ARCADIS Design & Consultancy for natural and built assets

Moorebank Precinct West Stage 2 Proposal
Response to Submissions

Appendix H: Stormwater and flooding environmental assessment

SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant Development

May 2017

CONTENTS

FIGURES

TABLES

ATTACHMENTS

DRAWINGS

1 INTRODUCTION

SIMTA are seeking approval for the construction and operation of the Moorebank Precinct West (MPW) Stage 2 Proposal (the Proposal), which will be the second stage of development under the MPW Concept Approval (SSD 5066).

An Environmental Impact Statement (EIS) was prepared for the Proposal seeking approval under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In particular, the EIS was prepared to address, and be consistent with, the following:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7709) for the Proposal, which were issued on 14 July 2016
- The relevant requirements of the MPW Concept Approval (SSD 5066) granted by the Planning Assessment Commission (PAC) on 3 June 2016
- The relevant requirements of the approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6086).

The EIS was publicly exhibited, in accordance with clause 83 of the *Environmental Planning and Assessment Regulations 2000* (EP&A Regulations), between 26 October 2016 and 25 November 2016. During this exhibition period, submissions were invited from all stakeholders including members of the community and government stakeholders. In response to the submissions received, and also to respond to design progression, amendments have been made to the Proposal (the Amended Proposal), as detailed below.

1.1 Report purpose

The purpose of this report is to provide further environmental assessment for the Amended Proposal and serve as an addendum to the Moorebank Precinct Intermodal Terminal Facility – MPW Stage 2 Stormwater and Flooding Environmental Assessment provided within the EIS. A summary of the works included in the Amended Proposal is provided below.

1.1.1 Amended Proposal

The MPW Stage 2 Proposal (the Proposal) involves the construction and operation of an intermodal terminal (IMT) facility to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum. The Proposal also includes the construction and operation of approximately 215,000 m^2 GFA, freight village (800 m^2) and associated infrastructure.

The Amended Proposal alters the Proposal based on design development, submissions received from government agencies and the community during exhibition of the EIS and consultation with key stakeholders. A summary of the amendments to the Proposal is as follows:

- Alignment of the operational hours for warehouses to the IMT facility and Port freight operations to enable freight movements outside of peak traffic times
- Drainage works:
  - Inclusion of the OSD (Basin 10) and relocation of another OSD (Basin 3) along the eastern boundary of the operational area, adjacent to the western verge of Moorebank Avenue
  - Re-sizing of OSD basins along the western boundary of the operational area
  - Reduction to the widths of selected OSD outlet channels
  - Provision of an additional covered drain within the Endeavour Energy easement
- Identification of container wash-down facilities and de-gassing areas within the IMT facility
- Illuminated backlit signage within the warehousing area
- Inclusion of an upgraded layout for the Moorebank Avenue/Anzac Road intersection
- Adjustments to warehouse layouts.

The amendments to the Proposal are shown in Figure 1.

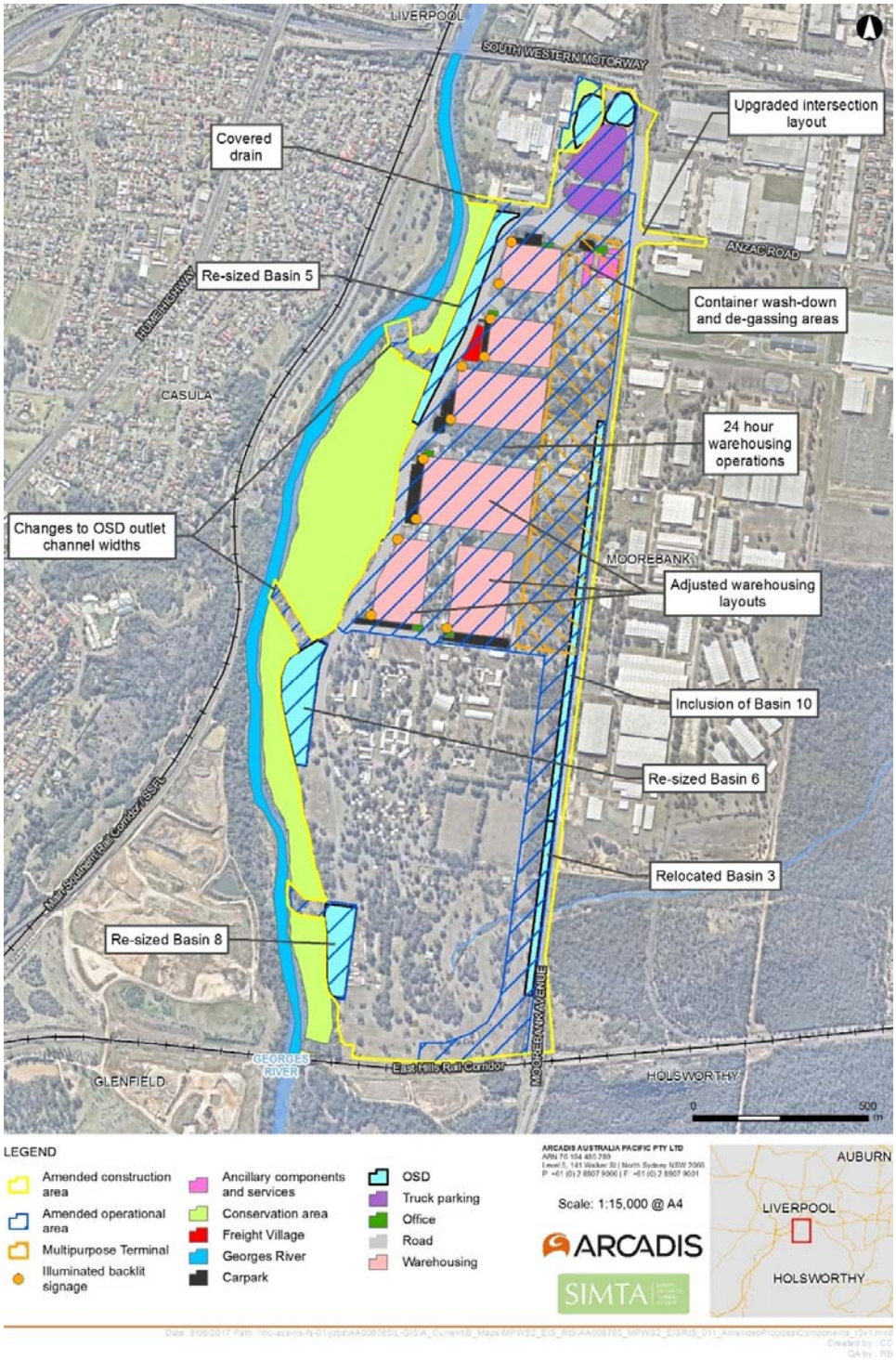

Figure 1: Amendments to the Proposal

2 IMPACT ASSESSMENT

2.1 MPW Stage 2 Proposal (EIS) Assessment

The assessment undertaken for the EIS was prepared to respond to both the MPW Concept Approval (SSD 5066) and the SEARs (SSD 7709) and involved:

- rainfall/runoff hydrologic and hydraulic assessments to identify potential adverse stormwater and flood impacts and demonstrate that the Proposal would effectively mitigate such potential impacts.
- development of an erosion and sediment control plan (ESCP).
- water sensitive urban design (WSUD).

The outcomes of the above-noted assessment resulted in the following findings, recommendations and conclusions.

