021b) covers a small portion of the Cheltenham Structure Plan Area (see Figure 5.3). The remaining flood studies have been made available from Melbourne Water.

TABLE 5.2 FLOOD STUDIES RELEVANT TO CHELTENHAM STRUCTURE PLAN AREA

MAJOR CATCHMENTS	DRAINAGE CATCHMENTS	FLOOD MODELLING	YEAR	MELBOURNE WATER TECH SPEC/ARR	1 % AEP CLIMATE CHANGE	INCREASED RAINFALL INTENSITIY
Elster Creek	Gilarth St M.D. (4974)	Park Street Main Drain flood mapping: final report	BMT (2010)	Melbourne Water Tech Spec 2009 / ARR 1987	Y	32 % for 2100
	Green Ville St M.D (4970)					
	Highett M.D (4973)					
	Meek St Drain (4960)	Elwood Canal Catchment flood mapping 2009/10	GHD (2011)	Melbourne Water Tech Spec 2009 / ARR 1987	Y	32 % for 2100
	Moorabbin M.D (4940)					
	Highett M.D (4973)	SRL EES station modelling	AJM-JV (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	23 % for 2150
Mordialloc Settlement Drain	Argust St Drain (5011)	Mordialloc Settlement Drain flood mapping	GHD (2013)	Melbourne Water Tech Spec 2008 / ARR 1987	Y	32 % for 2100

Figure 5.4 to Figure 5.11 present the 1 % AEP including Climate Change flood extents and flood hazard and road risk in the Structure Plan Area from the SRL East EES (AJM-JV 2021b), Mordialloc Creek (GHD, 2013), Elwood Canal (GHD, 2011) and Park St Flood Mapping (BMT 2010).

Figure 5.4, Figure 5.5 and Figure 5.9 present the 1 % AEP including climate change flood extents and flood hazard developed for the SRL East EES. The mapping indicates:

- Most of the area is impacted by local pluvial runoff, with shallow sheet flows directed to the Banks Avenue Main Drain, the Gilarth Street Main Drain, and the Highett Street Main Drain. Local pluvial flooding can be described as shallow depth of flow (less than 0.2 m) and generally has a H1 hazard classification suggesting that most properties are safe and have safe access during a 1 % AEP including climate change flood event.

- There are sections along Bay Road, Tulip Grove, Luxmoore Street and Davie Avenue with flood depth of more than 0.3 metres, which have a flood hazard classification of H3. Greater than H3 on roads with no other access point indicates that some adjacent properties at these locations have unsafe access during a 1 % AEP including climate change flood event.

- There is moderate flood risk at the pond at Sir William Fry Reserve. Relevant SRL East Environmental Performance Requirements (EPRs) for the SRL East note that no changes are proposed to the pond and so the flood hazard is considered to be low.

- The catchment of the Cheltenham Structure Plan Area is relatively flat and could be sensitive to changes in topography or development.

Figure 5.6 and Figure 5.10 show the 1 % AEP including climate change flood extents and safety road risk developed for the Park Street Main Drain flood mapping (BMT 2010). The modelling suggests that:

- Overland flow paths follow the Melbourne Water Main Drains including Gilarth Street, Highett Road and Banks Avenue north towards the bay, with the 1 % AEP including climate change flood extent overlaying these areas.

- The 2018 Safety Road flood risk mapping indicates a low flood risk for flood affected areas in the Structure Plan Area.

- While no flood depths maps of these areas were provided by Melbourne Water, the City of Bayside Flood Emergency Plan (SES 2019) notes there are some areas where flood depths are greater than 1 metre, indicating that several properties at over-floor flooding risk during a 1 % AEP flood event at Merchant Street, Bay Road, Highett Road and High Grove (see Appendix B). While these properties are located outside the Structure Plan Area, upstream impacts have the ability to impact properties downstream, so will require consideration during structure planning for Cheltenham Structure Plan Area.

Figure 5.7 shows the 1 % AEP including climate change flood extents developed for the Mordialloc and Elwood flood mapping project (2011, 2014) while the Safety Road Risk is shown in Figure 5.11. The map suggests that:

- The 1 % AEP including climate change flood extent covers the Southland Shopping Centre and eastern section of the Structure Plan Area.

- The 2018 Safety Road flood risk mapping indicates a moderate to high flood risk area along Karen Street, where water ponds at Southland Shopping Centre. In addition, the Safety Road risk in the eastern sections of the Structure Plan Area is generally low, although along Dawn Street a section of moderate road risk is identified.

- In the north-eastern section of the Structure Plan Area, the 1 % AEP including climate change flood extents cover several properties. According to the City of Kingston Flood Emergency Plan (SES 2017), these areas are generally shallow flow depths surrounding the Moorabbin Main Drain, with no properties at risk to over-floor flooding (in the Kingston local government area – in the northern section of the Structure Plan Area) (see Appendix B) .

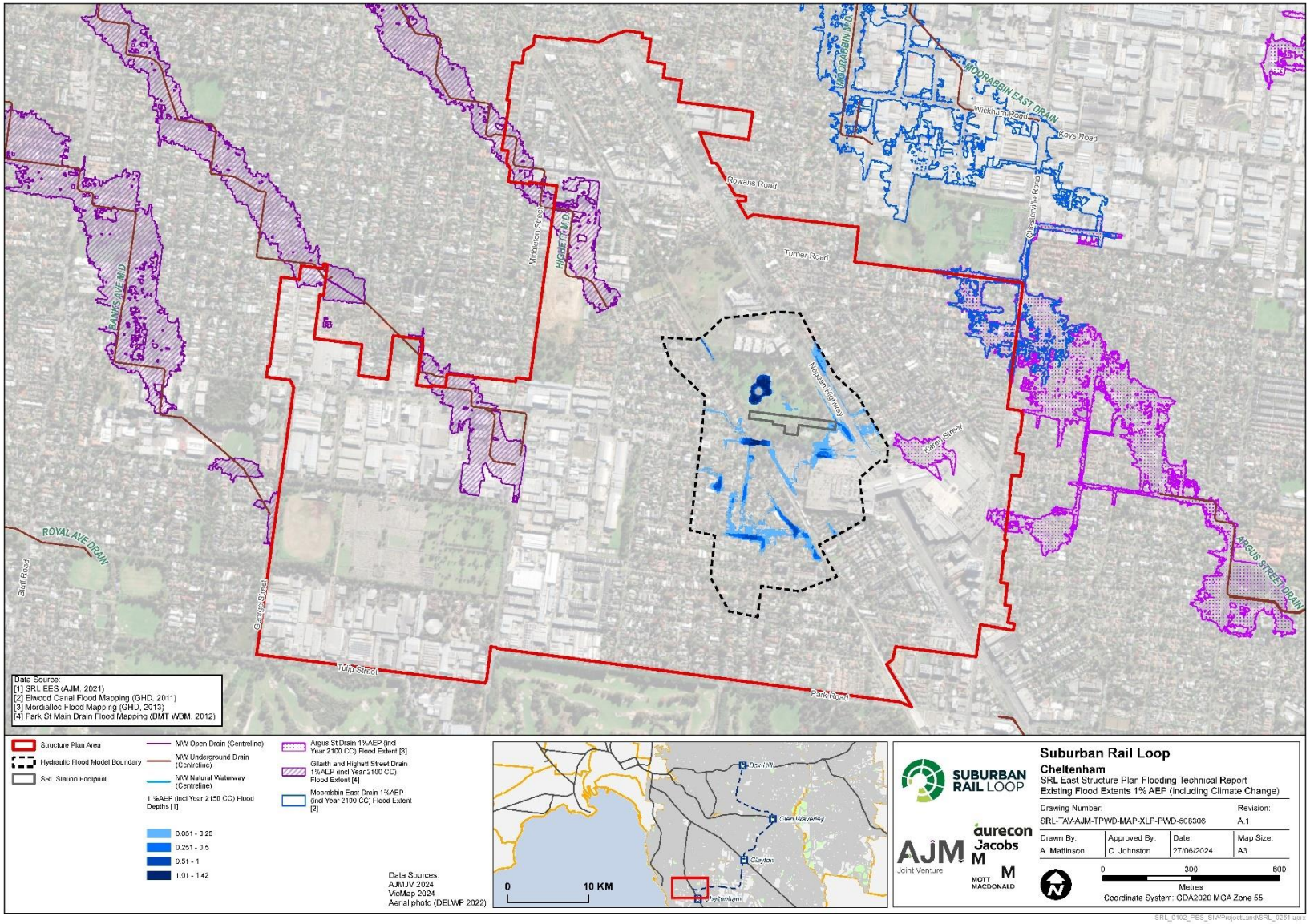

FIGURE 5.4 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (1 OF 4)

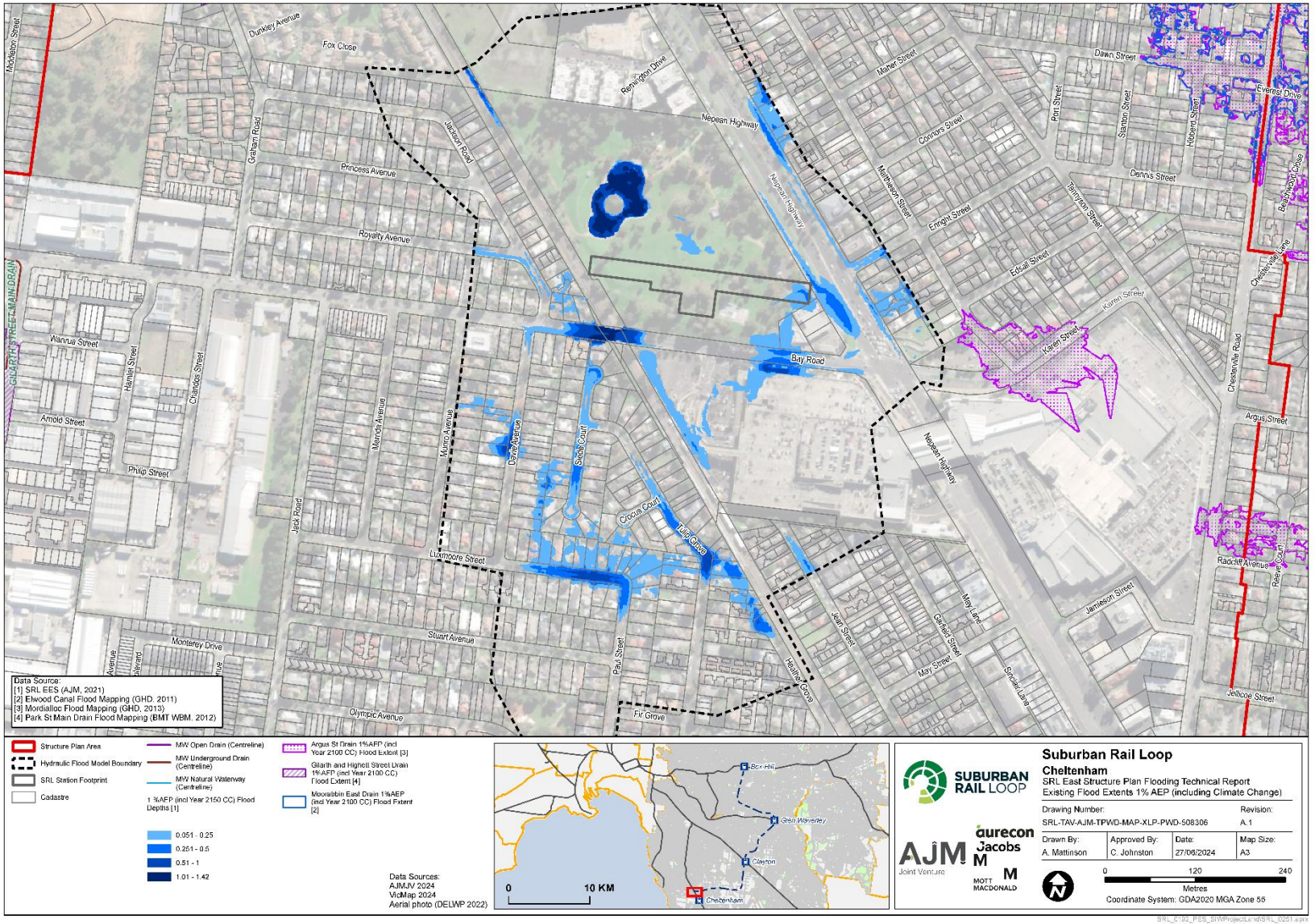

FIGURE 5.5 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (2 OF 4)

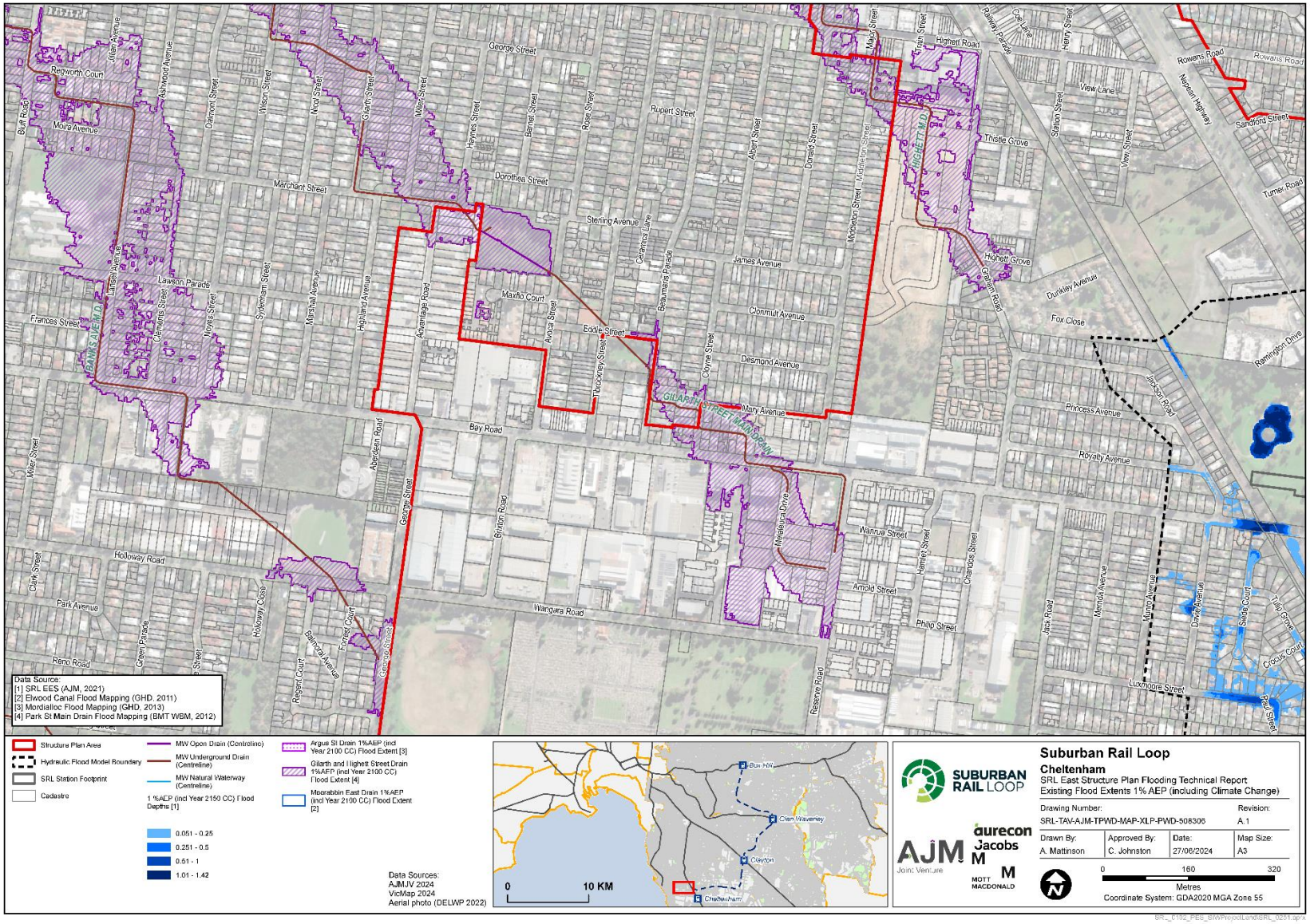

FIGURE 5.6 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (3 OF 4)

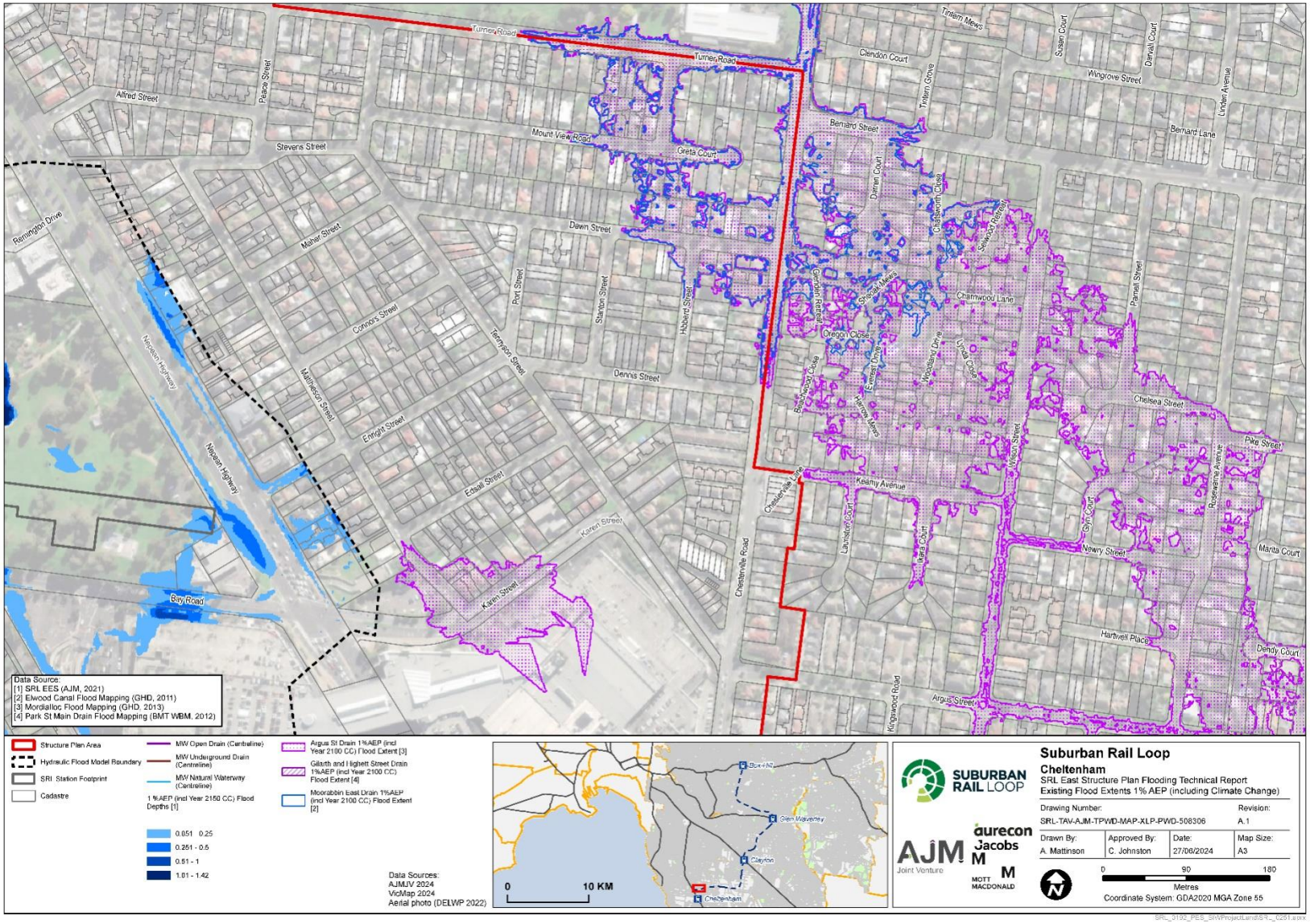

FIGURE 5.7 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (4 OF 4)

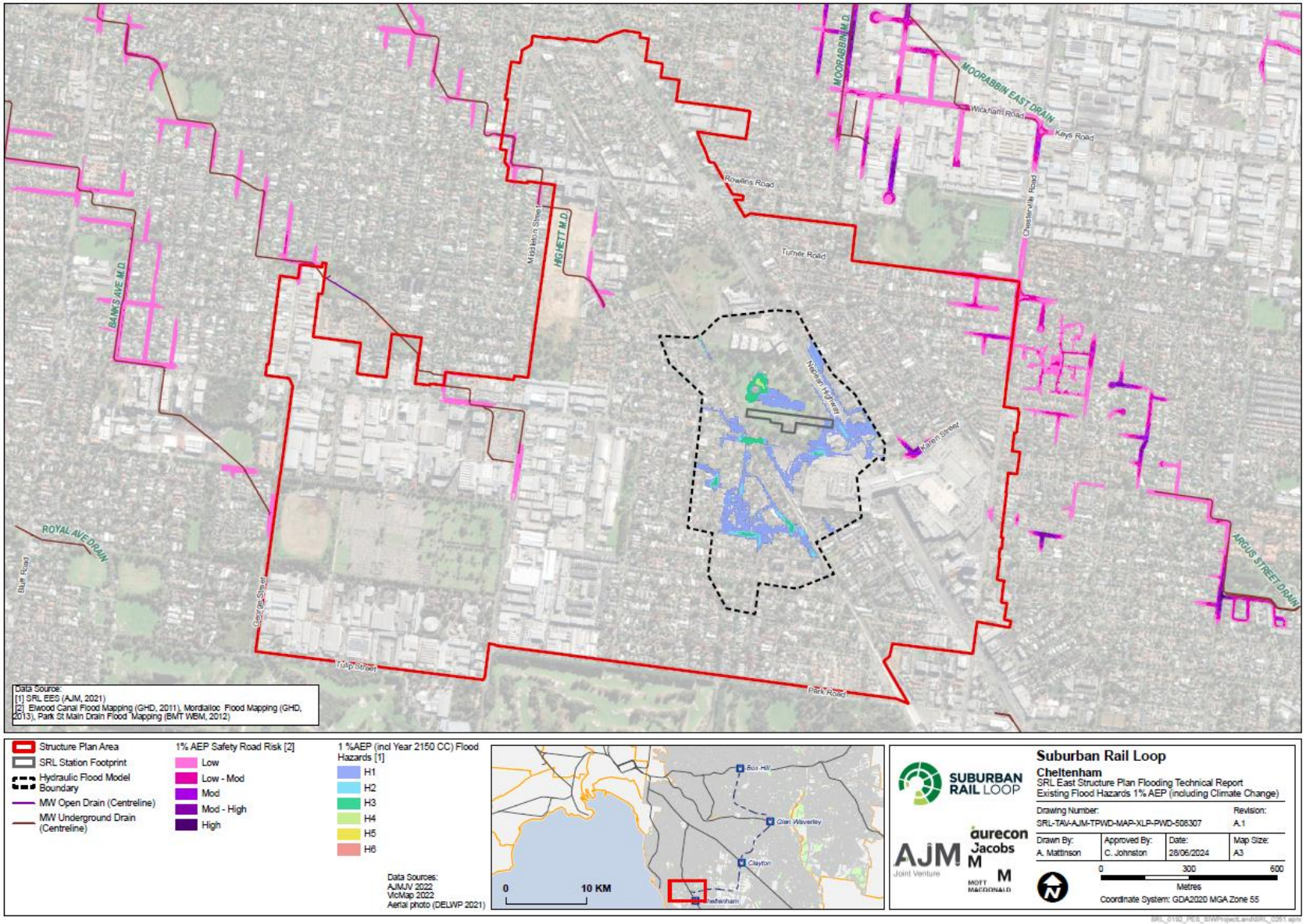

FIGURE 5.8 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (1 OF 4)

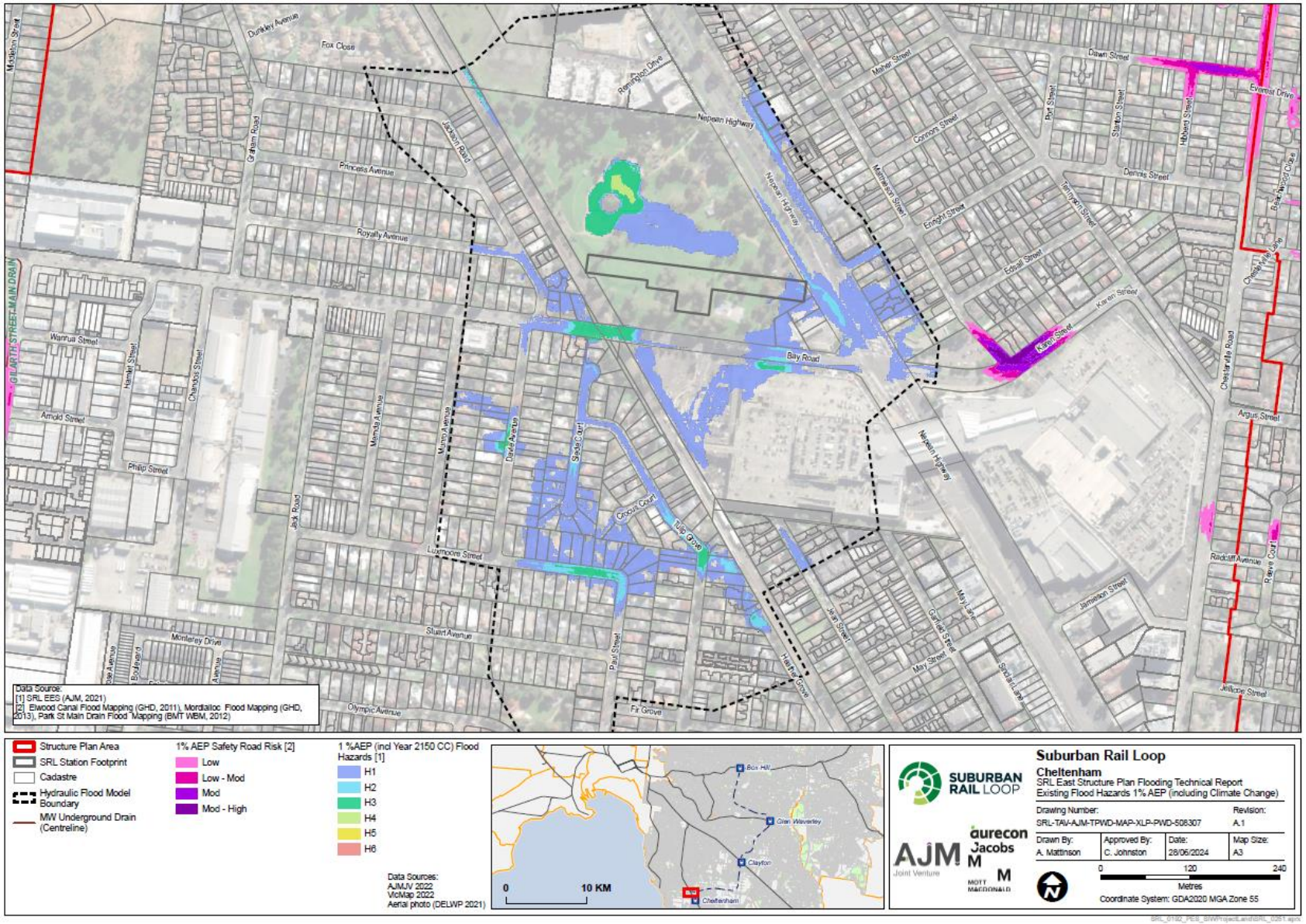

FIGURE 5.9 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (2 OF 4)

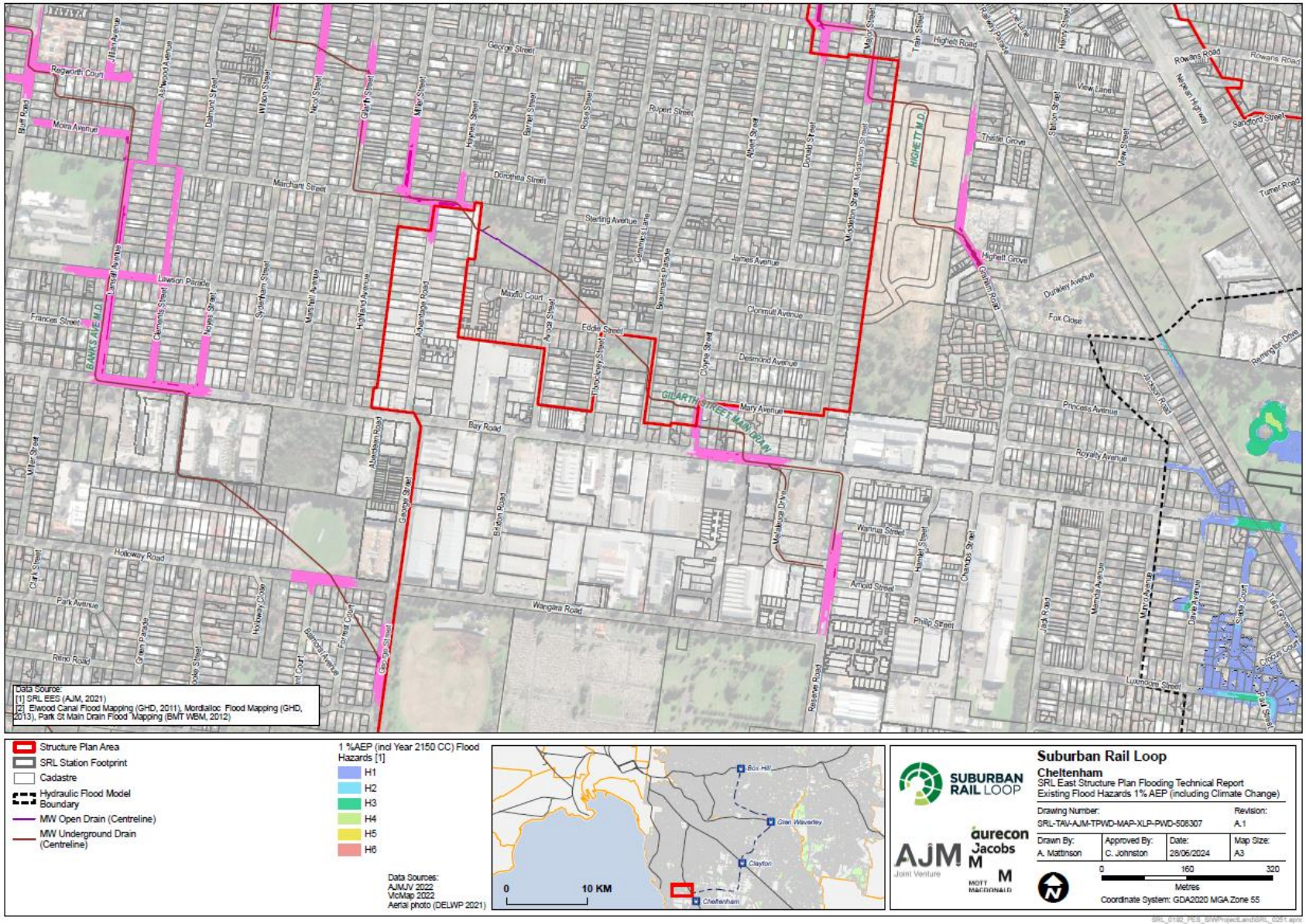

FIGURE 5.10 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (3 OF 4)

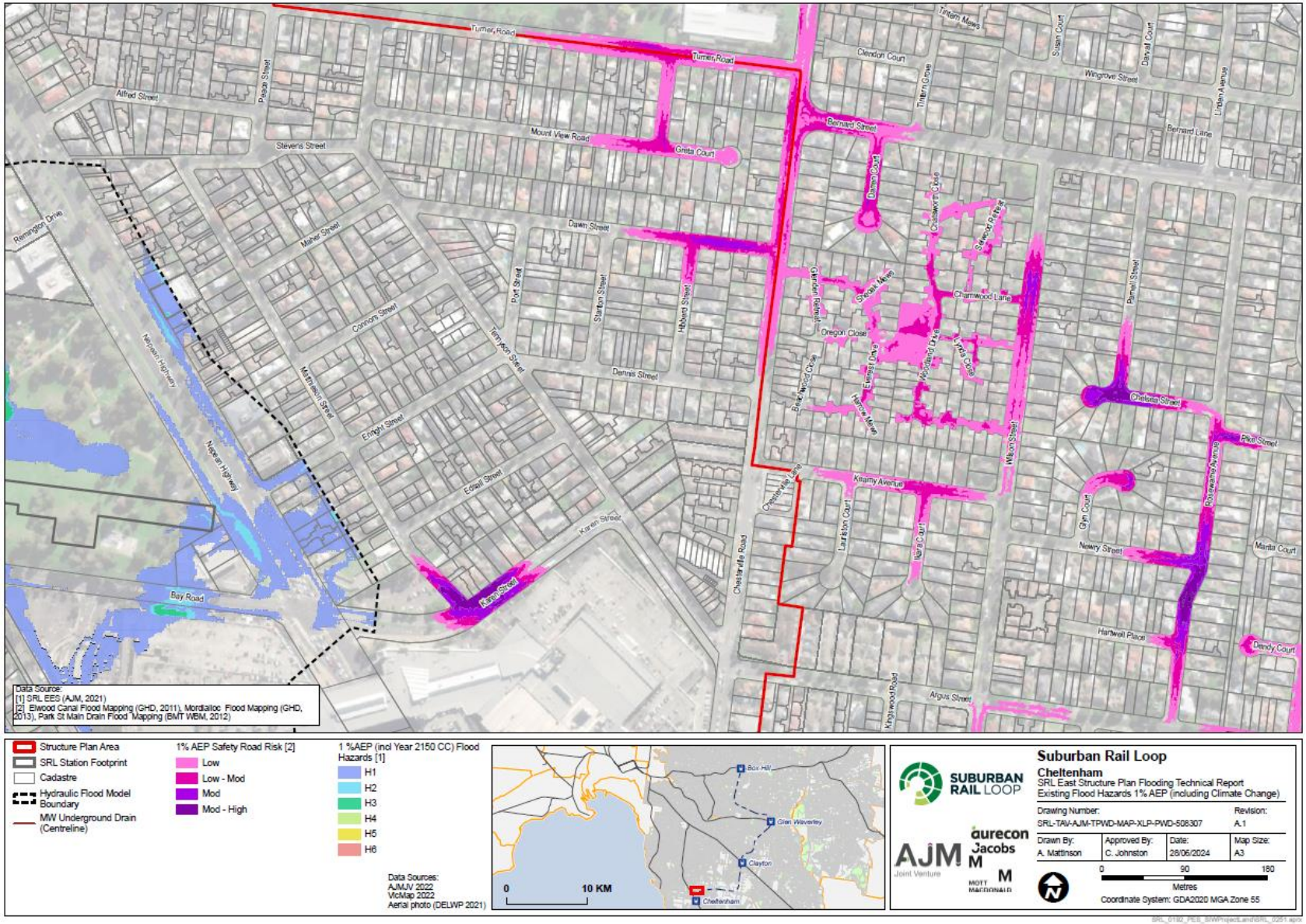

FIGURE 5.11 CHELTENHAM STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (4 OF 4)

5.3 Clayton Structure Plan Area

The Clayton Structure Plan Area is located within the Mordialloc Settlement Drain catchment and the Mile Creek catchment, as shown in Figure 5.12.

