Venues NSW

SSD 9835 Sydney Football Stadium Redevelopment Section 4.55 Modification

Precinct Village and Car Park (MOD 7) Stormwater and Flooding Assessment

MP1-REP-CIV-002

Issue 02 | 6 September 2021

Job number 282684

Arup
Level 5
151 Clarence Street
Sydney NSW 2000
Australia
www.arup.com

ARUP

Document Verification

ARUP

Job title		SSD 9835 Sydney Football Stadium Redevelopment Section 4.55 Modification			**Job number** 282684
Document title		Precinct Village and Car Park (MOD 7) Stormwater and Flooding Assessment			**File reference**
Document ref		MP1-REP-CIV-002			
Revision	**Date**	**Filename**	274189-CIV-REP-0001[Draft]		
Draft 1	11 Aug 2021	**Description**	First draft for project team review		
			Prepared by	Checked by	Approved by
		Name	Andrew Crouch	Louise Millward	Andrew Johnson
		Signature			
Issue 01	20 Aug 2021	**Filename**	MP1-REP-CIV-002 Stormwater and Flooding Assessment.docx		
		Description	Issue to Venues NSW		
			Prepared by	Checked by	Approved by
		Name	Andrew Crouch	Louise Millward	Andrew Johnson
		Signature			
Issue 02	6 Sep 2021	**Filename**	MP1-REP-CIV-002 Stormwater and Flooding Assessment.docx		
		Description	Minor Amendments		
			Prepared by	Checked by	Approved by
		Name	Andrew Crouch	Louise Millward	Andrew Johnson
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
			Issue Document Verification with Document		✓

Contents

Executive Summary

Venues NSW (VNSW) is proposing to introduce a village community space, event plaza and multi-level car park to complement the SFS and adjoining Moore Park and Centennial Parklands. The Village Precinct and Carpark project will facilitate the permanent closure of the EP2 on-grass parking areas within Moore Park opposite the MP1 car park and enable its use for open space purposes consistent with the Moore Park Masterplan.

This report has assessed the stormwater and flooding impacts of the proposed Precinct Village and Car Park on the surrounding area in the context of the approved SFS project.

Flood modelling has been completed to assess the impacts of the proposed development. This assessment has demonstrated that the Precinct Village and Car Park does not result in material adverse flood impacts on the surrounding area. A number of measures including the provision of OSD are proposed as a means to mitigate flood impacts and manage flood risk in the Precinct. The proposal is consistent with the approved SFS flood management strategy.

A stormwater drainage strategy has been developed that is consistent with the SFS approved strategy for management of surface water during construction and operation, including water quality management.

Based on this assessment it can be concluded that the proposed Precinct Village and Car Park development is consistent with the existing SSD 9835 consent in regard to stormwater and flood management.

1 Introduction

On 6 December 2018, the then Minister for Planning approved a concept development application and concurrent early works package (SSD 9249) to facilitate redevelopment of the Sydney Football Stadium.

The concept approval established the maximum building envelope, design and operational parameters for a new stadium with up to 45,000 seats for patrons and allowing for 55,000 patrons in concert mode. The concurrent Stage 1 works, which were completed on 28 February 2020, facilitated the demolition of the former SFS and associated buildings.

Stage 2 of the Sydney Football Stadium (SFS) Redevelopment (SSD 9835) was approved by the Minister for Planning and Public Spaces on 6 December 2019. Stage 2 provides for:

- construction of the stadium, including:
  - 45,000 seats (additional 10,000 - person capacity in the playing field in concert mode) in four tiers including general admission areas, members seating and corporate / premium seating;
  - roof cover over all permanent seats and a rectangular playing pitch;
  - a mezzanine level with staff and operational areas;
  - internal pedestrian circulation zones, media facilities and other administration areas on the seating levels;
  - a basement level (at the level of the playing pitch) accommodating pedestrian and vehicular circulation zones, 50 car parking spaces, facilities for teams and officials, media and broadcasting areas, storage and internal loading areas;
  - food and drink kiosks, corporate and media facilities; and
  - four signage zones.
- construction and establishment of the public domain within the site, including:
  - hard and soft landscaping works;
  - publicly accessible event and operational areas;
  - public art; and
  - provision of pedestrian and cycling facilities.
- wayfinding signage and lighting design within the site;
- reinstatement of the existing Moore Park Carpark 1 (MP1) upon completion of construction works with 540 at-grade car parking spaces and vehicular connection to the new stadium basement level;
- operation and use of the new stadium and the public domain areas within the site for a range of sporting and entertainment events; and
- extension and augmentation of utilities and infrastructure.

SSD 9835 has been modified on five previous occasions:

- MOD 1 amended Conditions B14 and B15 to satisfy the regulatory requirements of the Contaminated Land Management Act 1997;
- MOD 2 approved the design, construction and operation of the Stadium Fitness Facilities;
- MOD 3 approved design refinements to the western mezzanine and introduced a new condition to facilitate approval of signage details within the approved signage zones;
- MOD 4 relocated the approved photovoltaic array from the SFS roof to the Level 5 plant room roofs and revised the approved sustainability strategy; and
- MOD 5 updated plan references and dates in the Instrument of Consent.

A sixth modification which seeks approval for the fit out and operation of the SFS' eastern mezzanine for the Sydney Roosters Centre of Excellence (MOD 6) was placed on public exhibition by the Department of Planning, Industry and Environment between 19 August and 1 September 2021.

2 Precinct Village and Car Park

2.1 Vision

Venues NSW (VNSW) is proposing to introduce a village community space, event plaza and multi-level car park to complement the SFS and adjoining Moore Park and Centennial Parklands. The proposed development will facilitate the permanent closure of the EP2 on-grass parking areas within Moore Park opposite the MP1 car park and enable its use for open space purposes consistent with the Moore Park Masterplan.

The vision for the Precinct Village and Car Park is set out below:

> *The Precinct Village and Car Park provides a platform and canvas for an exceptional community asset and iconic design, that visually and physically connects to the adjacent Moore Park East and Kippax Lake. It provides patrons with quality café and dining experiences in an idyllic parkland setting and well-being play and relaxation nodes which engage with all ages. An event plaza, connected to the Stadium plaza provides a seamless opportunity for greater patron and community engagement through non-event and event day functions* (Architectural Design Statement, Cox August 2021).

2.2 Location

The Precinct Village and Car Park is proposed to be located on the land west of the SFS, currently approved under SSD 9835 as the MP1 Car Park. It will extend to Moore Park and Driver Avenue and will adjoin the existing UTS, Rugby Australia and NRL Central buildings, all of which are to be retained and do not form part of the project site. A Location Plan is provided at Figure 1.

;;

Figure 1: Precinct Village and Car Park Location

2.3 Development Description

The Precinct Village and Car Park has been designed to align with the conditions and commitment established within SSD 9835, particularly relating to delivering a LEED Gold rated sustainable precinct, and will include:

- Up to a maximum of 1,500 space multilevel carpark below ground level with the following access arrangements:
  - 1 x egress point onto Moore Park Road to be used on event days only;
  - 1 x two-lane access point from Driver Ave to be used on event and non-event days; and
  - dedicated area within the car park for operation/servicing vehicles.
- Reconfiguration of the currently approved drop off requirements for the elderly and mobility impaired;
- Free flow level pedestrian access to and from the SFS concourse from Driver Ave and Moore Park Road;
- Electric car charging provision;
- A versatile and community public domain, comprising:
  - provision for 4 x north-south orientated tennis courts on non-event days with the potential to become an event platform on event days;
  - children's playground;

- 1,500m^2 cafe / retail / restaurants with associated amenities in a single storey pavilion (6 metre) low level;
- customer service office and ticket window; and
- vertical transport provisions.

- Utilities provision augmentation.

Figure 2 illustrates the proposed Precinct Village and Car Park concept. Refer to the architectural plans within the Architectural Design Statement (Cox, August 2021) and landscape plans (Aspect, August 2021) for further details.

Figure 2: Precinct Village and Car Park Development

2.4 Proposed Operation

The Precinct Village is proposed to be accessible from 8am to 11pm to align with the approved operating hours for the SFS.

The tennis court operating hours are proposed to be the same as the approved operating hours for the Stadium Fitness Facilities.

The car park will be automated, replicating the existing arrangements at the nearby Entertainment Quarter and will be accessible 24 hours a day, 7 days a week.

The public domain is proposed to be curated as a series of distinct, flexible and purpose specific settings for event day patrons and the general public. These inviting public places will offer rich, engaging and shared experiences. An indication of the activity types, frequencies and durations proposed within the

public domain is provided in the Architectural Design Statement (Cox Architecture, August 2021) and Planning Statement (Ethos Urban, August 2021).

2.5 Delivery

The Precinct Village and Car Park is proposed to be delivered in two stages:

- Stage 1, herein referred to as the East Car Park, consists of the area between the Rugby Australia and NRL Central buildings, immediately adjacent to the SFS concourse; &
- Stage 2, herein referred to as the West Car Park, consists of the residual area immediately adjacent to the proposed East Car Park, bounded by Driver Ave and Moore Park Road.

The East Car Park is proposed to be delivered ahead of the opening of the SFS in 2022. The West Car Park is proposed to be delivered after the SFS opening, sometime in 2023.

3 Proposed Modifications

To facilitate the Precinct Village and Car Park, SSD 9249 and SSD 9835 are required to be modified. The proposed modification to SSD 9249 (concept development application) has been submitted under separate cover. SSD 9835 is proposed to be modified to facilitate construction, fit-out and operation of Precinct Village and Car Park as described above.

4 Purpose of this Report

This Stormwater and Flooding Assessment Report has been prepared to support the Precinct Village and Car Park Project. This Report specifically addresses the following Secretary's Environmental Assessment Requirements (SEARs) issued in respect of SSD 9825 and as relevant to the Precinct Village and Car Park project:

Table 1: Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirements	Report Section
24. Utilities • Prepare an Infrastructure Management Plan in consultation with relevant agencies, detailing information on the existing capacity and any augmentation and easement requirements of the development for the provision of utilities including staging of infrastructure. • Prepare an Integrated Water Management Plan detailing any alternative water	Stormwater infrastructure outlined in this report, all other infrastructure is covered within the Infrastructure Services Strategy Report. Existing stormwater infrastructure is addressed in Section 126.4 and Section 9.2.2. Proposed stormwater drainage requirements, including WSUD are addressed in Section 9.

Secretary's Environmental Assessment Requirements	Report Section
supplies, end uses of potable and non-potable water, and water sensitive urban design, measures for rainwater harvesting for irrigation and stormwater polishing.	
26. Drainage The EIS shall: • Detail measures to minimise construction and operational water quality impacts on surface waters and groundwater including Kippax Lake and Moore Park. Stormwater plans detailing the methods of drainage without impacting on the downstream properties.	Construction water quality impacts are addressed in Section 9.2.1. Operational water quality impacts are addressed in Section 9.2.5. Stormwater drainage strategy as a whole is addressed in Section 9.
27. Water and Natural Resources The EIS shall: • Identify the background conditions for any water resource likely to be affected by the development. • Identify the annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan. • Identify any volumetric water licensing requirements (including those for ongoing water take following completion of the project). • Identify and map the water sources likely to be impacted by the development including rivers, estuaries, waterways, wetlands, groundwater, groundwater dependent ecosystem, proposed intake and discharge locations. • Identify whether any construction activities would intersect the water table and require dewatering, in accordance with the assessment process for aquifer interference activities, NSW Aquifer Interference Policy 2012. • Assess impacts on hydrology including water balance, surface and ground water sources (both quality and quantity), downstream water dependent flora and	This report addresses items related to surface water/stormwater management only. Surface water background conditions are unchanged from those reported previously for the SSD 9835 submission. Surface water impacts are addressed in Section 9.