- The HEC-RAS waterway modelling affirmed that potential adverse flood impacts along the Georges River would be adequately mitigated by limiting the Proposal site raising to areas above the 1% AEP.
- The DRAINS rainfall-runoff modelling indicated that the:
  - proposed drainage systems and on-site detention (OSD) would provide adequate system capacities and mitigate potential adverse flood impacts that may otherwise result from the Proposal.
  - northern Moorebank Avenue widening (extending from the M5 Motorway to north of Anzac Road) as part of the Anzac Road/Moorebank Avenue intersection can be appropriately aligned, and in conjunction with stormwater system upgrades, mitigate potential adverse flood impacts.
  - introduction of a channel system downstream of the existing MPE site culvert crossing Moorebank Avenue, would adequately convey flows through the Proposal site to the Georges River.
- Hydraulic modelling of the OSD outlet channels (incorporating backwater analysis methodology or equivalent, e.g. HEC-RAS software) is required to facilitate the design of the channels and demonstrate their effectiveness with respect to energy dissipation and scour protection elements.
- The preliminary ESCP demonstrates how potential water quality impacts would be mitigated during construction of the Proposal.
- The stormwater quality modelling demonstrated that implementation of the WSUD measures identified, including the use of gross pollutant traps and rain gardens, would result in a 'neutral or beneficial effect' on water quality as a result of the Proposal during operation.
- A number of design considerations to optimise stormwater management along Moorebank Avenue were identified. These included:
  - 2-dimension rainfall-runoff modelling analysis of the Moorebank Avenue corridor. This modelling would further inform the detailed design of the northern Moorebank Avenue widening and channel system (at the MPE culvert crossing location) and confirm hydraulic performance and stormwater/flood mitigation approach.
  - it is also recommended that consideration be given to the construction timing of future design stages (on the eastern side of Moorebank Avenue) with respect to management of greater than 100 year ARI flows.

  The above aspects have informed design development undertaken and were used to inform the drainage component of the Amended proposal (Refer to Section 2.2).

2.2 Amended Proposal Assessment

2.2.1 Inclusion of the OSD along the eastern boundary

Introduction

Further design progression, as outlined in Section 2.1 of this report, has identified the need for an OSD storage along the eastern boundary of the MPW site, between the IMT facility and Moorebank Avenue to improve the drainage of the Proposal site and the surrounding land uses. As a result, an OSD (Basin 10) is to be provided along the eastern boundary of the Proposal site. In particular, this OSD (Basin 10), aligns with the 'western OSD' as it is identified and included within the MPE Stage 2 Proposal (SSD 7628). Basin 10 has been included within this Proposal to highlight the need for this OSD for both approvals and to ensure alignment between the two operations and their respective approvals.

This OSD Basin 10 would also be, in part, used for drainage from the MPE Project (during both construction and operation) and Moorebank Avenue to the east of the Proposal site.

As outlined in Figure 3, stormwater runoff from within the Proposal site, MPE site and Moorebank Avenue would be conveyed through pit and pipe systems to Basin 10. Water from the OSD would then discharge to the main culvert/channel (to the north) that flows westwards through the MPW site and discharges to the Georges River.

Assessment Methodology

This assessment methodology has been prepared based on the SEARs (SSD 7709) provided for the Proposal and the detailed assessment provided within both the EIS and the Stormwater and Flooding Environmental Assessment (Appendix R of the EIS). DRAINS software has been used to generate rainfall runoff models that represent both existing site conditions and post- development site conditions to enable a comparison of discharges and to quantify Basin 10's performance. These DRAINS models (described below) are the same as those prepared for MPE Stage 2 Proposal (SSD 7628).

Existing Conditions

Modelling of existing flooding conditions includes site areas on both the western (MPW site) and eastern (MPE site) sides of Moorebank Avenue in their current conditions (refer to the attached Revised Stormwater and Drainage Design Drawings).

The Proposal base case (existing) condition includes drainage to be provided as part of the MPE Stage 1 Project. The assessment of the Proposal has adopted existing condition (i.e. pre-MPE Stage 1) site discharges for the purposes of setting discharge target flows for the Proposal (and MPE Stage 2) works, since:

- The detailed design and construction of the MPE Stage 1 Project is yet to be completed
- The requirements are that MPE Stage 1 discharges are to be no greater than for existing conditions.

Figure 2 also identifies the catchment areas of the Proposal site that flow towards Moorebank Avenue, and contribute to flows at Outlet C.

The DRAINS modelling has been undertaken for storm durations of 5 minute to 24 hours for the 2 year, 5 year, 10 year, 20 year, and 100 year ARIs, and 15 minute to 6 hours probable maximum precipitation (PMP) events.