Most of the Clayton Structure Plan Area is in the Mordialloc Settlement Drain catchment, covering approximately 4.3 square kilometres, comprising a mix of residential and commercial land, road reserves and some public open spaces. Water tends to flow from north to south via the drainage network and overland flow and follows the East Oakleigh Drain, the Clayton Drain and the Burton Avenue Drain, as illustrated by the blue arrows in Figure 5.12. These drains discharge to Clayton Drain then discharges to the estuarine section of Mordialloc Creek approximately 11 kilometres from the Clayton Structure Plan Area.

The Clayton Structure Plan Area in the Mile Creek catchment covers approximately 1.4 square kilometres. Water flows from the north until it is captured by the Westall Drain, shown by the black arrows in Figure 5.12. Water then flows further south towards Mile Creek.

5.3.1 PLANNING CONTROLS

There are three drains covered by an SBO in in the Clayton Structure Plan Area, as shown in Figure 5.13:

- Burton Ave Drain, located east of the SRL East station
- Clayton Drain, located approximately 450 metres to the west of the station
- East Oakleigh Drain, located approximately 550 metres to the south of the station.

A permit is required to construct a building or to construct or carry out works on land subject to an SBO as specified by the planning scheme. As the determining referral authority, Melbourne Water assesses flood risk factors and the effect of a development redirecting or obstructing flow paths.

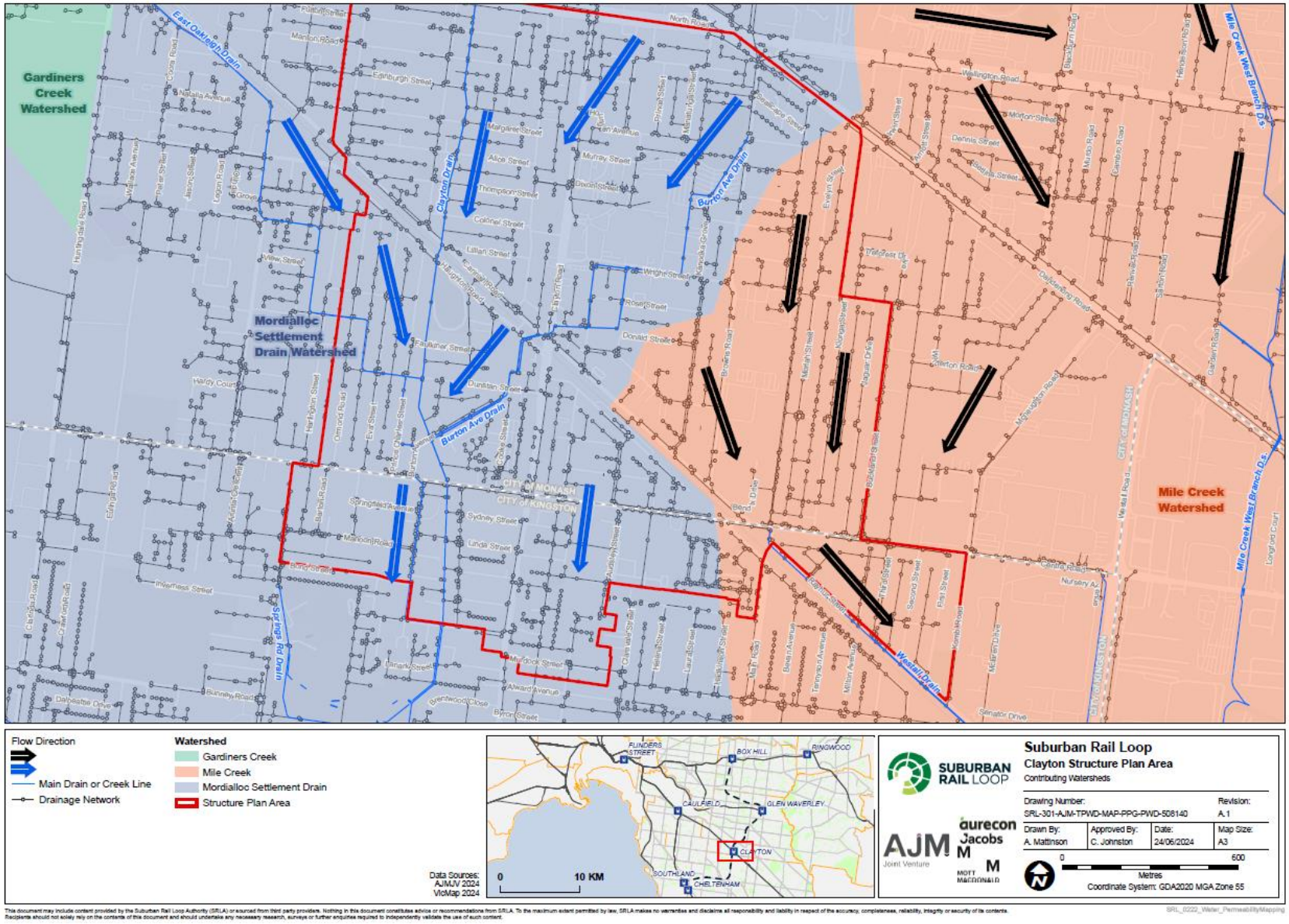

FIGURE 5.12 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS IN CLAYTON STRUCTURE PLAN AREA

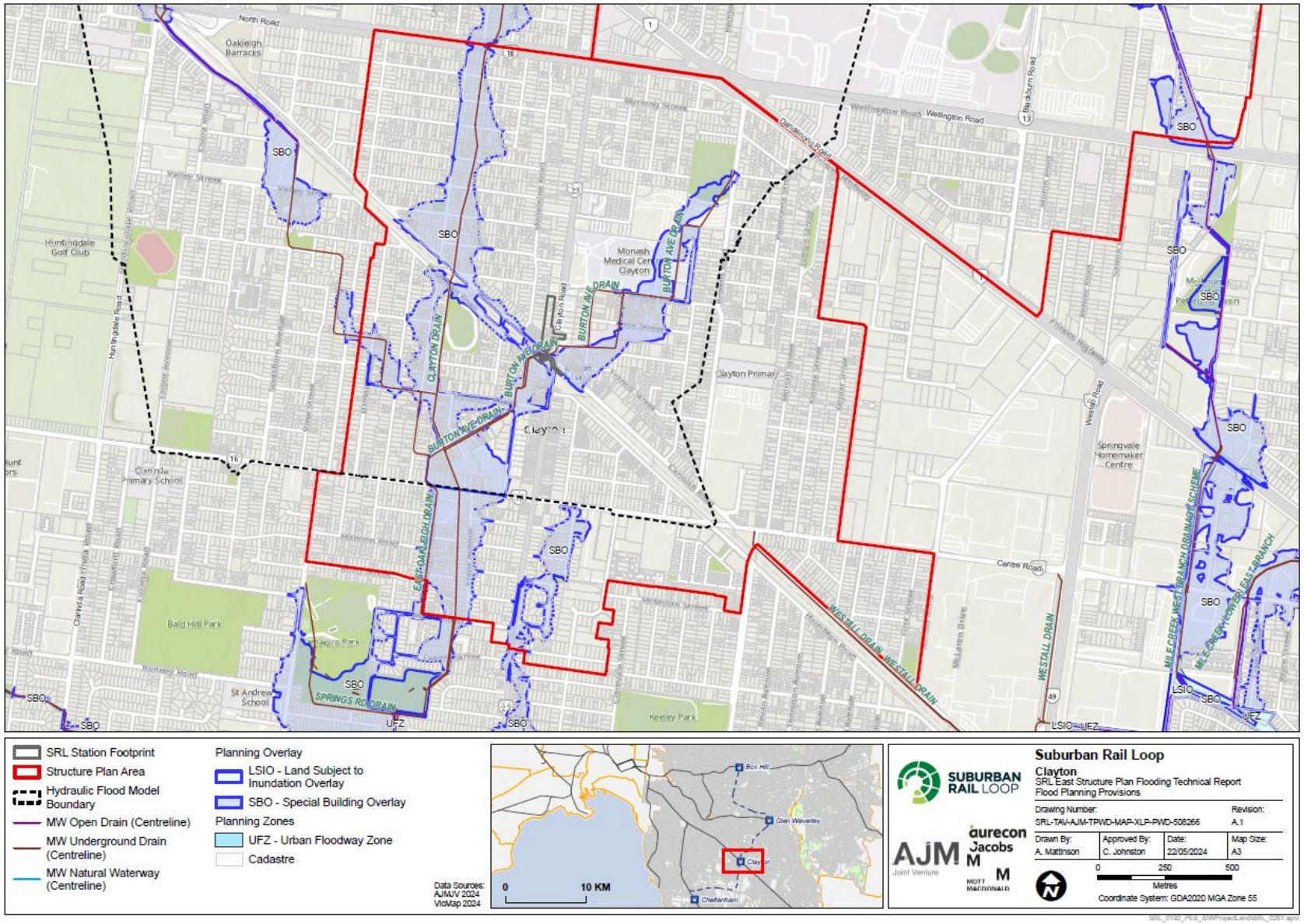

FIGURE 5.13 FLOOD PLANNING CONTROLS IN CLAYTON STRUCTURE PLAN AREA

5.3.2 FLOOD CONDITIONS

Flood modelling of the Clayton Structure Plan Area that has informed this assessment are summarised in Table 5.3.

The flood modelling developed for the SRL East EES (AJM-JV 2021b) covers 60 % of the Clayton Structure Plan Area. The remaining flood studies have been made available from Melbourne Water.

TABLE 5.3 FLOOD STUDIES RELEVANT TO CLAYTON STRUCTURE PLAN AREA

MAJOR CATCHMENTS	DRAINAGE CATCHMENTS	FLOOD MODELLING	YEAR	MELBOIURNE WATER TECH SPEC / ARR	1 %AEP CLIMATE CHANGE	RAINFALL INTENSITY
Mordialloc Settlement Drain	Clayton Drain (5040)	Mordialloc Settlement drain flood mapping	GHD (2013)	Melbourne Water Tech Spec 2008 /ARR 1987	Y	32 % for 2100
	West Oakley Drain (5041)					
	Burton Ave Drain (5042)					
	Clayton Drain (5040)	SRL East EES station modelling	AJM-JV (2021)	MW Tech Spec 2019 / ARR 2019	Y	23 % for 2150
	East Oakley Drain (5041)					
	Burton Ave Drain (5042)					
Mile Creek	Westall Drain (1007)	Flood mapping of the drainage system in Mile Creek catchment	BMT (2018)	Melbourne Water Tech Spec 2008 /ARR 1987	Y	32 % for 2100

Figure 5.14 to Figure 5.19 present the 1 % AEP including Climate Change flood extents, flood hazard and road risk in the Structure Plan Area from the SRL East EES (AJM-JV 2021b), Mordialloc Creek Flood Mapping (GHD, 2013) and the Mile Creek Flood Mapping (BMT 2018).

Figure 5.15 to Figure 5.18 present the 1 % AEP including climate change flood extents and flood hazard developed for the SRL East EES. The modelling suggests that:

- Most of the SRL flood model area is impacted by local pluvial runoff with shallow sheet flows (typically less than 0.2 metres) directed to drainage assets (south) and generally has a flood hazard classification of H1, suggesting that most properties are safe and have safe access during a 1 % AEP including climate change flood event.
- Flood water north of Carinish Road pools along the road to depths typically less 1 metre. This section has a flood hazard classification ranging from H4 to H5, so properties fronting this road are not safe and do not have safe access during a 1 % AEP including climate change flood event.
- Flood depths reach 1 to 2 metres at Monash Medical Centre, with a flood hazard classification of H3 and above, indicating the site is unsafe during a 1 % AEP including climate change flood event.
- Flood water south of Carinish Road is shallower with depths typically less than 0.2 metres for most of the area, reaching up to 1 metre along Burton Avenue around the aged care carpark along the drain. A section near Burton Avenue has a flood hazard classification of H4, making part of the site unsafe during a 1 %AEP including climate change flood event.

- Note unlike the flood depths, the flood hazards have not been filtered by the 0.05m depth criteria, and as such the extents are larger.

Figure 5.16 to Figure 5.19 present the 1 % AEP including climate change flood extents and safety road risk developed for the Mile Creek catchment flood mapping (BMT 2018) and the Mordialloc Settlement Drain flood mapping (GHD 2013). The mapping indicates:

- In the south-eastern portion of the Structure Plan Area from Centre Road, water flows south-east towards Rayhur Street along Westall Drain, with the railway line obstructing the flow. Properties in this area are subject to flooding during a 1 % AEP including climate change flood event. The Safety Road flood risk mapping indicates a moderate to high flood risk area in this area.

- In the southern portion of the Structure Plan Area, flood water continues to flow south towards the East Oakleigh Drain. The Safety Road flood risk mapping indicates a low to moderate flood risk in this area.

.

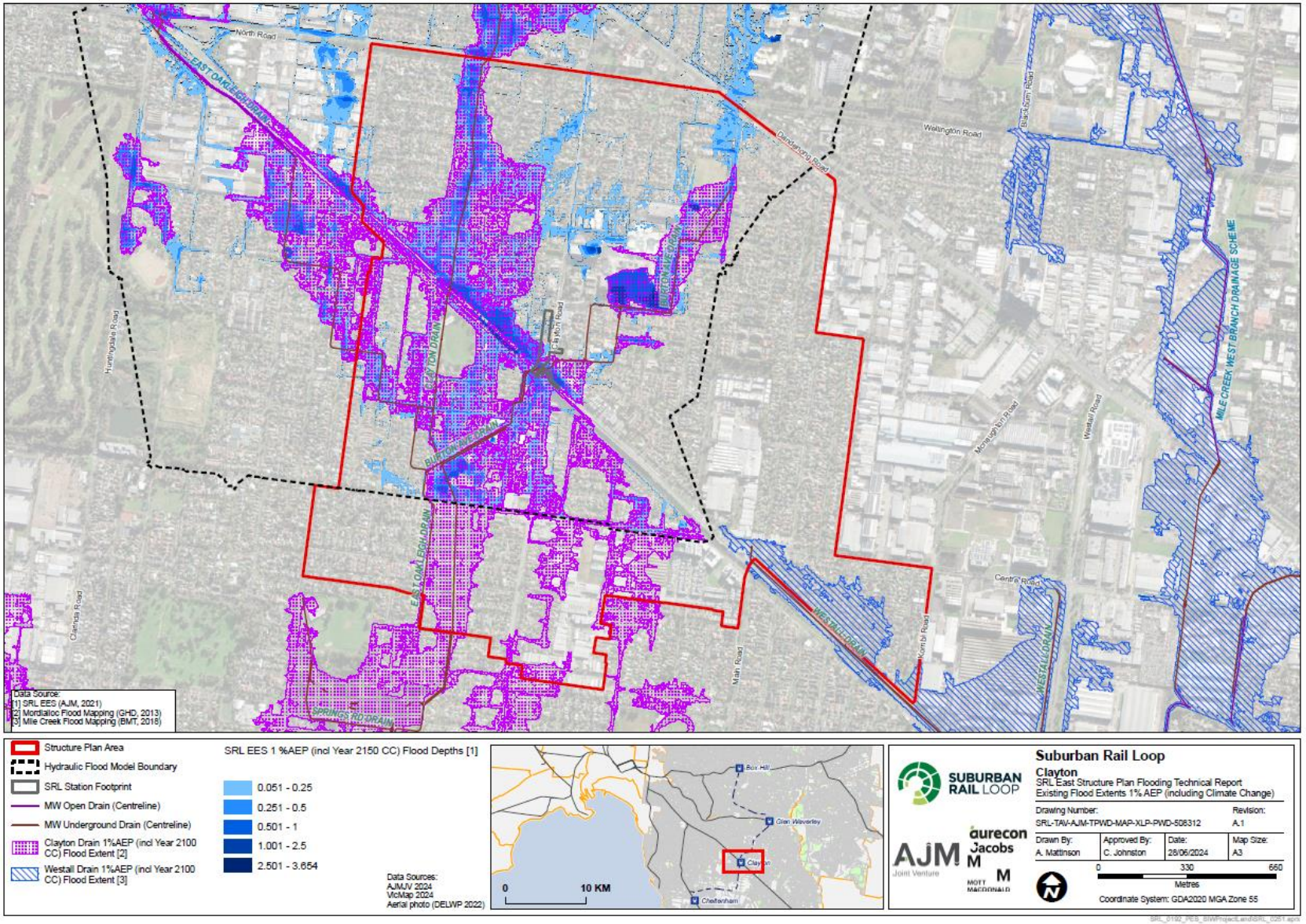

FIGURE 5.14 CLAYTON STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (1 OF 3)

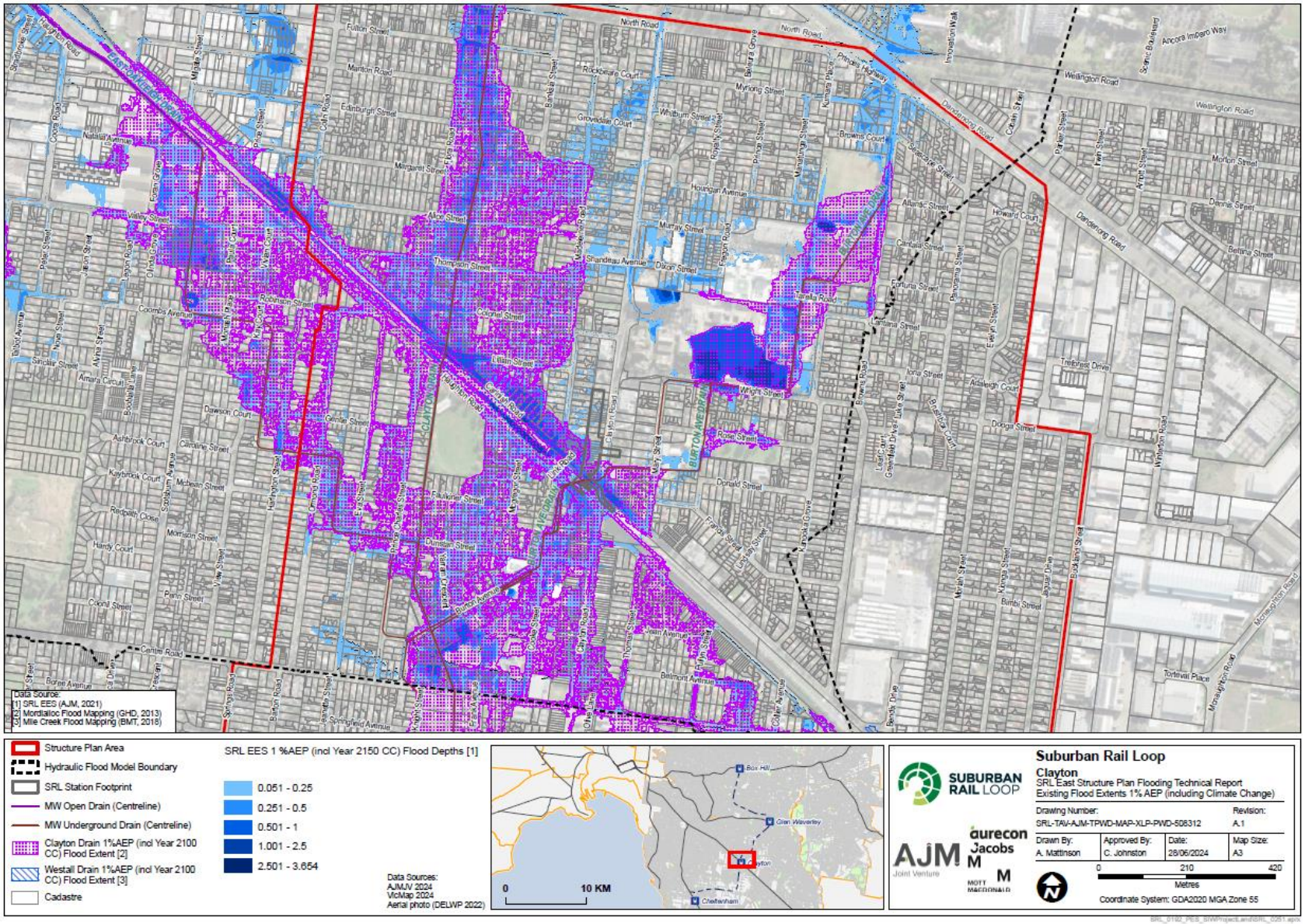

FIGURE 5.15 CLAYTON STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (2 OF 3)

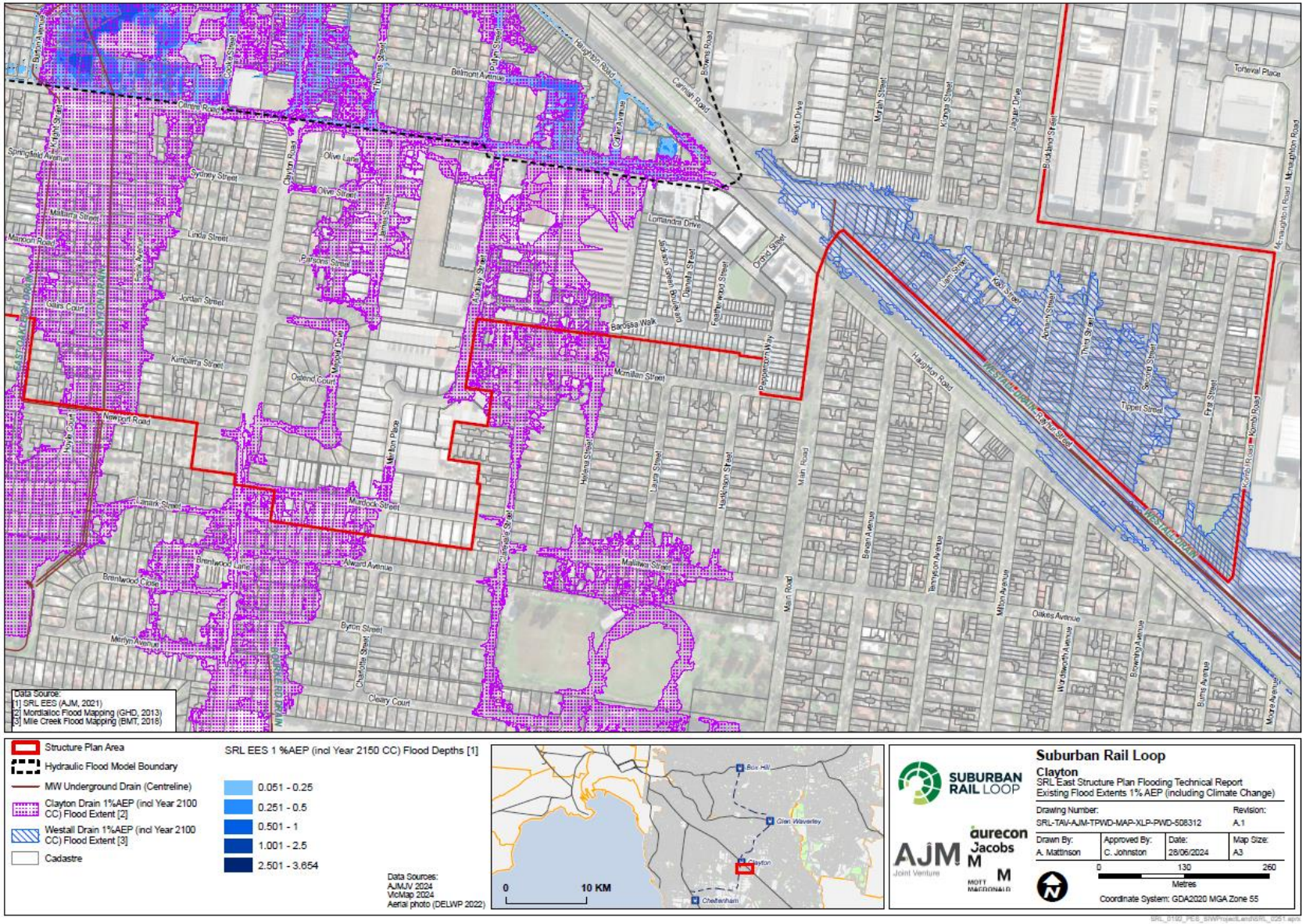

FIGURE 5.16 CLAYTON STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (3 OF 3)

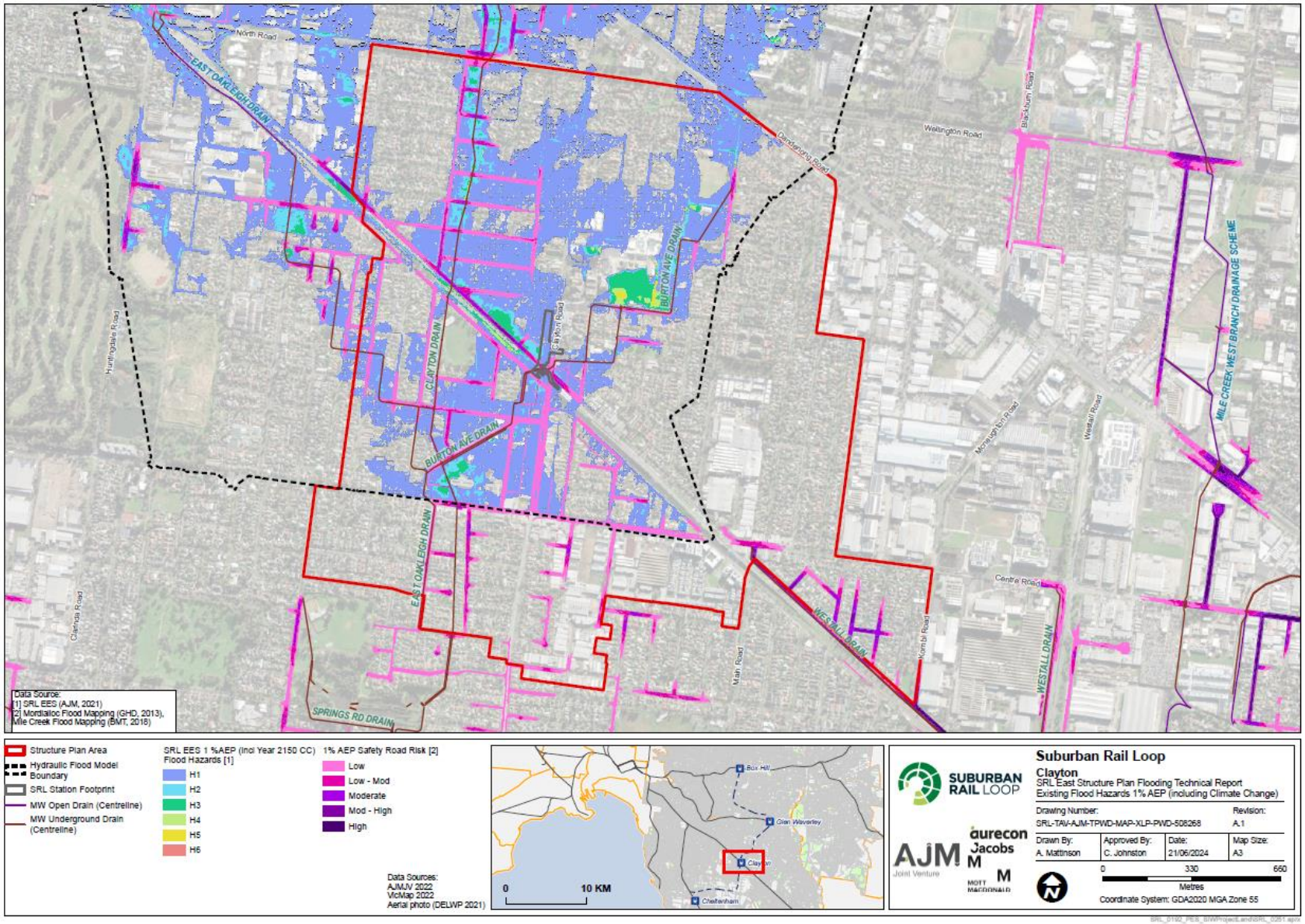

FIGURE 5.17 CLAYTON STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (1 OF 3)