Secretary's Environmental Assessment Requirements	Report Section
fauna, related infrastructure, adjacent licensed water users, rivers, streams, wetlands, estuaries, basic landholder rights, groundwater dependent ecosystems. • Outline strategies and measures proposed to reduce and mitigate these impacts on hydrological attributes. • Provide full technical details and data (where relevant) of: all surface and groundwater modelling; surface and groundwater monitoring activities and methodologies; management and disposal of produced or incidental water; monitoring groundwater levels to assess the high wet weather groundwater levels and its relation to the basement level; and final landform of the site, including final void management (where relevant) and rehabilitation measures. • Any dewatering (if applicable) should identify and demonstrate the drawdown impacts on nearby users including potential Groundwater Dependent Ecosystems. • Where dewatering is required, a Dewatering Management Plan must be developed that includes the method of groundwater disposal. • Identify an adequate and secure water supply for the life of the project. This includes confirmation that water can be sourced from an appropriately authorised and reliable supply. This is also to include an assessment of the current market depth where water entitlement is required to be purchased. • Assess any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts. • Prepare groundwater level contour map (mAHD) of the Botany Sands Groundwater Source, for the entire site with actual field data indicated at bore sites, based on field observation.	

Secretary's Environmental Assessment Requirements	Report Section
• Provide a detailed and consolidated site water balance. • Provide the assessment of the impact on "Water and Soils" in relation to the proposed development in accordance with the document 'Attachment A – OEH Standard Environmental Assessment Requirements (sub points 10 - 13), which is attached to the SEARs.	
28. Flooding The EIS shall: • Identify flood risk on-site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (2005), including the potential effects of climate change, sea level rise an increase in rainfall intensity. If there is a material flood risk, include design solutions for mitigation.	Flood risk and mitigation addressed in Section 8.

This Stormwater and Flooding Assessment Report is to be read in conjunction with the following reports and documents:

- Planning Statement prepared by Ethos Urban (August, 2021);
- Architectural plans/elevations/sections and Architectural Design Statement, prepared by Cox Architecture (August, 2021);
- Design Integrity Assessment Report prepared by Cox Architecture (August, 2021);
- Landscape plans and Landscape Design Report prepared by Aspect (August, 2021);
- Transport Assessment prepared by JMT (August, 2021);
- Noise and Vibration Assessment prepared by Arup (August, 2021);
- Visual Impact Assessment prepared by Ethos Urban (August, 2021);
- Social/Economic Statement prepared by Ethos Urban (August, 2021);
- Heritage Impact Statement prepared by Artefact (August, 2021);
- Sustainability Assessment prepared by LCI (August, 2021);
- Security Statement/CPTED prepared by Intelligent Risks (August, 2021);
- Contamination Assessment prepared by Douglas Partners (August, 2021);
- Aboricultural Assessment prepared by Tree IQ (August, 2021);

- Wind Assessment prepared by Arup (August, 2021);
- Infrastructure Services Strategy prepared by Arup (August, 2021);
- Geotechnical Assessment prepared by Arup (August, 2021);
- Public Domain Lighting Assessment prepared by Arup (August, 2021);
- Accessibility Statement prepared by Before Compliance (August, 2021); and
- BCA Assessment prepared by Blackett Maguire Goldsmith (August 2021).

5 Documents Referenced

The following documents have been referenced in the preparation of this assessment:

- Stormwater Management Plan Rev.E and Response to Submissions letter prepared by Aurecon (May and September, 2019);
- Stormwater and Flooding Assessment Rev.3 prepared by Arup (June, 2018);
- Environmental Impact Statement prepared by Ethos Urban (June, 2019);
- Approved SFS Plans prepared by Cox Architecture (September, 2019);
- Redevelopment of the Sydney Football Stadium Stage 2 State Significant Development Assessment SSD-9835 (November, 2019); and
- Redevelopment of the Sydney Football Stadium State Significant Development Modification Assessment SSD-9249-Mod-1 (June, 2019).

6 Pre-SFS Development Site Conditions

The pre-development site conditions have been detailed in the *Sydney Football Stadium Redevelopment Stormwater and Flooding Assessment* (Arup, June 2018) and the *Sydney Football Stadium Stormwater Management Plan* and *Response to Submissions* letter (Aurecon, May and September 2019 respectively). A short summary is included in the following sections, however for further information please refer to the individual reports.

6.1 Context

The proposed Precinct Village and Car Park is located to the north-west of the new SFS. The location was previously occupied by the at-grade MP1 car park (Refer Figure 3). The location is bounded by the new SFS to the east, Moore Park Road and the UTS Rugby Australia building to the north, the NRL building to the south and Driver Avenue to the west and south-west.

Figure 3: Aerial photograph of the site and its context (source: Google Maps)

The proposed footprint is contained within the extent of the formerly existing at grade MP1 car park and land which is currently approved to be constructed as a 540 space car park under SSD 9835.

6.2 Pre-SFS Development Topography

The topography of the existing at-grade car park, prior to commencement of the SFS project, generally graded gently from north to south, with local stormwater runoff draining in a southerly direction towards Driver Avenue. Levels on the existing MP1 car park ranged from 43.8mAHD at the north to 41mAHD at the south.

6.3 Pre-SFS Development Flooding Risk

In pre-development conditions, prior to commencement of the SFS project, overland flow entered the stadium precinct from Moore Park Road. This effect has been observed during previous significant storms and is also predicted by flood models for the area.

In the 1% AEP flood overland flow accumulates at the low point in Moore Park Road immediately north of the MP1 car park before continuing south via Driver Avenue and via the area adjacent to the UTS Rugby Australia building. Once entering the MP1 car park, stormwater accumulates at a shallow depth across the car park with flow generally travelling north to south and draining via the drainage network when capacity is available.

South of the car park, overland flow accumulates at the low point in Driver Avenue adjacent to the Sydney Cricket Ground and Kippax Lake.

These flood mechanisms are annotated on the 1% AEP pre-development flood map in Figure 4.

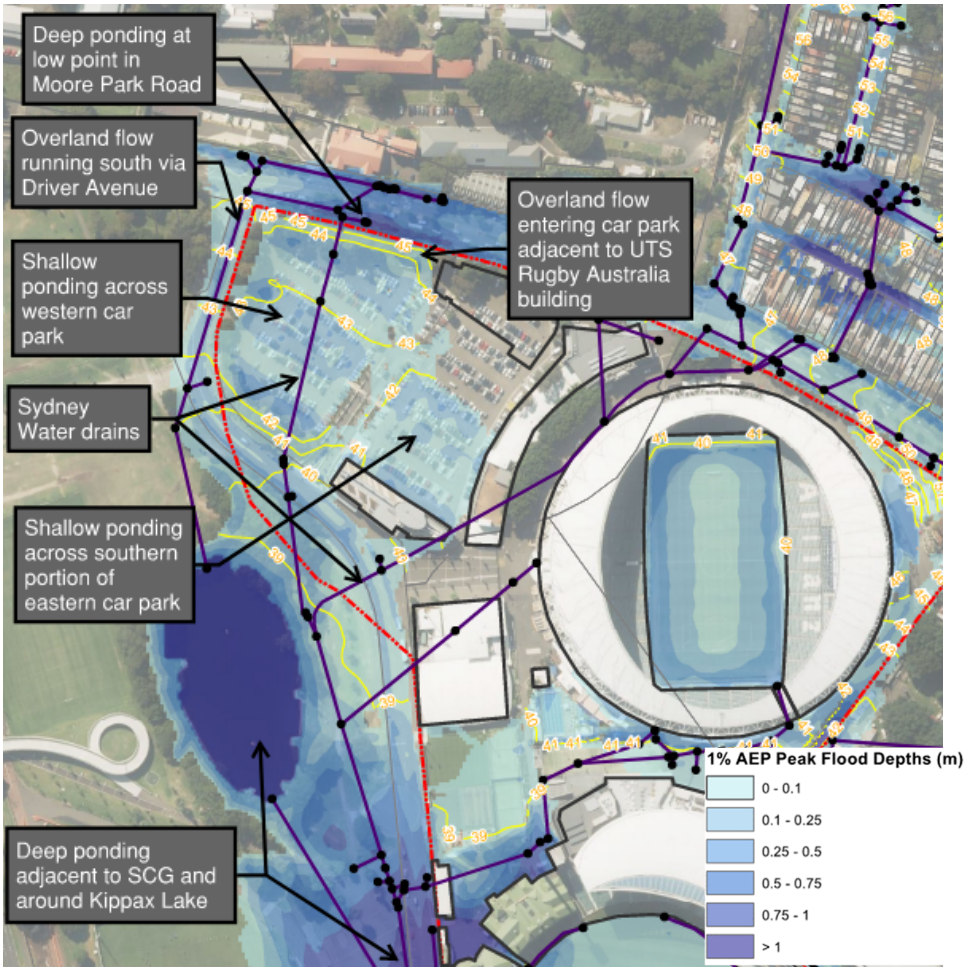


Figure 4: Pre-development 1% AEP flood levels and depths (source: Stormwater and Flooding Assessment, Arup June 2018)

6.4 Pre-development Stormwater Infrastructure

There are existing Sydney Water owned and private stormwater drains within the car park and surrounding area as illustrated by the purple lines in Figure 4. A 600mm diameter Sydney Water drain runs from south to north through the western portion of the MP1 car park. The upstream catchment of this drain only includes inlet pits on the south side of Moore Park Road. Stormwater drainage pits within the western car park connect into this drain.

A second Sydney Water trunk drain runs north to south around the western extent of the stadium. This drain has been relocated to the west as part of the SFS project. Stormwater from the eastern portion of the car park is collected in pits which discharge into this trunk drain.

7 Proposed Development Details

As detailed in Section 2.2, the Precinct Village and Car Park is proposed to be constructed in place of the existing at-grade MP1 car park located west of the SFS. The proposed facilities are described in Section 2.3 and will include rooftop public domain plazas, tennis courts and a multi-storey car park. A ground floor level access road running from south to north is proposed to provide access to the car park from Driver Avenue. A single lane left-out only connection is proposed to Moore Park Road on the western side of the UTS Rugby Australia building.

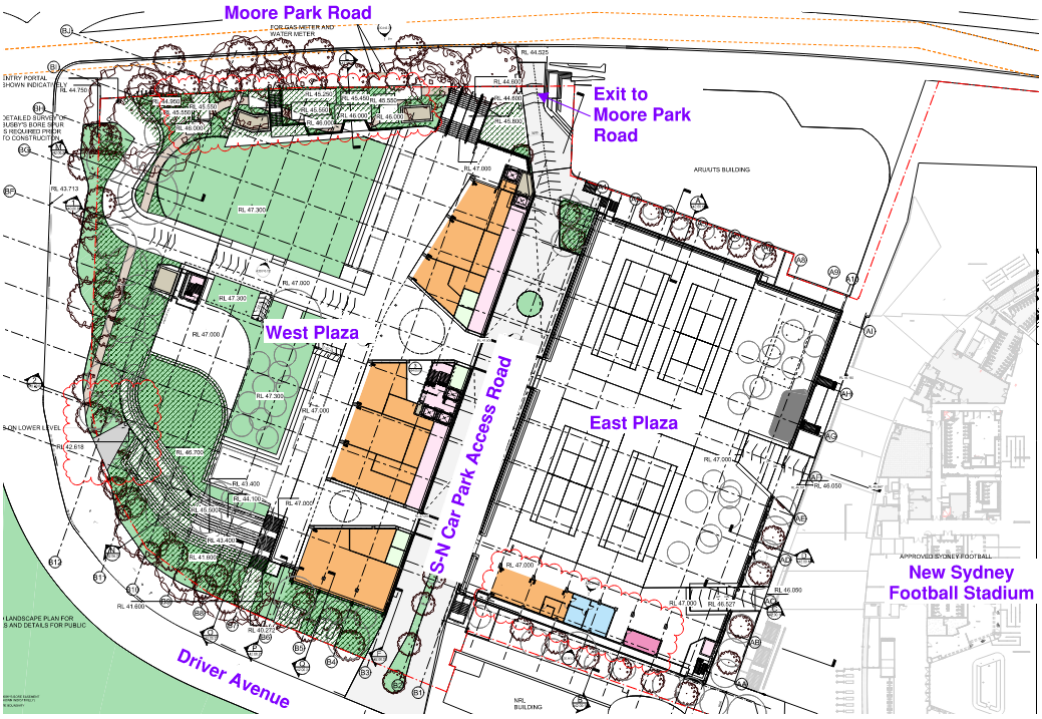


Figure 5: Precinct Village and Car Park plaza level plans (Cox Architecture, August 2021)

8 Flood Risk Management

This section provides:

- an overview of the adopted flood management strategy for the approved SFS redevelopment;
- assessment of potential flood impacts associated with the Precinct Village and Car Park;
- mitigation measures adopted for the Precinct Village and Car Park;
- the level of protection achieved for the Precinct Village and Car Park;
- consideration of flood emergency management; and
- next steps for refinement of flood modelling in subsequent stages of design.