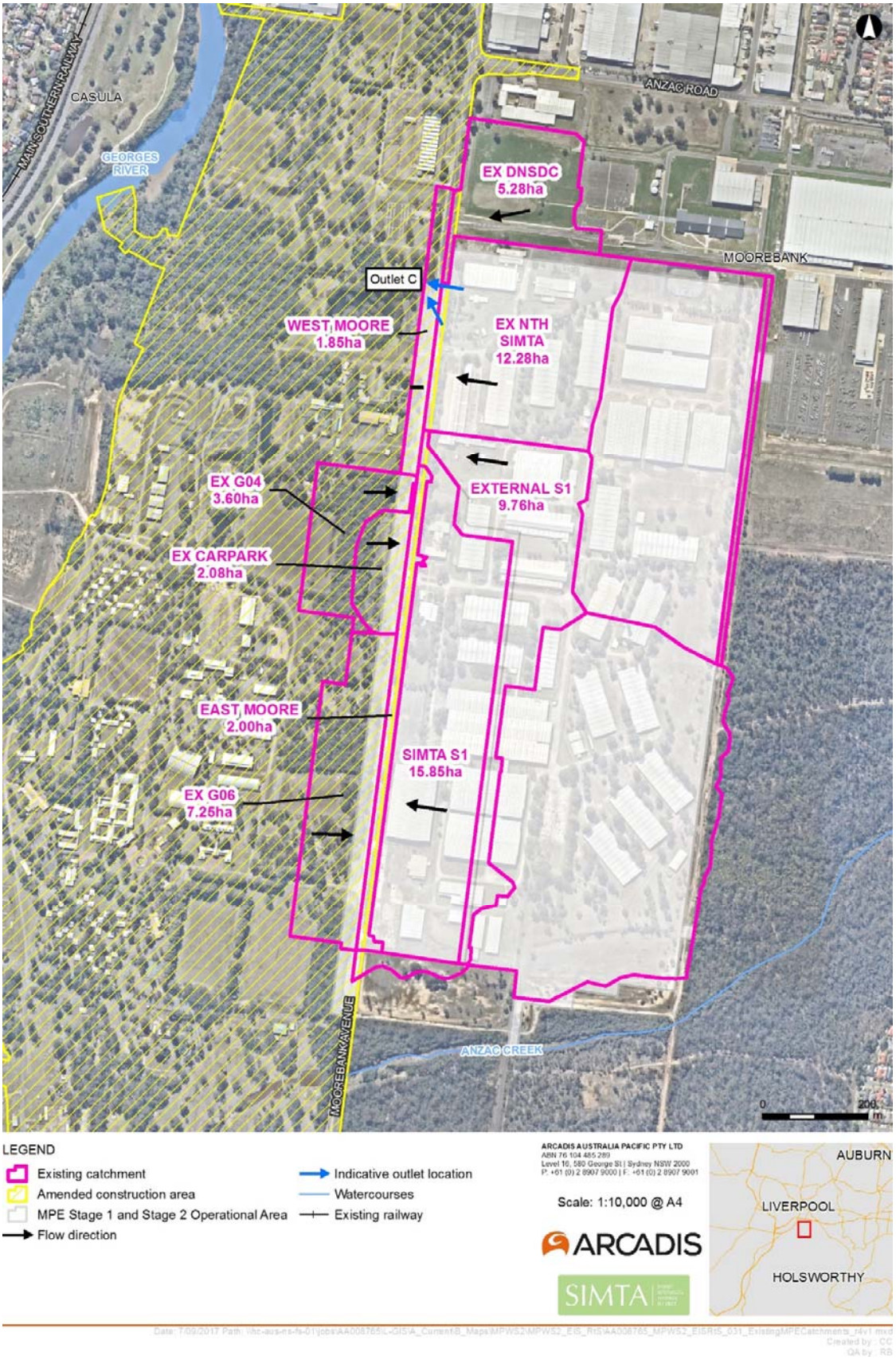

Figure 2: Existing catchment associated with Basin 10

Proposed Site Development Conditions

In demonstrating compliance with the SEARs (SSD 7709), analysis and design of the Proposal site under developed conditions has been undertaken with DRAINS rainfall runoff modelling. This DRAINS modelling takes into account surrounding drainage infrastructure to be installed under separate approvals, namely the MPE precinct. These projects and related drainage strategies have been considered to provide a holistic approach to drainage design for the Moorebank Precinct, and its immediate surrounds.

The existing conditions DRAINS modelling was adjusted to represent the post development site conditions as outlined in Figure 3 and in the accompanying Revised Stormwater and Drainage Design Drawings. Model adjustments have included:

- Changes to sub-catchment boundaries. A sub-catchment plan that represents the layout adopted for the proposed conditions DRAINS model is included in the Revised Stormwater and Drainage Design Drawings.
- Increased imperviousness (to be 100% impervious) and reduced flow travel times representative of the proposed development (IMT Facility, warehousing and pavement areas).
- Introduction of Moorebank Avenue concept cross-drainage and long-drainage systems.
- Basin 10 detention storage which will service the proposed MPW Stage 2 and MPE catchments that drain into OSD (refer to Figure 3).
- Detention storages which will service (and are subject to separate approvals and approval applications) the MPE Precinct, namely Basins 1, 2, 9 and 10[1] (refer to Figure 3). The two detention storages (Basin 9 and Basin 10) that discharge westward from the MPE operational area have been configured such that Basin 9 discharges westward into the channel/culvert system which extends under Moorebank Avenue to the Georges River. However, as indicated in the drawings, additional (east-west) cross drainage systems which service the MPE Precinct and the western area of the Proposal site also drain to Basin 10.

[1] Approval for Basin 10 is sought in both the MPW Stage 2 (SSD 7709) Proposal and MPE Proposal as this basin is integral to the operation of both sites. The design of the basin is consistent within each proposal.

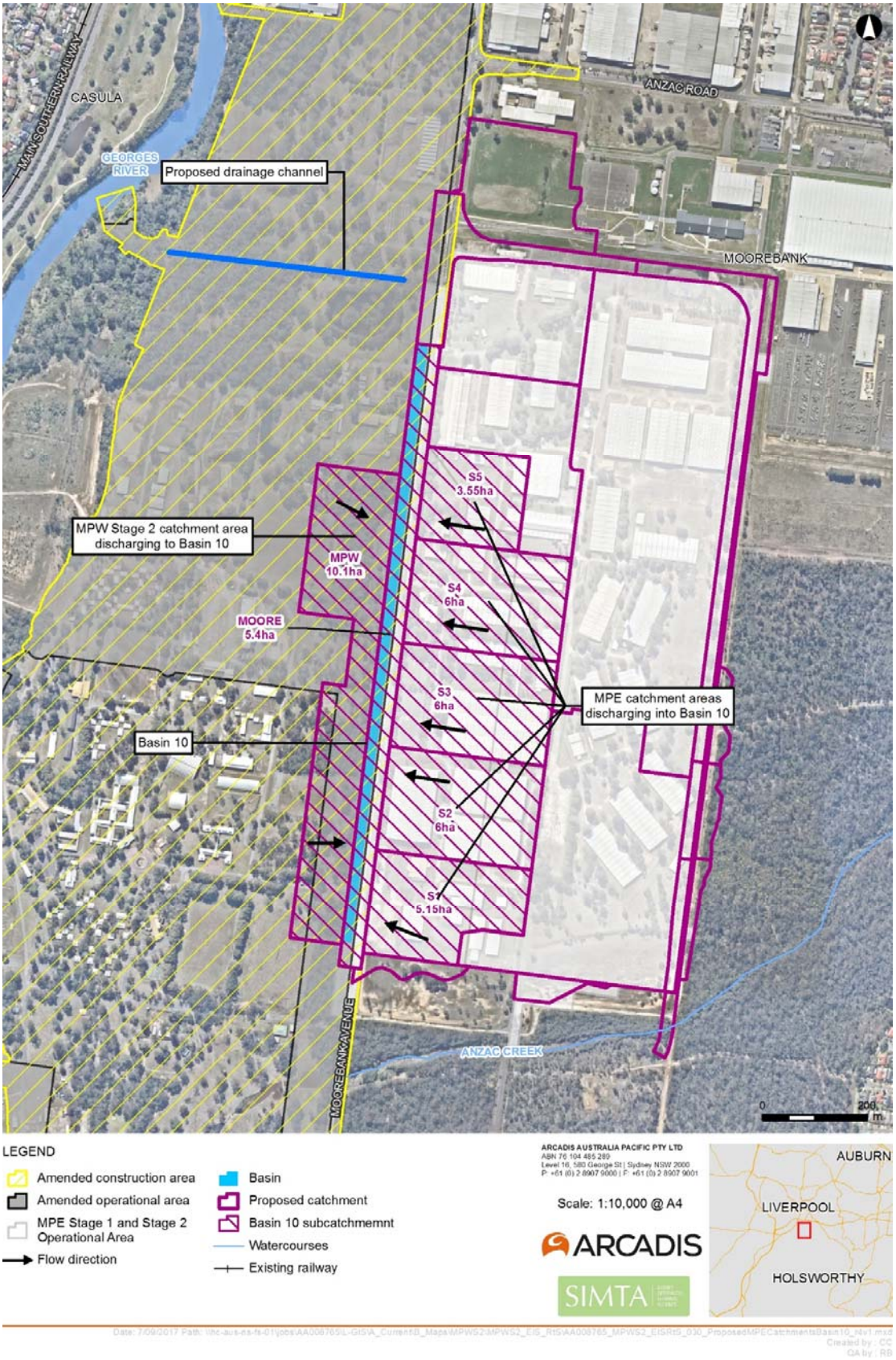

Figure 3: Proposed catchments associated with Basin 10

Assessment Results

A comparison of DRAINS model existing condition and post-development condition flows at the downstream of the Proposal site (see Figure 3 above) is included in Table 1 with a fuller comparison (being for a range of storm durations) provided in ***Attachment A***. The results indicate that the proposed detention storages would adequately mitigate potential flow increases leaving the Proposal site.

A summary of the performance of the OSD storage is provided in Table 2.