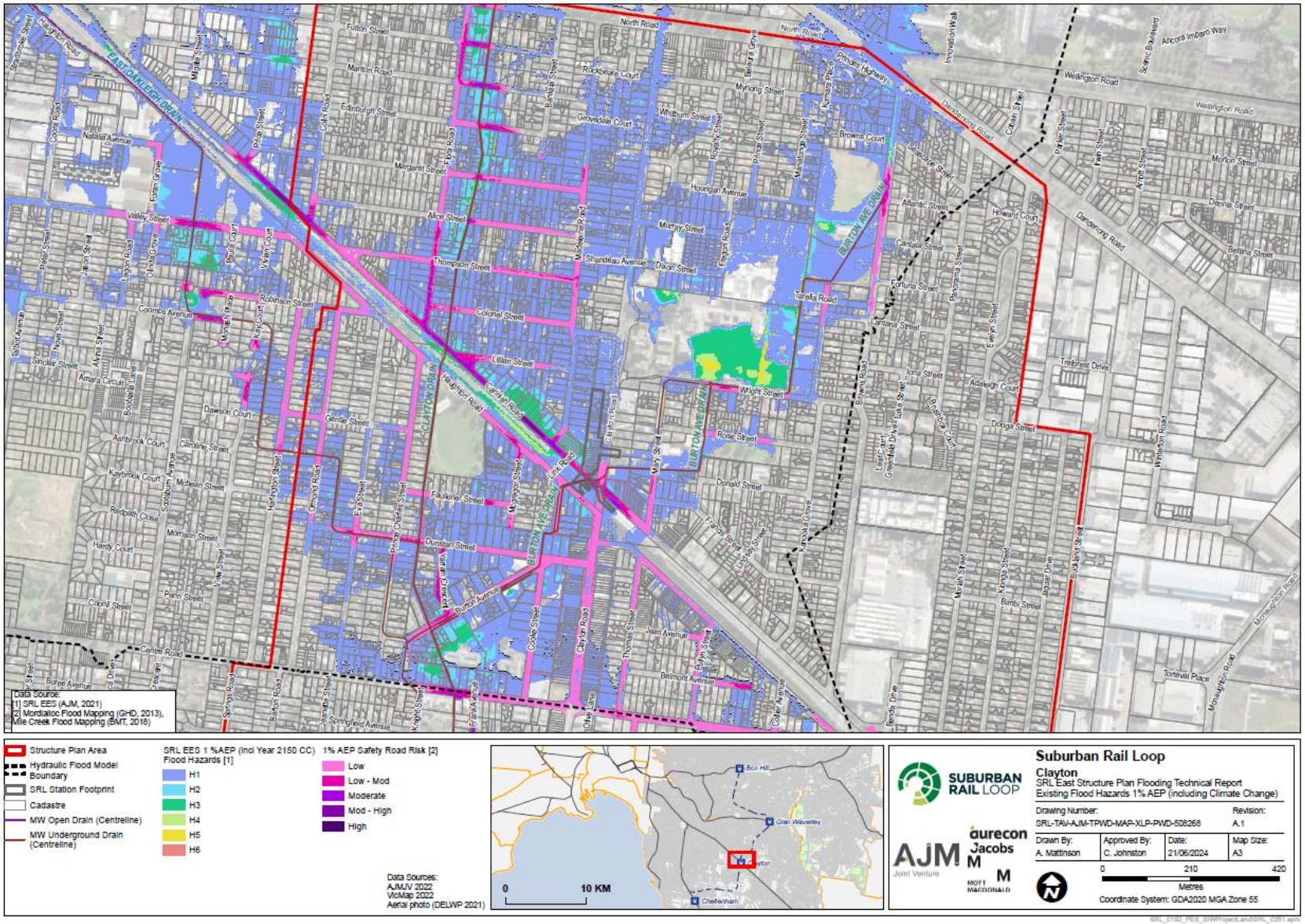

FIGURE 5.18 CLAYTON STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (2 OF 3)

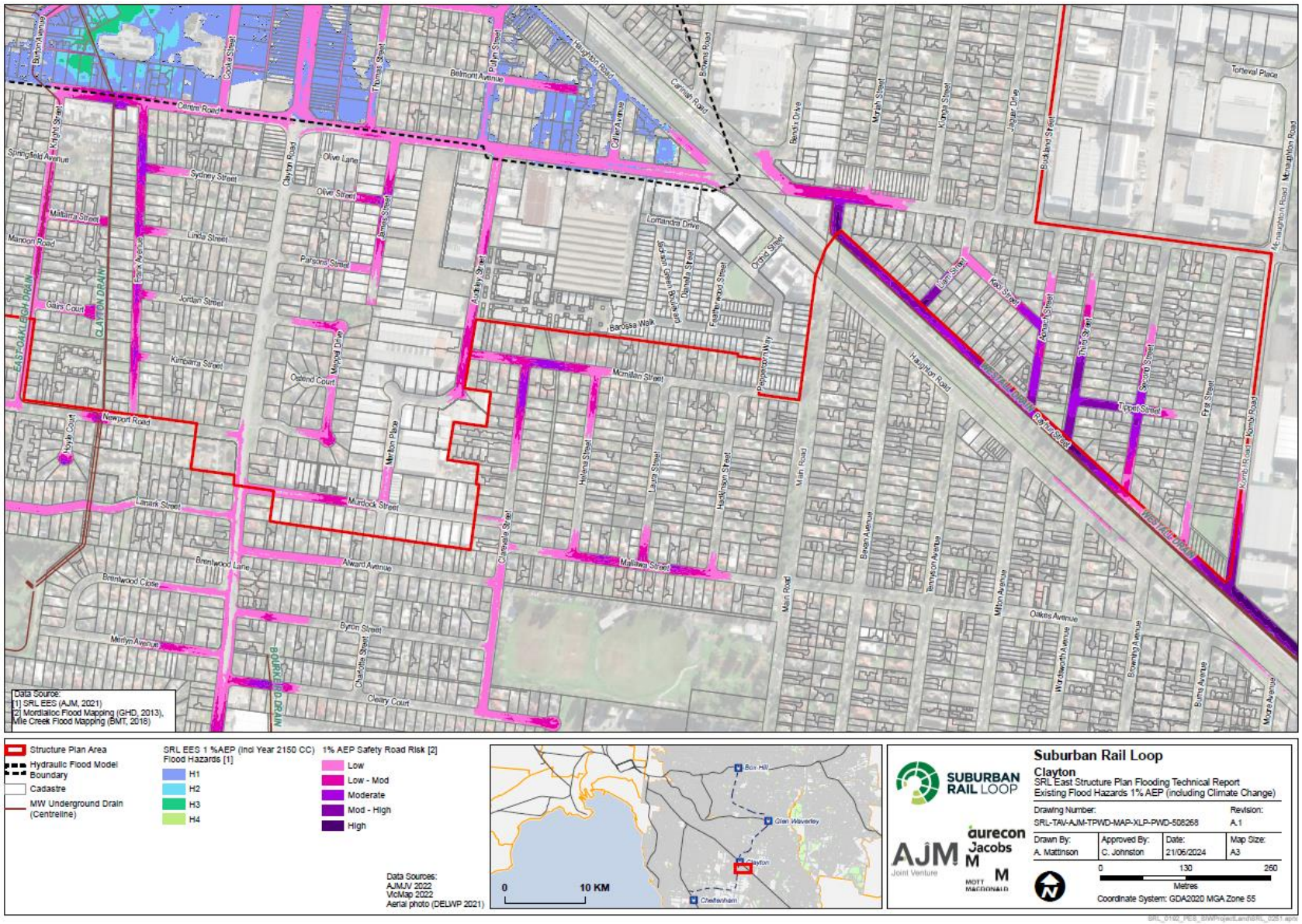

FIGURE 5.19 CLAYTON STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (3 OF 3)

5.4 Monash Structure Plan Area

The Monash Structure Plan Area is mainly located in the Mile Creek catchment and the Mordialloc Settlement Drain catchment, with a very small section in the Gardiners Creek catchment, as presented in Figure 5.20.

Most of the Monash Structure Plan Area is located in the upstream section of the Mile Creek catchment covering approximately 3 square kilometres, which mainly comprises commercial and residential land as well as open spaces on the Monash University campus. Water here tends to flow from the north-west to south-east until it is captured by the Monash University Drain and Retention Basin, as illustrated by the black arrows in Figure 5.20. Water is then conveyed via the drainage network or Monash University Drain and overland flow into the Mile Creek West Branch main drain and continues south-east, crossing Wellington Road towards Mile Creek. Mile Creek is a highly modified channel located 2 kilometres south-east of the Structure Plan Area.

An area of approximately 0.8 square kilometres of the Monash Structure Plan Area is within the Mordialloc Settlement Drain catchment, which comprises a mix of residential and commercial land including road reserve. Water here flows from north-east via the drainage network to the south-west, towards Clayton Drain and the Burton Avenue Drain, as shown by the blue arrows in Figure 5.20, located approximately 0.5 kilometres from the Monash Structure Plan Area.

In the Gardiners Creek catchment, water travels north towards Scotchmans Creek and north-west into the Marcina Street Drain, approximately 0.5 kilometres from the Monash Structure Plan Area.

5.4.1 PLANNING CONTROLS

An SBO covers the Monash University drain and retention basin in the Monash Structure Plan Area, as presented in Figure 5.21:

- The Monash University Drain and Retention Basin located within Monash University campus
- The Mile Creek West Branch drainage system continuing to the south east of the structure plan area is covered by the SBO.

In addition to this, there are several SBO covering land west and south-east of the Monash Structure Plan Area.

A permit is required to construct a building or to construct or carry out works on land subject to an SBO as specified by the planning scheme. As the determining referral authority, Melbourne Water assesses flood risk factors and the effect of a development redirecting or obstructing flow paths.

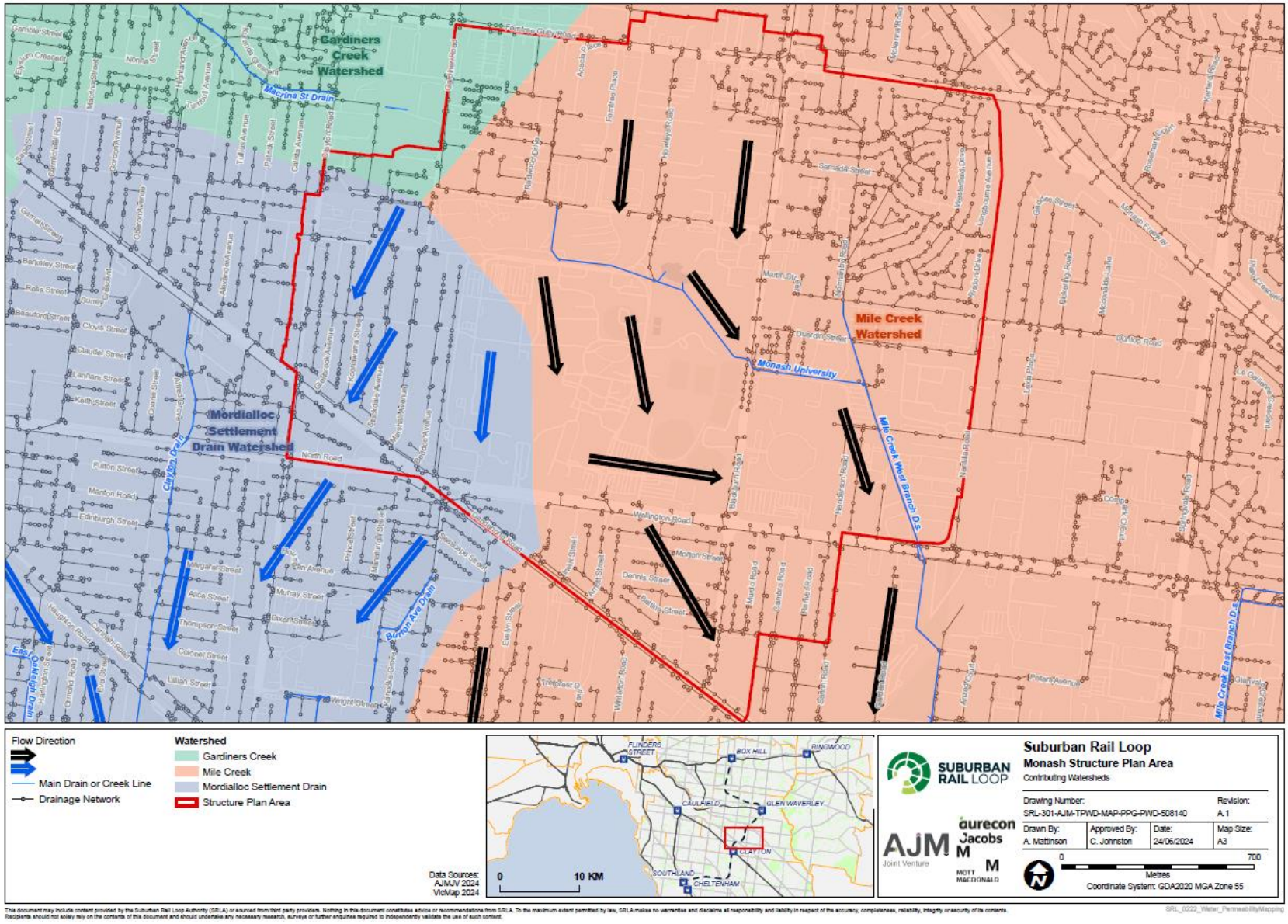

FIGURE 5.20 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS AT MONASH STRUCTURE PLAN AREA

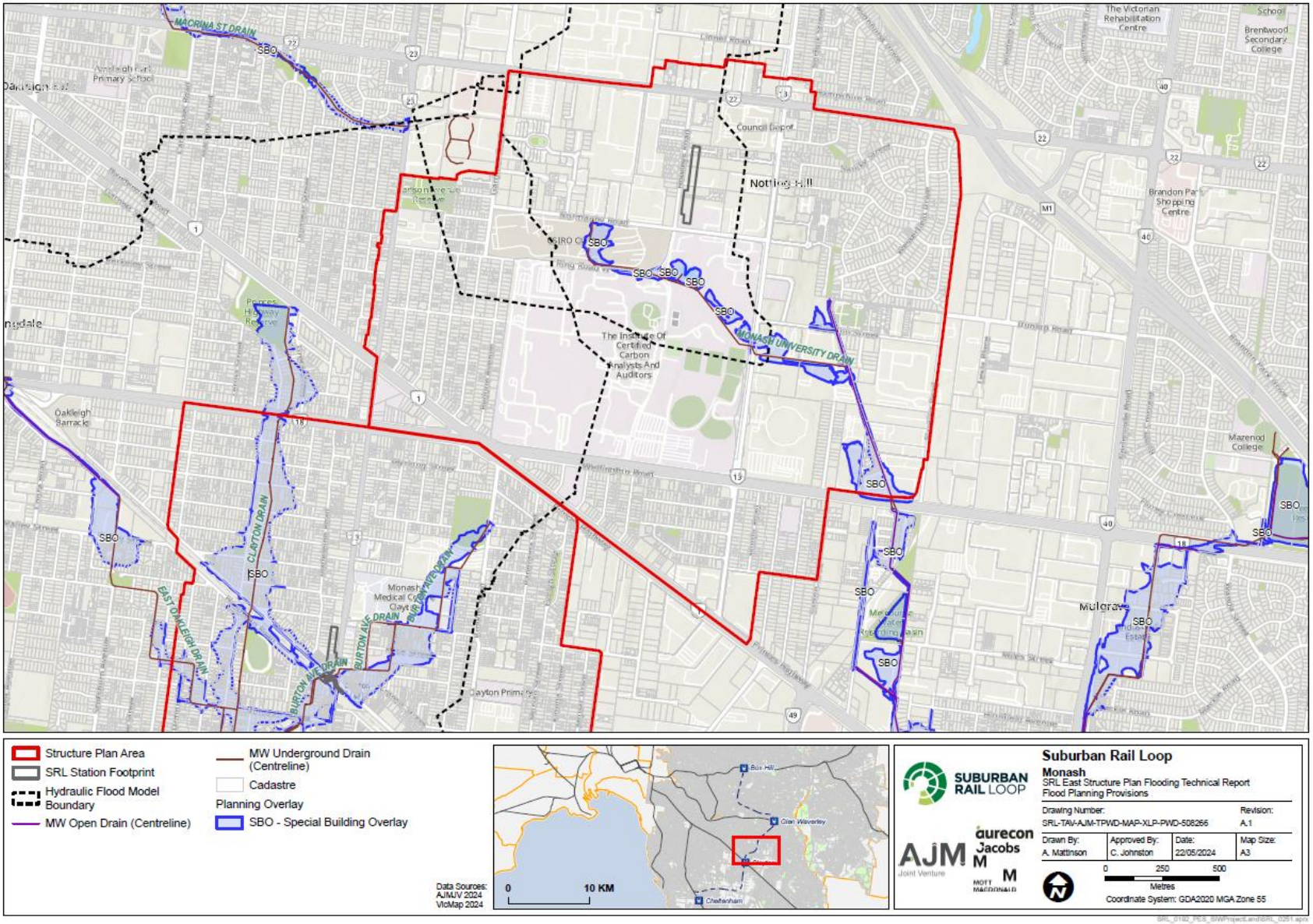

FIGURE 5.21 FLOOD PLANNING CONTROLS IN MONASH STRUCTURE PLAN AREA

5.4.2 FLOOD CONDITIONS

Flood modelling of the Monash Structure Plan Area that has informed this assessment are summarised in Table 5.4.

The flood modelling developed for the SRL East EES (AJM-JV 2021b) covers north west of the Monash Structure Plan Area as presented in Figure 5.22. The remaining flood studies have been made available from Melbourne Water.

TABLE 5.4 FLOOD STUDIES RELEVANT TO MONASH STRUCTURE PLAN AREA

MAJOR CATCHMENTS	DRAINAGE CATCHMENTS	FLOOD MODELLING	YEAR	MELBOURNE WATER TECH SPEC / ARR	1 %AEP CLIMATE CHANGE	RAINFALL INTENSITY
Mile Creek	Monash University (1002)	Flood mapping of the drainage system Mile Creek Catchment	BMT (2018)	Melbourne Water Tech Spec 2008 /ARR 1987	Y	32 % for 2100
	Clayton North (1012)					
	Mile Creek West Branch DS					
	Monash University (1002)	SRL EES station modelling	AJM-JV (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	23 % for 2150
Mordialloc Settlement Drain	Burton Ave Drain (5042)	SRL EES station modelling	AJM-JV (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	23 % for 2150

Figure 5.22 and Figure 5.23 present the 1 % AEP including Climate Change flood extents and flood hazard and road risk in the Structure Plan Area from the SRL East EES (AJM-JV 2021b) and the Mile Creek Flood Mapping (BMT 2018).

The maps indicate the following:

- Most of the modelled area has a flood hazard classification of H1, indicating that properties are safe and have safe access during a 1 % AEP including climate change flood event (see Figure 5.23).
- Most of the hydraulic model area is impacted by local pluvial runoff with shallow sheet flows (typically less than 0.2 metres) directed to drainage assets to the south – Monash University Drain - which correlates to a safety classification of H1 (see Figure 5.23).
- Once flows reach the Monash University Drain, flood depths generally range from 0.05 to 0.5 metres, with the retention basin reaching depths greater than 2 metres shown in Figure 5.22. Along the drain and the retention basin there is a hazard classification of H2 to H6, indicating there are areas that are unsafe for vehicles and people (see Figure 5.23).
- Note unlike the flood depths, the flood hazards have not been filtered by the 0.05m depth criteria, and as such the extents are larger.

Figure 5.22 and Figure 5.23 also show the 1 % AEP including climate change flood extents and safety road risk developed for the Mile Creek in the western portion of the Structure Plan Area. The mapping indicates:

- Water tends to flow south along the Monash University Drain toward Wellington Road. Properties in this area are subject to flooding during a 1 %AEP including climate change flood event.
- The 2018 Safety Road risk mapping indicates there are low flood risk areas along Blackburn Road and Wellington Road, but a high-risk area on Duredin Street.

- According to the City of Monash Flood Emergency Plan (SES 2019b), flood depths can be greater than 0.6 metres along Duredin Street and on the property corner of Nantilla and Wellington Road (see Appendix B). The maps also indicate that no properties in the Monash Structure Plan Area are at risk from over-floor flooding.

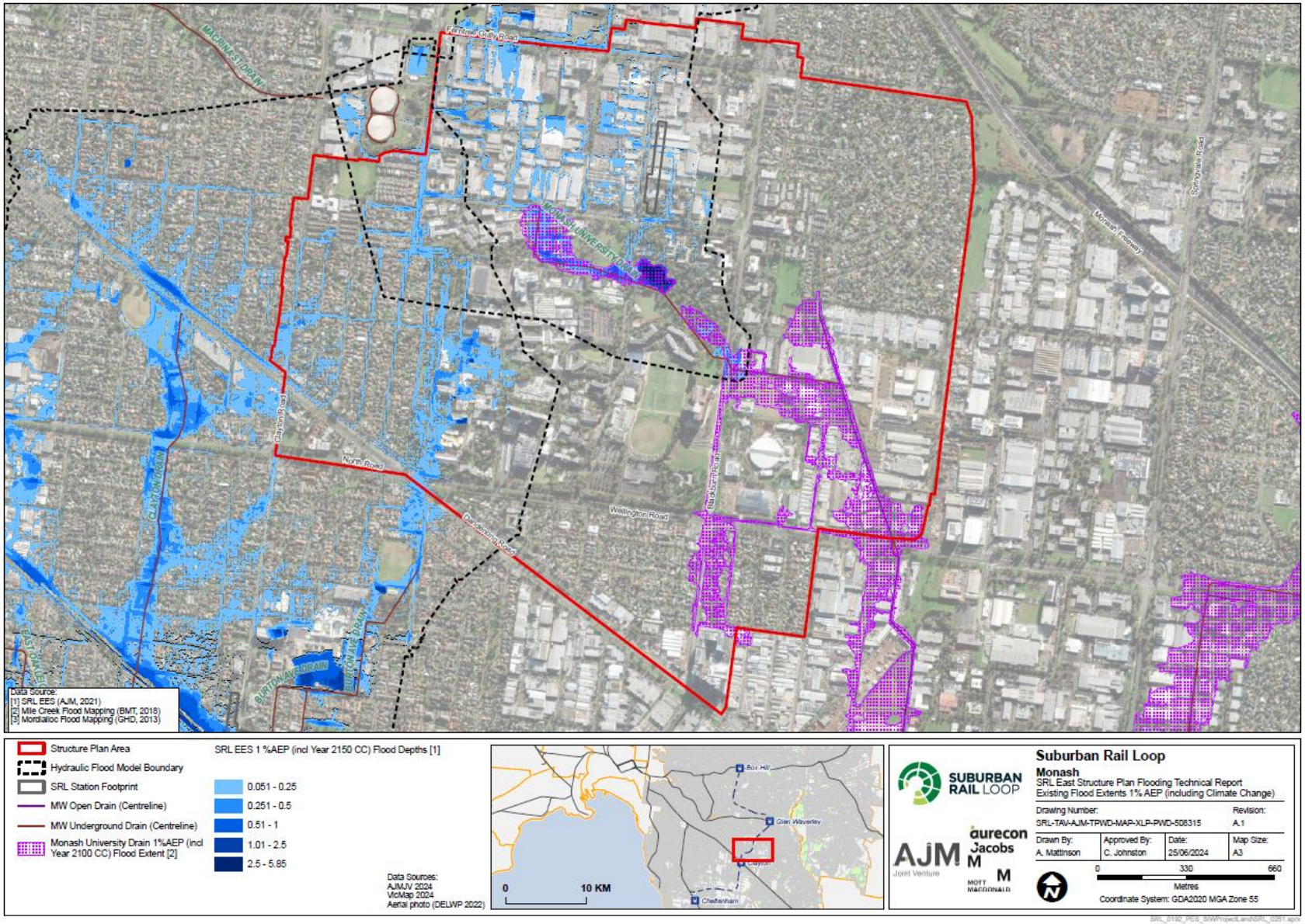

FIGURE 5.22 MONASH STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS

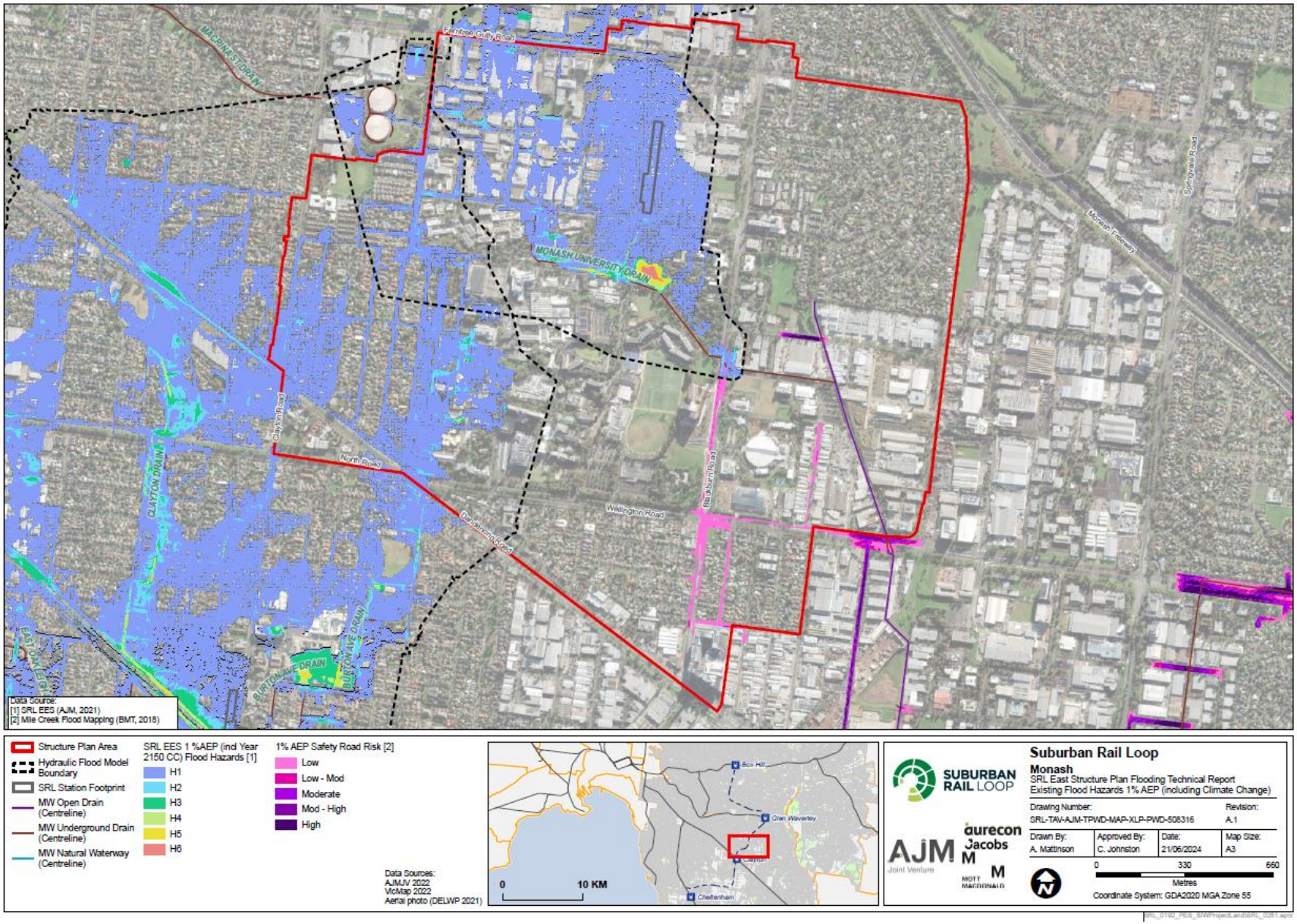

FIGURE 5.23 MONASH STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD

5.5 Glen Waverley Structure Plan Area

The Glen Waverley Structure Plan Area is split across the Dandenong and Gardiners Creek catchments, as presented in Figure 5.24.

The Glen Waverley Structure Plan Area in the Dandenong catchment covers a small area of approximately 0.8 square kilometres, comprising mainly residential and commercial land and road reserves, with some public open green spaces. Water tends to flow from the south-west to the north-east, via the drainage system (Nunawading Outfall) and overland flow, as illustrated by the black arrows in Figure 5.24. Water continues to flow north-east towards Dandenong Creek, approximately 1.5 kilometres from the Glen Waverley Structure Plan Area.

In the Glen Waverley Structure Plan Area in the Gardiners Creek catchment, water tends to flow from the south-east to the north-west towards the Montclair Avenue Drain and the Glen Waverley Drain, as illustrated by the blue arrows in Figure 5.24. There is also a water body, Bunker Lake, in the south-west of the Structure Plan Area. Scotchmans Creek is located approximately 1 kilometre south-west of the Structure Plan Area within the Gardiners Creek catchment, which drains into Gardiners Creek.

5.5.1 PLANNING CONTROLS

An SBO covers a small portion of the Glen Waverley Drain located in the southern extent of the Glen Waverley Structure Plan Area, as shown in Figure 5.25. The Mont Clair Avenue Drain and Scotchmans Creek are also covered by an SBO immediately adjacent to the southern boundary of the Glen Waverley Structure Plan Area.

A permit is required to construct a building or to construct or carry out works on land subject to an SBO as specified by the planning scheme. As the determining referral authority, Melbourne Water assesses flood risk factors and the effect of a development redirecting or obstructing flow paths.