8.1 SFS Flood Mitigation Strategy

The flood mitigation strategy adopted for the SFS project fundamentally involves better managing the stormwater runoff from Moore Park Road during a significant storm as described in Section 6.3. This will be achieved by grading the stadium plaza areas to allow the overland flow to drain safely westerly around the stadium concourse and down to Driver Avenue and Kippax Lake. This location is generally open, hard paved and remote from buildings and so can safely accommodate short term flooding as it does in the pre-SFS development conditions.

To support this strategy, the Stormwater Management Plan (Aurecon, May 2019) proposes the introduction of new levels and grading to external areas together with retaining walls and flow barriers to direct overland flow originating from Moore Park Road. This management of overland flow will be complemented by the proposed local stormwater drainage network and on-site detention (OSD) to capture rainfall within the precinct and discharging it at an attenuated rate.

The flood risk at the MP1 car park was not affected by the SFS development with overland flow paths through this area remaining as discussed in Section 6.3.

8.2 Precinct Village and Car Park Flood Impact Assessment

8.2.1 Modelling Approach

The baseline model configuration has been adopted utilising the final SFS design TUFLOW flood model (Des26, May 2020) provided to Arup by VNSW. Arup updated the model to provide a more refined baseline model for the Precinct Village and Car Park site. This included incorporation of updated site survey information, refinement of the representation of the terrain at the north of the site along Moore Park Road and the inclusion of existing local drainage in the MP1 car park that was not included in the previous model.

This model was then used as the baseline model against which potential impacts of the Precinct Village and Car Park were assessed.

8.2.2 Flood Impact and Mitigation

Through the design of the Precinct Village and Car Park some potential flood impacts, both within and external to the site, were identified. Mitigation measures for each impact were identified and integrated into the design. These mitigation measures will be further refined during future design stages. A summary of these potential impacts and mitigation strategies is included in Table 2.

Table 2: Summary of potential flood impacts and mitigation strategies

Potential Flood Impact	**Proposed Mitigation**	**Commentary**
Precinct car park/plaza footprint blocking overland flow entering site resulting in increases in flood level on Moore Park Road	Northern extent of Village Precinct and Car Park project has been set back from Moore Park Road to mitigate this impact.	Through sensitivity testing the northern extent of the proposed Village Precinct and Car Park project has been positioned such that no material flood impacts are shown on Moore Park Road in the 1% AEP event.
High flow velocity/hazard along south-north car park access road posing risk to users	South-north access road design proposal has been graded to fall to a centralised channel, and includes additional drainage to convey stormwater away from pedestrian areas. On-site detention is proposed to reduce peak flow through the site.	Further refinement of design of south-north access road, stormwater capture and on-site detention sizing and configuration is required during future design stages.
Additional flow directed to new SFS lower levels	Area on western side of UTS Rugby Australia building including left-out connection to Moore Park Road to be regraded to provide flood protection to existing stairs.	Flood modelling of preliminary design shows this impact can be mitigated.
Additional flow directed to NRL building basement	South-north access road grading design includes central swale to provide flood protection to basement.	Flood modelling of preliminary design shows this impact can be mitigated.
Increase in flood levels south of site due to loss of flood storage on MP1 car park	Perimeter of West Car Park designed to maintain an overland flow path and maximise surface detention of flows. On-site detention is additionally proposed to minimise these localised impacts.	With proposed mitigation, there is generally no material flood impact to Kippax Lake, Centennial Parklands and the SCG. There is localised afflux of up to 50mm on Driver Avenue adjacent the site, which can be further mitigated through grading adjustments in detailed design.

Arup updated the final design SFS flood model to include the proposed Precinct Village and Car Park footprint to investigate the impacts of the development on flooding behaviour. This involved the addition of a blocked-out building area across the extent of the raised car park and Village Precinct and a fully graded south-north access road. The blocked-out building area in the model conservatively extends beyond the footprint of the car park in order to allow for refinement to perimeter grading.

Grading of the south-north access road includes a central median swale. This will assist by providing a conveyance route which is clear of pedestrian areas for stormwater entering the site from Moore Park Road.

The proposed case model also includes two below ground on-site detention (OSD) tanks. The first is located at the north of the site adjacent to Moore Park Road and the UTS Rugby Australia building and will be filled via a large grated linear inlet structure running west-east across the entry from Moore Park Road. This tank would discharge to a new culvert running under the south-north access road, which will connect with existing drainage at Driver Avenue. A second OSD tank is proposed under the eastern plaza in order to minimise flood impacts to the south of the site. New OSD tanks in conjunction with the inclusion of additional drainage and a central swale in the road profile will minimise the surface flow and hazard in the area. Further design refinement will be required during future design stages to confirm the size and configuration of the proposed OSD tanks.

The proposed case flood model also includes a diversion of the 600mm Sydney Water drain around the west of the new car park.

The primary flood mitigation strategies incorporated in the model are illustrated in Figure 6.

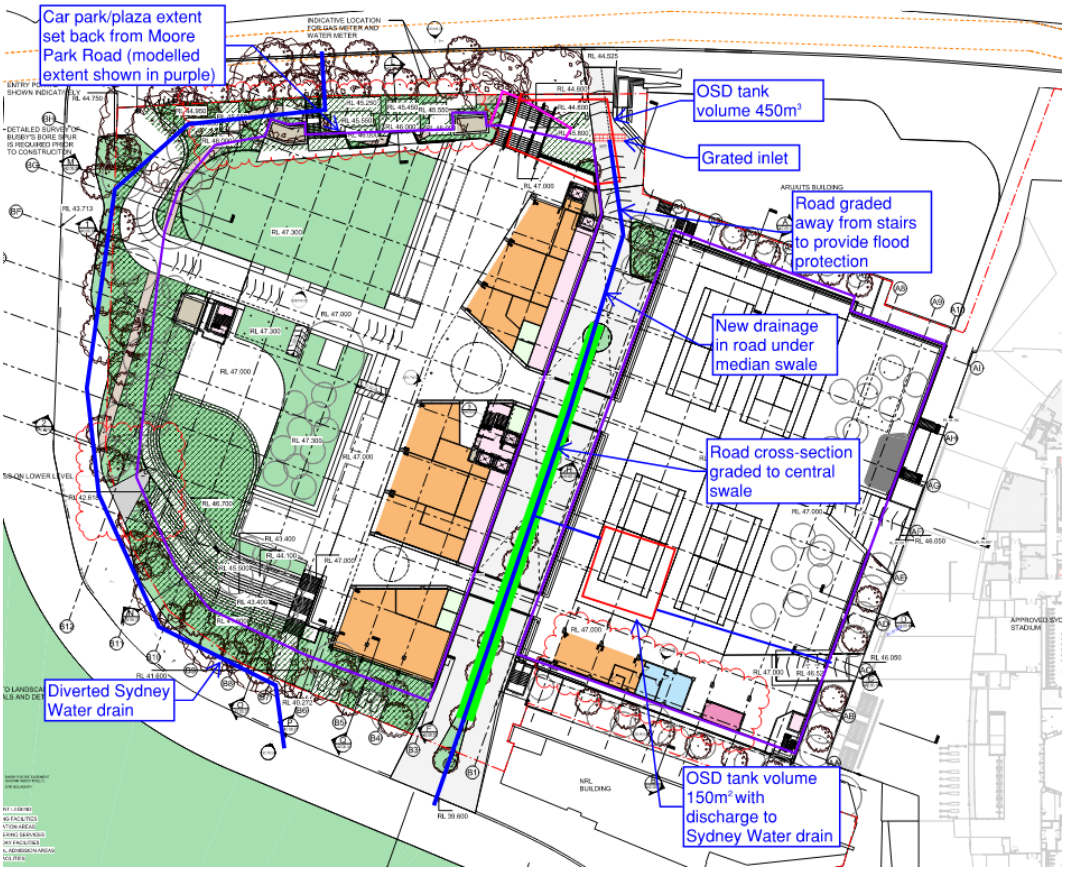


Figure 6: Flood mitigation measures incorporated in design

Flood depth, afflux and hazard maps for the Precinct Village and Car Park, with comparison to the approved SFS, are included in Appendix A.

As shown in Figure 7 and Figure 8, there is no material increase in flooding on Moore Park Road, Kippax Lake, the SCG and the majority of Driver Avenue. There are localised increases of up to 50mm on and adjacent to Driver Avenue immediately adjacent the site, which can be further mitigated through grading adjustments in detailed design. A reduction in flood depth is observed adjacent the UTS Rugby Australia building, adjacent the NRL building and adjacent the SFS site.