Table 1 Outlet C Existing Conditions and Proposed Development Peak Flows

Discharge Location	Site Condition	Catchment Area (ha)	DRAINS Model Label	Flow (m^3/s)				
				5yr ARI	10yr ARI	20yr ARI	100yr ARI	PMF*
Outlet C (just downstream of Moorebank Avenue)	Existing	59.95	EX Channel	6.9	8.2	9.9	12.9	75
	Proposed	61.72	Channel	4.7	5.2	5.7	6.9	120

* PMF is indicatively only, natural storages within the catchment and inter-catchment flow has not been considered

Table 2 Basin 10 Detention Storage Performance Summary

Storage [water quality extended detention level mAHD]	Catchment Area (ha)	Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Water Level (mAHD)	Volume * (m^3)
Basin 10 West Georges River Moorebank Ave – u/s of Outlet C [13.5]	42.20	100 year	25.1	3.1	15.57	24000
		PMF	105	80	17.5	46400

* Approximate active storage above water quality extended detention water level of 13.5mAHD.

Mitigation Measures

No additional mitigation measures are required for the construction or operation of the Amended Proposal with regards to the inclusion of Basin 10.

2.2.2 Northern Stormwater Drainage

Introduction

Additional site survey undertaken in the northern area of the Proposal site (to the north and south of Bapaume Road) has provided further insight on existing drainage systems and flow regimes in these areas (as outlined in Figure 4). In particular:

- to the south of Bapaume Road is a stormwater conduit system that conveys flows westward and discharges (via a 900 mm diameter pipe) into the Georges River that had not previously been identified.
- along Bapaume Road a Council owned stormwater conduit system that also appears to serve the existing Amiens wetland has been identified.

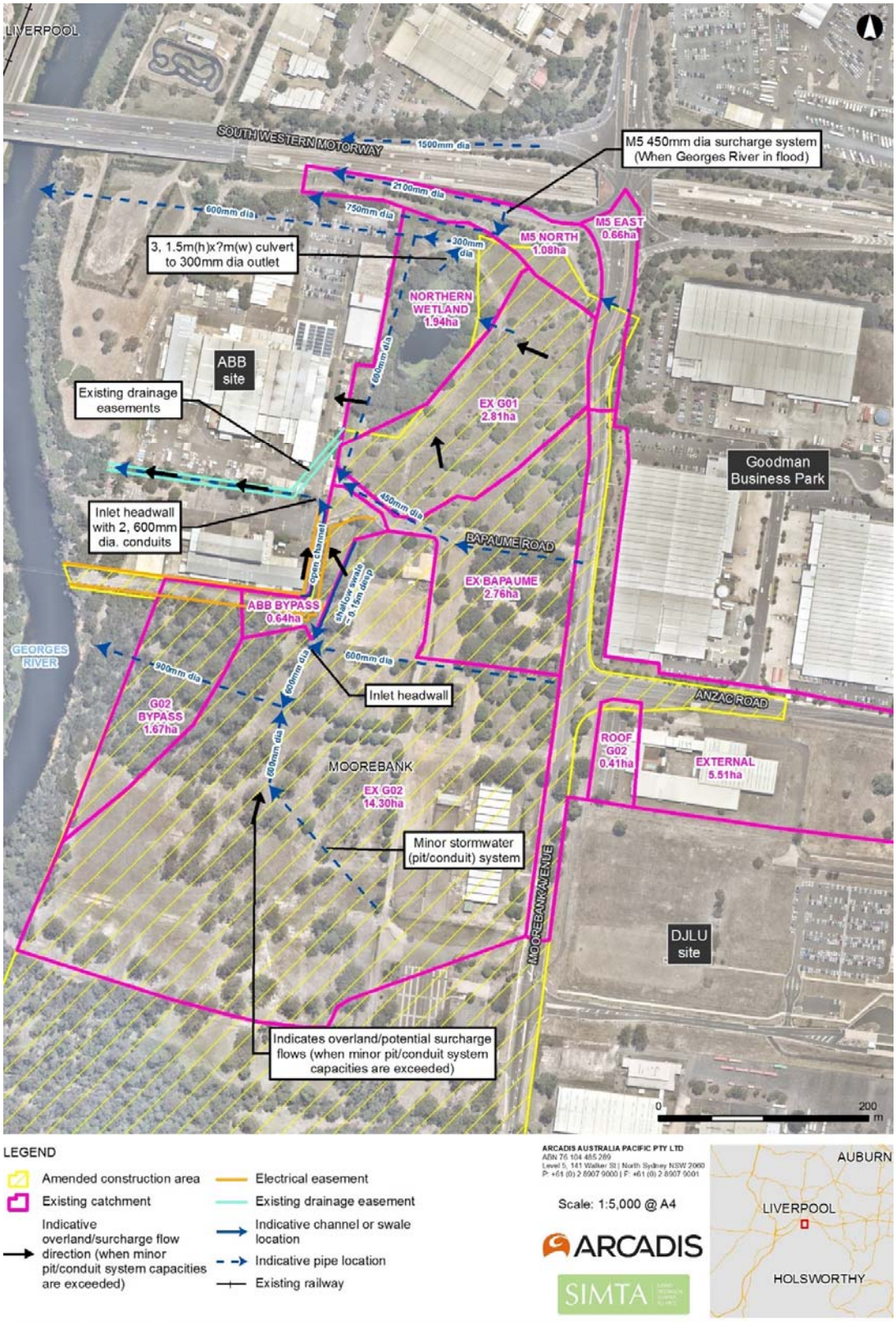

Figure 4: Northern MPW area stormwater drainage for existing conditions

Assessment Methodology

The earlier DRAINS models generated for the EIS have been updated and refined to more adequately represent rainfall-runoff for both existing and post development site conditions.

Furthermore, a water balance assessment has been undertaken to quantify potential changes in surface runoff volumes which may potentially influence flood impacts. The water balance has been determined by:

- MUSIC modelling using a representative continuous 10-year rainfall simulation, and
- DRAINS modelling of storm events (5 minute to 24 hours for the 3 mth, 5 year, 10 year, 20 year, and 100 year ARIs.

  The DRAINS modelling has been based on conditions when the Georges River water levels would be low (i.e. the catchment stormwater conduits would be freely discharging into the Georges River). However, that said, the DRAINS modelling of rainfall-runoff volumes has informed on stormwater management and flood mitigation performance for conditions when the Georges River water levels would be high (i.e. the catchment stormwater conduits would be closed off by the floodgates at the Georges River).

Existing Conditions

Existing drainage systems within this northern area of the Proposal generally discharge westward from Moorebank Avenue to the Georges River. Key features of these systems are outlined in Figure 4 and are described as follows.

The Bapaume Road stormwater conduit system itself is understood:

- to extend westward until the western end of Bapaume Road, then
- 'dog-leg' northward along the western side of the Amiens Wetland. At this northern extent, this system receives inflows from a ~300 mm diameter conduit system which serves as the Amiens Wetland outlet control system; before angling westward to the Georges River.

To the north of Bapaume Road, a description of the Amiens wetland drainage interfacing with the M5 South Western Motorway drainage is as follows.