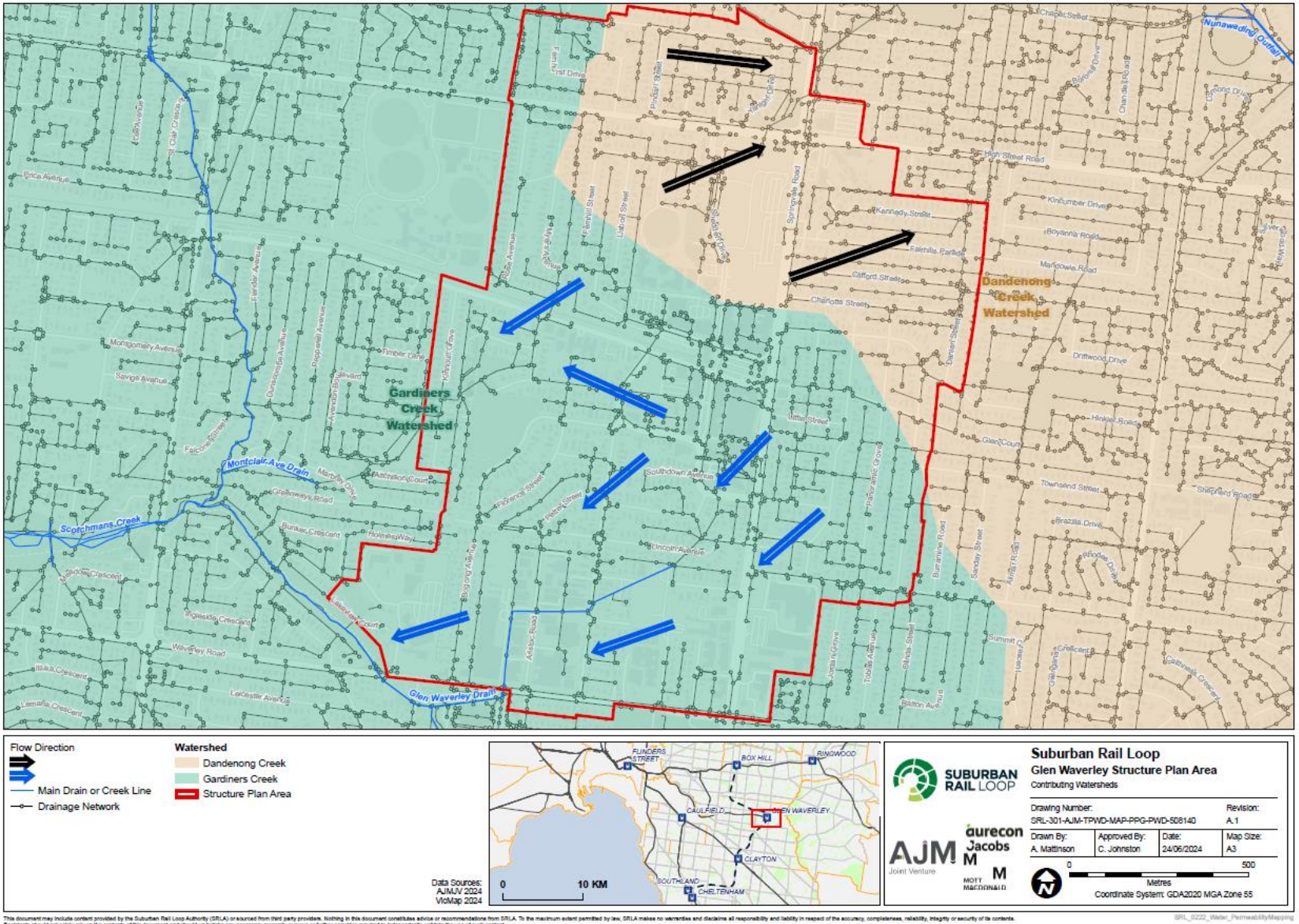

FIGURE 5.24 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS IN GLEN WAVERLEY STRUCTURE PLAN AREA

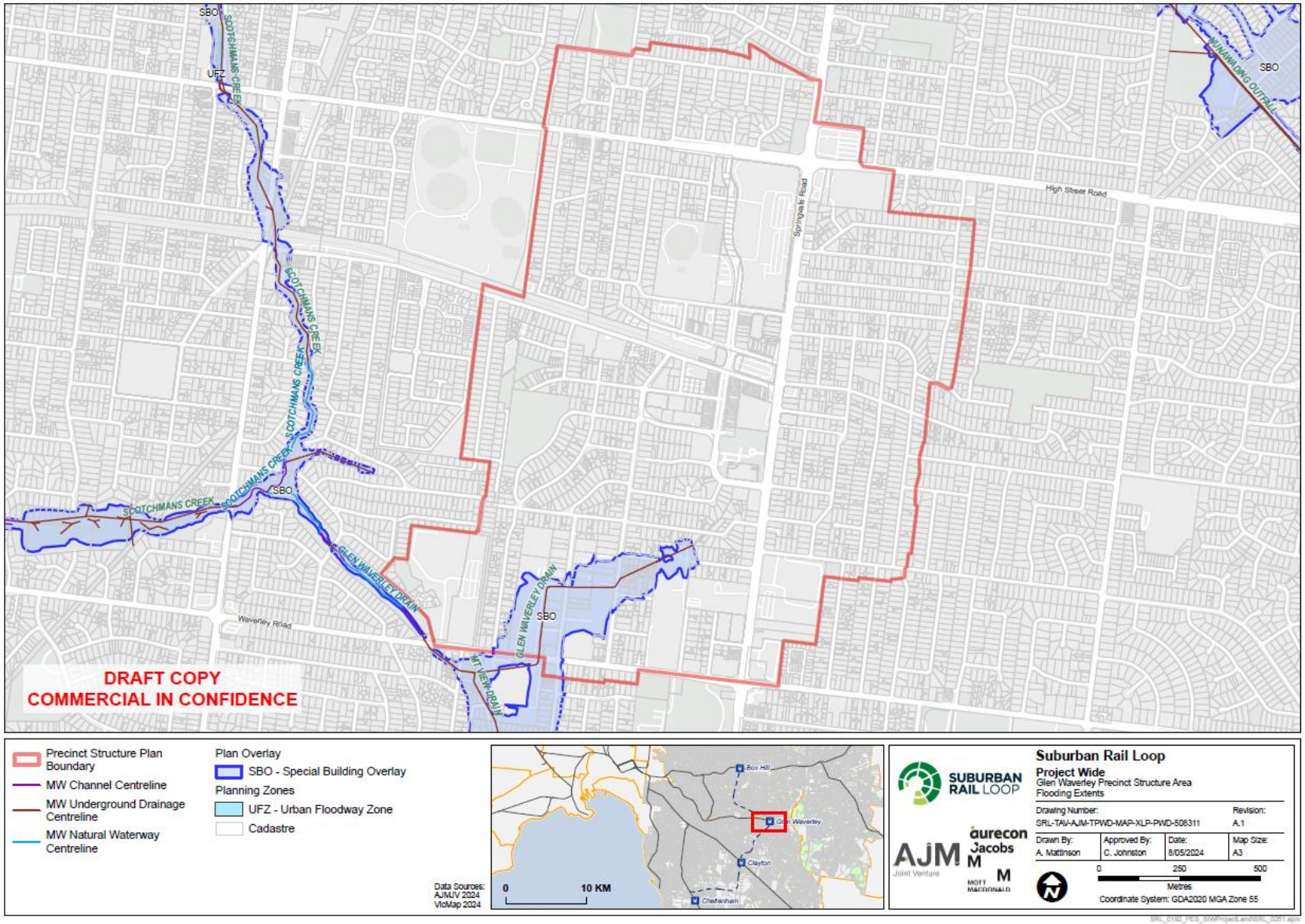

FIGURE 5.25 FLOOD PLANNING CONTROLS IN GLEN WAVERLEY STRUCTURE PLAN AREA

5.5.2 FLOOD CONDITIONS

Flood modelling of the Glen Waverley Structure Plan Area that has informed this assessment are summarised in Table 5.5.

The flood modelling developed for the SRL East EES (AJM-JV 2021b) covers the central portion of the Glen Waverley Structure Plan Area as shown in Figure 5.26. The remaining flood studies have been made available from Melbourne Water.

TABLE 5.5 FLOOD STUDIES RELEVANT TO GLEN WAVERLEY STRUCTURE PLAN AREA

STRUCTURE PLAN AREA	MAJOR CATCHMENTS	DRAINAGE CATCHMENTS	FLOOD MODELLING	YEAR	MELBOURNE WATER TECH SPEC / ARR	1 %AEP CLIMATE CHANGE	RAINFALL INENSITY
Glen Waverley	Gardiners Creek	Mont Clair Ave Drain (4868)	Scotchmans Creek flood mapping final report	BMT (2018)	Melbourne Water W Tech Spec 2008 /ARR 1987	Y	32 % for 2100
		Glen Waverley Drain (4865)					
		Mont Clair Ave Drain (4868)	SRL EES station modelling	AJM-JV (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	23 % for 2150
	Dandenong Creek	Nunawading Outfall (0309)	Nunawading flood mapping	Cardno (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	18.4 % for 2100

Figure 5.26 to Figure 5.30 present the 1 % AEP including Climate Change flood extents and flood hazard and Safety Road Risk in the Structure Plan Area from the SRL East EES (AJM-JV 2021b), the Scotchmans Creek (BMT, 2018) and Nunawading flood mapping (Cardno, 2021). The maps indicate the following:

- Most of the SRL hydraulic model area is impacted by local pluvial runoff, with shallow sheet flows directed to the Glen Waverley Drain as shown in Figure 5.28. Local pluvial flooding is typically shallow (assumed less than 0.2 metres) with up to 1 metre in some locations. This area generally has a H1 hazard classification suggesting that most properties are safe and have safe access during a 1 % AEP including climate change flood event (see Figure 5.32)

- There are sections near the intersection of Myrtle Street and Montclair Avenue, continuing over to Bogong Reserve of depths up 1 metre and the Waverley Road Retention Basin (within the Reserve) over 1 metre in depth. This area is primarily hazard classification H1 with concentrated areas of H2, H3 and H4. Areas greater than H3 are unsafe on roads for vehicles and people during a 1 % AEP including Climate Change flood event, with some adjacent properties having unsafe access (see Figure 5.32).

- Note unlike the flood depths, the flood hazards have not been filtered by the 0.05m depth criteria, and as such the extents are larger.

Figure 5.27 to Figure 5.31 present the 1 % AEP including climate change flood extents and Safety Road Risk developed for the Scotchmans Creek flood mapping project (BMT 2018). The mapping indicates:

- Overland flow paths follow the Glen Waverley Drain west towards Scotchmans Creek, with the 1 % AEP including climate change flood extent overlaying these areas. Properties in this area are subject to flooding during a 1 % AEP including climate change flood event.

- The Safety Road Risk in Figure 5.31 mapping indicates a high flood risk area along Myrtle Street.

- The maps in the Municipal Flood Emergency Plan for the City of Monash (SES 2019b) suggests that flow depths along the Glen Waverley Drain can be greater than 0.6 metres, particularly at Glenallen School and Myrtle Street for the 1 % AEP flood event (see Appendix B). In addition to this, several residential and

industrial properties are at risk to over-floor flooding during a 1 % AEP flood event, including those on Batten Street, Myrtle Street, Aristoc Road and Ivanhoe Street (see Appendix B).

Figure 5.29 presents the 1 % AEP including climate change flood extents developed for the Nunawading flood mapping project (Cardno 2021) which suggests that:

- Scattered areas are subject to flooding during a 1 % AEP including climate change flood, as water flows to the north towards Nunawading Outfall, but does not form a solid flood extent
- The Glen Waverley Structure Plan Area is in the upstream catchment, and it is likely that much of the flow is shallow sheet flow.

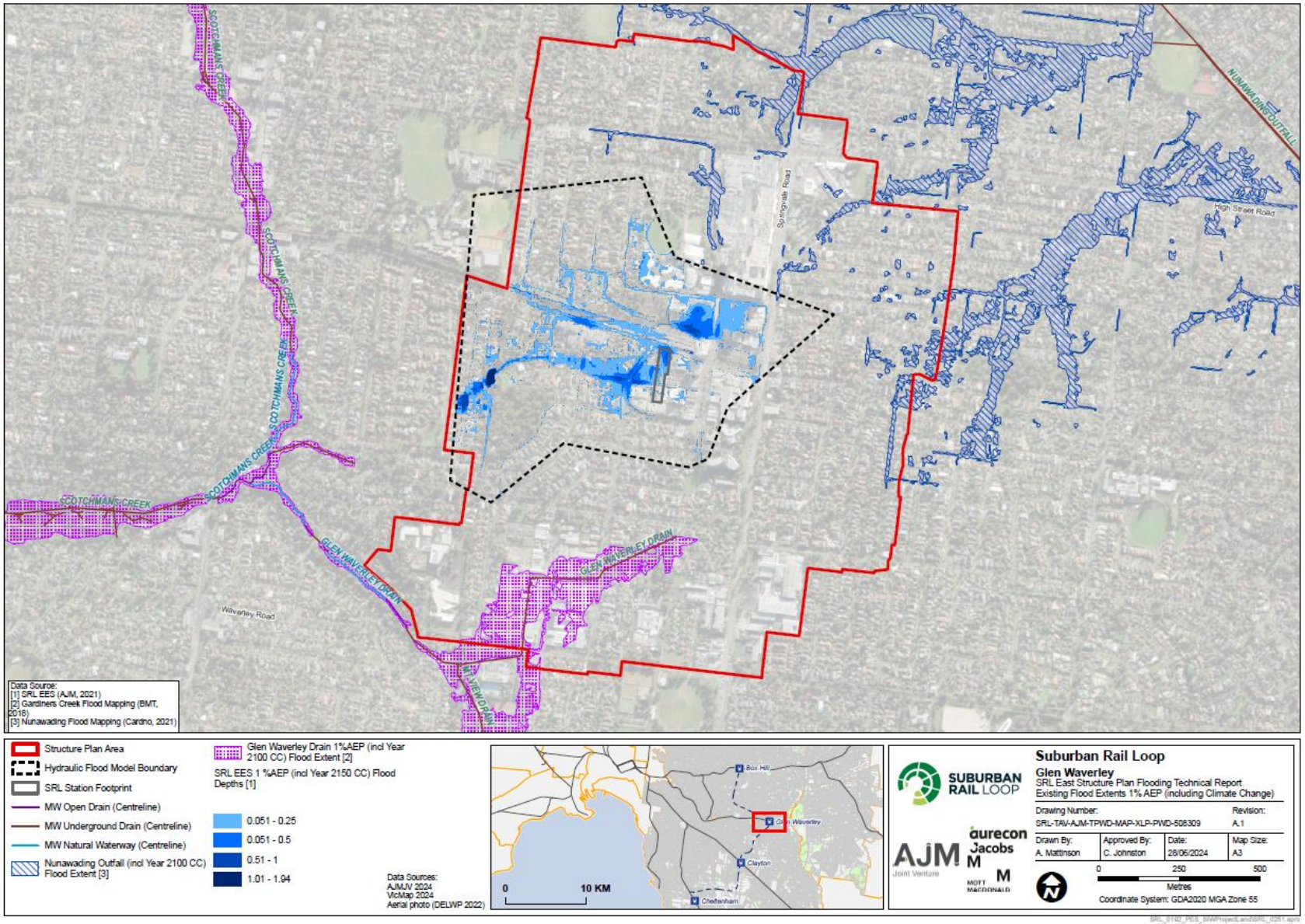

FIGURE 5.26 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (1 OF 4)

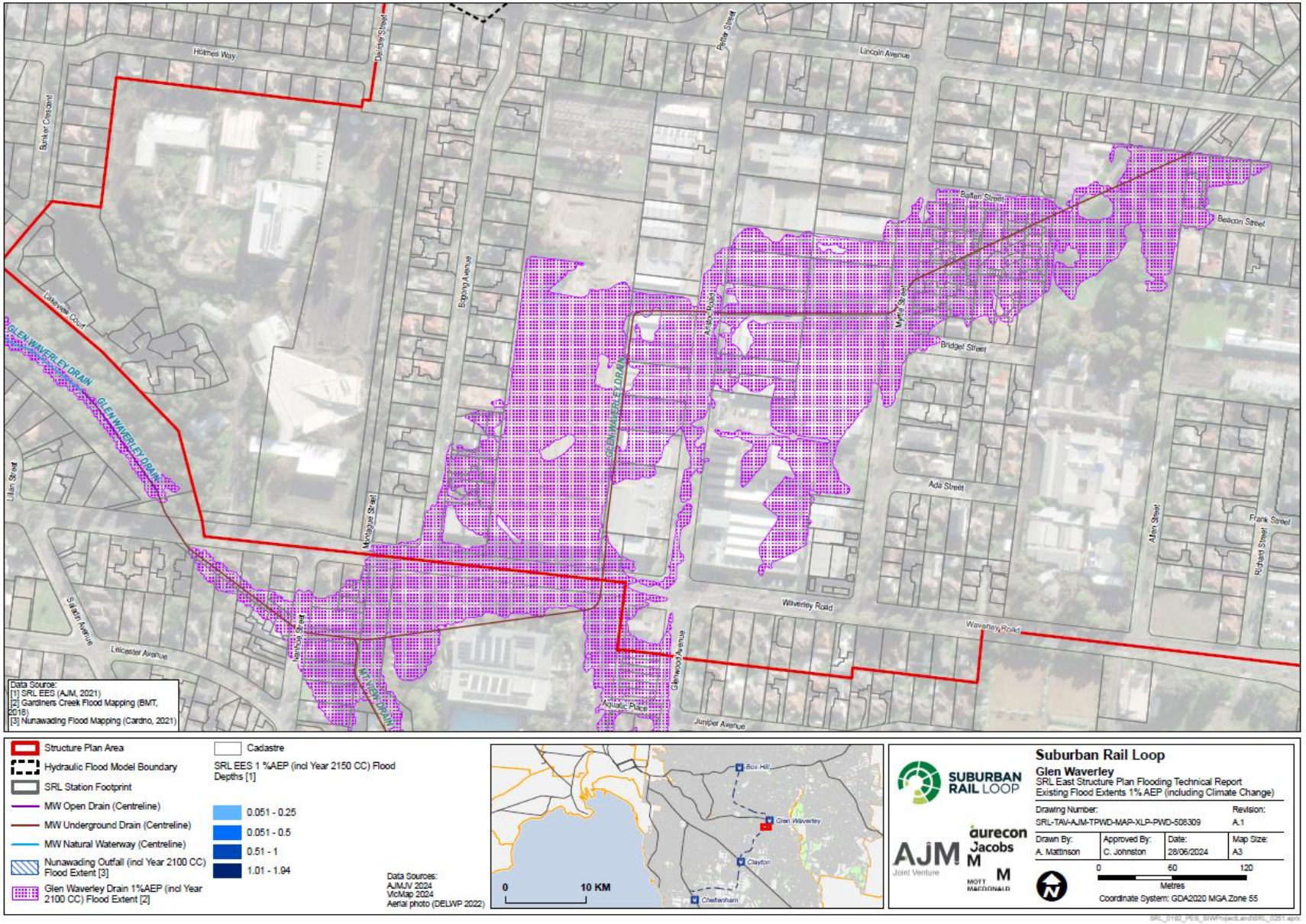

FIGURE 5.27 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (2 OF 4)

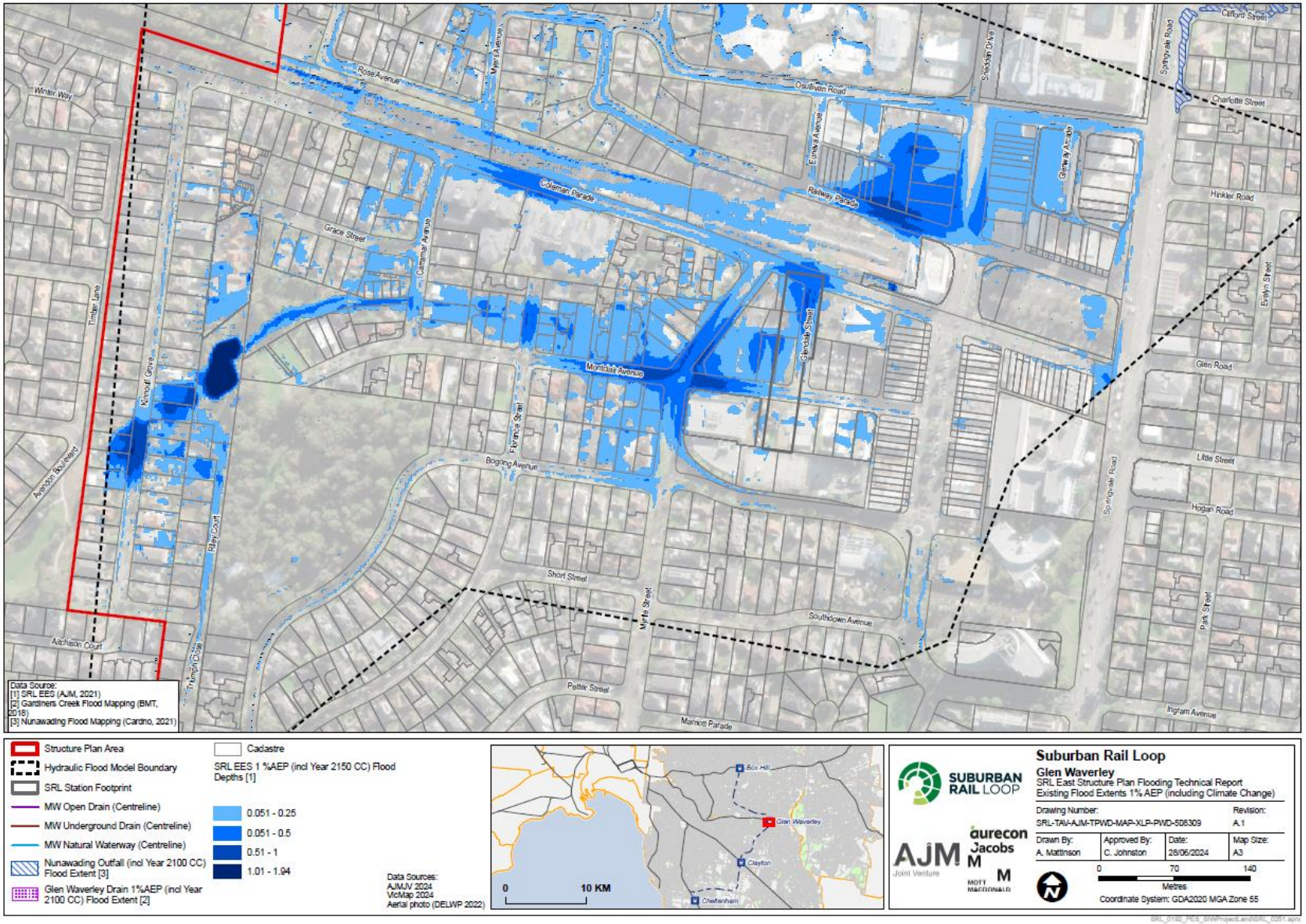

FIGURE 5.28 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (3 OF 4)

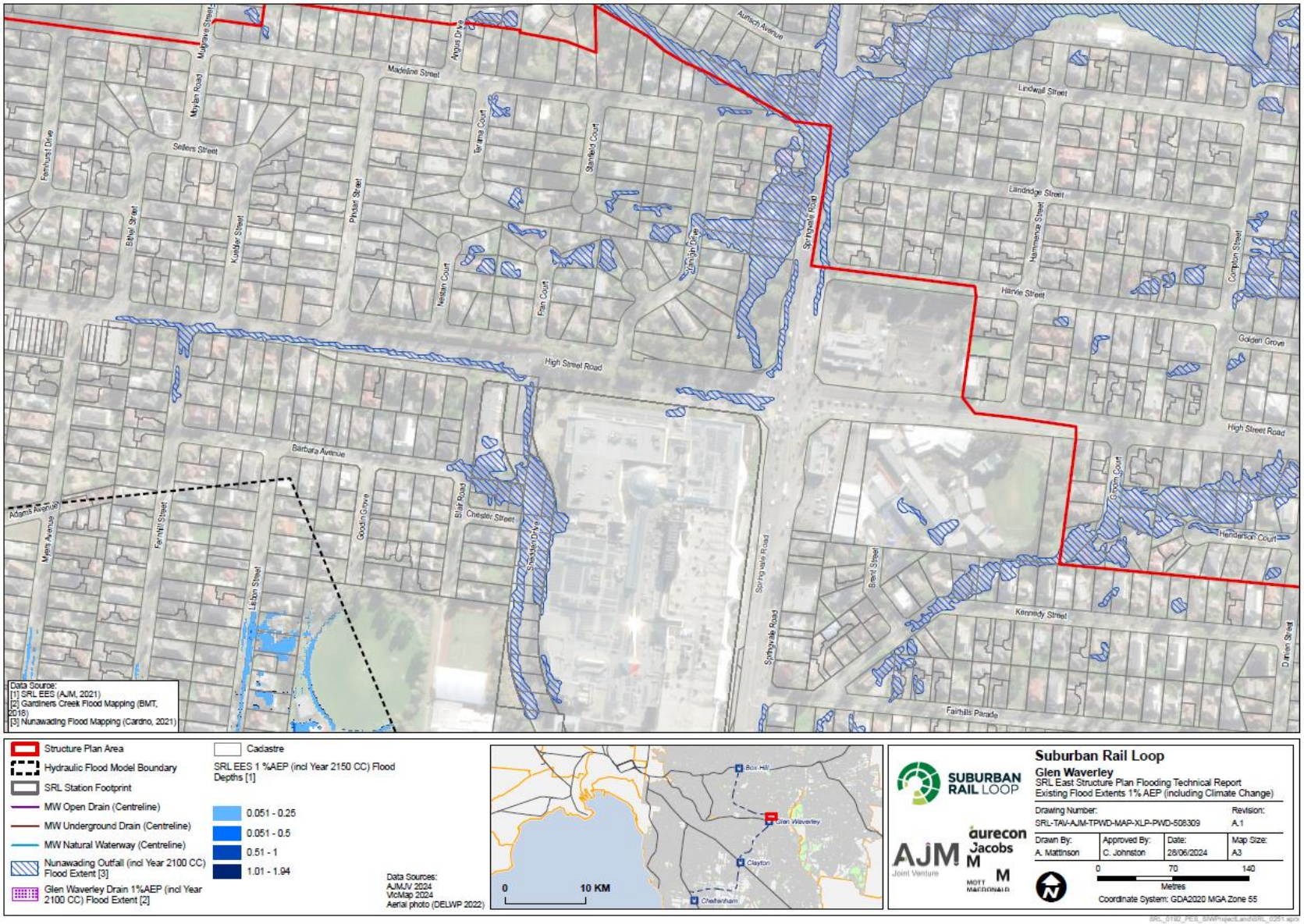

FIGURE 5.29 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (4 OF 4)

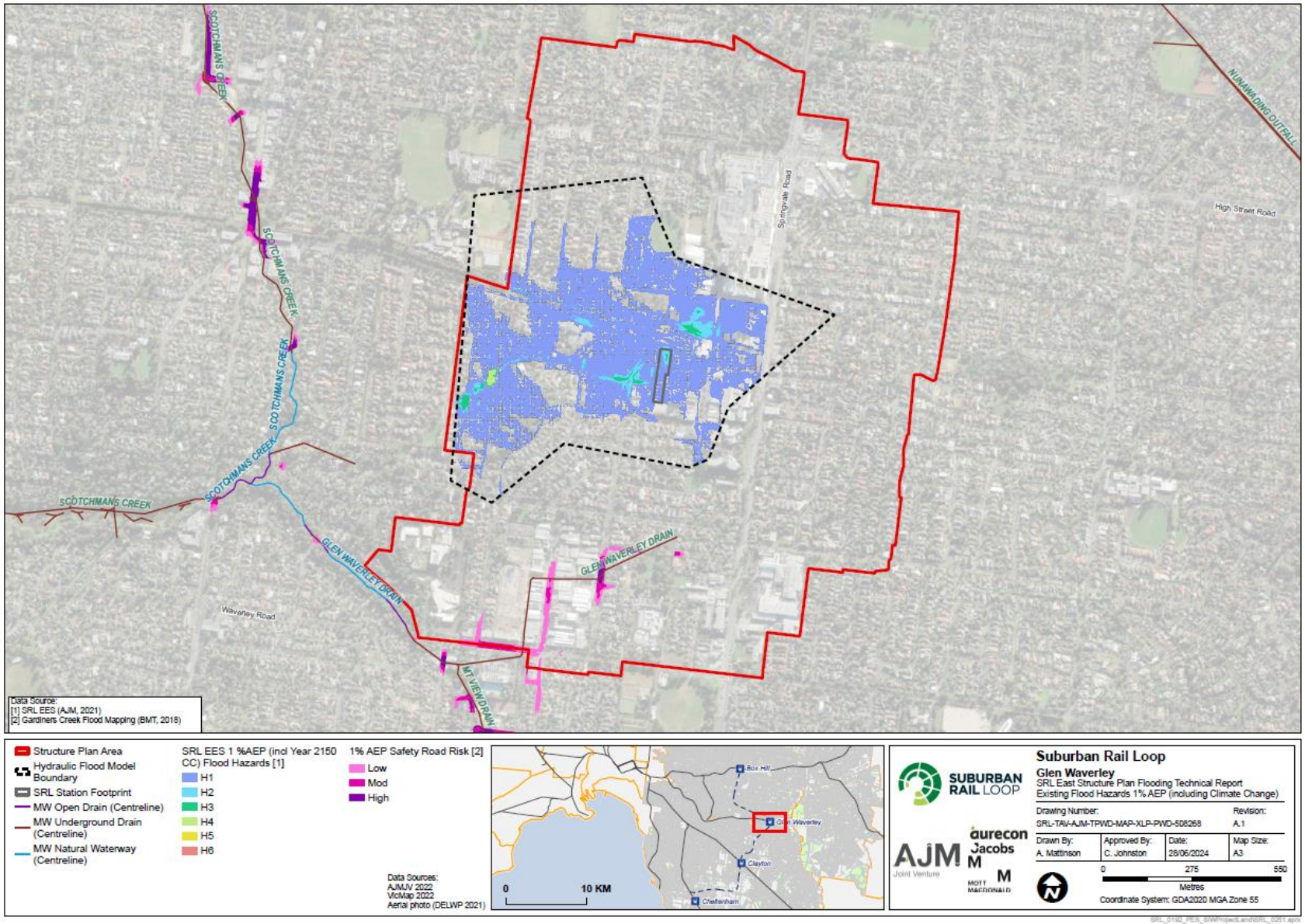

FIGURE 5.30 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (1 OF 3)

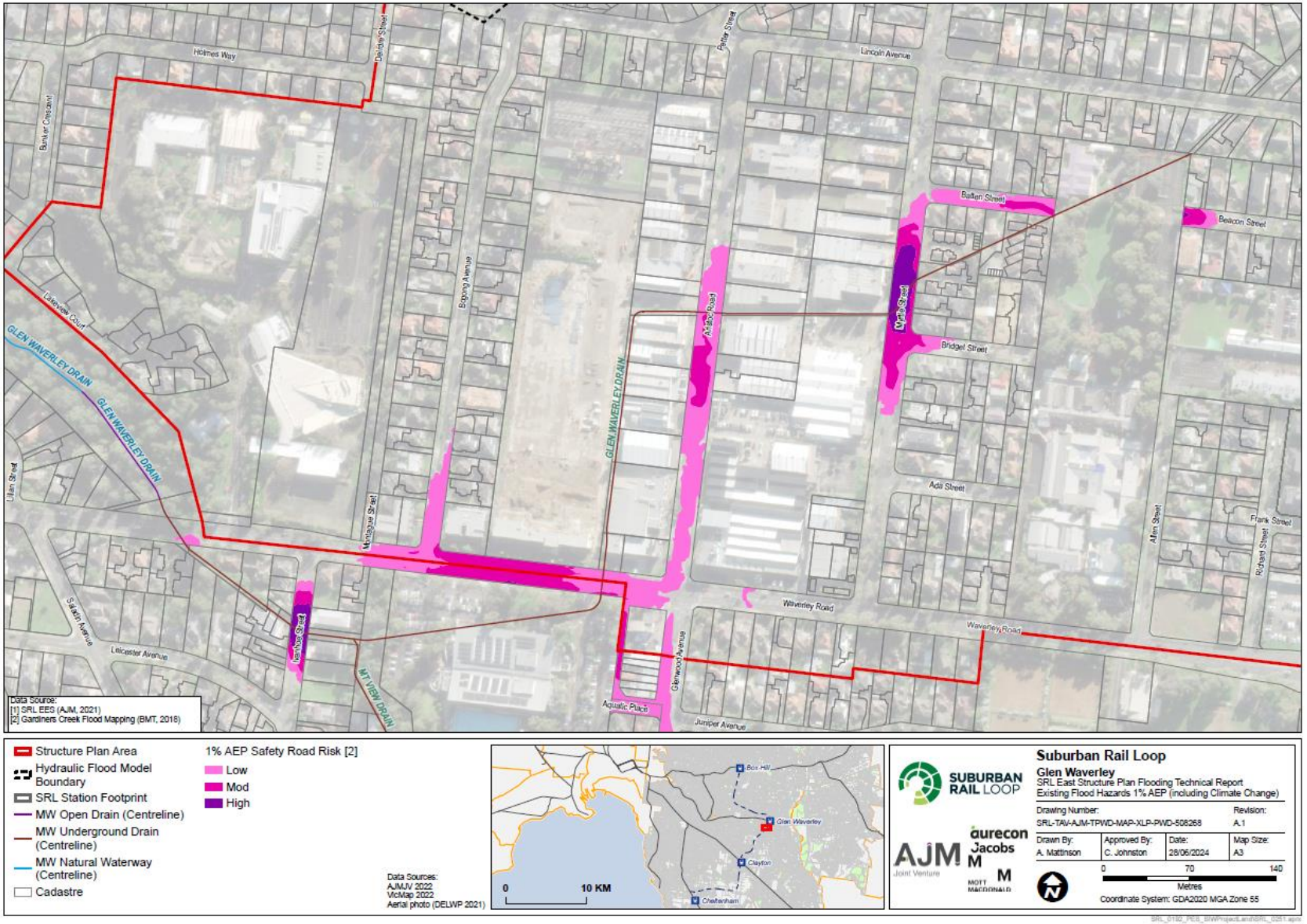

FIGURE 5.31 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (2 OF 3)

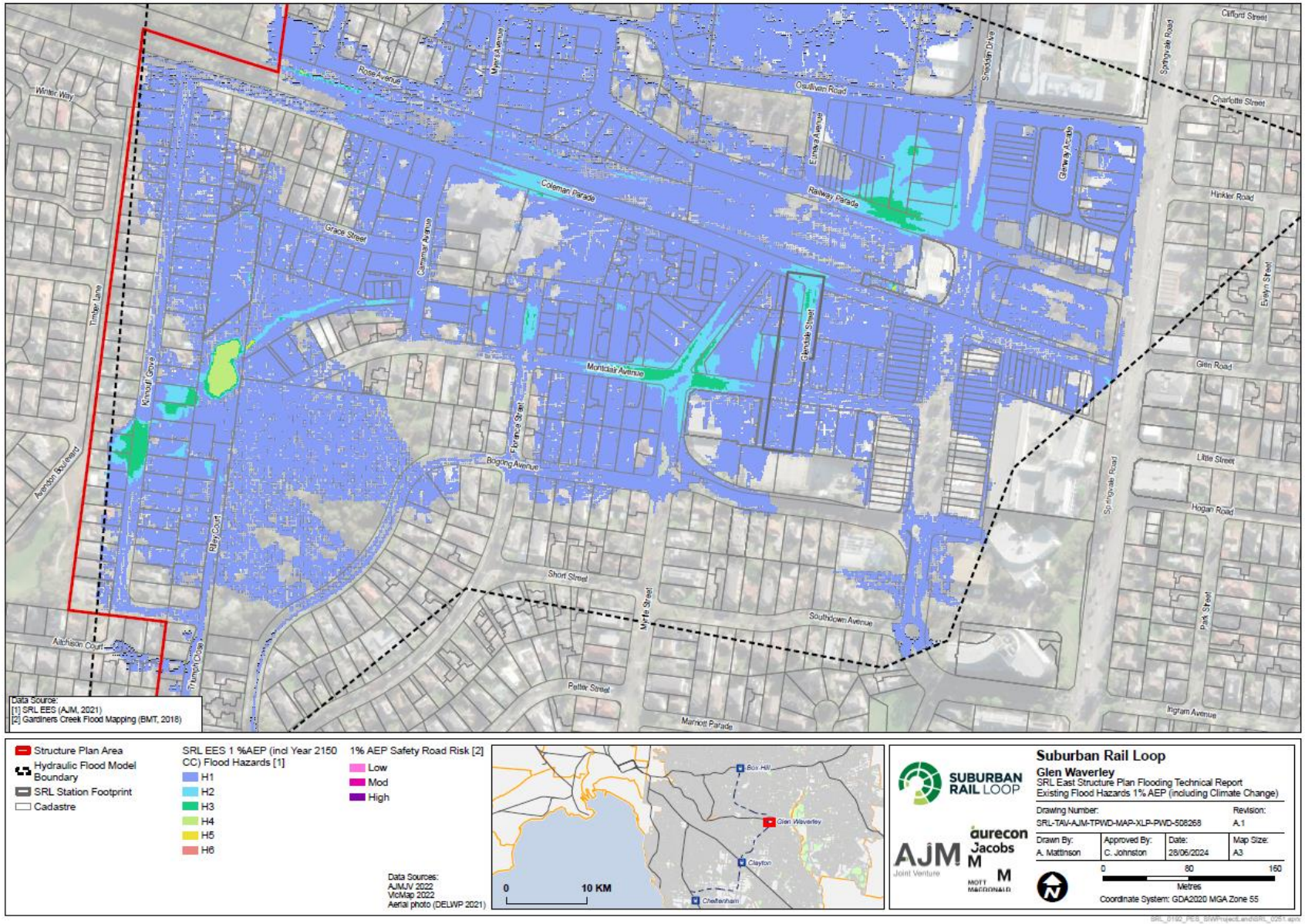

FIGURE 5.32 GLEN WAVERLEY STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARD (3 OF 3)

5.6 Burwood Structure Plan Area

The Burwood Structure Plan Area is located in the Gardiners Creek catchment, with Gardiners Creek centrally located in the Burwood Structure Plan Area, as shown in Figure 5.33.