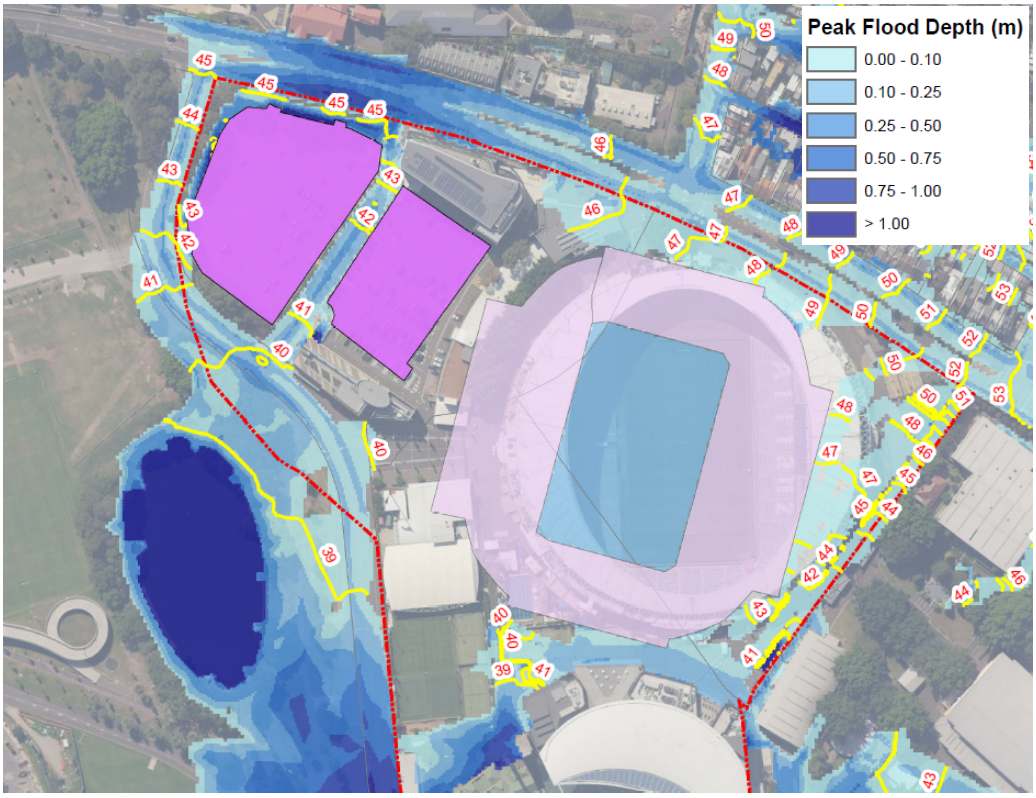


Figure 7: 1% AEP flood depth map incorporating Precinct Village and Car Park

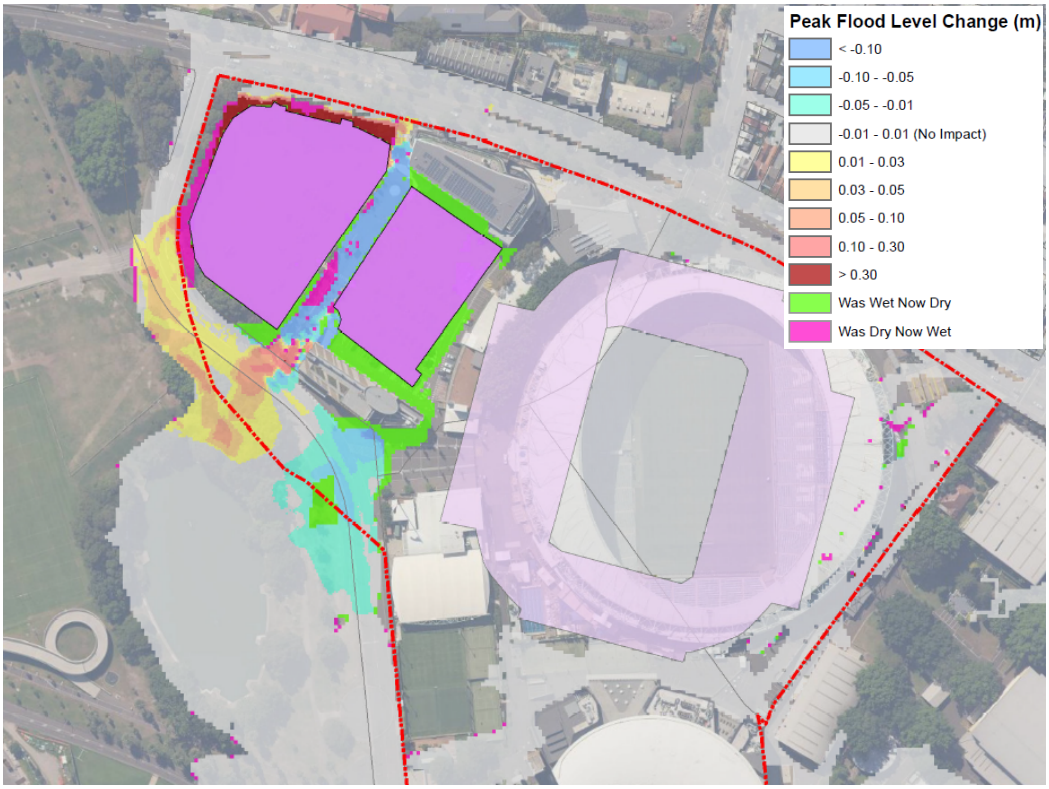


Figure 8: 1% AEP flood depth afflux map, showing impact of Precinct Village and Car Park

8.3 Flood Protection

Provision of a central swale along the south-north road will protect car park entrances from 1% AEP flooding. Protection beyond the 1% AEP to the higher of the 1% AEP plus 500mm freeboard or the Probable Maximum Flood (PMF) level is proposed to be achieved via flood gates at these entries. This will provide suitable protection to the West Car Park basement levels and the SFS basement, in accordance with the *City of Sydney Interim Floodplain Management Policy*. A typical cross-section of the road profile is included in Figure 9.

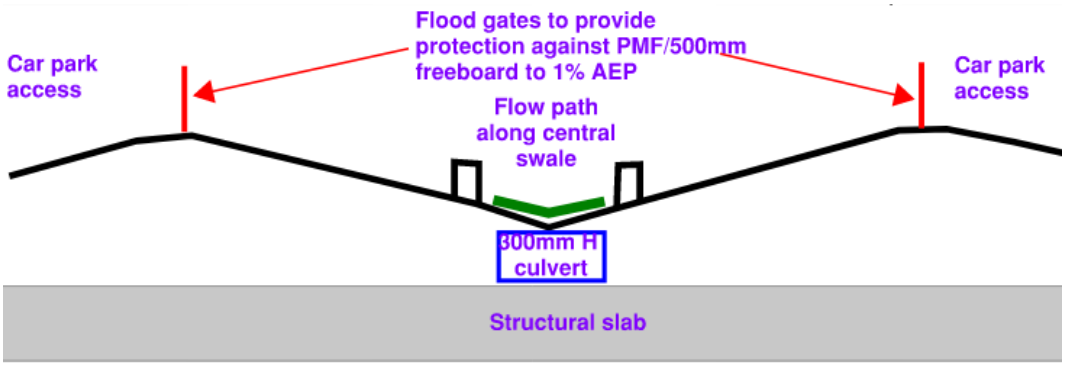


Figure 9: Typical south-north road cross-section

All openings/penetrations to basement levels including lifts, egress stairs, ventilation etc. will require protection up to the 1% AEP +500mm or PMF level, whichever is greater. While modelling indicates relatively high flood depths in the 1% AEP at the northern edge of the Western Car Park, there will similarly be no penetrations in the external wall below the 1% AEP +500mm or PMF level. Comparison of the 1% AEP and PMF flood maps extracted from the Centennial Parklands Flood Study (WMA Water, 2016) in Figure 10 indicates that the 1% AEP +500mm will be the governing criterion.

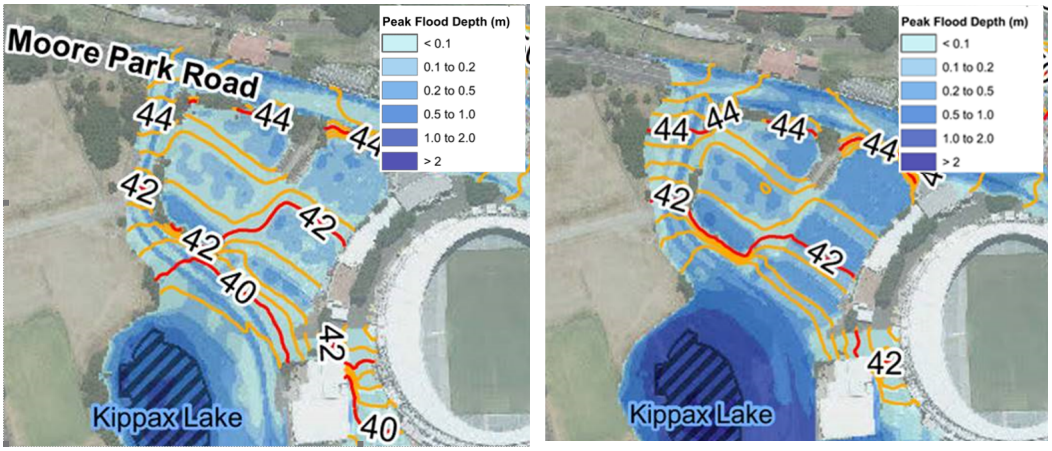


Figure 10: Comparison of 1% AEP and PMF Flood Levels (Source: Centennial Park Flood Study WMA Water, 2016)

This should be confirmed in subsequent design stages through modelling of the PMF in the SFS flood model.

8.4 Precinct Village and Car Park Flood Evacuation

SFS Condition of Consent D30 requires an appropriate Emergency Flood Evacuation Management Plan be prepared, submitted and approved by the Certifying Authority prior to occupation. This Management Plan is on track to be finalised prior to occupation as required by Condition D30. The John Holland and Aurecon proposals for flood evacuation as reviewed by Arup at the time of publication are broadly consistent with the NSW Floodplain Development Manual (2005) and will be finalised through design development.

The Emergency Flood Evacuation Management Plan will be amended to incorporate the specific requirements of this development. The strategy will include options to either rest in place or evacuate to the north-west via Moore Park Road.

8.5 Climate Change

Climate change factors impact flooding, but their degree of influence varies by site. The two main potential impacts on flooding and their relevance to the Precinct Village and Car Park are:

- Sea level rise: this is not considered to affect the site as there are no tidal effects to the site or its stormwater outfalls; and
- Increased frequency of events due to increased rainfall intensities: this may affect the site and is typically considered in terms of sensitivity analysis. Sensitivity analysis will be undertaken in subsequent stages of the design process.

8.6 SFS Flood Planning Conditions

The relevant flood risk related planning conditions associated with the SFS SSD approval (ref: SSD-9835) will be considered as part of the Precinct Village and Car Park detailed design, together with the strategies and commentary offered in this report. Compliance with Condition D30 is addressed in Section 8.4.

8.7 Limitations and Next Steps

While the flood modelling undertaken is considered suitable for the purpose of this assessment, the following limitations are noted and require review and refinement in subsequent design stages:

- It has been noted some of the existing stormwater drainage information incorporated in the TUFLOW model was either not up-to-date or based on incomplete information. Further updates to the TUFLOW model may be required at later design stages as better information on the existing stormwater network becomes available. This includes inclusion of the as-built details of the relocated 1500mm Sydney Water stormwater drain;

- Inflows applied in the TUFLOW model may need to be refined at later design stages, as the catchment inflows around the car park site are quite broad in scale relative to the size of the site;
- The representation of the proposed car parks, access road and proposed stormwater, including OSD tanks, should be considered as a schematic design only. These elements have been modelled for this stage of the project to demonstrate a feasible solution with regard to management of flood impacts for the site. The TUFLOW model will need to be iteratively refined and re-assessed as the design progresses;
- Inclusion of a detailed surface digital terrain model for the area between the new car park buildings and the site boundaries once available will allow a more accurate representation of flood storage;
- Currently the flood impact assessment has only been undertaken for one design storm event (1% AEP), for one storm duration (60 minutes), reported as the critical event within the *SFS Stormwater Management Plan Rev.E* (Aurecon). It is recommended that further design events and durations be modelled in later design stages to assess predicted flood impacts for different storm events and different durations. This is particularly relevant regarding the sizing of the OSD tanks, which can alter the critical duration affecting the site and surrounding areas from pre-development conditions. Additionally, modelling of the PMF will need to be undertaken to confirm protection for the proposed car parks; and
- Modelling has been undertaken utilising inputs based on Australian Rainfall and Runoff 1987 (ARR87) guidelines, as this is consistent with the inputs used in the prior SFS model. Consideration should be given to utilising inputs from the newer Australian Rainfall and Runoff (2019) guidelines, which is considered current best practice.

9 Stormwater Infrastructure

This section provides details of:

- the stormwater drainage strategy for the approved SFS;
- management of stormwater during construction of the Precinct Village and Car Park;
- relocation and protection requirements for existing stormwater drainage infrastructure to facilitate the proposed development;
- the proposed strategy for drainage of external areas of the Precinct Village and Car Park; and
- how this strategy will integrate into the existing and planned stormwater network.

9.1 SFS Stormwater Infrastructure Strategy

The approved SFS drainage strategy proposes the provision of stormwater drainage pits and pipes around the extents of the new stadium which will service the proposed building roof and external areas. A proportion of this drainage infrastructure will be connected to the on-site detention (OSD) tanks, which will ultimately discharge to the existing Sydney Water systems through Driver Avenue and Fox Studios.

The Sydney Water drain which runs from Moore Park Road to Driver Avenue on the western side of the SFS has been relocated to the west to accommodate the location of the new SFS. The new alignment of this drain passes under the eastern extent of the MP1 car park. This Sydney Water drain connects to existing drainage at Driver Avenue.

Another component of the Stormwater Management Plan (Aurecon, May 2019) is a proposal to increase the capacity of the existing OSD system with two separate OSD tanks. A trunk drain is proposed to convey collected stormwater from the western side of the stadium in a southerly direction to the OSD tanks.

The key components of the SFS drainage strategy are shown in Figure 11.