- The permanent water level of the Amiens wetland (6.8 mAHD) is controlled by its northern culvert outlet which discharges overland into a surface stormwater pit within which is an outlet conduit of approximately 300mm diameter. Some 25 meters downstream (to the west the surface inlet pit) the 300mm diameter conduit combines with the Council drainage system (~600mm diameter) from Moorebank Avenue/Bapaume Road, and continues westward to the Georges River.
- The M5 Motorway (located immediately north of the Amiens wetland area) is served by several drainage systems, namely:
  - An inlet pit within the M5 Motorway southern road reserve with a top of grate at 7.59 mAHD, linking to a 750 mm diameter conduit which extends to the Georges River. The conduit outlet has its invert level (IL) at 4.50mAHD and fitted with a non-return floodgate. It is noted that the Georges River 100 year ARI flood level at this location (adopted by Council) is 10.4 mAHD.
  - a 1500 mm diameter conduit on the north side of the M5 Motorway which extends to the Georges River. This conduit outlet has its IL at 5.07 mAHD and is fitted with a non-return floodgate.
  - a 2100 mm diameter conduit on the south side of the M5 Motorway which extends to the Georges River. This conduit outlet has its IL at 4.50 mAHD and is fitted with a non-return floodgate.
  - When the M5 Motorway floodgates are closed, this will prevent Georges River return flows, and conversely prevent water discharging from the Amiens wetland.

To the south of Bapaume Road at the location of the existing 750 mm diameter (drop pit) outlet (which originates from the 900 mm diameter pipe discussed above) where there is significant local scouring present (refer to Figure 5**)**.

Figure 5 Existing 750mm outlet scouring (on the east bank of the Georges River)

The DRAINS modelling has been undertaken for storm durations of 5 minute to 24 hours for the 2 year, 5 year, 10 year, 20 year, and 100 year ARI events, on the basis that the catchment stormwater conduits are freely discharging into the Georges River. However, the modelling also quantifies catchment rainfall-runoff volumes which informs on potential flow conditions when the Georges River water levels would be high (and the stormwater floodgates may be closed).

Proposed Site Development (Amended Proposal) Conditions

Stormwater management for the proposed development has been represented by adjusting the existing conditions DRAINS modelling. As outlined in Figure 6 (and the Revised Stormwater and Drainage Design Drawings), the model adjustments have included:

- Changes to sub-catchment boundaries.
- Increased imperviousness (including within site pavement areas and Moorebank Avenue and Anzac Road widening) and associated reduced flow travel times.
- Introduction of concept drainage systems.
- Removal of the existing 900 mm/750 mm diameter drainage line that discharges into the Georges River.
- Introduction of a covered drain and associated outlet into the Georges River partly within the existing electrical easement.
- OSD Basin 4, located in the north-eastern part of the Proposal site (previously assessed within the EIS, however, also included here for completeness)

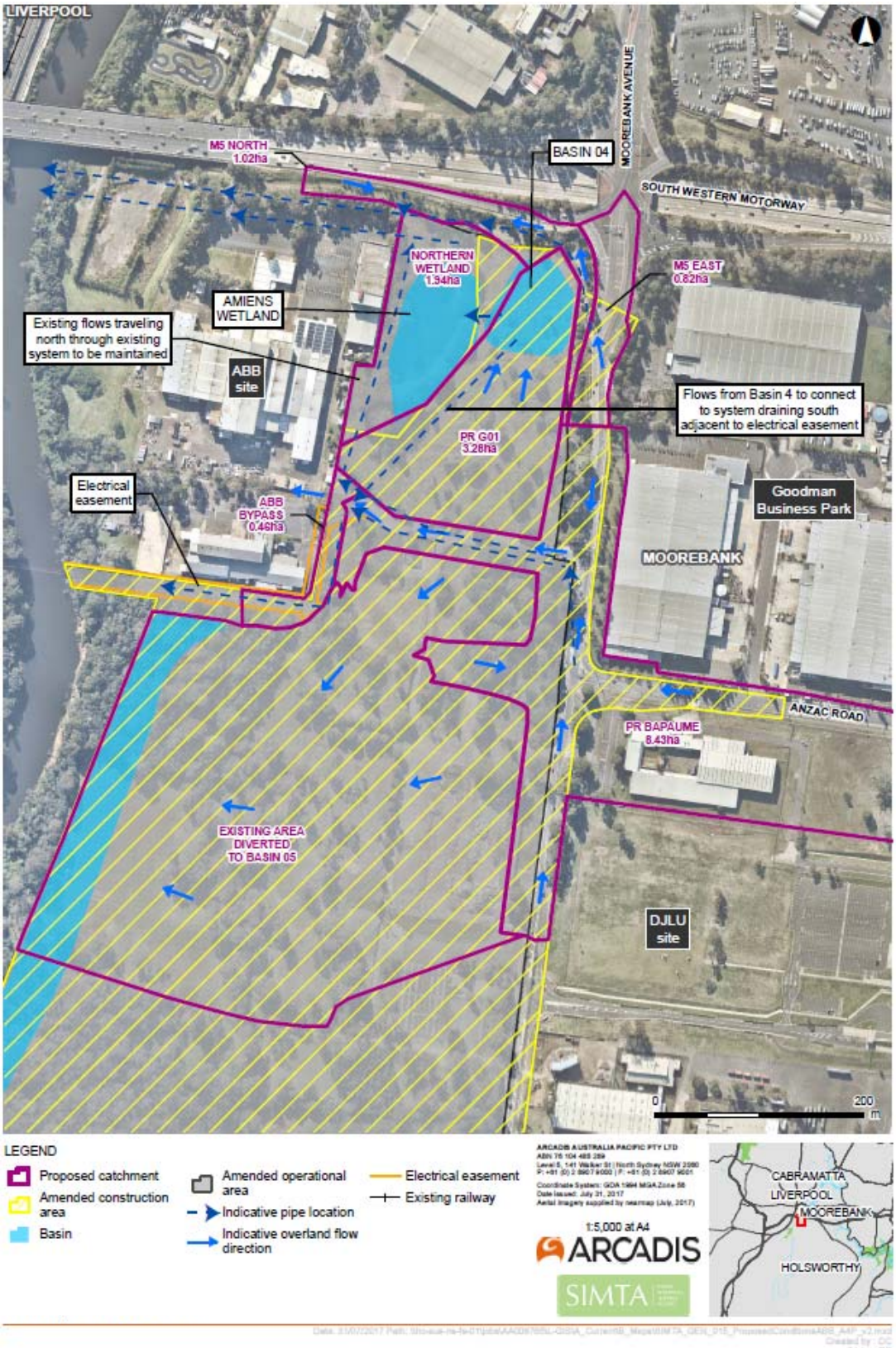

Figure 6: Northern MPW stormwater drainage for proposed development conditions

A key aspect of the proposed stormwater system is to not increase any flows through the neighbouring ABB site and as best possible replicate existing conditions. As a result, no works are proposed on the ABB site.

The proposed stormwater management captures and conveys site runoff from:

- the north of Bapaume Road into proposed Basin 4.
- the south of Bapaume Road into proposed Basin 5.
- Bapaume Road, Moorebank Avenue, Anzac Road and eastern external catchment areas, westward through the Proposal site so as to maintain/replicate existing flow conditions, by:
  - re-use of the existing Liverpool City Council drainage system (where possible) from the western end of Bapaume Road northward then westward along the M5 Motorway boundary to the Georges River.
  - introduction of drainage systems which will convey flows to Basin 5 and the proposed covered drain (partly within the existing electrical easement) to the Georges River.

The water balance assessment (refer to ***Attachment B***) for the Amiens wetland indicates that initial 'environmental' low flow discharges from proposed Basin 4 into the (Amiens) wetland, with less frequent storm event discharges from Basin 4 bypassing the wetland, would replenish the wetland while mitigating potential flood impacts on neighbouring areas.