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 space reserve which is generally flanked 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.

At the approved SRL station at Burwood, the station design will include naturalising the section of Gardiners Creek between Burwood Highway and the Sinnott Street Pedestrian Bridge. Section 5.6.3 provides information about naturalisation work planned for Gardiners Creek.

Most of the Burwood Structure Plan Area drains into Gardiners Creek in the local drainage network with excess flow as overland flow, as illustrated in Figure 5.33. Other existing drains in the Burwood 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 Burwood Structure Plan Area.

5.6.1 PLANNING CONTROLS

There are several flood related planning controls within the Burwood Structure Plan Area, presented in Figure 5.34 and listed as follows:

- Gardiners Creek - subject to a Land Subject to Inundation Overlay (LSIO).
- Special Building Overlay (SBO):
  - The McComas Grove Drain (4880) SBO is located approximately 70 metres east of the SRL station at Burwood site
  - The Stott Street Drain (4875) SBO is approximately 550 metres to the north of the station site
  - The Brockhoffs Main Drain (4874) SBO is approximately 1.3 kilometres to the south of the station site.
- The land located immediately south-west of the SRL station at Burwood is designated as an Urban Floodway Zone (UFZ). The UFZ prohibits most uses and developments and is applied to urban environments with a high risk of flooding, which is typical for covering land containing a waterway.

A permit is required to construct a building or to construct or carry out works on land subject to an SBO, LSIO and UFZ as specified by the planning scheme. The UFZ typically restricts development to low intensity uses such as recreation. As the determining referral authority, Melbourne Water assesses flood risk factors and the effect of a development redirecting or obstructing flow paths.

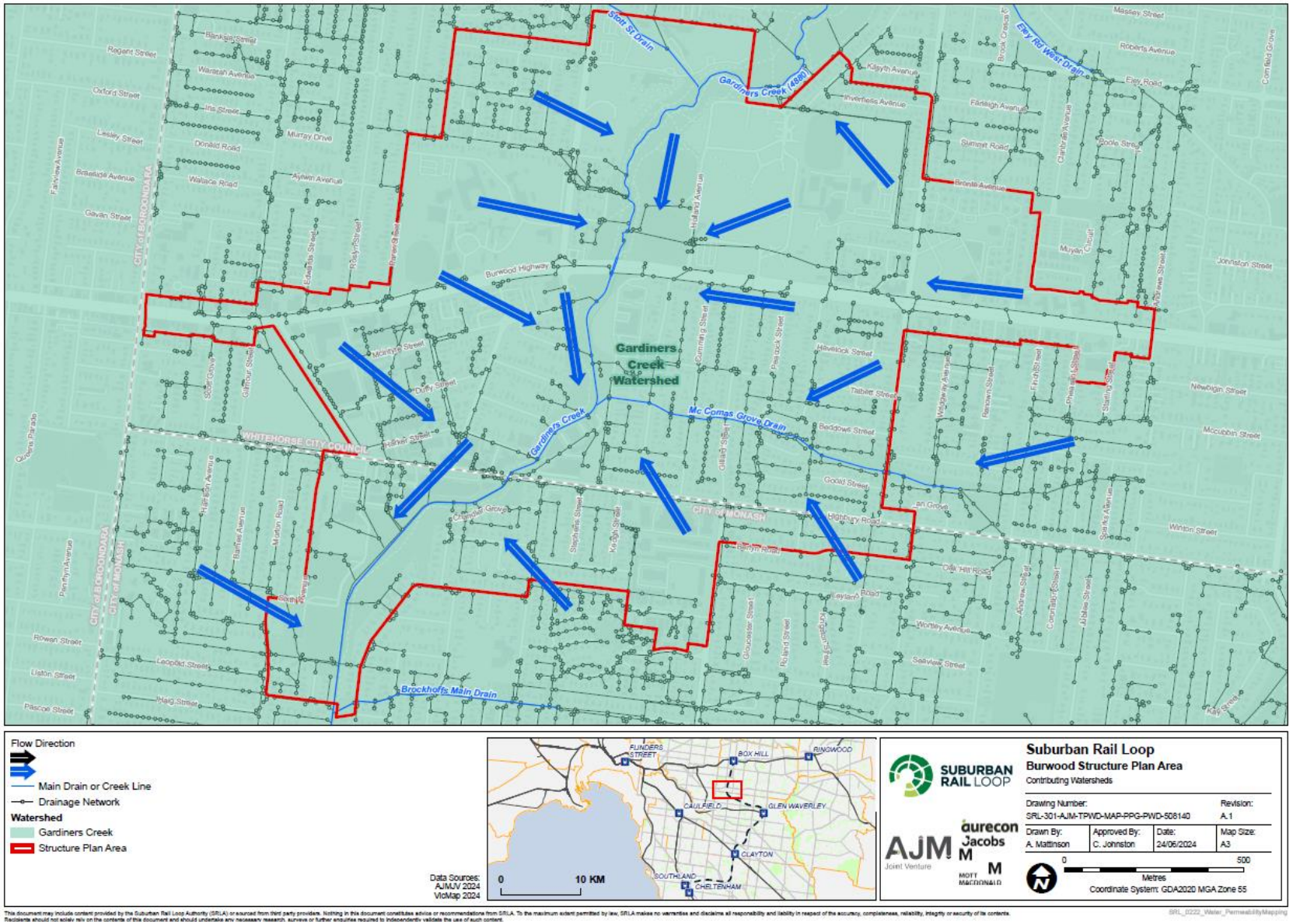

FIGURE 5.33 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS IN BURWOOD STRUCTURE PLAN AREA

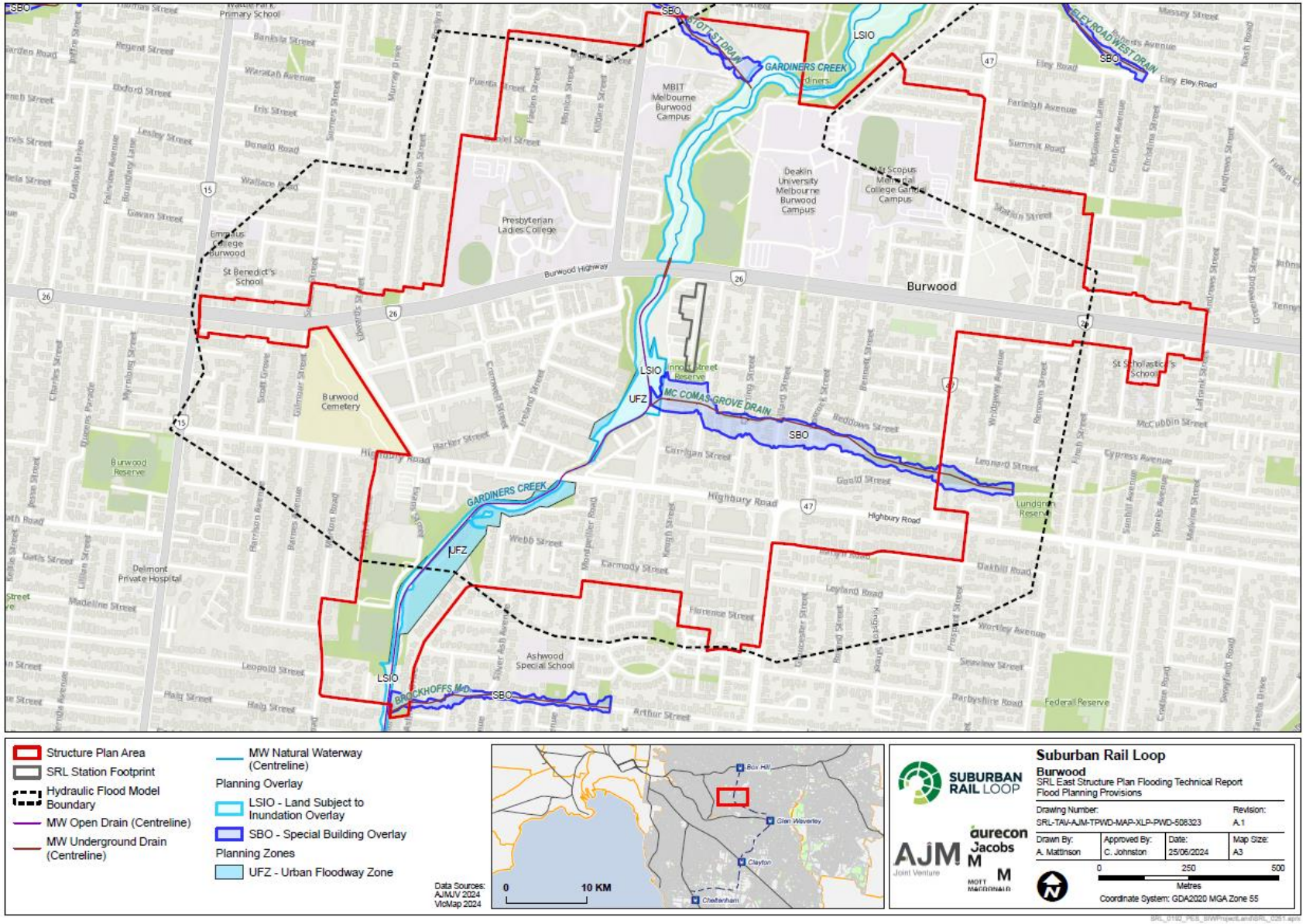

FIGURE 5.34 FLOOD PLANNING CONTROLS IN BURWOOD STRUCTURE PLAN AREA

5.6.2 FLOOD CONDITIONS

Flood studies of the Burwood Structure Plan Area that have informed this assessment are summarised in Table 5.6.

The flood modelling developed for the SRL East EES (AJM-JV 2021b) covers most of the Burwood Structure Plan Area as shown in Figure 5.34. The remaining flood studies have been made available from Melbourne Water.

TABLE 5.6 FLOOD STUDIES RELEVANT TO BURWOOD STRUCTURE PLAN AREA

MAJOR CATCHMENTS	DRAINAGE CATCHMENTS	FLOOD MODELLING	YEAR	MELBOURNE WATER TECH SPEC / ARR	1 %AEP CLIMATE CHANGE	RAINFALL INTENSITY
Gardiners Creek	Gardiners Creek (4870)	SRL East EES station modelling	AJM-JV (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	23 % for 2150
	McComas Grove Drain (4875)					
	Stott St Drain (4881)					
	Brockhoffs Main Drain (4874)	Brockhoffs Main Drain flood modelling and mapping report	Water Tech (2010)	Melbourne Water Tech Spec 2009 / ARR 1987	Y	32 % for 2100

Figure 5.35 to Figure 5.39 present the 1 % AEP including Climate Change flood extents and flood hazard classifications in the Structure Plan Area from the SRL East EES (AJM-JV 2021b) and the Brockhoffs Main Drain flood modelling (Water Tech 2010). The maps indicate:

- 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 (see Figure 5.35).
- The flood extents are consistent with the LSIO and SBO that applies in the Burwood 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 mostly 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 one metre due to bypass flows along the McComas Grove Main Drain alignment that drains to Gardiners Creek (see Figure 5.36). There is a moderate to high flood risk area along the Drain, with a flood hazard classification above H3, and in some sections, classifications of H4 or H5. This indicates that these areas are unsafe for people and vehicles, with some properties vulnerable to structural damage. This can be seen in Figure 5.40)

- Peak flood depths in the Gardiners Creek channel adjacent to the SRL station at Burwood reach three metres (Figure 5.37), with a flood hazard classification reaching H5, making it unsafe for vehicles and people, with structures vulnerable to structural damage (see Figure 5.41)

- Shallow sheet flow typically less than 0.1 metres flows along Burwood Highway (see Figure 5.37) and has a flood hazard classification of H1 making it generally safe for people, vehicles and buildings (see Figure 5.41). This is due to bypass flows along the highway's drainage network.

- Flood maps in the City of Whitehorse Flood Emergency Plan (SES 2016) indicate several properties are within the flood extent covering McComas Grove Drain which are at risk of over-floor flooding during a 1 % AEP event (see Appendix B).

- Note unlike the flood depths, the flood hazards have not been filtered by the 0.05 metres depth criteria, and as such the extents are larger.

Figure 5.38 and Figure 5.42 show the 1 % AEP including Climate Change flood extents and road risk developed for the Brockhoffs Main Drain flood mapping (Water Tech, 2010). The mapping indicates:

- Overland flow paths follow the Brockhoffs Main Drain and flow west discharging into Gardiners Creek south of the Structure Plan Area. Properties in this area are subject to flooding during a 1 % AEP including climate change flood event.

- There is a high flood risk area outside the Structure Plan Area following Brockhoffs Main Drain.

5.6.3 COMMITTED PROJECTS

Gardiners Creek Naturalisation

The Environmental Performance Requirements (EPRs) for SRL East include SW8 *Develop and implement a management plan for naturalisation of Gardiners Creek* and EC5 *Gardiners Creek naturalisation is to be undertaken to improve habitat values.*

A section of Gardiners Creek adjacent to the SRL station at Burwood, between Burwood Highway and the existing wooden bridge at Sinnott Street Reserve, will be naturalised. That is, the concrete channel will be removed, and the channel will be returned to a more natural bedform that mimics natural function by integrating meanders, vegetation, rocks, pools and riffles. This work is scheduled to occur after 2030, a component of the SRL station construction works. It is likely that the naturalisation will change the flood conditions in the area.

As per the EPRs and approved Surface and Tunnel Plans for SRL East, the design of these works will be required to show that the works are not having any residual adverse flood impact deemed unacceptable by Melbourne Water.

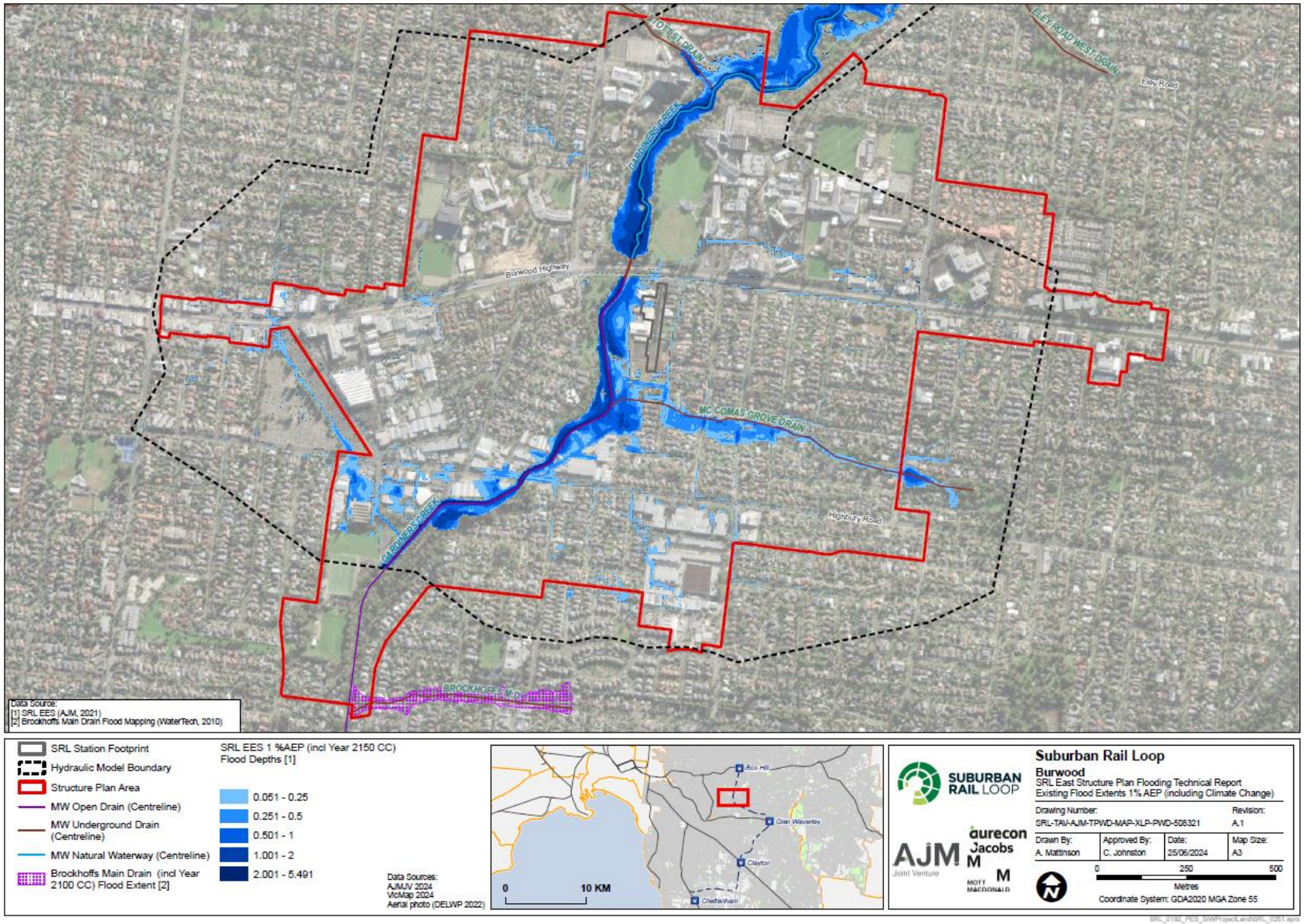

FIGURE 5.35 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (1 OF 4)

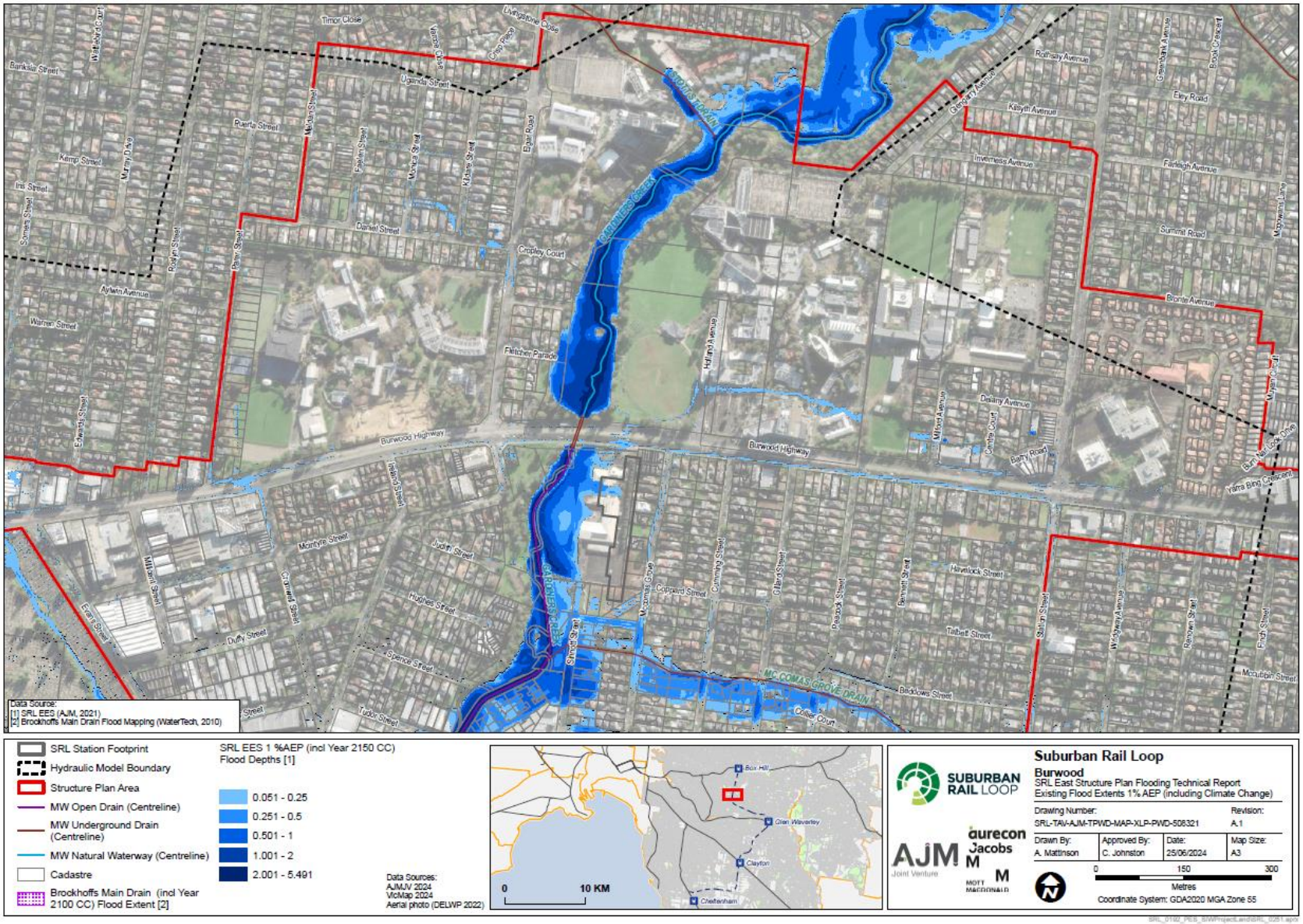

FIGURE 5.36 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (2 OF 4)

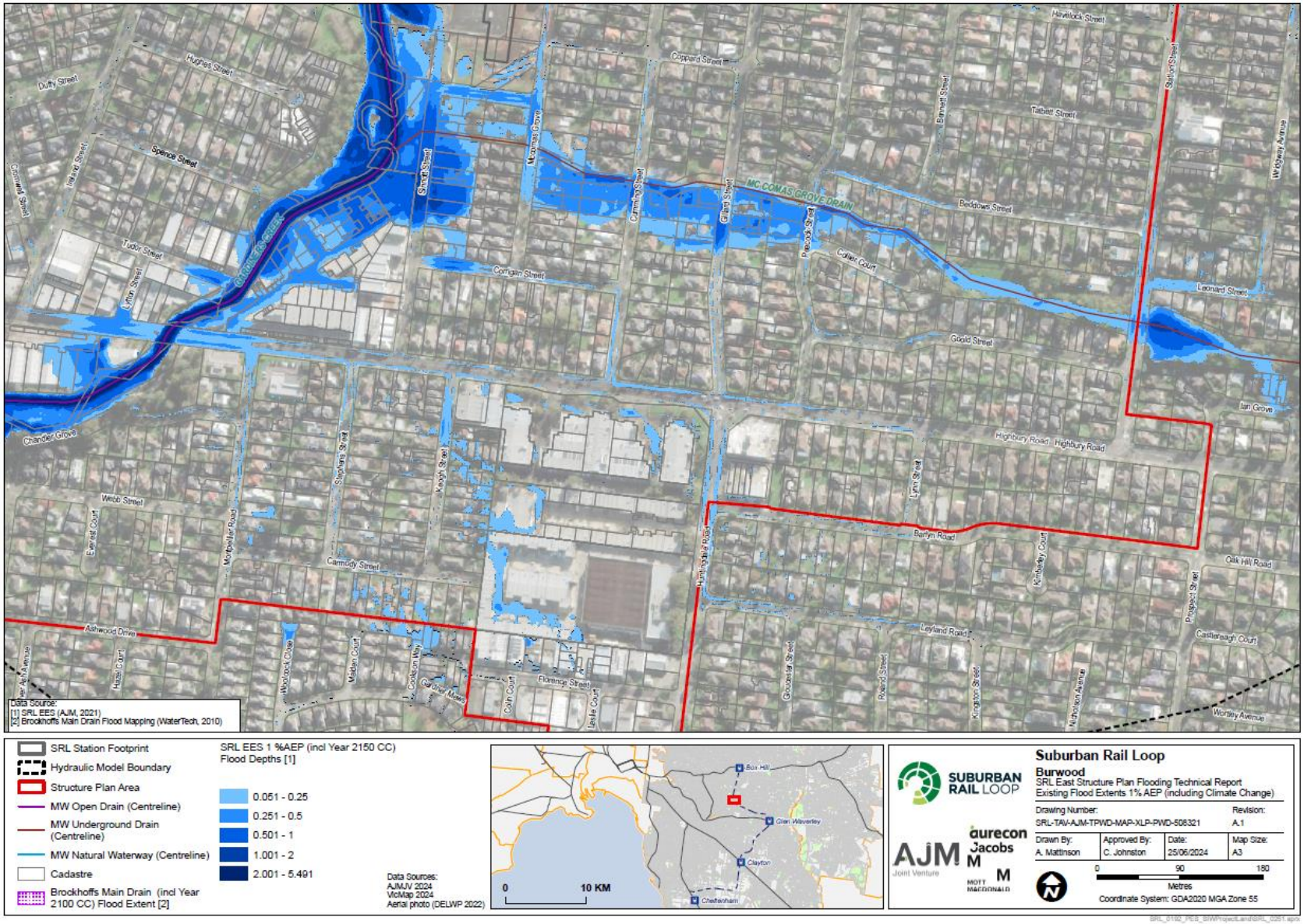

FIGURE 5.37 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (3 OF 4)

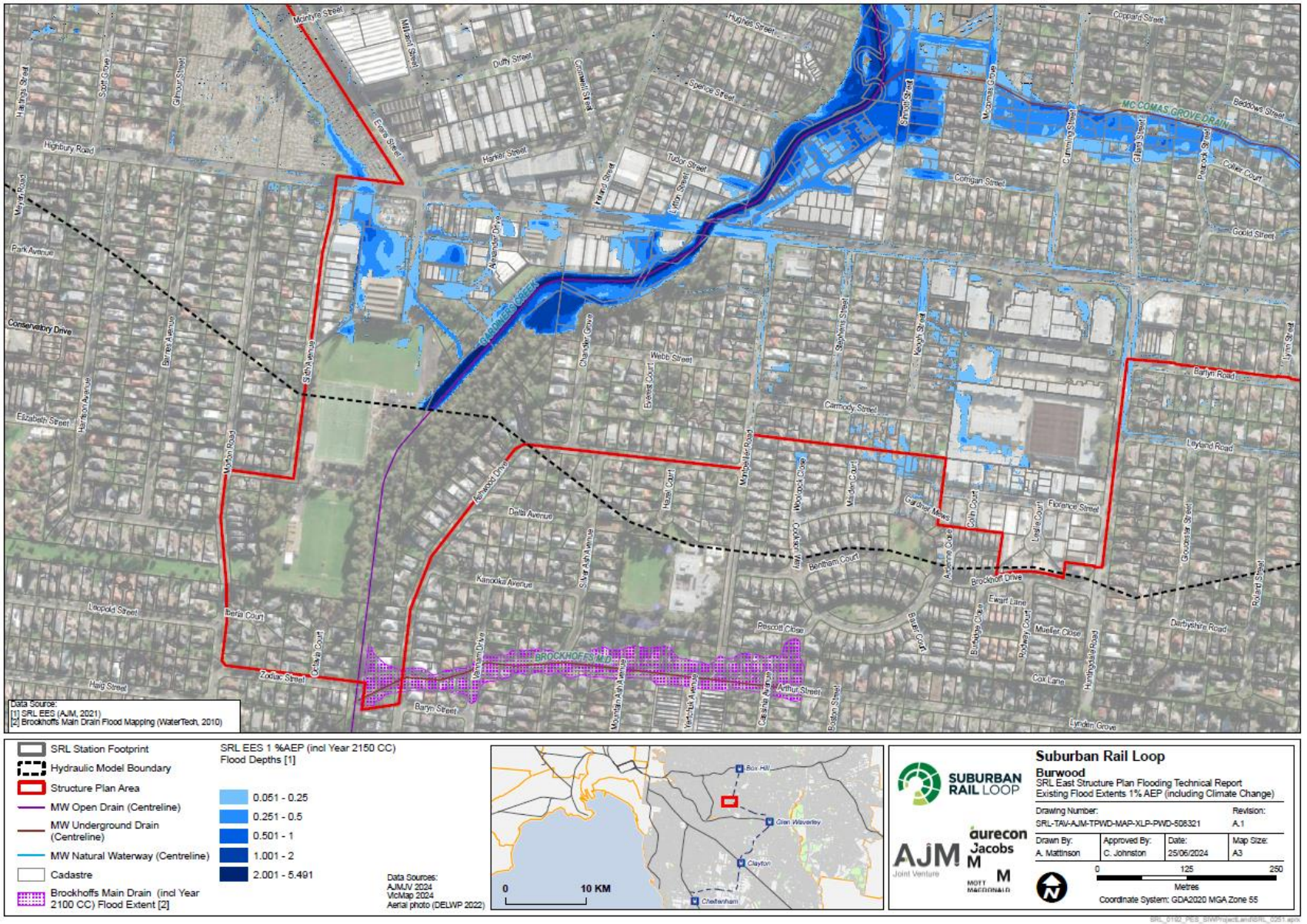

FIGURE 5.38 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (4 OF 4)