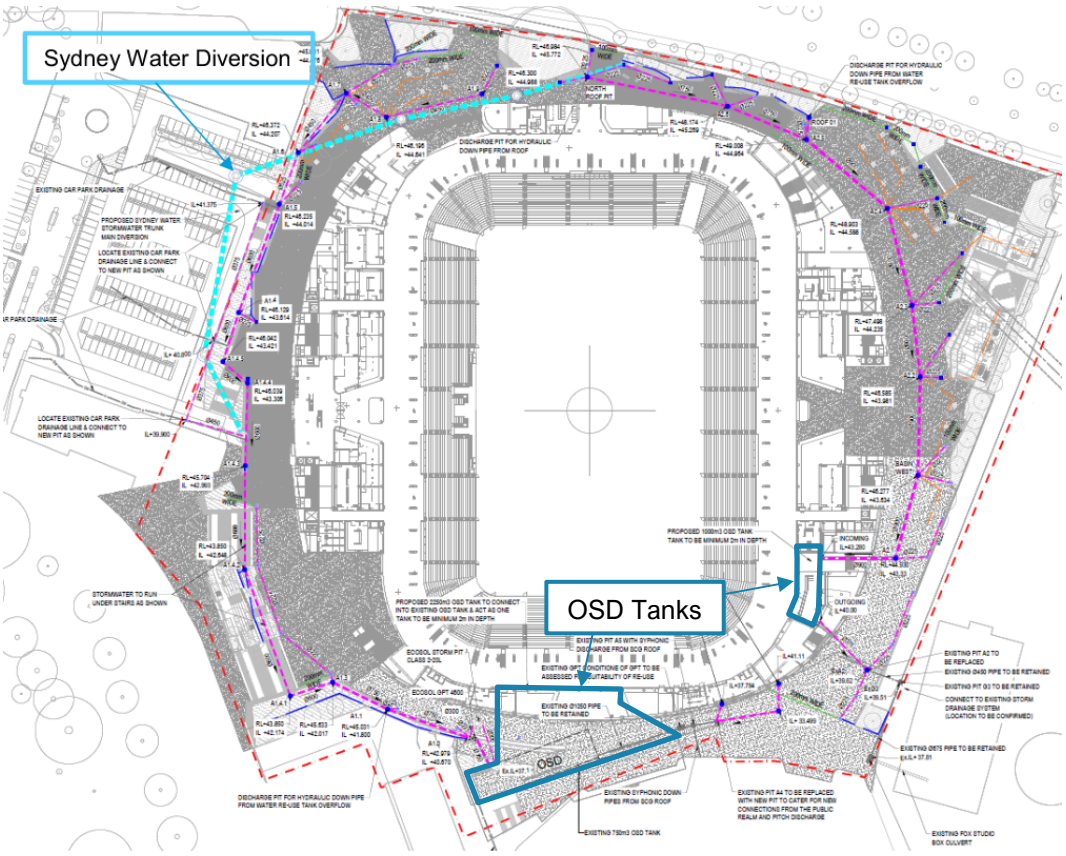


Figure 11: Sydney Water trunk drain diversion (source: Aurecon, 2019)

9.2 Proposed Precinct Village and Car Park Stormwater Management Strategy

The Precinct Village and Car Park design proposal aligns well with the current SFS design in the context of the proposed stormwater infrastructure. The overall drainage strategy for the site will not be significantly impacted by the development with stormwater from the site continuing to discharge to the Sydney Water mains and ultimately draining to Driver Avenue to the south. The following sections discuss the proposed stormwater management strategy for the site during both the construction and operation phases.

9.2.1 Construction Phase Sediment and Erosion Control

Careful planning with regard to the phasing of clearing, excavation, stockpiling, and filling stages across the site will be required to effectively manage runoff from the site during construction. This will need to be considered in relation to the implementation of mitigation and control measures and stormwater runoff quality monitoring.

A detailed Soil and Water Management Plan is to be developed for the construction stage, with reference to relevant guidelines, in particular Managing Urban Stormwater Soils and Construction Volume 1 (Landcom, 2004). The plan will include the use of the following measures:

- Shaker pads at construction access points;
- Sediment fences;
- Cut-off drains;
- Protection of existing grated stormwater inlets through drop inlet sediment traps/sandbagging;
- Sediment basins and/or sediment sumps within basement excavations;

The final design, sizing and location of these measures will be determined based on the proposed phasing of site works. The final Soil and Water Management Plan will be prepared as part of the detailed design phase and should include a detailed description of the proposed overall approach and specific erosion and sediment control measures including:

- Proposed phasing of works;
- Location of shaker pads and construction access points;
- Location of sediment fences;
- Size and location of cut-off drains;
- Size and location of sediment basins, including any interim basins;
- Location of stormwater discharge points and where applicable, pump rates from sedimentation basins;
- Proposed groundwater management strategies, in particular for car park excavation; and
- Proposed water quality and quantity monitoring strategies during construction.

9.2.2 Trunk Drainage Interfaces

The main impact on the existing stormwater network is that the existing 600mm diameter Sydney Water stormwater drain that runs north to south through the existing MP1 car park will need to be relocated. It is proposed that the relocated alignment follows the outside of the western extent of the Precinct Village as shown in Figure 12. As noted, this drain has a small upstream catchment so hydraulic impacts due to its relocation are not anticipated. The existing local drainage network within the MP1 car park will be removed as part of the works.

Figure 12: Proposed Sydney Water drain diversion

The 1500mm Sydney Water trunk drain that has been relocated as part of the SFS project under the proposed East Plaza will be left in-place.

An initial consultation meeting with Sydney Water was held on 21st July 2021 to discuss the proposed treatment of their existing assets. Meeting minutes were recorded and are attached in Appendix B. Specific requirements for the diversion of the 600mm diameter pipeline and retention/protection of the 1500mm diameter pipeline will need be confirmed by Sydney Water through a Notice of Requirements following submission of a Section 73 application once the Water Servicing Coordinator (WSC) has been appointed. This typically occurs post development approval and prior to obtaining the relevant Crown Certificate; this approach is intended to be taken for the Precinct Village and Car Park project.

Future detailed design of the Precinct Village and Car Park will need to give careful consideration to the configuration of the stormwater infrastructure to integrate with the SFS design. The primary interfaces will be at the eastern extent where the development will connect into the Sydney Water trunk drain.

9.2.3 Interface with Busby's Bore

Busby's Bore (Sydney Water heritage water main) passes through the northern and south-western areas of the site. A detailed discussion on Busby's Bore is provided in the *Infrastructure Services Strategy* prepared by Arup (August, 2021).

The top of the Busby's Bore spur is estimated to be approximately RL 33m, interpreted from the *Busby's Bore Draft Conservation Management Plan,* Sydney Water, December 2004 (CMP). The protection requirements of this asset will be

provided in the Sydney Water, Section 73, Notice of Requirements and will also need to be confirmed by a heritage consultant, however the CMP references a 3m curtilage to the asset.

The proposed relocation of the Sydney Water 600mm diameter stormwater pipeline and associated local site drainage connections will cross above the Busby's Bore spur in plan, however the drainage asset will be significantly shallower than the curtilage of Busby's Bore and as such it is not considered to impact the heritage asset.

9.2.4 Local Stormwater Drainage

A new local drainage network will be installed to collect stormwater runoff from the plaza areas and south-north car park access road. This runoff will be divided between three distinct sub-catchment areas:

- West Plaza – draining to the diverted Sydney Water drain around west of plaza;
- South-north car park access road – draining south to Driver Avenue; and
- East Plaza – draining to Sydney Water drain diverted as part of SFS project.

The proposed grading direction for each of these areas is shown in Figure 13. All sub-catchments will ultimately discharge to Driver Avenue and no major changes to current sub-catchment delineations are proposed.

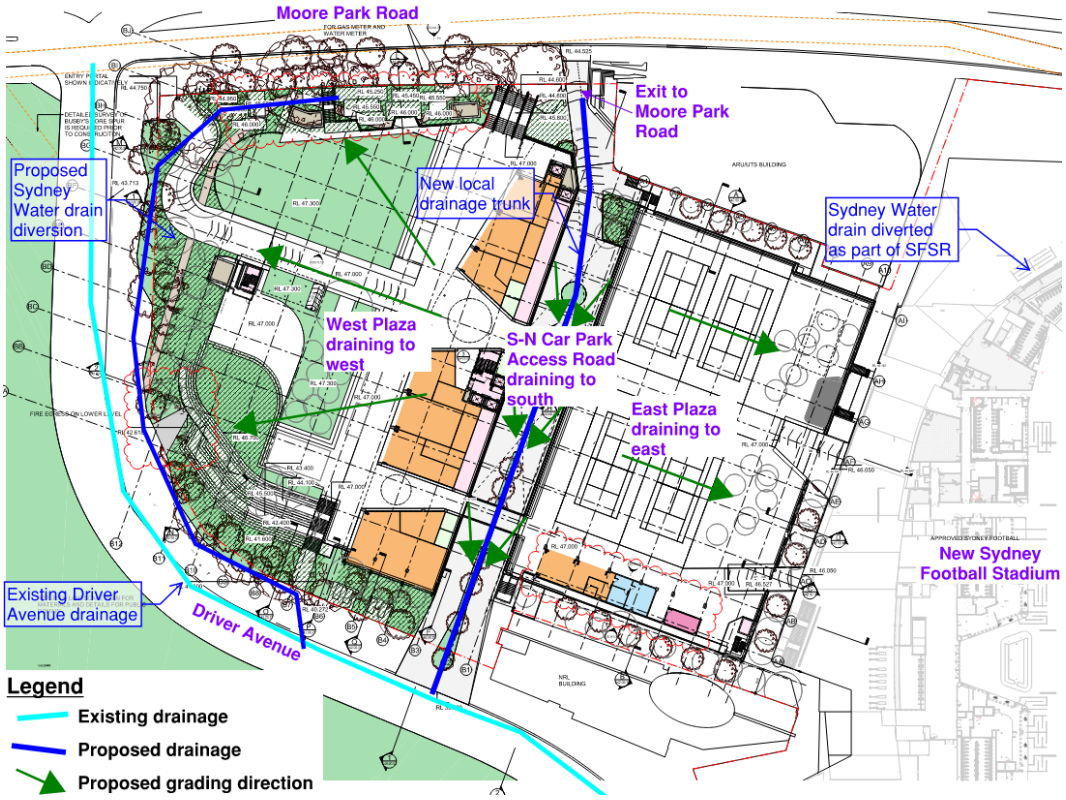


Figure 13: Proposed local stormwater grading directions

Local stormwater drainage will be sized for a 5% AEP event and overland flow paths provided for the 1% AEP event, consistent with relevant policies and guidelines and the SFS design.

9.2.5 Water Quality Treatment

SFS Planning Condition B47 requires compliance with stormwater quality pollutant reduction targets identified in Section 3.2 of SFS Stormwater Management Plan (Rev E) prepared by Aurecon dated 28th May 2019. These targets are summarised in Table 3 below.

Table 3 Stormwater Quality Targets

Pollutant	Performance Target
Gross Pollutants (GP)	Reduce the baseline annual pollutant load for litter and vegetation
Total Suspended Solids (TSS)	Reduce the baseline annual pollutant load for total suspended solids by 85%
Total Phosphorous (TP)	Reduce the baseline annual pollutant load for total phosphorous by 65%
Total Nitrogen (TN)	Reduce the baseline annual pollutant load for total nitrogen by 45%

In order to achieve these stormwater quality pollutant reduction targets, water sensitive urban design (WSUD) elements are proposed within the Precinct Village and Car Park development. These include:

- Four 4m x 12m bioretention rain gardens around northern, western and south-western perimeter of western plaza area to treat runoff from the western plaza;
- Vegetated central median swale along south-north car park access road;
- Proprietary Jellyfish filtration unit (or similar) to further treat runoff from south-north car park access road; and
- Proprietary gross pollutant traps (Ecosol TFR) and Jellyfish filtration units (or similar) to treat runoff from eastern plaza area.

Proposed locations of these core WSUD elements are shown in Figure 14.

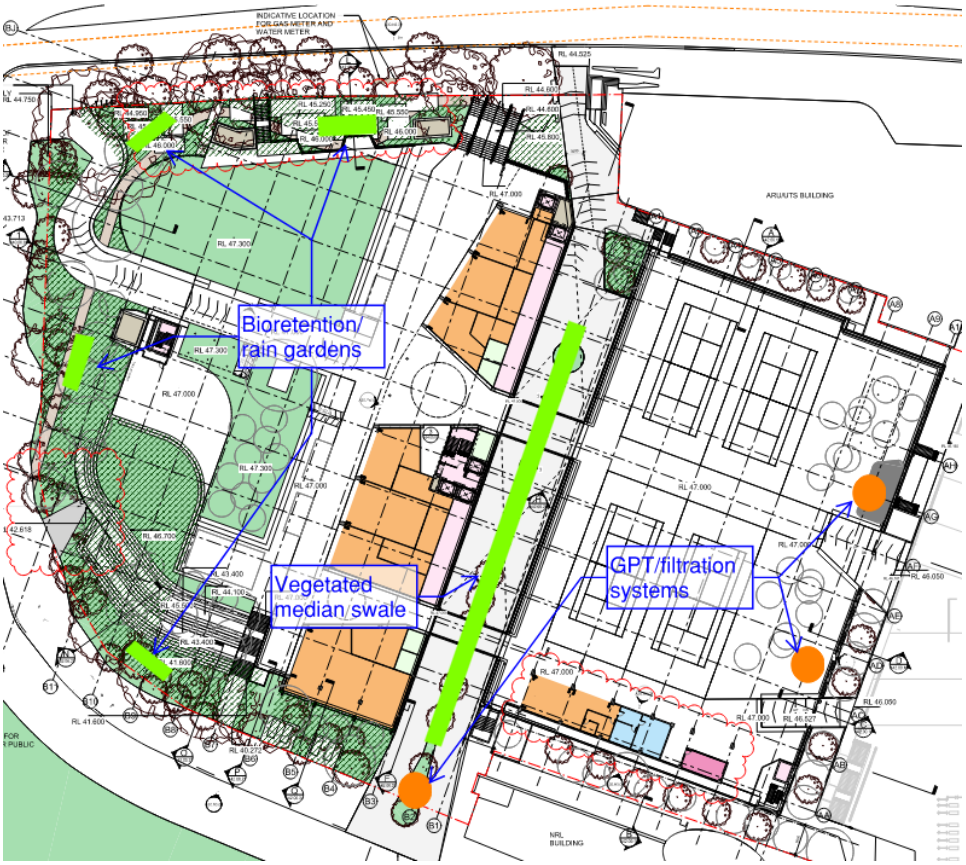


Figure 14: Proposed WSUD features

This strategy has been assessed using a preliminary MUSIC water quality model. The model has been set up using City of Sydney MUSIC Link parameters and follows the indicative grading strategy outlined in Section 9.2.4. A screenshot of the model is included in Figure 15.