In doing so, the water balance assessment for 'base' case (existing) conditions has taken into account the areas development history (based on Figure 7 aerial photos), indicating the wetland being serviced by a significantly larger catchment area, and extensive housing development.

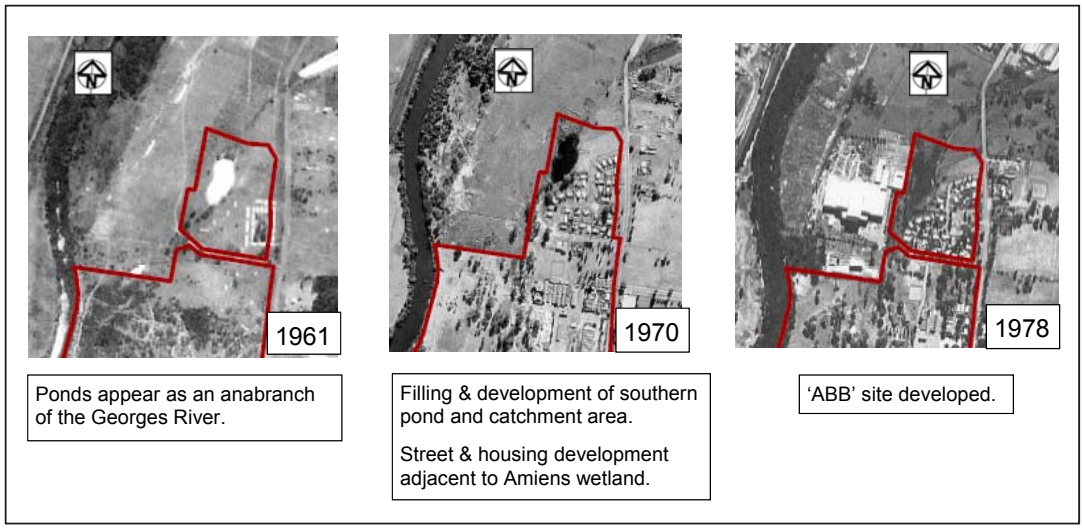

Figure 7: Historic aerial photos of the wetland development

Assessment Results

A comparison of DRAINS model existing condition and post-development condition flows at key locations is included in Table 3. A summary of the performance of the OSD Basin 4 storage is provided in Table 4, and rainfall-runoff volumes are provided in Table 5.

Table 3: Northern Area Existing Conditions and Proposed Development Peak Flows *

Discharge Location	Site Condition	DRAINS Model Label	Flow (m^3/s)				
			5yr ARI	10yr ARI	20yr ARI	100yr ARI	PMF
Georges R. south of electrical easement	Existing	EX Channel	1.62	1.68	1.72	1.78	**
	Proposed	**P G01/10**	**1.39**	**1.59**	**1.87**	**2.16**	**
MPW/ABB site boundary adjacent to Bapaume Road	Existing	ABB_Site	1.27	1.89	2.7	4.26	**
	Proposed	**ABB_Site**	**0.13**	**0.16**	**0.19**	**0.24**	**
Amiens Wetland inflow	Existing	NW_Inflow	1.37	1.55	1.80	2.19	**
	Proposed	**C_Northen_Wetland**	**0.56 #**	**0.65 #**	**0.75 #**	**0.89 #**	**
Amiens Wetland outflow	Existing	P_NW + Weir_NW	0.35	0.46	0.64	1.02	**
	Proposed	**P_NW + Weir_NW**	**0.11 #**	**0.12 #**	**0.13 #**	**0.25 #**	**

* The flow results are based on the water levels in the Georges River being low, such that local catchment runoff is freely discharging into the River.

**Drowned out by Georges River flood level of 12.5mAHD

DRAINS model flows exclude initial 'rain garden' flow which is to enter the Amiens Wetland from Basin 4

Table 4: Basin 4 Detention Storage Performance Summary

Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Water Level (mAHD)	Volume (m^3)
PMF	**	**	**	**
100 year	1.93	0.28	11.48	3400
20 year	1.56	0.22	11.45	3170
10 year	1.37	0.11	11.42	3000
5 year	1.23	0.07	11.41	2890

**Drowned out by Georges River flood level of 12.5mAHD

Table 5: Indicative Rainfall-Runoff Volumes from local catchments entering the Georges River *

Event	Duration (hours)	Volume (m^3)	
		Existing Conditions	Proposed Development
100 year ARI *	2 hour	22030	10470
	6 hour	32220	16920
20 year ARI *	2 hour	15560	7490
	6 hour	22530	11950
~3 month # [flow rate into Amiens Wetland]	10 years #	21.3 ML [0.014 m^3/s]	21.3 ML [0.015 m^3/s]

* DRAINS model area between the Transmission easement and the M5 motorway (excluding areas diverted to Basin 5).
# MUSIC model (10 year simulation period) volumes/flow rates entering the Amiens wetland (Refer to *Attachment B* for model details)

The modelling results indicate that:

- flows from the northern area of the Proposal site that discharge downstream (westward) to the Georges River would be reduced (as indicated in Table 3) from those of the existing conditions. This is the result of the southern portion of this area being diverted to proposed Basin 5, in combination with the mitigation performance of proposed Basin 4 (as indicated in Table 4).
- flows entering the ABB site (adjacent to Bapaume Road) would be significantly reduced (as indicated in Table 3) from those of the existing conditions. This is the result of the southern portion of this area being diverted to proposed Basin 5, in combination with the mitigation performance of proposed Basin 4 (as indicated in Table 4).
- the volume of rainfall-runoff entering the Georges River from local catchment areas located between the electrical easement (along the southern boundary of the ABB site) and the M5 Motorway is significantly reduced from those of the existing conditions, for storm events larger than 3 month (as indicated in Table 5).This volume reduction indicates that the potential for local flooding of this area when the Georges River is in flood (resulting in the closing of floodgates) would be mitigated.
- conveying the Basin 4 first flow (from its rain garden 3 month extended detention volume) while diverting greater flows southward away from the Amiens wetland would maintain water balance to the wetland (as indicated in Table 5).

As such, the proposed stormwater management would adequately mitigate potential flow increases within the ABB site and this northern area of Proposal site.

Mitigation Measures

The rainfall-runoff modelling has enabled a comparison of discharges and quantification of OSD performance, and facilitated the inclusion of proposed stormwater design mitigation measures that would result in the Amended Proposal providing effective stormwater management and flood mitigation for the north area of the Proposal site and its surrounds. In particular, it is noted that while the EIS assumed that minor system catchment flows from the Proposal site and Bapaume Road discharged to the ABB, this addendum assessment identifies existing conduit drainage systems (to the south of the electricity easement, and northward from Bapaume Road to the Georges River), that divert flows away from the ABB site, and provides stormwater management for the Proposal that similarly diverts flows away from the ABB site.

2.2.3 Relocation of Basin 3A

Introduction

Relocation of temporary Basin 3A (renamed to Basin 3 in its proposed location) to a location between the Rail link connection and Moorebank Avenue in the south-eastern portion of the site is proposed as it would:

- be more effective in the mitigation of stormwater runoff impacts; and
- remain in this location for the ultimate site operation thereby providing a long-term solution for operational site drainage.

The location of Basin 3 is shown in the Revised Stormwater and Drainage Design Drawings.

Assessment Methodology

The DRAINS software models developed for the EIS assessment (for existing and proposed development conditions) have been used to determine OSD performance for the proposed Basin 3 relocation. Catchment areas for existing conditions and the Proposal (development conditions) are outlined in Figure 8 and Figure 9**,** respectively.