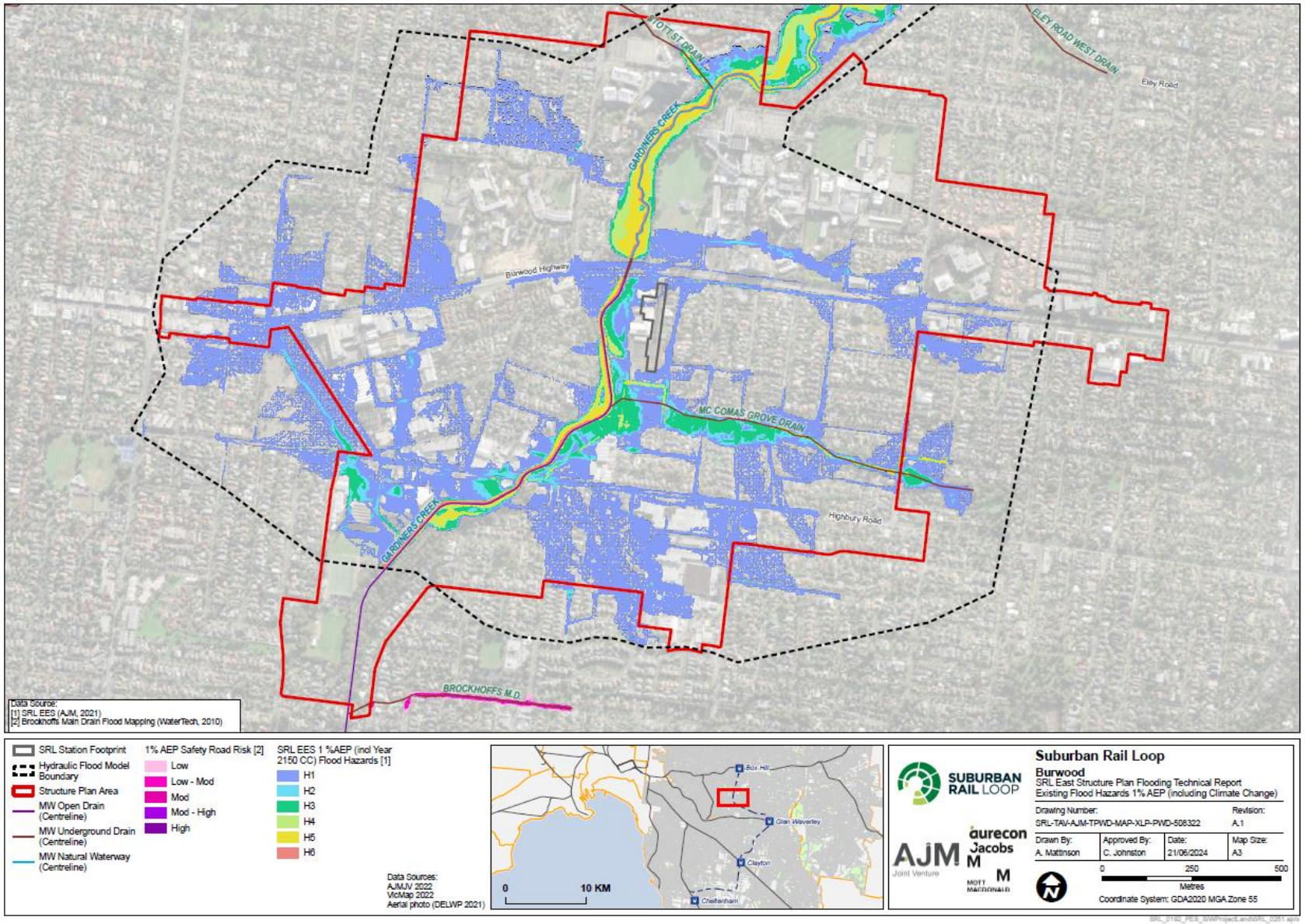

FIGURE 5.39 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (1 OF 4)

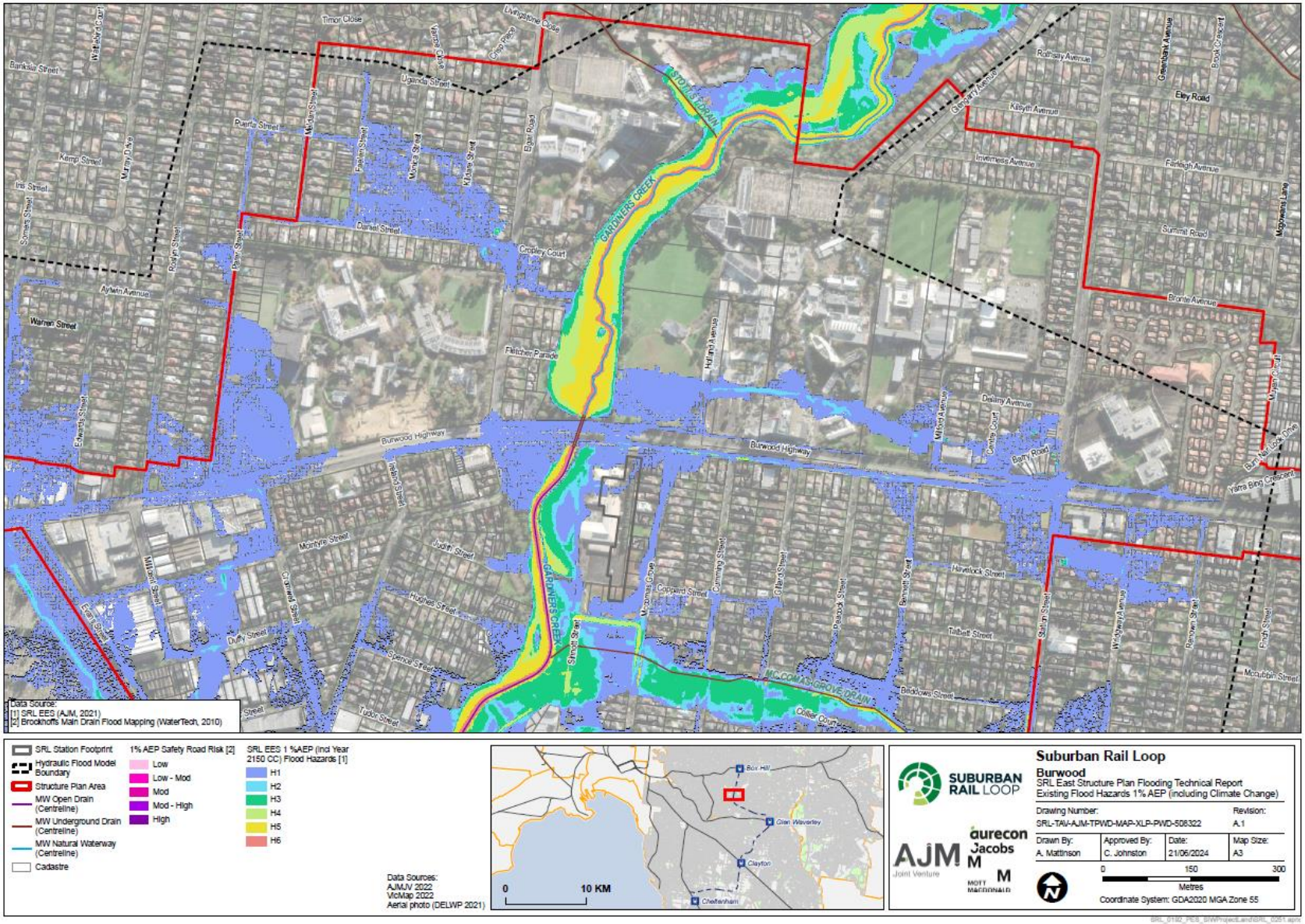

FIGURE 5.40 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (2 OF 4)

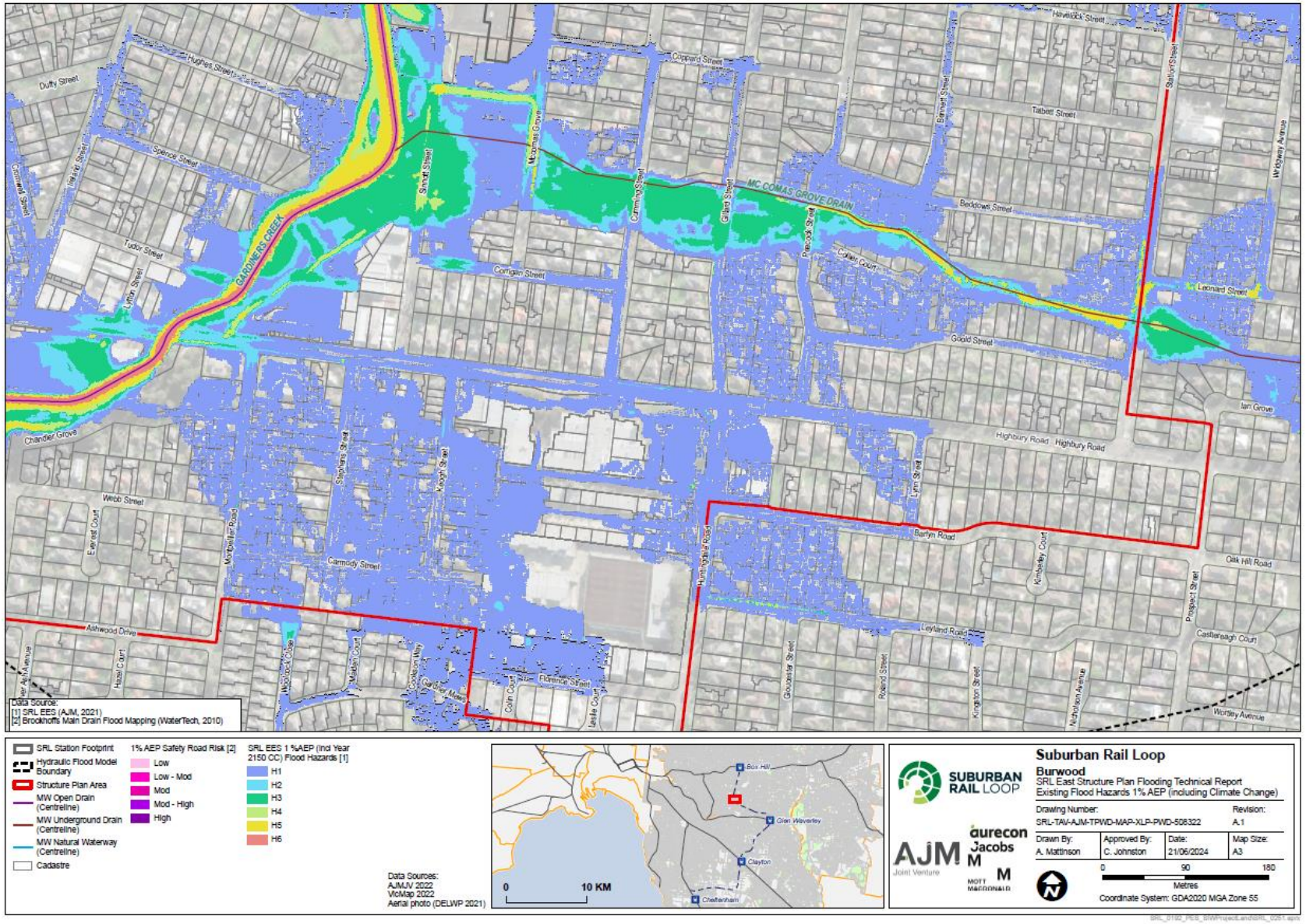

FIGURE 5.41 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (3 OF 4)

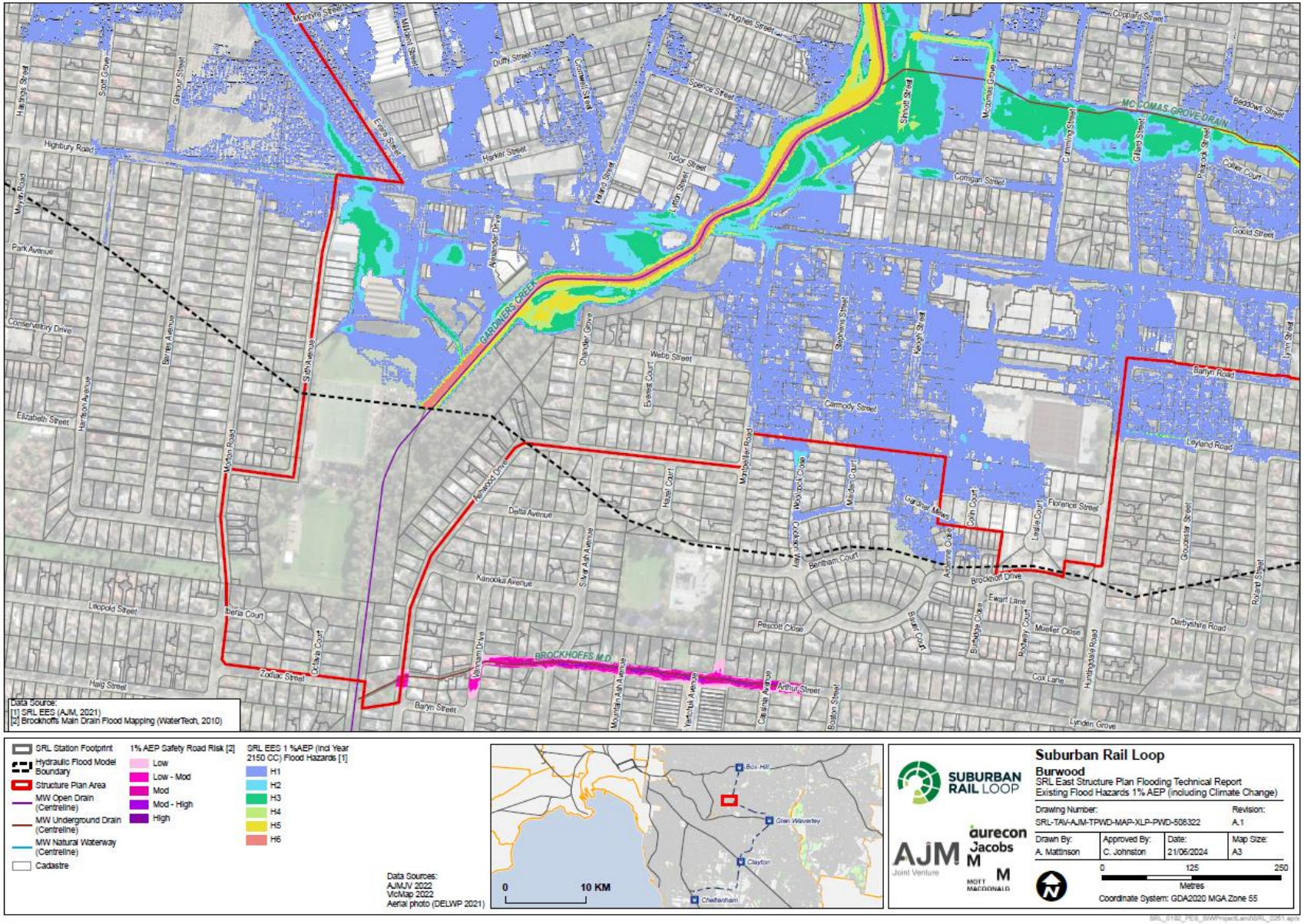

FIGURE 5.42 BURWOOD STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (4 OF 4).

5.7 Box Hill Structure Plan Area

The Box Hill Structure Plan Area is located on a ridge between the Koonung Creek catchment to the north and the Gardiners Creek catchment to the south, as shown in Figure 5.43.

In the Koonung Creek catchment, water flows overland in a northward direction toward Box Hill Gardens, before entering Severn Street Main Drain, approximately 350 metres north-west, as shown by the black arrows in Figure 5.43. The water eventually discharges into Koonung Creek at Elgar Park, approximately 2 kilometres north of the Structure Plan Area via the stormwater drainage network. There is one detention pond within this overland flow path, at Box Hill Gardens, shown in Figure 5.43.

In the Gardiners Creek catchment in the south of the Structure Plan Area, water tends to drain south and discharge into Gardiners Creek at Box Hill South, approximately 2.5 kilometres south via the local drainage network, as shown by the blue arrows in Figure 5.43. There is a detention pond at Surrey Park owned and managed by the Whitehorse City Council, which forms part of the water reuse system for the local gardens.

5.7.1 PLANNING CONTROLS

There are three Special Building Overlays (SBO) covering land in the Box Hill Structure Plan Area, as shown in Figure 5.44.

- To the north-west of the Box Hill Structure Plan Area, an SBO applies to land to the north-west and west of Box Hill Gardens, where it crosses Thames Street to the Severn Street Main Drain
- To the south of the Box Hill Structure Plan Area, an SBO applies to land 400 metres south of the SRL station, across Albion Road and Canterbury Road, associated with the Box Hill South Main Drain.
- At the eastern end of the Box Hill Structure Plan Area, an SBO applies to land adjacent to the intersection of Middleborough Road and Whitehorse Road.

A permit is required to construct a building or to construct or carry out works on land subject to an SBO as specified by the planning scheme. As the determining referral authority, Melbourne Water assesses flood risk factors and the effect of a development redirecting or obstructing flow paths.

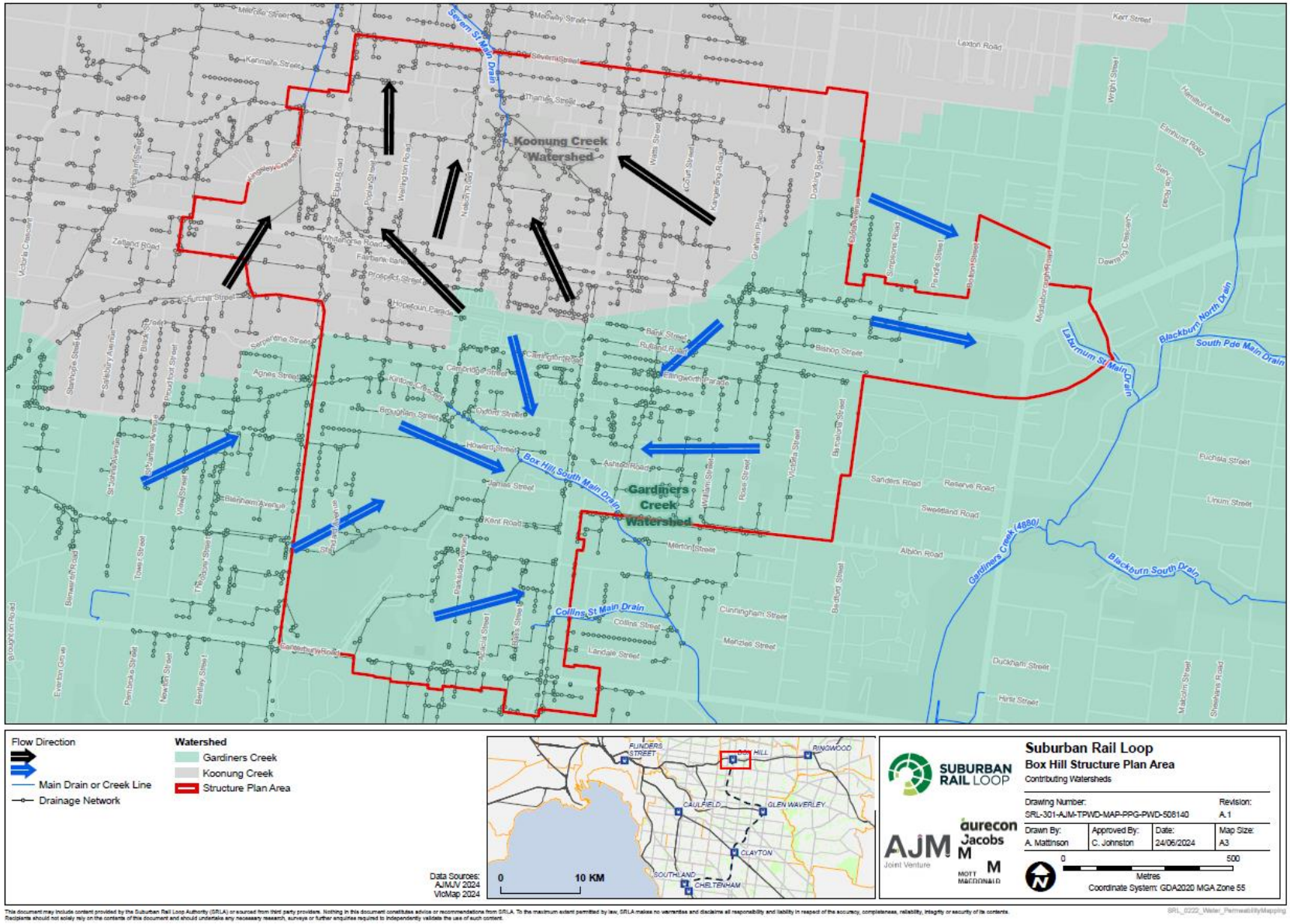

FIGURE 5.43 DRAINAGE ASSETS AND CONTRIBUTING CATCHMENTS IN BOX HILL STRUCTURE PLAN AREA

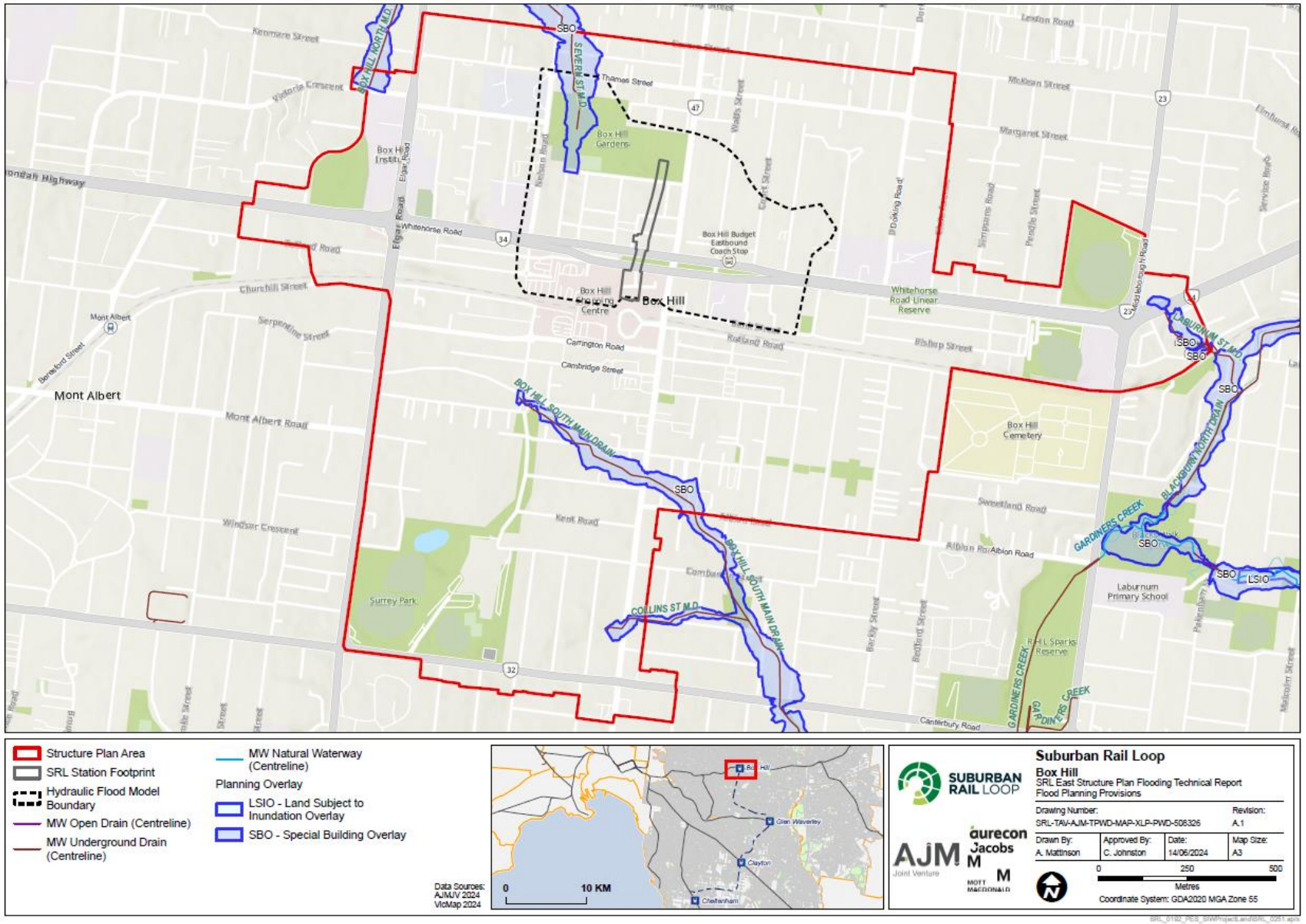

FIGURE 5.44 FLOOD PLANNING CONTROLS IN BOX HILL STRUCTURE PLAN AREA

5.7.2 FLOOD CONDITIONS

Flood studies of the Box Hill Structure Plan Area that have informed this assessment are summarised in Table 5.7.

The flood modelling developed for the SRL East EES (AJM-JV 2021b) does not cover the entire Box Hill Structure Plan Area and is shown as the hydraulic flood model boundary on Figure 5.44. The remaining flood studies have been made available from Melbourne Water.

TABLE 5.7 FLOOD STUDIES RELEVANT TO BOX HILL STRUCTURE PLAN AREA

MAJOR CATCHMENTS	DRAINAGE CATCHMENTS	FLOOD MODELLING	YEAR	MELBOURNE WATER TECH SPEC/ ARR	1 %AEP CLIMATE CHANGE	RAINFALL INTENSITY
Koonung Creek	Box Hill North Main Drain (4741)	Melbourne Water 20/21 Flood mapping program – Whitehorse (Koonung)	W4G (2023)	2019 Melbourne Water Tech Spec / ARR 2019	Y	18.5 % for 2100
	Severn St Main Drain					
	Bushy Creek Main Drain					
	Severn St Main Drain	SRL East EES station modelling	AJM-JV (2021)	Melbourne Water Tech Spec 2019 / ARR 2019	Y	23 % for 2150
Gardiners Creek	Box Hill South Main Drain (4885)	Whitehorse flood mapping 2019/2020 – Blackburn	Engeny (2021)	2019 Melbourne Water MW Tech Spec / ARR 2019	Y	18.4 % for 2100
	Collins St Main Drain (4886)					
	Gardiners Creek (4880)					
	Blackburn North Main Drain (4893)					
	Laburnum St Main Drain (4894)					

Figure 5.45 to 5.50 present the 1 % AEP including climate change flood extents and flood hazard classifications in the Structure Plan Area from the SRL East EES (AJM-JV 2021b), as well as Whitehorse flood mapping by Engeny (2021) and W4G (2023). The mapping indicates the following:

- In the northern section of the Box Hill Structure Plan Area, local pluvial runoff with shallow sheet flows travels to the north along the Severn Street Main Drain and the Box Hill North Main Drain. There are flood depths of greater than 0.5 metres along these drains, particularly north of Box Hill Institute TAFE and Box Hill Gardens (see Figure 5.46). In addition to this, the flood hazard classification reaches H3, suggesting these areas are unsafe for children, the elderly and vehicles, which can be seen in Figure 5.49.
- The remaining shallow sheet flooding (depths < 0.2 metres) correlates with a H1 flood hazard classification, which is generally safe for vehicles, people and buildings (see Figure 5.46 and Figure 5.49).
- Note unlike the flood depths, the flood hazards have not been filtered by the 0.05m depth criteria, and as such the extents are larger.

Figure 5.45 to Figure 5.50 show the 1 % AEP including climate change flood extents and flood hazard developed for the Whitehorse flooding of the Blackburn catchment (Engeny, 2021) project. The mapping indicates:

- Flow generally travels as sheet flow south, until it reaches the Box Hill South Main Drain or the Laburnum Street Main Drain. Along these drains, flood depths become deeper, approximately 0.8 metres.

- Flood hazard is generally a H1 flood hazard classification, although the hazard increases along the drain and around Box Hill Oval to H3, indicating these areas are unsafe for children, the elderly and vehicles, and properties in these areas are classified as unsafe. There are some areas with a H4 flood hazard classification on an oval in Surrey Park, suggesting it is unsafe for people and vehicles.

The 1 % AEP flood maps provided in the City of Whitehorse Flood Emergency Plan (SES 2016) indicate that a number of properties are exposed to over-floor flooding during a storm event (see Appendix B). These include properties north-west of Box Hill Gardens along Nelson Road following Severn Main Drain, Kenmare Street along Box Hill North Main Drain, between Oxford Street and Albion Road along Box Hill South Main Drain and Bas Street and Patricia Street along Collins Street Main Drain. Properties with floor levels lower than the nominated flood level will experience greater flood damage.