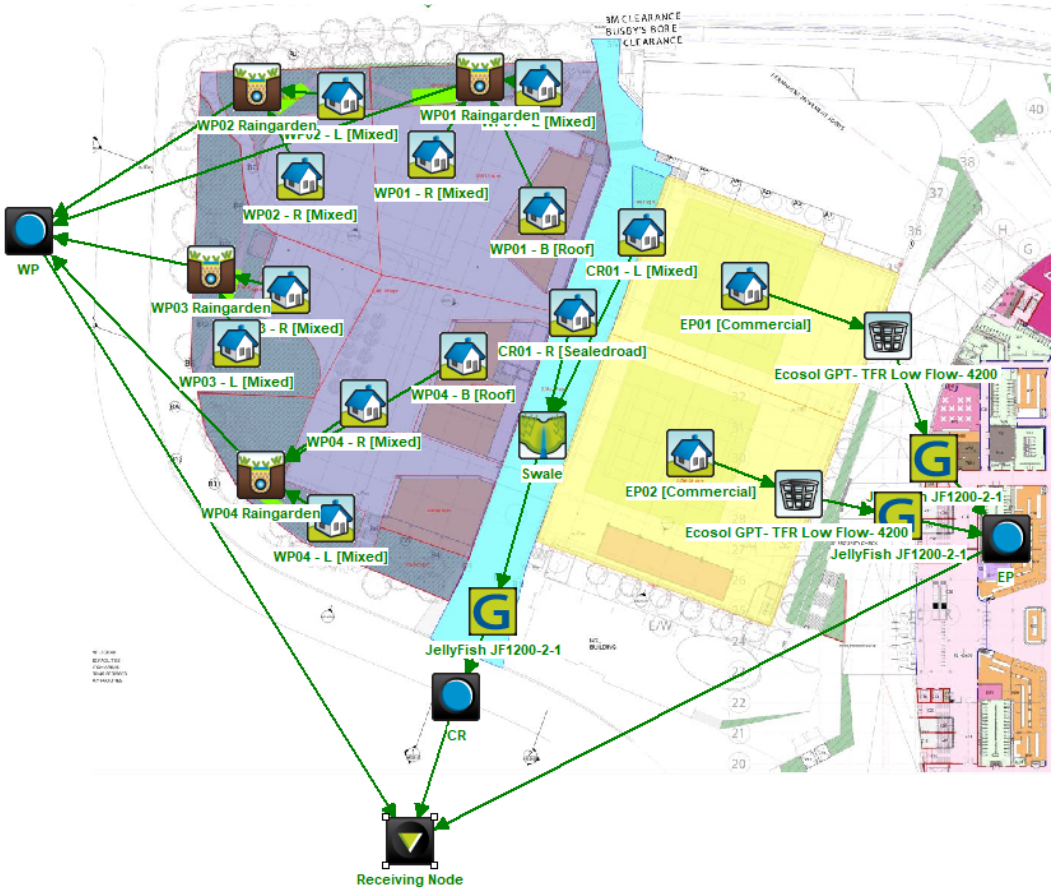


Figure 15: Site post-development MUSIC model

MUSIC model results are summarised in Table 4. These results show compliance can be achieved against the pollutant reduction targets for the site. This also represents a substantial improvement on the performance of the existing site which does not include any water quality treatment.

Table 4: MUSIC model results

REPORT				
% Load Reduction	None	None	4.74	✓
GP % Load Reduction	90	None	99.4	✓
TN % Load Reduction	45	None	63	✓
TP % Load Reduction	65	None	65.3	✓
TSS % Load Reduction	85	None	92.1	✓

It is anticipated that refinement of bioretention areas will be necessary as the precinct drainage network design and landscape design is developed. Further opportunities to incorporate bioretention and filtration systems will also be explored.

9.2.6 On Site Detention (OSD)

The Precinct Village and Car Park development will be independent of the SFS OSD provision, with runoff from the site bypassing those storages as discussed in Section 9.1.

OSD requirements for the Precinct Village and Car Park will need be confirmed by Sydney Water through a Notice of Requirements following submission of a Section 73 application once the Water Servicing Coordinator (WSC) has been appointed. This typically occurs post development approval and prior to obtaining the relevant Crown Certificate; this approach is intended to be taken for the Precinct Village and Car Park project.

As the existing MP1 car park is predominantly impervious, the proposal is not anticipated to increase the total volume of stormwater runoff from the site. However, due to the reduction in flood storage, the development has the potential to displace and concentrate flows both through the site and in the area downstream. To mitigate these potential impacts the proposal includes OSD. As discussed in Section 8.2, flood modelling indicates that flood impact can be managed through incorporation of a 450m^3 below-ground OSD tank at the north of the site adjacent to Moore Park Road and the UTS Rugby Australia building and a 150m^3 below-ground OSD tank within the footprint of the East Car Park. There is opportunity to refine these volumes during detailed design.

9.2.7 Site Water Balance

The Precinct Village and Car Park development involves the replacement of the existing above-ground car park with raised plaza areas and a central road. The existing car park surface is impermeable asphalt with minimal vegetation across the whole area.

The design proposal for the western plaza proposal includes green spaces that will act to slow stormwater runoff from the site in comparison to the existing site. Proposed bioretention rain gardens will also delay and reduce overall stormwater discharge from the site. The proposed central swale in the south-north access road will also act to slow runoff from the site. The eastern plaza area includes tennis courts and will be impermeable.

Based on the proposed changes to the surfaces within the site boundary, hydrological surface water impacts associated with the development are anticipated to include an overall reduction in stormwater discharge from the site. These impacts on the hydrological water balance of the site have been assessed using pre-development and proposed-case MUSIC water quality models for the site. The results from these models confirm that a reduction in total surface water runoff and stormwater discharge from the site is expected as shown in Table 5. This represents an improvement and brings the site closer to natural conditions.

Table 5: Summary of changes in site hydrological water balance

Scenario	Direct rainfall (ML/yr)	Site runoff (ML/yr)	Site stormwater discharge (ML/yr)
Pre-development	24.0	19.6	19.6
Proposed	24.0	17.5	16.7

Rainwater harvesting is not currently proposed for this development.

9.3 SFS Stormwater Planning Conditions

The relevant stormwater and flood risk related planning conditions associated with the SFS SSD approval (ref: SSD-9835) will be considered as part of the Precinct Village and Car Park detailed design, together with the strategies and commentary offered in this report. These relevant conditions are:

- SFS Condition of Consent B47 requires an appropriate Operational Stormwater Management System to be prepared, submitted and approved by the Certifying Authority prior to commencement of construction. The subclauses of this condition address a variety of stormwater management matters.

This report has demonstrated that Precinct Village and Car Park proposal is consistent with the SFS stormwater Condition B47 approved under SSD 9835. Notably, the stormwater management proposal is consistent with the SFS conceptual designs that were submitted with the EIS. As the stormwater drainage system will be integrated (in part) with the SFS system, it is also consistent with the water sensitive urban design strategy for the SFS.

10 Conclusion

This report has assessed the stormwater and flooding impacts of the proposed Precinct Village and Car Park on the surrounding area in the context of the approved SFS project.

A flood impact assessment has demonstrated that the Precinct Village and Car Park does not result in material adverse flood impacts on the surrounding area. A number of measures including the provision of OSD are proposed as a means to mitigate flood impacts and manage flood risk within the Precinct.

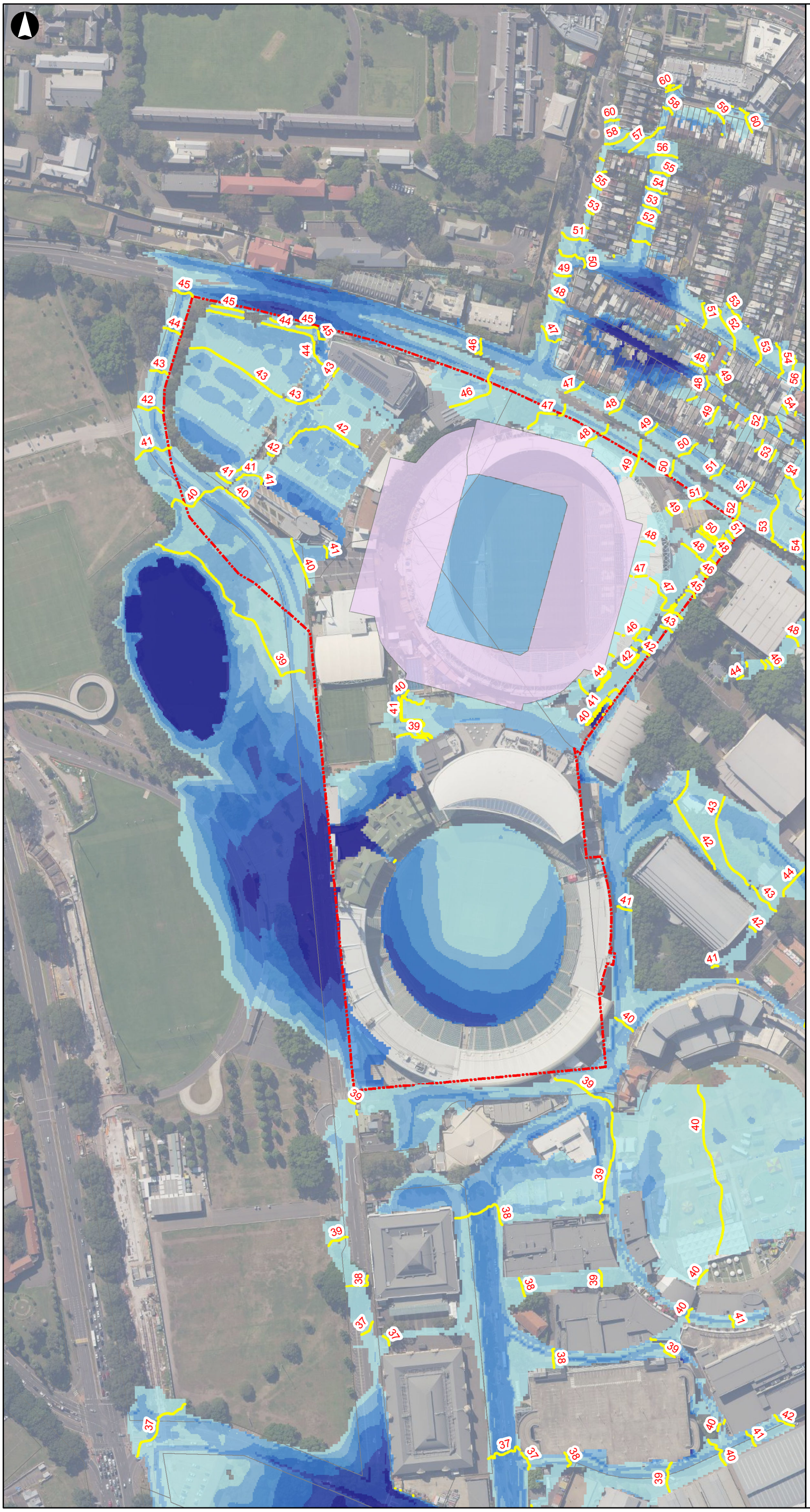
A stormwater drainage strategy has been developed that is consistent with the SFS strategy for management of surface water during construction and operation.