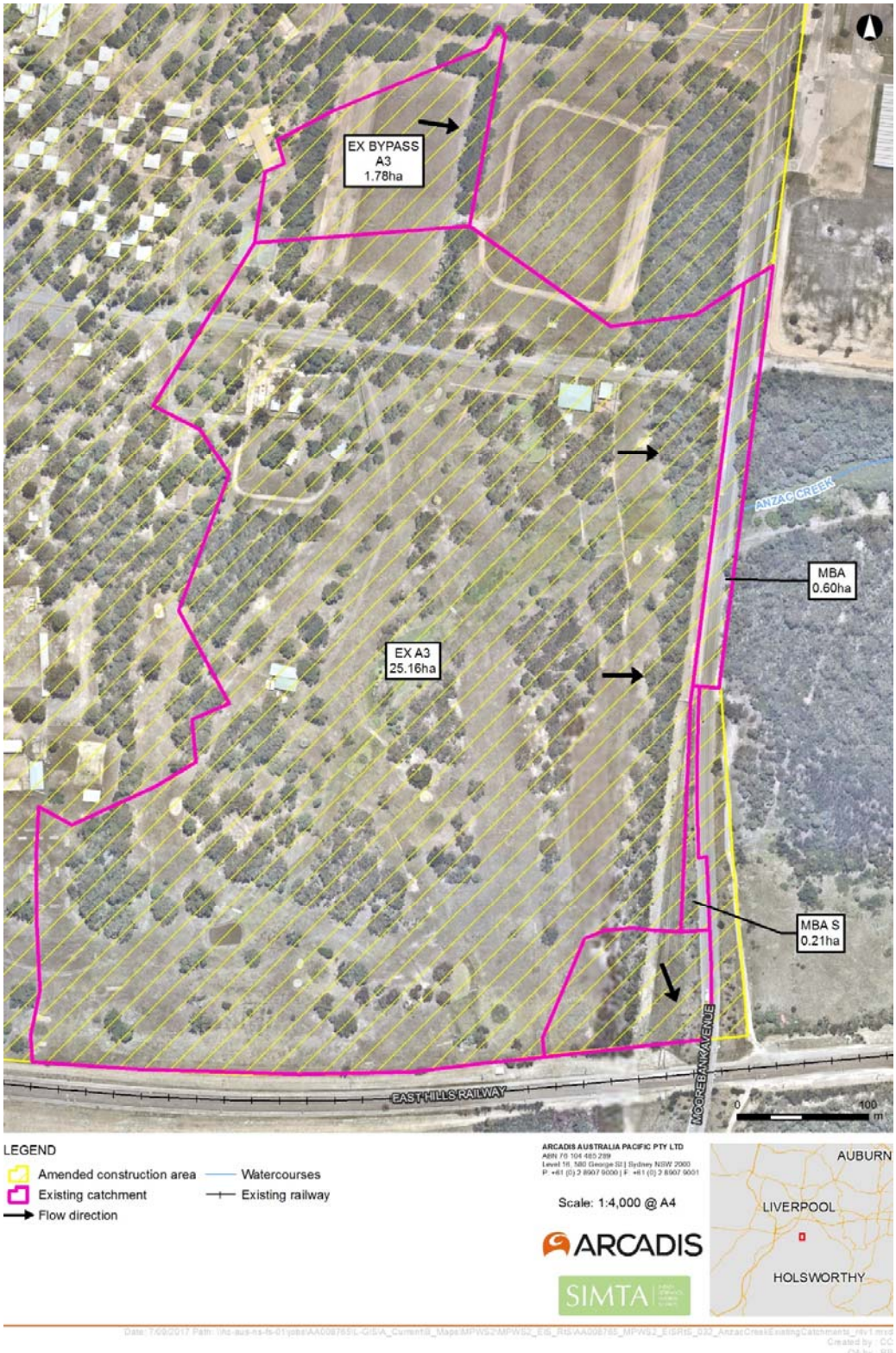

Figure 8: Anzac Creek existing conditions

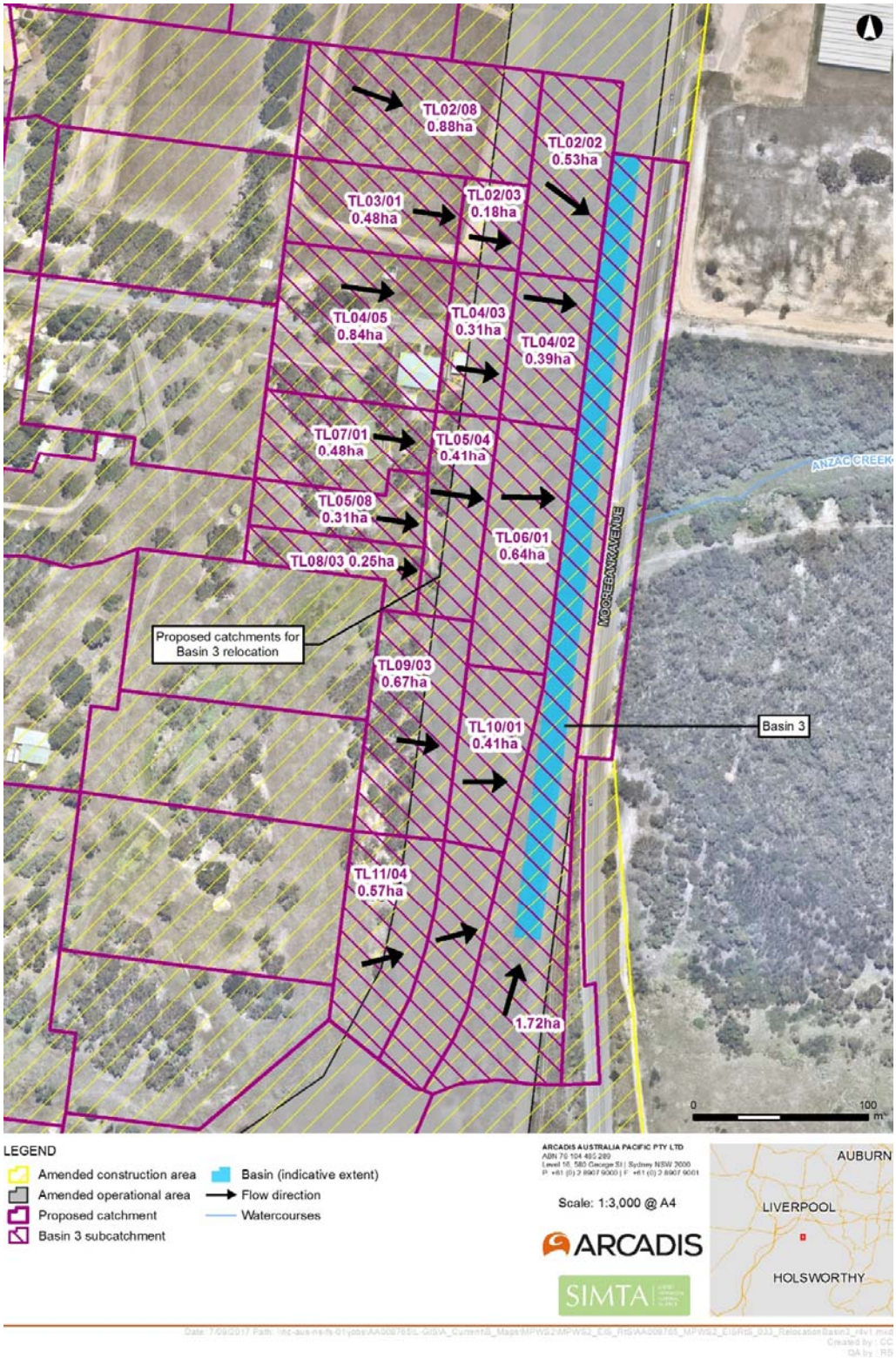

Figure 9: Proposed catchments for Basin 3 relocation

Assessment Results

A comparison of DRAINS model existing condition and post-development condition flows at the downstream of Basin 3 (Moorebank Avenue, see Figure 8 and Figure 9) is included in Table 6, with a fuller comparison (being for a range of storm durations) provided in ***Attachment C***. The results indicate that the proposed detention storages would adequately mitigate potential flow increases leaving the Proposal site.