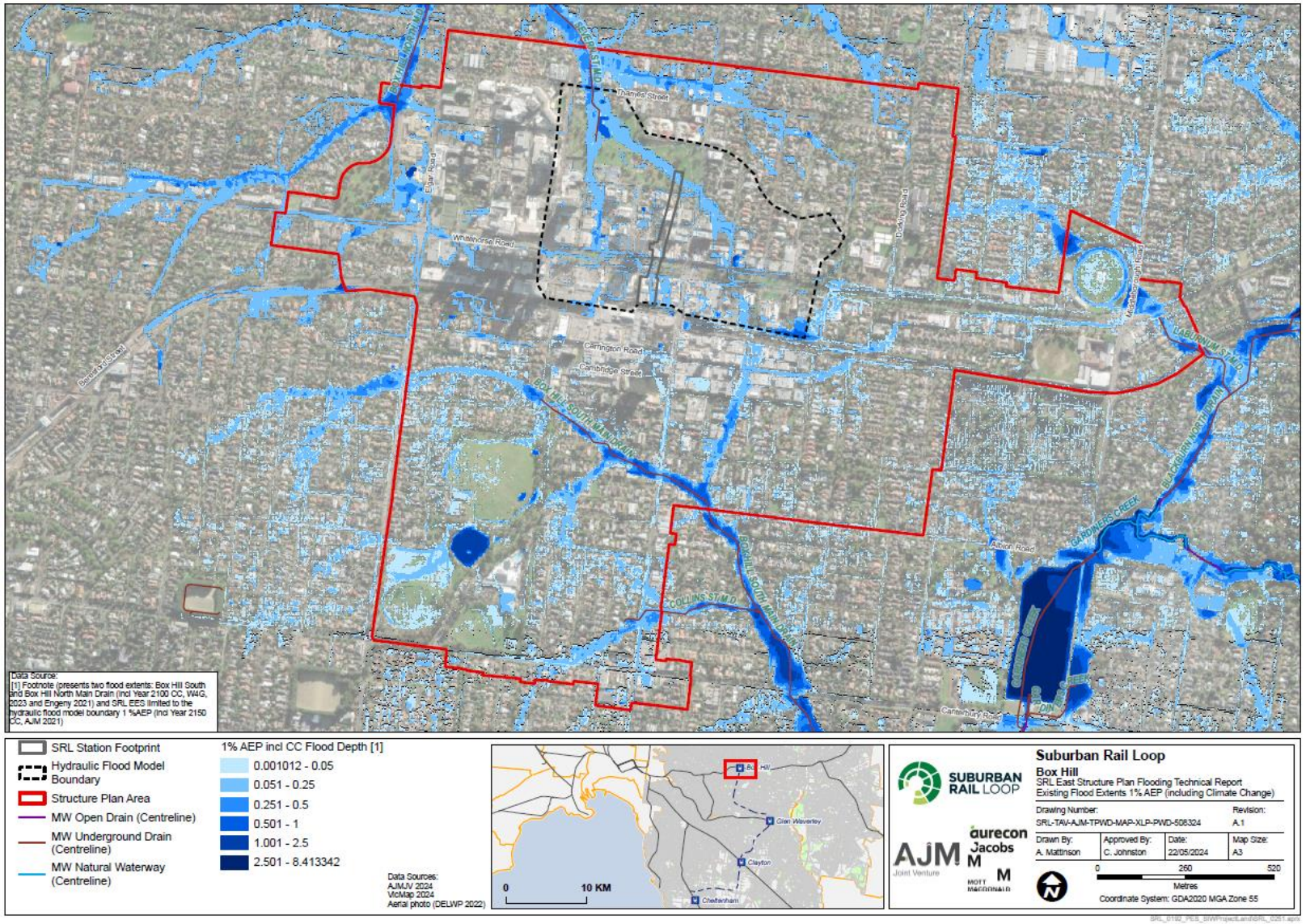

FIGURE 5.45 BOX HILL STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (1 OF 3)

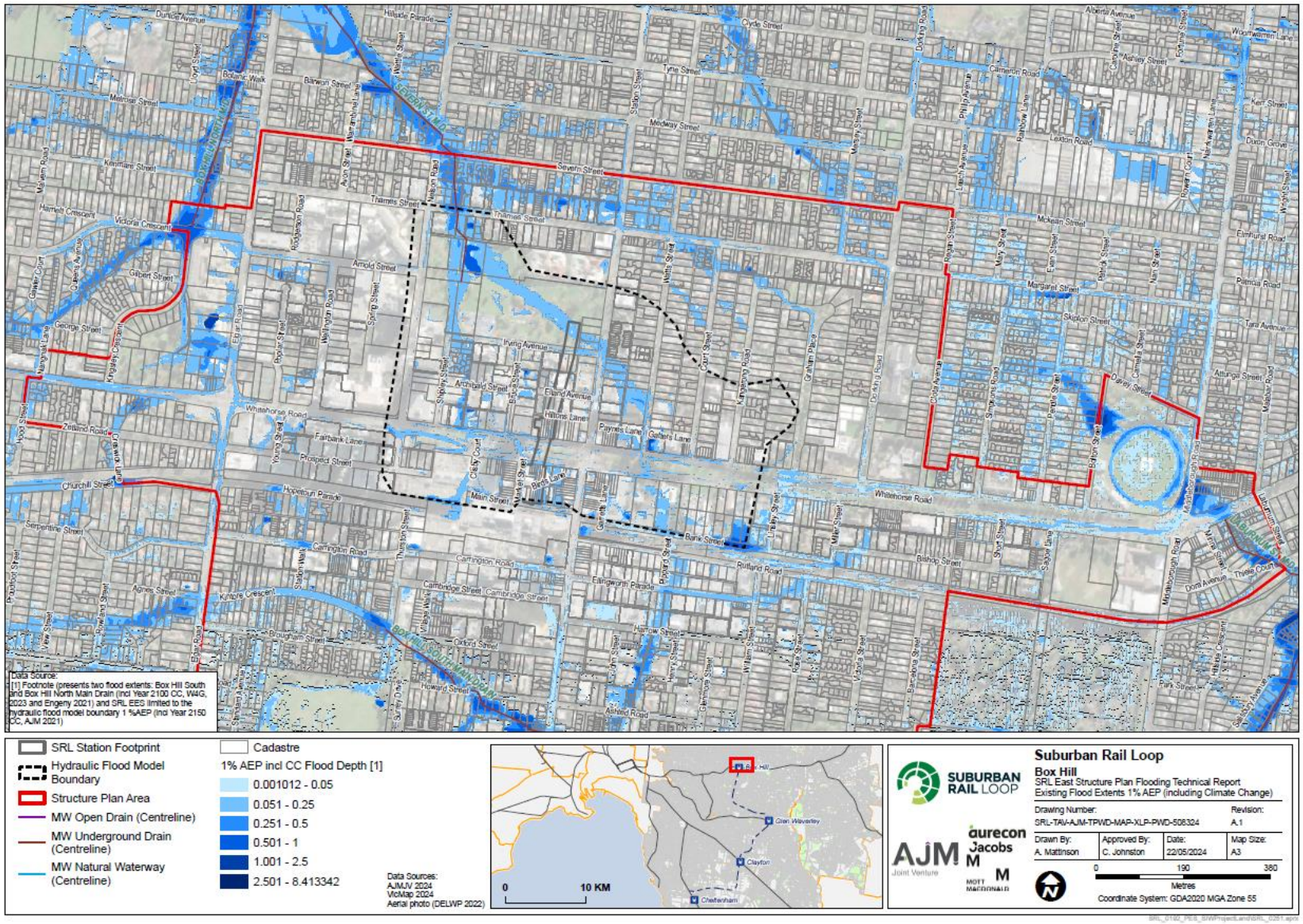

FIGURE 5.46 BOX HILL STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (2 OF 3)

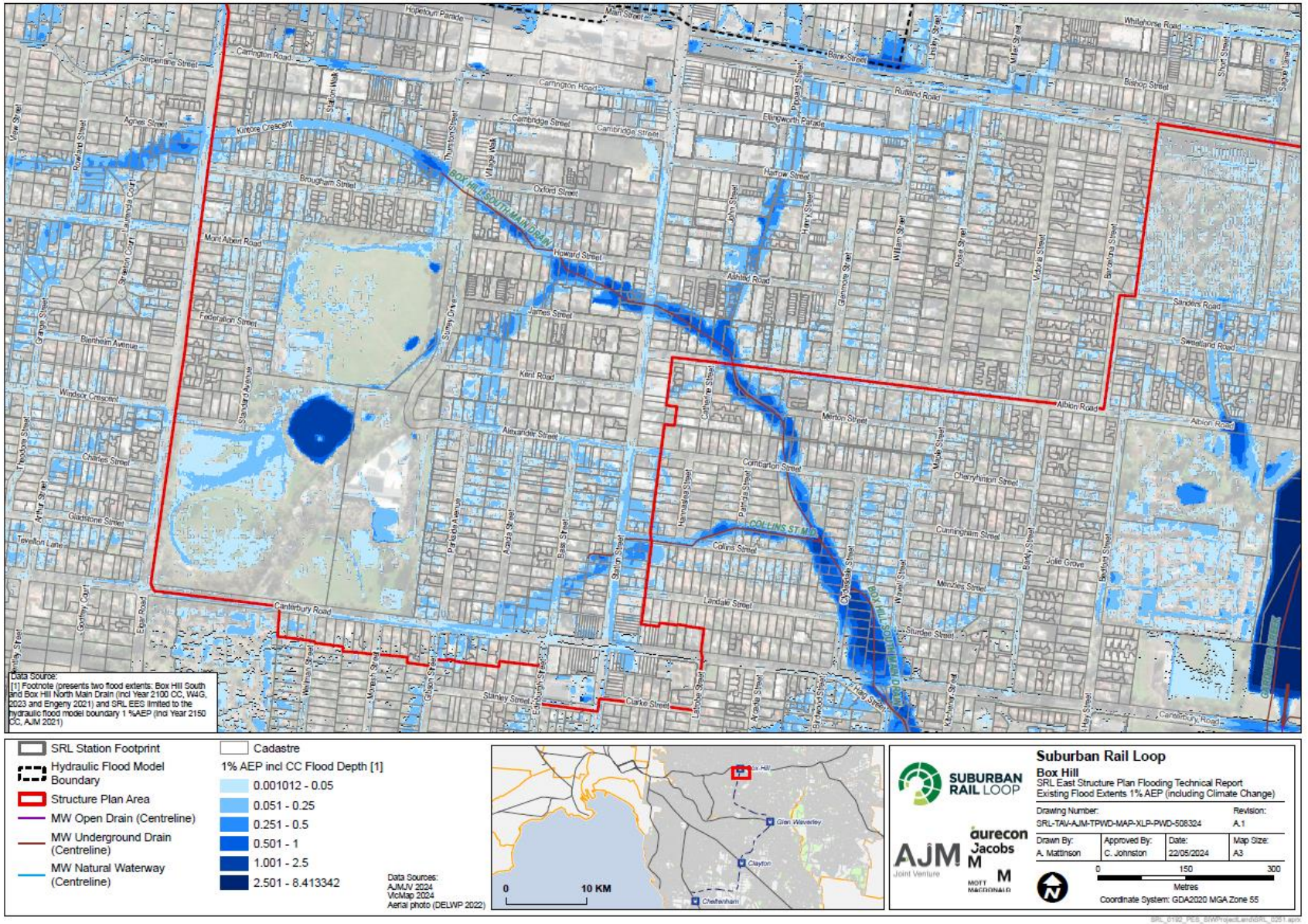

FIGURE 5.47 BOX HILL STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD DEPTHS (3 OF 3)

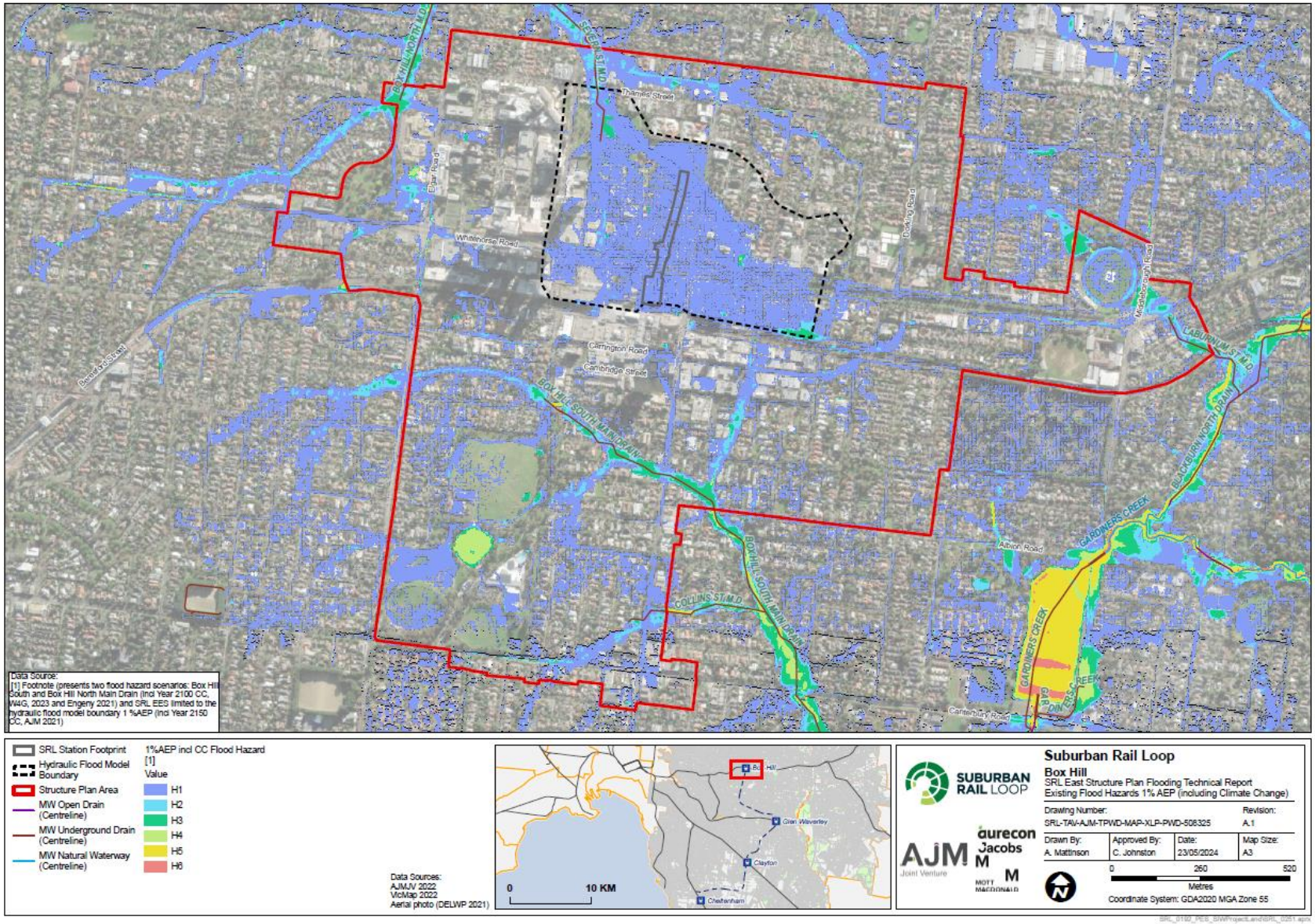

FIGURE 5.48 BOX HILL STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (1 OF 3)

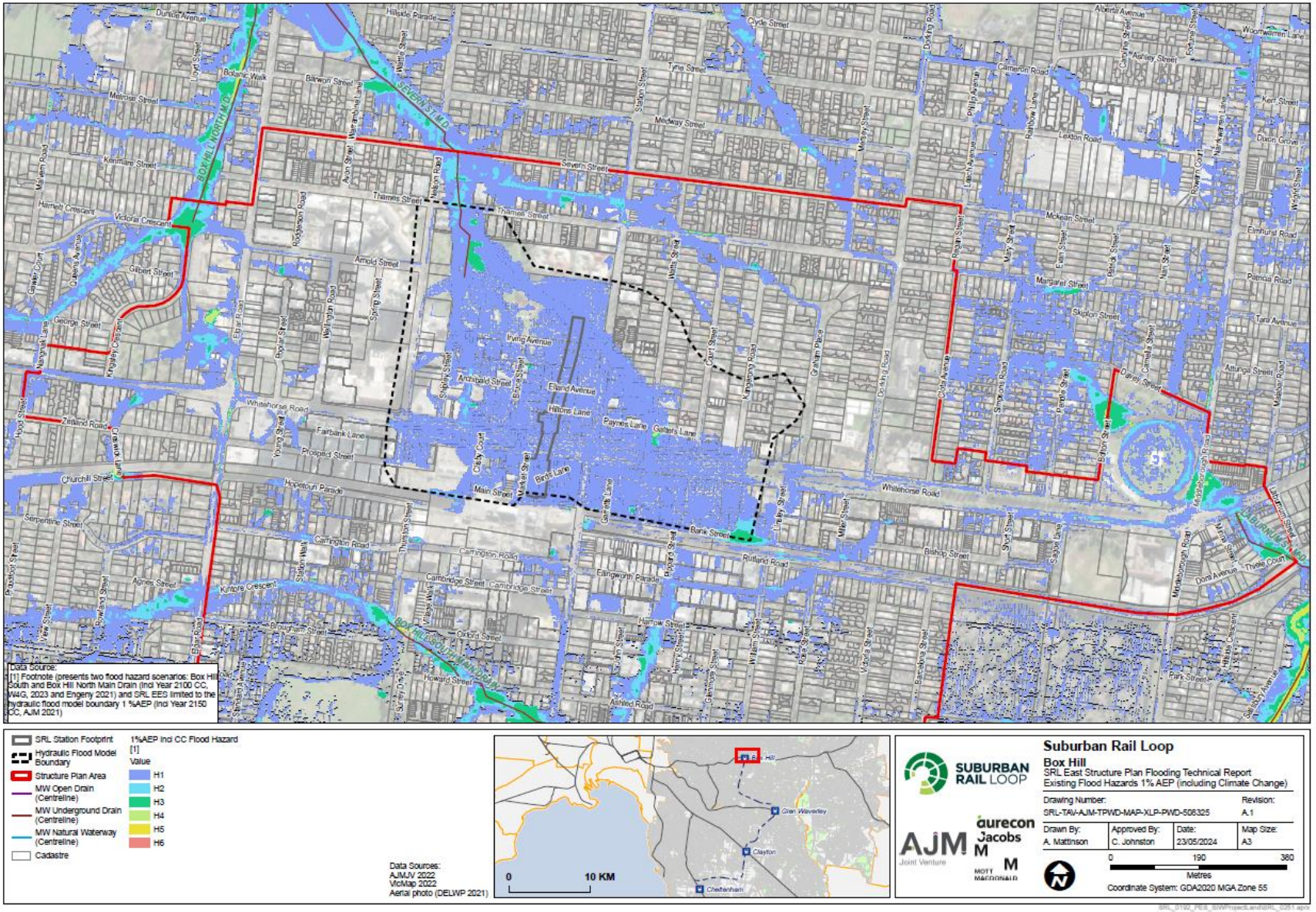

FIGURE 5.49 BOX HILL STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (2 OF 3)

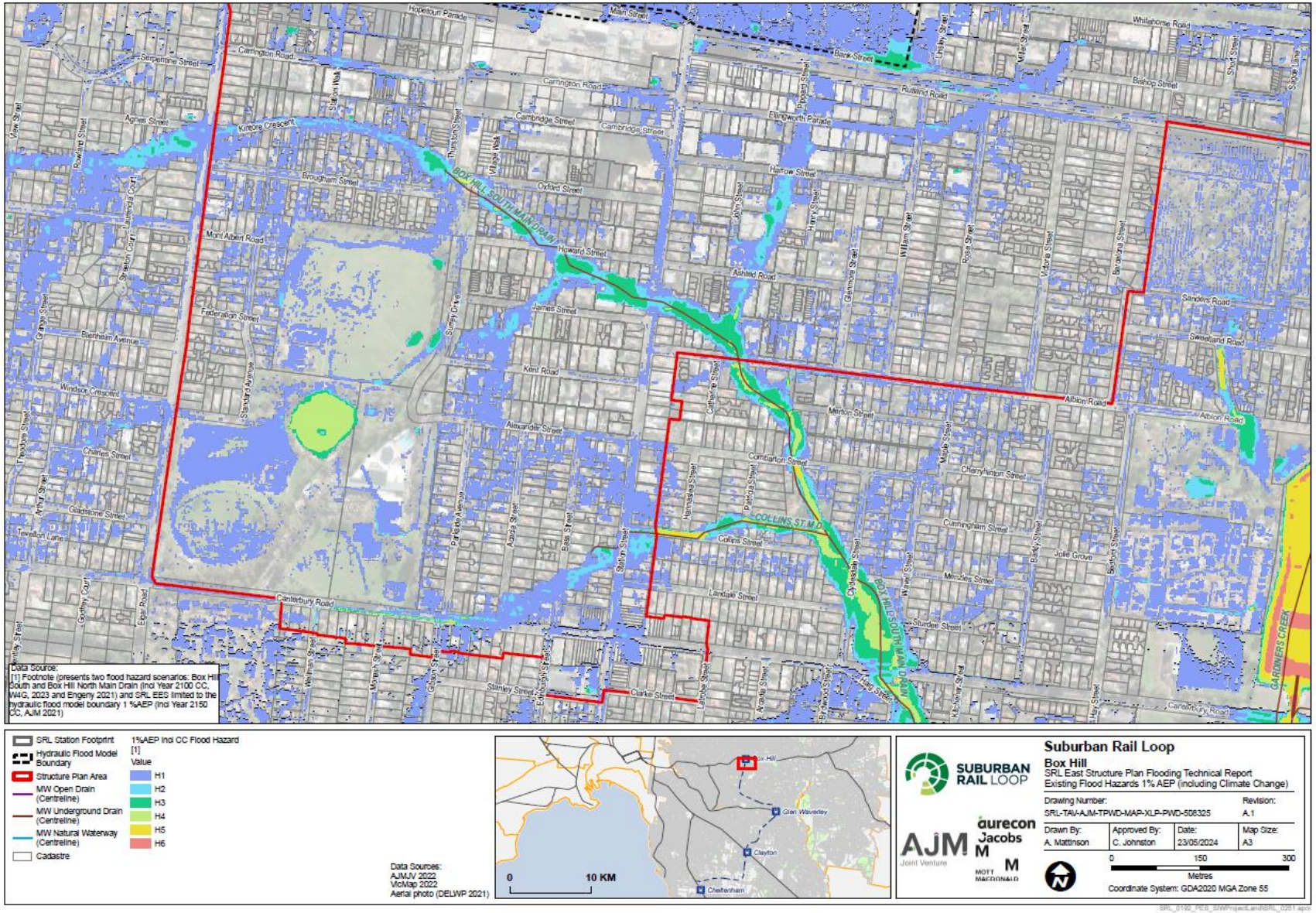

FIGURE 5.50 BOX HILL STRUCTURE PLAN AREA 1 % AEP INCLUDING CLIMATE CHANGE FLOOD HAZARDS (3 OF 3)

5.8 Committed projects

The approved SRL East involves construction of stations at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill, central to each SRL East Structure Plan Area.

Melbourne Water has assessed the flood studies prepared for the SRL East Stations in line with *Melbourne Water AM STA 6100 Infrastructure Projects in Flood-Prone Areas (June 2022)*. As part of the statutory requirements imposed by Melbourne Water, the new station exceeds protection from the 1 % AEP event including climate change (year 2150). In addition to the above, no adverse impacts are created by the design on adjacent property for the 1 % AEP event, and that, where necessary, mitigation strategies have been implemented to ameliorate these impacts (stormwater tanks, drainage upgrades). These are in line with the stormwater environmental performance requirements (EPRs).

This is relevant to all six Structure Plan Areas in SRL East.

6. Risks and Opportunities

This section assesses risks in the Burwood and Box Hill Structure Plan Areas, as available data allowed additional assessment of the flood risk. This section discusses opportunities relating to flooding that inform the SRL East Structure Plans.

6.1 Assessing flood impacts for strategic planning

Urban redevelopment which 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. The Guidelines for Development in Flood Affected Areas (DELWP 2019) acknowledges that:

> *It is often difficult to estimate small changes in flood behaviour for individual development proposals. Over time these small changes accumulate, which can result in more frequent flooding if stormwater systems are overloaded. It can also increase the depth, velocity and extent of flooding.*
>
> *Flood mapping that considers changes in flood behaviour for cumulative impacts can be useful for strategic planning. One way is to require flood modellers to adjust the ratio of impervious surfaces to pervious surfaces in their computer models. Another way is to require sensitivity testing of the impacts of increased development on flood behaviour, including the impact on stormwater drainage. Significant changes in flood behaviour may require structural works, such as retarding basins.*

6.1.1 DATA AVAILABLE

Table 6.1 presents the data from the available flood studies presented in Section 5, that is available to assess the potential flood conditions to inform the Burwood and Box Hill Structure Plan Areas.

The Burwood TUFLOW hydraulic model developed for the SRL East EES (AJM-JV 2021b) covers approximately 90 per cent of the Burwood Structure Plan Area which was granted 'in principle non objection' status by Melbourne Water. The model enables an assessment of safety risk and flood impact assessment. It should be noted that further model reviews and approvals will be required as the project progresses. In addition to this, Melbourne Water flood mapping outputs for Whitehorse LGA *(Engeny, 2021 & Water4Good, 2023)* covers the whole Box Hill Structure Plan Area, enabling the assessment of safety risk.

TABLE 6.1 AVAILABLE FLOOD STUDY DATA USED TO ASSESS FLOOD IMPACTS

STRUCTURE PLAN AREA	FLOOD STUDY	DATA INPUT	ASSESSMENT OUTPUT
Burwood	SRL East EES Burwood flood model, AJM-JV 2021b	TUFLOW Model	Flood impact assessment
		Flood Hazard (H1-H6)	Flood safety assessment
Box Hill	Whitehorse flood mapping 2019/2020 – Blackburn (Engeny, 2021) Melbourne Water 2020/21 Flood mapping program –	Flood Hazard (H1-H6)	Flood safety assessment

STRUCTURE PLAN AREA	FLOOD STUDY	DATA INPUT	ASSESSMENT OUTPUT
	Whitehorse (Koonung) (W4G, 2023)		

The remaining flood studies presented in Section 5 and the available data are not fit for purpose to assess the flood impacts to inform the other Structure Plans Areas (including Glen Waverley, Monash, Clayton and Cheltenham) as the data was not available or the model output covered an insufficient area. AJM-JV are aware that there are ongoing flood mapping studies being undertaken by Melbourne Water and Council within the other Structure Plan Areas, and new data will become available in the future.

Results presented herein are preliminary and have been developed to inform the preparation of Structure Plans and must not be used for any other purpose.

It is recommended that SRLA continue to engage with Melbourne Water to determine the best available flood models to be used for planning decisions and ensure that Melbourne Water's flood management requirements are updated in the Structure Plan where required.

6.1.2 FLOOD SAFETY ASSESSMENT

6.1.2.1 Burwood

A flood safety assessment was undertaken using the Rail Day 1[4] 1 % AEP including climate change flood hazard information presented in the SRL East EES (AJM-JV 2021b). The flood hazard was assessed based on the method and safety classification outlined in Section 2.3 and Appendix D of this report.

The total area and percentage of total development for each safety classification is shown in Table 6.2 and Figure 6.1. The assessment indicates:

- Approximately 78 per cent of the developable land in the Structure Plan Area is deemed as either safe site or has safe access during a 1 % AEP including climate change flood event, or there is no flood hazard (NA)
- 22 per cent of the Structure Plan Area deemed as constrained, or unsafe site and access. This generally applies to parcels along the McComas Drain and Gardiners Creek as presented in green through to red in Figure 6.1. These unsafe or constrained sites will need to provide flood mitigation solutions if there is a proposed increase of people within the area (i.e. high-density development or public thoroughfare) to reduce risk to people's safety. Recommendations have been prepared to respond to this risk. Designing sites to reduce flood risk is explored in Section 6.2.
- It should be noted, a small portion of Presbyterian Ladies College parcel is covered by a high flood hazard rating and as such the parcel is deemed unsafe. However, this whole site would not be subject to an unsafe classification, and thus percentage of developable land subject to high safety risk is likely to reduce.

[4] Rail Day 1 is the modelled flood conditions when the SRL East station is built, estimated to be 2035. Rail Day 3 is the scenario that assumes the complete built form proposed by the structure plan, estimated to be 2041.

TABLE 6.2 SAFETY CLASSIFICATION AREA ANALYSIS - BURWOOD STRUCTURE PLAN AREA

AREA (HECTARES)	NO FLOOD HAZARD[5]	SAFE SITE, SAFE ACCESS	SAFE SITE, CONSTRAINED	SAFE SITE, UNSAFE ACCESS	UNSAFE SITE, SAFE ACCESS	UNSAFE SITE, CONSTRAINED	UNSAFE SITE, UNSAFE ACCESS	TOTAL AREA
Residential Zones	65.2	26.0	3.0	1.1	16.2	0.7	3.3	115.5
Commercial Zones	1.6	7.4			0.2			9.2
Industrial Zones	3.8	9.5	0.2	0.8	4.8	0.1	1.3	20.6
Mixed Use Zone		0.6				0.1		0.7
Other zones not assessed (PUZ, PPRZ, SUZ, TZ, UFZ)								78.3
Total parcels								224.3
Road reserve								43.8
Structure Plan Area								268.1
Percentage of developable land	48.4 %	29.8 %	2.2 %	1.3 %	14.5 %	0.6 %	3.2 %	

[5] No flood hazard includes areas outside of the flood model boundary, but based on the existing conditions it is unlikely these areas are subject to flooding.

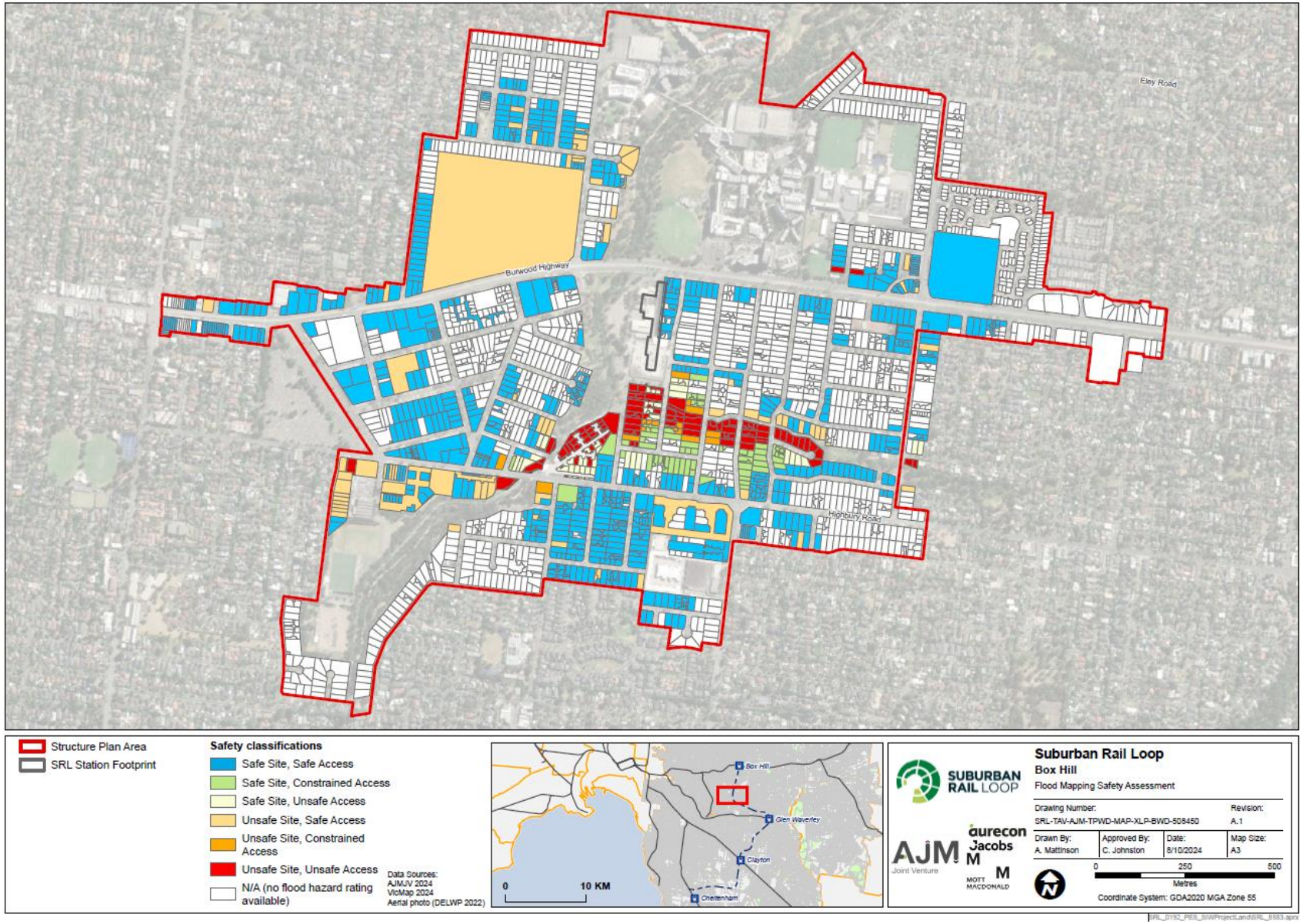

FIGURE 6.1 FLOOD SAFETY CLASSIFICATION ASSESSMENT – BURWOOD STRUCTURE PLAN AREA

6.1.2.2 Box Hill

A flood safety assessment was undertaken using the Existing 1 % AEP including climate change flood hazard information in the Whitehorse Flood mapping project (Engeny, 2021, & W4G, 2023). The flood hazard was assessed based on the method and safety classification outlined in Section 2.2 and Appendix C of this report.

The total area and percentage of total development for each safety classification is shown in Table 6.3 and Figure 6.2. The assessment indicates:

- Approximately 81 per cent of the developable land in the Structure Plan Area is deemed as either safe site or has safe access during a 1 % AEP including climate change flood event, or there is no flood hazard (NA).

- 19 per cent of the Structure Plan Area deemed as constrained, or unsafe site and access. This generally applies to parcels along and near Severn St Main Drain, Box Hill South Main Drain, Collins St Main Drain and Laburnum St Main Drain as presented in green through to red in Figure 6.2. These unsafe or constrained sites will need to provide flood mitigation solutions if there is a proposed increase of people within the area (i.e. high-density development or public thoroughfare) to reduce risk to people's safety. Recommendations have been prepared to respond to this risk. Designing sites to reduce flood risk is explored in Section 6.2.