Based on this assessment it can be concluded that the proposed Precinct Village and Car Park development is consistent with the existing SSD 9835 consent in regard to stormwater and flood management.

Appendix A

Precinct Village and Car Park Flood Maps

A3



Issue	Date	By	Chkd	Appd
A	13/08/2021	MWB	AC	LM

Metres
0 40 80 160

ARUP

Barrack Place Level 5
151 Clarence Street
PO Box 76 Millers Point
NSW Sydney, 2000
Tel +61 (2) 9320 9320
Fax +61 (2) 9320 9321
www.arup.com

N

Client

venues.
new south wales

Job Title

Sydney Football Stadium
Precinct Village and Car Park

Peak Flood Depth and Level
Base Case Scenario
1% AEP Event

Scale at A3

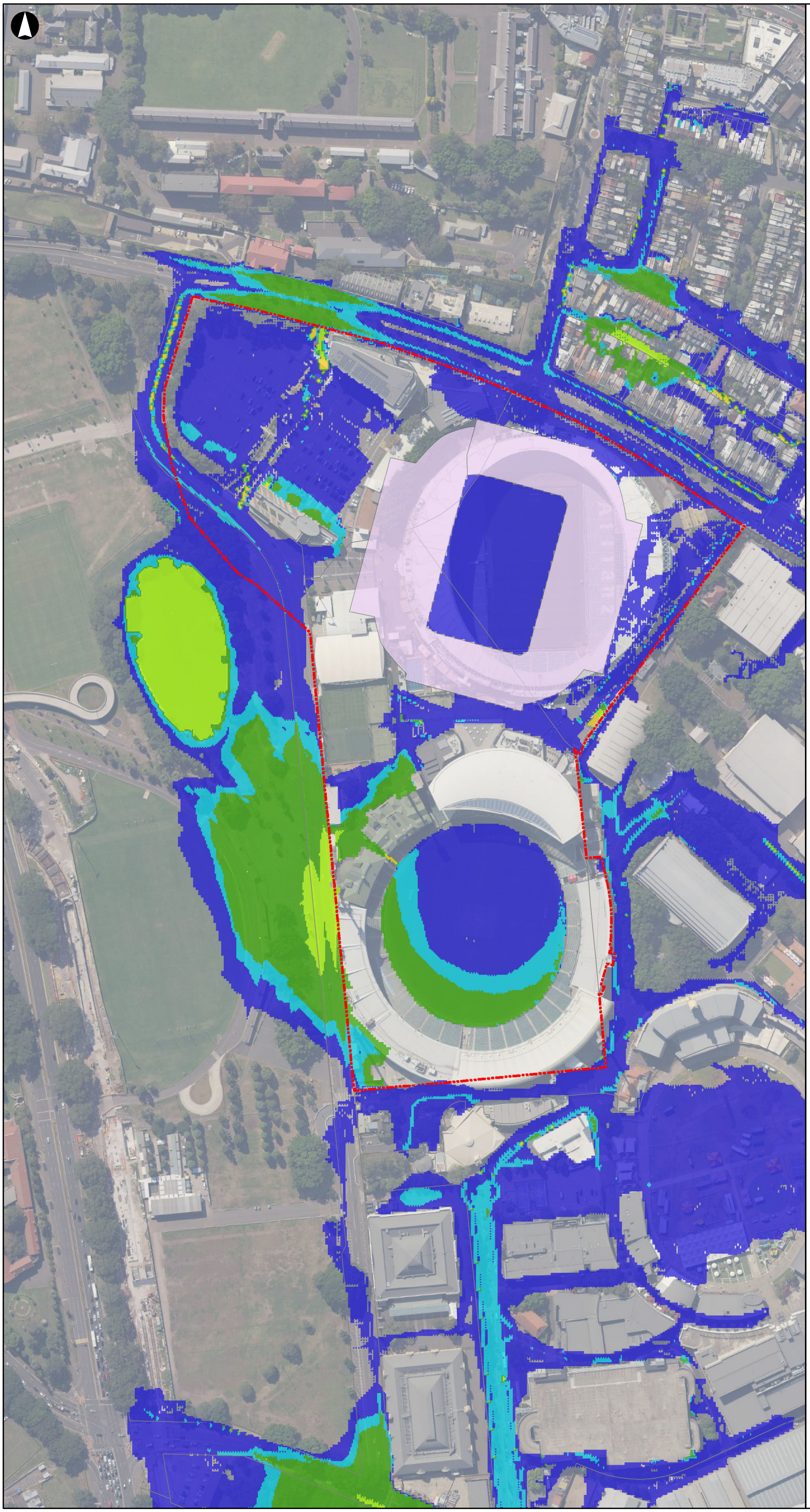
1:3000

Job No	Figure Status
282684	**Preliminary**

Figure No	Revision
001	**A**

J:\260000\260159-00 Sydney Football Stadium\Work\Internal\Design\Civil\Flooding\John_TUFLOW\GIS\mxd\Arup_Des18c\Figure1-Arup Des11 1AEP depth.mxd

A3



Legend

- Proposed SFS
- Venues NSW Boundary

Flood Hazard Classification

- H1
- H2
- H3
- H4
- H5
- H6

This figure has been provided for information only. Neither Arup, nor Venues NSW take any responsibility for the accuracy of the information contained within this figure. Before relying on the material in any matter, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.
Flooding and drainage network information shown is the property of the City of Sydney and Sydney Water.

Issue	Date	By	Chkd	Appd
A	13/08/2021	MWB	AC	LM

Metres
0 40 80 160

ARUP

Barrack Place Level 5
151 Clarence Street
PO Box 76 Millers Point
NSW Sydney, 2000
Tel +61 (2) 9320 9320
Fax +61 (2) 9320 9321
www.arup.com

N

Client

venues. new south wales

Job Title

Sydney Football Stadium
Precinct Village and Car Park

Flood Hazard Classification
Base Case Scenario
1% AEP Event

Scale at A3

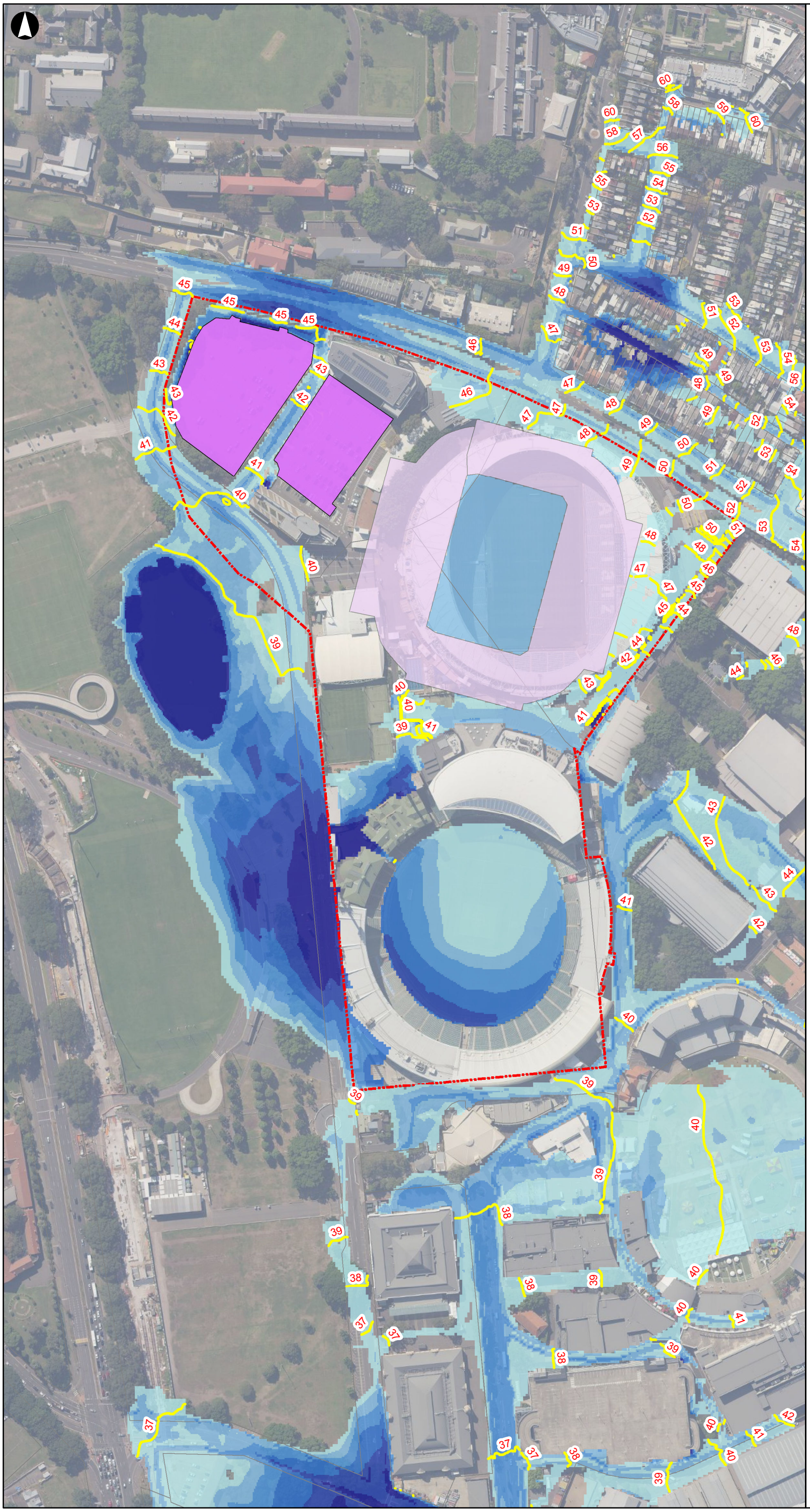
1:3000

Job No	Figure Status	Revision
282684	**Preliminary**	**A**

Figure No
002

J:\260000\260159-00 Sydney Football Stadium\Work\Internal\Design\Civil\Flooding\John_TUFLOW\GIS\mxd\Arup_Des18c\Figure2-Arup Des11 1AEP hazard.mxd

A3



Issue	Date	By	Chkd	Appd
A	13/08/2021	MWB	AC	LM

Metres
0 40 80 160

ARUP

Barrack Place Level 5
151 Clarence Street
PO Box 76 Millers Point
NSW Sydney, 2000
Tel +61 (2) 9320 9320
Fax +61 (2) 9320 9321
www.arup.com

N

Client

venues.
new south wales

Job Title

Sydney Football Stadium
Precinct Village and Car Park

Peak Flood Depth and Level
Proposed SFS Precinct Village and Car Park Development Scenario
1% AEP Event