A summary of the performance of the OSD storages is provided in Table 7.

Table 6: Southern Area Existing Conditions and Proposed Development Peak Flows

Discharge Location	Site Condition	Catchment Area (ha)	DRAINS Model Label	Flow (m^3/s)				
				5yr ARI	10yr ARI	20yr ARI	100yr ARI	PMF*
At the upstream of Moorebank Ave	Existing	25.17	F N1	1.1	1.3	1.6	2.2	15
	Proposed	9.96	F OSD 3	0.7	0.7	1.0	1.7	21

* PMF is indicatively only. Natural storages within the catchment and inter-catchment flow has not been considered

Table 7: Basin 3 Detention Storage Performance Summary

Storage [water quality extended detention level mAHD]	Catchment Area (ha)	Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Water Level (mAHD)	Volume * (m^3)
Basin 3 Georges River Moorebank Ave– u/s of Outlet C [15.2]	9.96	100 year	4.5	1.7	16.0	5500

* Approximate active storage above water quality extended detention water level (of 15.2mAHD).

Mitigation Measures

No additional mitigation measures are required for the construction or operation of the Amended Proposal with regards to the relocation of Basin 3A (i.e. to become Basin 3).

2.2.4 Re-sizing of OSD basins along the western boundary of the operational area

Introduction

As the Proposal design has progressed, proposed Basins 5, 6 and 8, and their associated upstream catchments, have been refined and re-configured to provide more efficient and effective flood mitigation performance. In particular:

- the Basin 8 catchment has been increased resulting in the Basin 8 footprint and volume being increased
- the Basin 6 catchment has been decreased, while retaining a similar footprint and volume

- the Basin 5 footprint configuration and volume has been refined due to increased mitigation efficiencies achieved by Basins 6 and 8. These basins are shown in the Revised Stormwater and Drainage Design Drawings report.

Assessment Methodology

The assessment process for re-configuring and re-sizing Basins 8, 6 and 5 has involved adjusting the associated catchment areas and basin volumes represented in the DRAINS modelling undertaken as part of the EIS (refer to Appendix R, Stormwater and Flooding Environmental Assessment).

Assessment Results

A summary of DRAINS model existing condition and post-development condition flows at the downstream locations of the Proposal site is included in Table 8. A summary of performance of the OSD storages is provided in Table 9.

Table 8: Georges River Existing Conditions and Proposed Development Peak Flows

Discharge Location	Site Condition	Catchment Area (ha)	DRAINS Model Label	Flow (m^3/s)				
				5yr ARI	10yr ARI	20yr ARI	100yr ARI	PMF**
8 Georges River MPW Site South	Existing	11.17	F Outlet 8	1.2	1.4	1.7	2.3	19
	Proposed	**26.13**	**F PR Outlet 7**	**0.3**	**0.4**	**0.6**	**0.8**	**30**
6 Georges River MPW Site (6+8) *	Existing	55.30	F Outlet 6	9.3	11.0	13.0	16.5	89
	Proposed	**75.59**	**F PR Outlet 6**	**1.4**	**1.5**	**1.9**	**3.1**	**88**
5 Georges River MPW Site (5+6+8) *	Existing	155.53	F Outlet 5	17.4	20.3	23.9	30.6	184
	Proposed	**184.48**	**F PR Outlet 5**	**6.2**	**7.0**	**7.9**	**10.4**	**165**

* indicates cumulative discharge from Proposal site areas
** PMF is indicatively only. Natural storages within the catchment and inter-catchment flow has not been considered

Table 9: Basins 8, 6 and 5 Detention Storage Performance Summary

Storage [water quality extended detention level mAHD]	**Catchment Area (ha)**	**Event**	**Peak Inflow (m^3/s)**	**Peak Outflow (m^3/s)**	**Water Level (mAHD)**	**Volume * (m^3)**
8 Georges River MPW Site South [11.8]	26.13	100 year	12.6	0.8	13.62	33100
6 Georges River MPW Site [11.6]	49.46	100 year	23.7	2.3	13.41	54100
5 Georges River MPW Site [11.3]	49.87	100 year	24.2	3.8	13.38	42450

* Approximate active storage above water quality extended detention water level

The results indicate that the proposed detention storages should adequately mitigate potential flow increases leaving the proposal site. Model input data and output results are provided in **Attachment D.**

Mitigation Measures

No additional mitigation measures are required for the construction or operation of the Amended Proposal with regards to Basins 8, 6 and 5.

2.2.5 Reduction to the widths of selected OSD outlet channels

Introduction

Design progression has identified the opportunity to refine the construction boundaries and areas necessary for Basin 5 and Basin 6 outlet channels, which are located along the western boundary of the Proposal site and discharge directly to the Georges River.

Assessment Methodology

The assessment methodology has included ground survey, channel sizings, allowance for construction processes and maintenance access corridors.

Assessment Results

The updated stormwater and drainage design would result in a minor reduction in the width of some areas of the OSD outlet channels to Basin 5 and Basin 6, without compromising the overall drainage requirements of the Proposal as identified within the EIS.

The EIS estimated the width of these channels to be between 50 to 70 metres.

Based on the updated design, the approximate revised widths of the basin outlet impact areas during construction and operation (following revegetation) are as follows:

- Basin 5: 40 to 72 metres during construction, and 25 to 72 metres during operation
- Basin 6: 41 metres during construction, and 22 metres during operation
- Basin 8: 52 metres during construction, and 30 to 50 metres during operation.

Mitigation Measures

No additional mitigation measures are required for the construction or operation of the Amended Proposal with regards to the OSD (Basin) outlet widths.

2.3 Conclusion

This assessment concludes that the amendments to the Proposal would result in consistent stormwater and flooding impacts to those already identified and assessed as part of the existing stormwater and flooding assessment. Therefore, the outcomes and recommendations of the assessment undertaken for the stormwater and flooding assessment are still relevant and appropriate for the assessment of the Amended Proposal.

In particular, the Amended Proposal (with respect to stormwater and flooding) includes mitigation of potential adverse flood impacts by the provision of the design components included, namely:

- Inclusion of the OSD (Basin 10) and relocation of another OSD (Basin 3) along the eastern boundary of the operational area, adjacent to the western verge of Moorebank Avenue.
- Re-sizing of OSD basins along the western boundary of the operational area.
- Reduction to the widths of selected OSD outlet channels.
- Provision of an additional covered drain within the electrical easement.

On the basis of the identified stormwater and flooring impacts, no further mitigation measures above those identified in the EIS, are considered necessary.