TABLE 6.3 SAFETY CLASSIFICATION AREA ANALYSIS - BOX HILL STRUCTURE PLAN AREA

AREA (HECTARES)	NO FLOOD HAZARD	SAFE SITE, SAFE ACCESS	SAFE SITE, CONSTRAINED ACCESS	SAFE SITE, UNSAFE ACCESS	UNSAFE SITE, SAFE ACCESS	UNSAFE SITE, CONSTRAINED ACCESS	UNSAFE SITE, UNSAFE ACCESS	TOTAL AREA
Residential Zones	70.4	45.4	6.3	2.7	9.1	8.7	2.3	145.5
Commercial Zones	14.5	7.9	0.2	0.1	3.6	0.2	0.1	26.8
Industrial Zones		0.3						0.3
Mixed Use Zone	1.1	1.7	0.3					3.2
Other zones not assessed (PUZ, PPRZ, SUZ, TZ, UFZ)								60.5
Total parcels								235.9
Road reserve								32.2
Structure Plan Area								268.1
Percentage of developable land	49.0 %	31.5 %	3.9 %	1.6 %	7.2 %	5.1 %	1.4 %	100 %

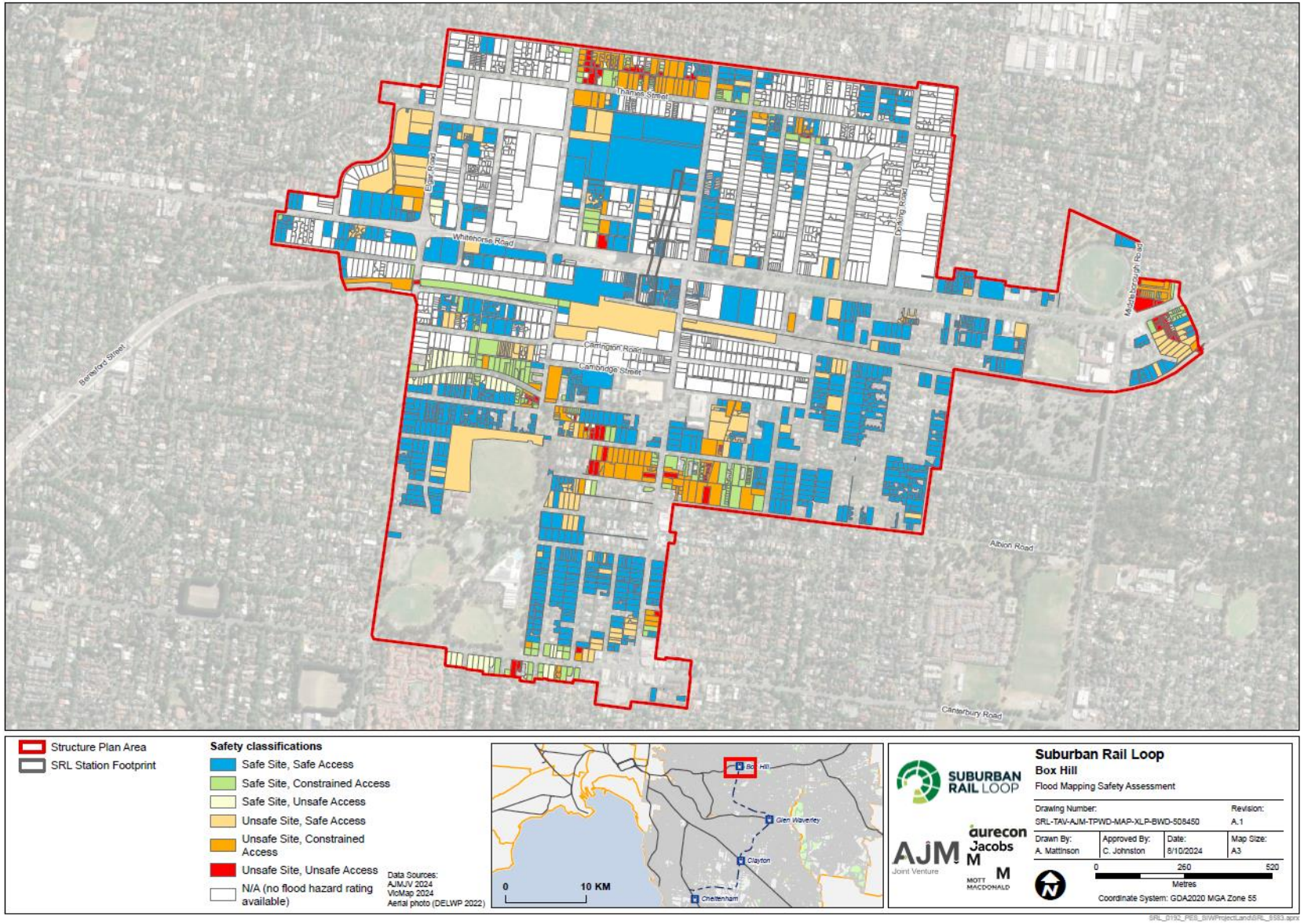

FIGURE 6.2 FLOOD SAFETY CLASSIFICATION ASSESSMENT – BOX HILL STRUCTURE PLAN AREA

6.1.3 FLOOD IMPACT ASSESSMENT

A flood impact assessment was undertaken to understand the potential hydraulic changes that may occur as a result of urban growth and development in the Burwood Structure Plan Area. This assessment compared the fraction imperviousness (informed by the permeability requirements under the existing zoning and accounted for in the existing hydraulic flood model) against inferred fraction impervious values for urban development types identified in the SRL East Draft Structure Plan - Urban Design Report – Burwood (AJM-JV, 2025). To achieve this, two modelled scenarios were compared using flood modelling from the SRL East EES for the Burwood Structure Plan Area, including:

1. Rail Day 1 scenario – which represents developed conditions (the station is built and existing zone permeability requirement); and

2. Rail Day 3 scenario –the combined Day 1 and proposed land use and built form changes as per the Burwood Structure Plan.

Technical details about the modelling, its approach and assumptions are provided in Appendix E.

Figure 6.3 presents an impact map for the 1 % AEP including climate change flood, which shows the difference in peak flood levels between the two scenarios.

Melbourne Water has recently revised their definition of permissible impact to 0mm meaning any increase in peak water surface elevations is not acceptable. This has been adopted and impacts have been mapped in Figure 6.3, which shows areas near the SRL station at Burwood and the outskirts as having no impact (implemented as the range of -1 to +1mm change in peak water surface elevation). Impacts greater than 1mm are represented in yellow, orange, red and brown which tended to concentrate along the majority of Gardiners Creek downstream of the SRL station, the McComas Grove Drain, and surface flow across the Deakin University campus plus other localised extents in the Burwood Structure Plan Area.

These results should be considered as an indicator of flood conditions under the future urban development within the Burwood Structure Plan Area resulting from land use changes. It does not consider associated topographical and other built form changes (such as setbacks, development footprints or lot consolidation), which can have a significant impact on flooding.

The risk-based decision-making framework is currently outlined in the Guidelines for Development in Flood Affected Areas (DELWP 2019) and adopted by Melbourne Water. Further flood modelling is required to understand the effects of lot consolidation, changes to public open space and built form is required to meet the guidelines.

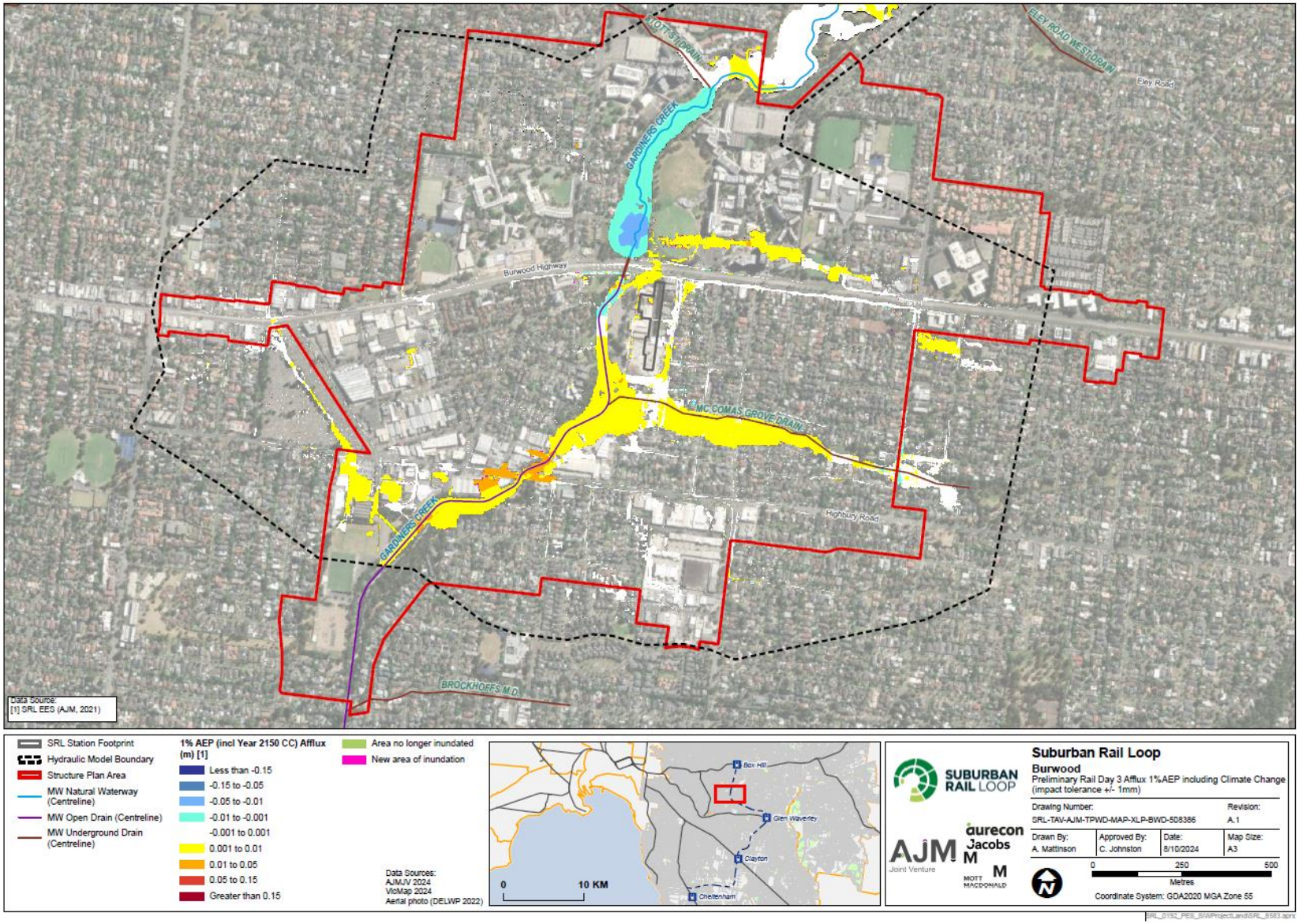

FIGURE 6.3 COMPARISON OF RAIL DAY 3 IMPACT ON 1 % AEP INCLUDING CLIMATE CHANGE RAIL DAY 1 FLOOD LEVELS (STRICT IMPACT RANGE I.E., +/- 1MM ACCEPTABLE IMPACT)

6.2 Existing planning controls

Melbourne Water will remain the floodplain management authority for the SRL East Structure Plan Areas. This report does not provide recommendations to change the existing flood planning provisions within planning schemes.

Any development within the Structure Plan Areas covered by a flood planning provision will be referred to Melbourne Water. The flooding conditions presented in Section 5 applicable to the Structure Plan Areas do not currently align to the flood planning provisions in the planning scheme. It is assumed that these overlays will be updated in a timely manner by Melbourne Water and Councils flood mapping program.

Melbourne Water manages existing flood risk in the Structure Plan Areas through assessment of development applications against the objectives and requirements of the Guidelines for Development in Flood Affected Areas (DELWP 2019). These guidelines follow a risk-based design approach to managing flood risk in urban areas. Discussion on how these guidelines are relevant to the SRL East Structure Plans is provided below.

6.2.1 DEVELOPMENT SHOULD NOT CREATE NEW HAZARDS OR INCREASE EXISTING HAZARD

As per Planning Practice Note 12: *Applying the flood provisions in planning schemes,* flood risk must be considered when preparing Planning Schemes and in land use decisions to avoid intensifying flooding impacts with inappropriately located uses and developments.

Change in flood hazard associated with new development is a concern as development should not create or increase the flood hazard on the development site or any adjoining properties. Applying a risk-based approach to redevelopment for flood hazards and how the developer proposes flood mitigation solutions to address the flood conditions of the site will be assessed through each development application.

Some areas within the Structure Plan Areas have been assessed as having existing hazardous flood conditions (within the site or access to the site) during a 1 % AEP including climate change flood event (see Section 5 of this report) that should be considered when developing the Structure Plans. The locations of areas in each SRL East Structure Plan Area with concentrated flood hazard classifications of H2 or above are listed in Table 6.4.

When a flood hazard classification is H2-H6 a site should be assessed to confirm if the proposed use and development is appropriate considering the flood risk. Melbourne Water's Safety Risks in Road and underlying flood data can be used to inform the flood hazard sites where flood hazard classification is not available.

TABLE 6.4 SUMMARY OF FLOOD HAZARDOUS AREAS

STRUCTURE PLAN AREA	AREAS OF FLOOD HAZARD	FIGURES
Cheltenham	Bay Road, Tulip Grove, Luxmoore Street, Davie Avenue, Southland Shopping Centre, Karen Street,	Figure 5.8, Figure 5.9, Figure 5.10, and Figure 5.11
Clayton	Carinish Road, Monash Medical Centre, Yarram Cresent, Burton Avenue, Ravhur Street and surrounding streets, all land along Clayton Drain.	Figure 5.17 , Figure 5.18 and Figure 5.19
Monash	Duredin Street, Blackburn Road, Wellington Road, Boundary Road	Figure 5.23
Glen Waverley	Myrtle Street, Waverley Road Retention Basin, and the Aristoc site along the Glen Waverley Main Drain including Aristoc Road	Figure 5.30, Figure 5.31, and Figure 5.32
Burwood	McComas Grove Drain along Lungrend Reserve and Gardiners Creek to Highbury Road, Sixth Street and Highbury Road	Figure 5.39, Figure 5.40, Figure 5.41, and Figure 5.42

STRUCTURE PLAN AREA	AREAS OF FLOOD HAZARD	FIGURES
Box Hill	Nelson Road following Severn Main Drain, Kenmare Street along Box Hill North Main Drain, between Oxford Street and Albion Road along Box Hill South Main Drain and between Bass Street and Patricia Street along Collins Street Main Drain	Figure 5.48, Figure 5.49 and Figure 5.50

Locations subject to flooding that are not listed in Table 6.4 (that is, their flood hazard classification is below H2) may be less hazardous in nature, but they should not be dismissed requiring attention to manage flooding. Noting existing uses and development exists in these flood risk areas, a risk-based design approach should be adopted to assess all development applications as the flood risk of land uses varies and can be managed through a range of design standards. Typically flood management requirements are:

- All development in high flood risk areas must not increase the existing risk to life and / or property. Consolidation of lots that can facilitate safe access to flood free (or lower flood risk) land, during a 1 % AEP flood and climate change event, should be encouraged.
- All development must provide safe access and egress (i.e., outside of high flood risk areas) and basement entrances be located outside of the predominant floodwater direction.
- All developments, including development upstream of existing high flood risk areas must manage existing flooding and stormwater to not increase downstream flooding risk. Consultation with Melbourne Water is required to address residual flood risk (i.e., exposure, interaction, and duration to 1 % AEP and climate change flood events) to understand potential cumulative impact.
- Reduction of flood risk can be facilitated through urban redevelopment. Properties that are currently at over floor flooding risk have the potential to be redeveloped and meet current flood protection requirements.
- Built form changes such as setbacks, development footprint locations and new access or egress routes can have a beneficial impact on flooding risk.
- Redevelopment of lots that are currently subject to over floor flooding, reduces the flood risk when new development is built to current flood protection standards and the damages that could be incurred during a 1 % AEP flood event.
- New community services facilities and emergency services should be located outside the 1 % AEP flood extent and, where possible, at levels above the height of the probable maximum flood in accordance with Clause 13.03-1S (Floodplain management) of the Victoria Planning Provisions. This seeks to reduce the risk to critical services and vulnerable people accessing such services during an emergency.

6.2.2 DEVELOPMENT SHOULD MANAGE OFFSITE IMPACTS AND MINIMISE FLOOD DAMAGE

The Urban Floodway Zone (UFZ) controls land use as well as development, with land use in a UFZ being restricted to low intensity uses such as recreation. Private development is typically prohibited in a UFZ. Currently the only UFZ land in the SRL East Structure Plan Areas is in Burwood along Gardiners Creek. This land is publicly owned (Crown land) and remains a high flood risk area so is not suitable for development.

A Land Subject to Inundation Overlay (LSIO) identifies flooding associated with waterways and open drainage systems. These areas are commonly known as floodplains and have different flood characteristics to overland flooding. Development may be permitted in the LSIO but is subject to planning controls to minimise impact to the area.

The Special Building Overlay (SBO) identifies areas prone to overland flooding, which is typically caused by the drainage system being at capacity. Development may be permitted in areas covered by an SBO but is subject to planning controls to minimise flood impact.

Typical development requirements under LSIOs and SBOs for flood-affected areas are:

- Establishing setbacks of buildings from boundaries or drainage assets to allow for overland flow paths through property. Setbacks can provide flood storage if designed accordingly.
- Requiring surface levels to remain or be reduced to maintain or increase the flood storage available.
- Requiring easements over drainage assets to protect the asset and increase and area available for overland flow paths (if required).
- Development achieves the Nominal Flood Protection Level (NFPL) (floor levels, all opening including basement entrances) being the 1 % AEP flood level plus the applicable 'freeboard.' Freeboard is typically 300 millimetres above applicable flood levels for areas in an overland flow path and 600mm for open drainage systems. While the current requirements are for the 1 % AEP event, the project has adopted the 1 % AEP including climate scenario.
- Flood management solutions can be explored on open space and/or public land (i.e., existing roads, on-street parking and road reserve etc) in flood affected areas and can be delivered as part of adjacent development to manage flood impacts related to increased urban density.

6.2.3 PROTECT AND ENHANCE THE ENVIRONMENTAL FEATURES OF WATERWAYS AND FLOODPLAINS

Gardiners Creek is the only open waterway in the six SRL East Structure Plan Areas. The fluvial flooding from Gardiners Creek is contained to the creek's floodplain and associated open space in the northern portion of the Burwood Structure Plan Area until McComas Grove Drain discharges to the creek. Whitehorse planning scheme seeks to protect the amenity of the waterway with design and development controls, which need to be considered when developing the Structure Plan.

Industrial development on the corner of Sinnott Street and Highbury Road is currently located within 10 metres of the centreline of Gardiners Creek, with no active interface to the creek corridor. Clause 12.03-1S of the Victoria Planning Provisions requires that development is a minimum 30 metres from the banks of waterways. An opportunity in this area is to the development setback and to provide additional flood storage within the development setback which may contribute to alleviating flood conditions in this area.

The naturalisation of the concrete-lined section of Gardiners Creek associated with SRL East station EPR SW8 has the ability to deliver increased amenity and environmental benefit. Further naturalisation of Gardiners Creek and other constructed assets (drains) should be explored in the Structure Plan Areas as a flood management solution, where additional waterway health benefits can be generated.

6.3 Mitigating residual flood risk

In urban infill development, managing flood risk is paramount to ensure the safety and sustainability of the community during a flood but also times of water scarcity. As climate change science predicts, extreme weather events of higher frequency and intensity impact flood risk. Flood mitigation requires several strategies to minimize the impact of floods and maximise community benefit.

Infrastructure solutions that have historically been utilised to resolve flooding can include upgrading the drainage network (bigger or new pipes), increasing storage systems (retarding basins or tanks) and altering the

topography to manage surface water and mitigate, or minimise, potentially adverse impacts. As the layout of the urban form of the SRL East structure plan areas is largely set (i.e. not designing a new road or open space network) within adjoining land uses (nested in existing development) flooding mitigations need to look beyond the structure plan boundary to the catchment scale. Flood management infrastructure needs to balance resolving the risk with the cost and benefit to the community, which means large footprints is typically less feasible in urban infill area. Flood risk in urban areas can be managed through complying with design requirements outlined in Section 6.2.

Melbourne Water has the ability to use Urban Renewal Cost Recovery Scheme (URCRS) to fund major investment in flooding and drainage infrastructure in major urban renewal precincts. Preliminary discussions with Melbourne Water to date, have not flagged the requirement for such a scheme and have recommended the integrated water management process to consider water holistically within the Structure Plan Areas design, prior to understanding any cost recovery scheme. At this stage of the structure planning, no technical assessment has been undertaken to identify such infrastructure mitigation strategies.

Incorporating flood mitigation measures into proposed green and open spaces including flood attenuation, allow excess water to be stored temporarily and gradually released back into the drainage system. Integrating green infrastructure practices can be effective in reducing flood risk (for more frequent storm events, not necessarily rarer events including the 2 %, 1 % AEP flood events) through adoption of elements which mimic natural hydrological processes such as permeable pavements, green roofs, and rain gardens. These features help to absorb stormwater, reducing the volume of runoff and preventing it from overwhelming the drainage system during heavy rainfall.

A wholistic approach that combines effective stormwater management systems, engineering and green infrastructure practices can help mitigate, or minimise, flood risk in urban infill development, ensuring the safety and resilience of the community. IWM is the process for considering water wholistically in Victoria and IWM forums with water management responsibilities exist in the structure plan areas. An IWM Strategy has being prepared to explore such solutions and inform the structure plans.

6.4 Planning for climate change

Clause 13.03-1S of the Victoria Planning Provisions identifies land affected by flooding by the 1 % AEP or as determined by the floodplain management authority in a Planning Scheme. The existing flood extents in SBOs does not consistently consider climate change in the mapping results. SRLA's vision for the Structure Plan Areas is to be a progressive leader by connecting communities and creating great places in sustainable ways (through seven key sustainability categories) one being sustainable water management.

New flooding and climate change information will continue to be made available through the delivery of the SRL East Structure Plans. Melbourne Water has a program of works to be completed by 2026 to update its current flood mapping that informs planning overlays, to factor in climate change for each local government area. Part of the Kingston, Monash and Whitehorse drainage flood mapping (SBOs) has been updated, and open waterways (LSIO) is scheduled to be completed by 2026 with Planning Scheme Amendments to follow. The timing of this work may not align with the development of SRL East Structure Plans, and this data or information is not considered in this report.

SRLA should continue to work with Melbourne Water to understand the best available flood and climate change information, to plan for future communities. Given Melbourne Water's ongoing responsibility as the floodplain management authority for SRL East Structure Plan Areas, the Structure Plans need to be adaptive to be able to consider new flooding, climate change information and decision-making guidelines of the time.

7. Recommendations

This section provides recommendations in response to existing flooding conditions that should be considered for the Structure Plans. All development in the SRL East Structure Plan Areas will be subject to assessment against the guidelines and best available flooding information at the time.

7.1 Structure Planning

7.1.1 CHELTENHAM STRUCTURE PLAN AREA

1. A risk-based design approach should be adopted for all new development in flood risk areas (high flood risk see Bay Road, Tulip Grove, Luxmoore Street, Davie Avenue, Southland Shopping Centre, Karen Street) to ensure that there is no increase in the existing risk to life and/or property.

2. Future redevelopment of industrial land surrounding Gilarth Street Main Drain at the western edge of the Structure Plan Area should consider additional flood storage surrounding the drain to alleviate the flood conditions through increased setback from the drain and site design.

7.1.2 CLAYTON STRUCTURE PLAN AREA

3. A risk-based design approach for all development in flood risk areas (high flood risk see Carinish Road, Monash Medical Centre, Yarram Cresent, Burton Avenue, Ravhur Street and surrounding streets, land along Clayton Drain) to ensure that there is no increase to the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP flood including climate change event, should be encouraged to minimise flood risk.

4. Any expansion of the Monash Medical Centre and associated health assets should implement flood management solutions to address the existing flooding condition.

5. Any public open space or works in / on land in Nicholson Street, identified for acquisition in the SRL East Draft Structure Plan - Transport Technical Report – Clayton (AJM-JV, 2025) for an active transport corridor is site is subject to flooding during a 1 % AEP including climate change flood event, flowing from the north to the south, should be designed to safely manage and accommodate local flooding.

7.1.3 MONASH STRUCTURE PLAN AREA

6. A risk-based design approach should be adopted for all new development in flood risk areas (high flood risk see Duredin Street, Blackburn Road, Wellington Road. Boundary Road) to ensure that there is no increased risk to life and/or property, adopting a risk-based design approach.

7. Any public open space or works associated with proposed green streets and strategic corridors (identified in the SRL East Draft Structure Plan - Transport Technical Report – Monash (AJM-JV, 2025) which intersect with the 1 % AEP including climate change flood extent, should be designed to safely manage and accommodate localised flooding.

7.1.4 GLEN WAVERLEY STRUCTURE PLAN AREA

8. A risk-based design approach for all development in flood risk areas (high flood risk see Myrtle Street, Waverley Road Retention Basin, and the Aristoc site along the Glen Waverley Main Drain including Aristoc Road) to ensure that there is non-increase to the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP including climate change flood event, should be encouraged to minimise flood risk.

9. Increased setbacks and flood storage to alleviate existing flood conditions are encouraged for future redevelopment of land surrounding Glen Waverley Drain at the southern edge of the Structure Plan Area.

7.1.5 BURWOOD STRUCTURE PLAN AREA

10. A risk-based design approach for development in flood risk areas (high flood risk see McComas Grove Drain along Lungrend Reserve and Gardiners Creek to Highbury Road, Sixth Street and Highbury Road) to ensure that there is no increase to the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP flood including climate change event.

11. New developments should be set back a minimum 30 metres from the banks of Gardiners Creek in accordance with Clause 12.03-1S (River and riparian corridors, waterways, lakes, wetlands and billabongs) of the Victoria Planning Provisions.

12. Any future redevelopment of the industrial land at 127 Highbury Rd (which has a flood hazard classification of H3) should incorporate flood mitigation measures to manage the flood risks identified in Figure 4.13.

13. Encourage allotment consolidation of existing properties that are currently subject to over-floor flooding and/or high flood risk along McComas Grove Drain (see Table 6.4 for locations) to facilitate development that can facilitate safer site and access, achieve current flood protection standards and reduce flooding risk.

14. Proposed open space works around Sinnott Street, McComas Grove and Cumming Street (as identified in the SRL East Draft Structure Plan – Open Space Technical Report (AJM-JV, 2025)) which overlaps with flooding associated with the McComas Grove Drain should be designed to improve flood conditions such as increased flood storage and/or slowing velocities.

15. Any public open spaces or works associated with the proposed active transport connection opportunity around Sinnott Street intersects with the McComas Grove Drain flood extent, should be designed to manage and accommodate localised flooding.

7.1.6 BOX HILL STRUCTURE PLAN AREA

16. A risk based design approach should be adopted for new development in flood risk areas (high risk areas see Nelson Road following Severn Main Drain, Kenmare Street along Box Hill North Main Drain, between Oxford Street and Albion Road along Box Hill South Main Drain and between Bass Street and Patricia Street along Collins Street Main Drain) to ensure that there is no increase in the existing risk to life and/or property. Encouragement of allotment consolidation that can facilitate safe access to lower flood risk land, during a 1 % AEP flood including climate change event.

17. Encouragement of allotment consolidation for properties where there is existing over-floor flooding (Nelson Road following Severn Main Drain, Kenmare Street along Box Hill North Main Drain, between Oxford Street and Albion Road along Box Hill South Main Drain and between Bass Street and Patricia Street along Collins Street Main Drain. See Table 6.4 for locations) to facilitate development that can achieve current flood protection standards and reduce flooding risk.

18. Where redevelopment of existing community services or emergency facilities is proposed (i.e., expansion of Box Hill Hospital and associated health assets) flood management solutions will need to address existing flooding condition to reduce the flooding risk on community facilities.

7.2 Other opportunities

19. Additional naturalisation of Gardiners Creek (beyond the SW8 EPR requirement associated with the SRL East Burwood station works) from Sinnott Street bridge to Zodiac Street should be explored as a flood management solution where additional waterway health benefits can be generated.

The community and environment can benefit from flood mitigation solutions and integrating IWM strategic measures and principles:

20. Creation (or expansion) of blue and green areas along areas subject to flooding to facilitate flood mitigation (and IWM) measures. Provide connections between centres by creating active transport corridors as designated blue and green spaces.

21. Encourage multi-functional assets that deliver public amenity as well as provide flood / IWM measures (e.g. sporting fields / open space that can accommodate flood water during flooding events or harvest stormwater).

22. Prioritise integration of flood management functionality into IWM solutions.

23. Create or expand natural floodplain characteristics (e.g. vegetation, open spaces, development separation) along areas subject to flooding flow paths (including drains through naturalising) to provide greater amenity, to encourage flora and fauna and create health and valued landscapes and provide flood mitigation and climate resilience.

7.3 Integrated Water Management (IWM) Strategy

24. An IWM Strategy be prepared to confirm the flooding and stormwater treatment solutions that are feasible for each SRL East Structure Plan Area to understand the servicing requirements with water authorities.

25. Integrated water management plans should be developed in consultation with responsible authorities and should integrate flood management to optimise structure plan outcomes and reduce flooding risks.

An IWM Strategy[6] has been prepared for the SRL East Structure Plan to commence the IWM Plan by providing a high-level strategy that outlines the constraints and opportunities in each SRL East Structure Plan Areas to deliver on IWM principles. It is understood that IWM solutions may not be able to greatly reduce the 1 % AEP including climate change flood event although may be able to resolve more frequent flood events.

[6] SRL East Structure Plan – Integrated Water Management Strategy (AJM-JV, Technical Report K.1)

References

AJM-JV (2021a) *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-JV (2021b) *SRL East Environment Effects Statement Technical Appendix Q.2 Surface Water Impact Assessment* (Document Number: TA Q.1 Surface Water EC), Revision 01 October 2021).

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2019, Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia

BMT (2018) Scotchmans Creek Flood Mapping Final Report, prepared for Melbourne Water.

CSIRO (1999), Urban Stormwater Best Practice Environmental Management Guidelines, prepared for the Stormwater Committee, CSIRO Publishing, Victoria.

DELWP (2015), Planning Practice Note 12 – Applying the Flood Provisions in Planning Schemes: A guide for Councils June 2015, Department of Environment, Land, Water and Planning, Melbourne.

DELWP (2017), Integrated Water Management Framework for Victoria, Department of Environment, Land, Water and Planning, Melbourne.

DELWP (2017b), Plan Melbourne 2017-2050. Department of Environment, Land, Water and Planning, Melbourne.

DELWP (2018) Dandenong Catchment Scale Integrated Water Management Plan, Department of Environment, Land, Water and Planning.

DELWP (2018b) Yarra Catchment Scale Integrated Water Management Plan, Department of Environment, Land, Water and Planning.

DELWP (2019), Guidelines for Development in Flood Affected Areas, Department of Environment, Land, Water and Planning, Victoria.

DELWP (2022) Central and Gippsland Region Sustainable Water Strategy, Department of Environment, Land, Water and Planning.

EPA (2021), Urban stormwater management guidance, Publication 1739.1, Environment Protection Authority Victoria.

Melbourne Water (2018), Healthy Waterways Strategy, State Government of Victoria.

Melbourne Water (2022) Burndap Birrarung Burndap Umarkoo, Yarra Strategic Plan.

Melbourne Water (2022b), Greater Melbourne Urban Water & System Strategy: Water for Life, Melbourne Water, Greater Western Water, South East Water and Yarra Valley Water.

Planning and Environment Act 1987 (Vic).

SES (2017) City of Kingston Flood Emergency Plan, State Emergency Services.

SES (2019) City of Bayside Flood Emergency Plan, State Emergency Services.

SES (2019b) City of Monash Flood Emergency Plan, State Emergency Services.

SES (2016) City of Whitehorse Flood Emergency Plan, State Emergency Services.

Smith, G.P., Davey, E.K. and Cox, R.J. (2014), Flood Hazard UNSW Australia Water Research Laboratory Technical Report 2014/07 30 September 2014.

Victorian Government (2016) Water for Victoria.