Scale at A3

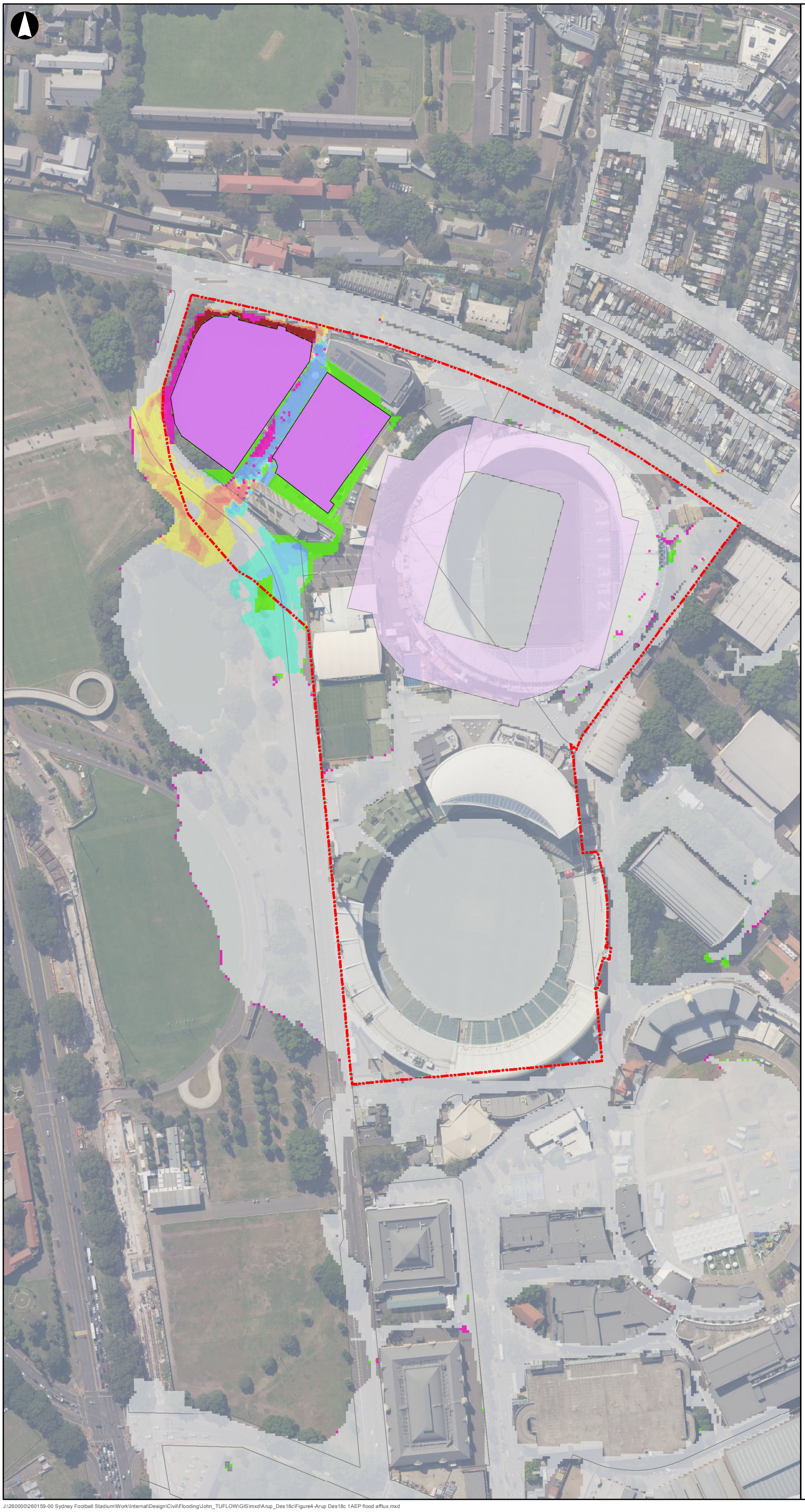
1:3000

Job No	Figure Status
282684	**Preliminary**

Figure No	Revision
003	**A**

J:\260000\260159-00 Sydney Football Stadium\Work\Internal\Design\Civil\Flooding\John_TUFLOW\GIS\mxd\Arup_Des18c\Figure3-Arup Des18c 1AEP depth.mxd

A3



Legend

- Proposed Car Park
- Proposed SFS
- Venues NSW Boundary

Peak Flood Level Change (m)

- < -0.10
- -0.10 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01 (No Impact)
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- > 0.30
- Was Wet Now Dry
- Was Dry Now Wet

Issue	Date	By	Chkd	Appd
A	13/08/2021	MWB	AC	LM

Metres

0 40 80 160

ARUP

Barrack Place Level 5
151 Clarence Street
PO Box 76 Millers Point
NSW Sydney, 2000
Tel +61 (2) 9320 9320
Fax +61 (2) 9320 9321
www.arup.com

N

Client

venues. new south wales

Job Title

Sydney Football Stadium
Precinct Village and Car Park

Peak Flood Level Change
Proposed SFS Precinct Village and Car Park Development Scenario
1% AEP Event

Scale at A3

1:3000

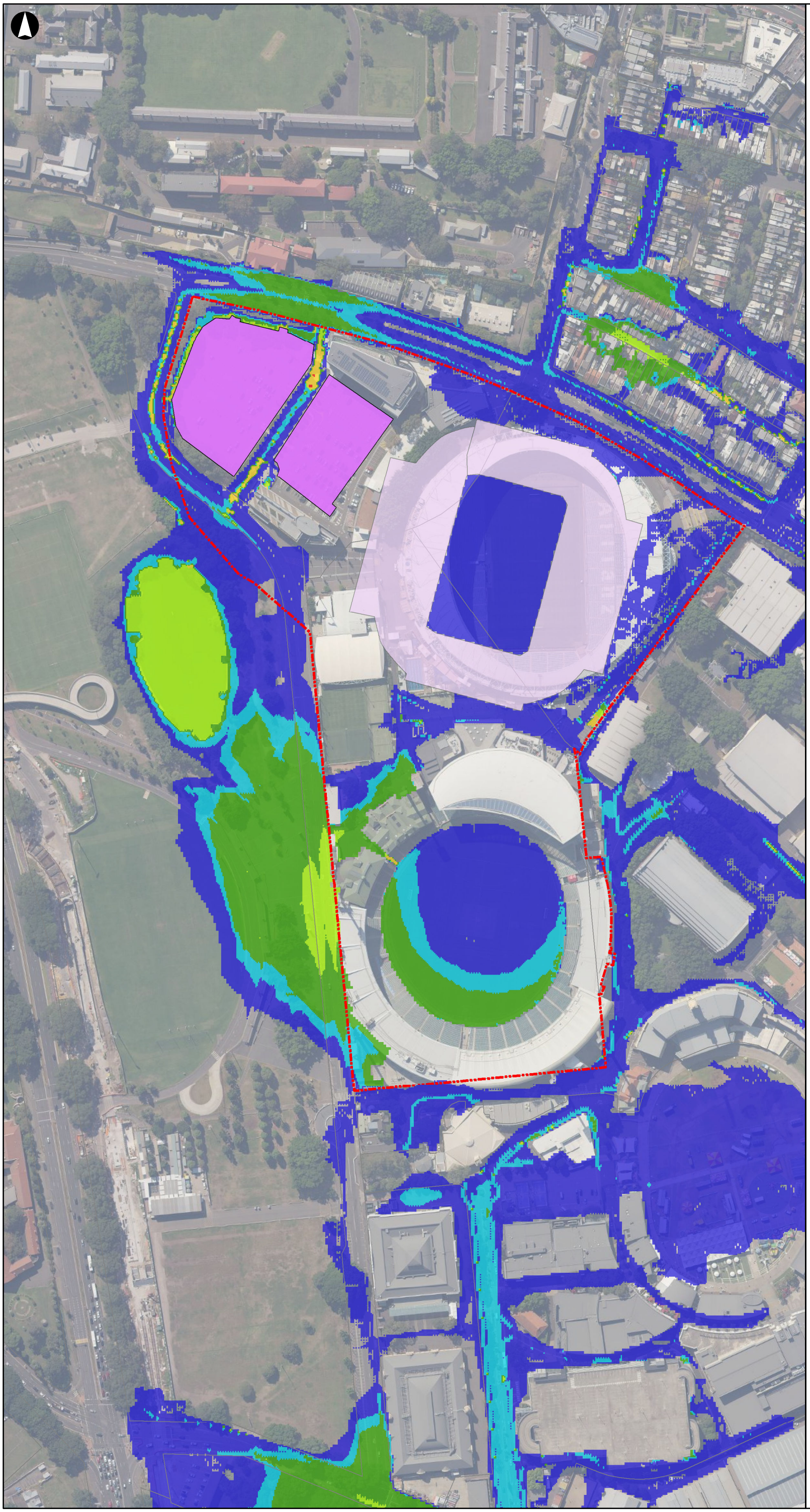
Job No	Figure Status	Revision
282684	**Preliminary**	**A**

Figure No

004

J:\260000\260159-00 Sydney Football Stadium\Work\Internal\Design\Civil\Flooding\John_TUFLOW\GIS\mxd\Arup_Des18c\Figure4-Arup Des18c 1AEP flood afflux.mxd

A3



Legend

- Proposed Car Park
- Proposed SFS
- Venues NSW Boundary

Flood Hazard Classification

- H1
- H2
- H3
- H4
- H5
- H6

This figure has been provided for information only. Neither Arup, nor Venues NSW take any responsibility for the accuracy of the information contained within this figure. Before relying on the material in any matter, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.
Flooding and drainage network information shown is the property of the City of Sydney and Sydney Water.

Issue	Date	By	Chkd	Appd
A	13/08/2021	MWB	AC	LM

Metres
0 40 80 160

ARUP

Barrack Place Level 5
151 Clarence Street
PO Box 76 Millers Point
NSW Sydney, 2000
Tel +61 (2) 9320 9320
Fax +61 (2) 9320 9321
www.arup.com

N

Client

venues. new south wales

Job Title

Sydney Football Stadium Precinct Village and Car Park

Flood Hazard Classification Proposed SFS Precinct Village and Car Park Development Scenario 1% AEP Event

Scale at A3

1:3000

Job No	Figure Status	Revision
282684	**Preliminary**	**A**

Figure No **005**

J:\260000\260159-00 Sydney Football Stadium\Work\Internal\Design\Civil\Flooding\John_TUFLOW\GIS\mxd\Arup_Des18c\Figure5-Arup Des18c 1AEP hazard.mxd

Appendix B

Consultation Record - Sydney Water

Minutes

ARUP

Project title	Precinct Village & Carpark, Moore Park	Job number	282684
Meeting name and number	Hydraulic Services Sydney Water Utilities 1	File reference	HF-MM-01
Location	Microsoft Teams	Time and date	10:00 am 21 July 2021
Purpose of meeting	To discuss the feasibility of Sydney Water utilities connections and diversions		
Present	Matthew Stivala (Arup) Louise Millward (Arup)		Jake Cherniayeff (Arup) Steven Avery (Sydney Water)
Apologies			
Circulation	Those present		

	Topic	Action
1.	**Cold Water**	
1.1	**Connection to existing carpark** • Existing connection to the site is not known. As-builts have been requested but not yet received.	Note
1.2	**Sydney Football Stadium connection** • SFS connection is close to capacity and the Precinct Carpark development is planned to be 'stand-alone'. • Therefore, it's proposed to have a separate connection for this development.	Note
1.3	**Assumed water main extension along Driver Avenue** • Confirmed that this is not a Sydney Water main extension. • It may be a private main extension, however its location needs to be confirmed.	Note
1.4	**Connection options** • Connections need to be assessed formally by Sydney Water through a WSC.	Note

Prepared by Matthew Stivala

Date of circulation 21 July 2021

Date of next meeting

2.	**Sewer**	
2.1	**400mm main cutting across North-West corner of site** • Building footprint isn't proposed above the sewer line, however landscaping is proposed and change of ground level may be required. • Generally, the sewer line can be built over, however needs to be formally assessed by Sydney Water through a WSC.	Note
2.2	**Sewer main capacities** • SFS discharges 30 L/s to the 300mm sewer main in Moore Park Road. • SFS discharges 20 L/s to the 225mm sewer main in Driver Avenue. • It is expected that the 225mm sewer main in Driver Avenue is at capacity. Connecting into this asset would likely require main upgrades. However, it needs to be assessed formally by Sydney Water. • It's unknown if the 300 / 400mm sewer main in Moore Park Road is at capacity and if the proposed development can discharge into it. It needs to be assessed formally by Sydney Water.	Note
3.	**Stormwater**	
3.1	**600mm main traversing through the Stage 2 site** • Diversion is necessary. • Either diversion option (either along Driver Avenue or through the site's central road) may be feasible.	Note
3.2	**1500mm main traversing through the Stage 1 site** • This service is proposed to remain in its current location, where it would pass beneath the eastern carpark. • It will be accessible through the carpark. Build over proposals will need to be formally assessed by Sydney Water.	Note
3.3	**General** • Stormwater assets require open access from above. • Development plans, dimensions, elevations, etc. are to be submitted with the Sydney Water application so it can be	Note

	verified that adequate access to the stormwater assets are maintained.	
4.	**Busby's Bore**	
4.1	**E-W section location** • A Veris survey was completed in May 2018 which locates the E-W section of Busby's Bore in a different location to the Sydney Water DBYD survey.	Note
4.2	**General** • Busby's Bore location and requirements need to be discussed further with Sydney Water.	Note