MELROSE PARK NORTH
PLANNING PROPOSAL

CONCEPT STORMWATER STRATEGY

NOVEMBER 2020

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M Projects
Suite C2.08, Level 2
22-36 Mountain Street NSW 2007 Job No. FG486

Attn: Mr Miled Akle

5 November 2020

Re: Melrose Park Flooding and Drainage Investigation – VRS and PP Development Sites

Dear Sir

This letter report deals with the initial findings of a flooding and drainage investigation that was undertaken into the impact that the redevelopment of Melrose Park North as a whole would have on flood behaviour.

1. Background

Payce and Sekisui House Australia (**the developers**) are in the process of redeveloping Melrose Park North which is bounded by Victoria Road to the north, Wharf Road to the east, existing residential development to the west and Hope Street to the south. Melrose Park North has been divided into two parcels of land for staging purposes, these being the Victoria Road (**VRS**) and Planning Proposal (**PP**) sites.

While earlier flooding and drainage investigations have been undertaken by others in recent years, Lyall & Associates was recently engaged by the developers to undertake further, more detailed flood modelling for both the VRS and PP sites. Our letter of 29 July 2020 provided background to the development of the hydrologic (DRAINS) and hydraulic (TUFLOW) models (collectively referred to herein as "**the flood models**") that were used to define the nature of flooding in the vicinity of the VRS and PP sites under pre-developed conditions, as well as those under post-VRS developed conditions. A subsequent letter dated 24 August 2020 provided additional information relating to post-VRS development conditions that were requested by City of Parramatta Council (**CoPC**).[1]

The following sections of this letter set out the modifications that have been made to the flood models in order that they reflected post-VRS and PP development conditions, as well as the impact that the future development within Melrose Park North as a whole would have on flood behaviour for design storms with Annual Exceedance Probabilities (**AEPs**) of 5% (1 in 20) and 1% (1 in 100).

2. Overview of Post-VRS and PP Development Conditions

Figure 1 (7 sheets) shows the key features of the upgraded road and stormwater drainage system under post-VRS and PP development conditions:

- The widening of Victoria Road to the south, as well as the upgrade of Kissing Point Road and Wharf Road intersections.
- The upgrade of the existing stormwater drainage system in Victoria Road to improve its hydrologic standard to a minimum of 5% (1 in 20) AEP where practical.

[1] It is noted that further refinements have been made to the structure of the flood models which are representative of post-VRS development conditions and it is these models that have been used as the basis of the present investigation.

- An internal road network which has connections to Victoria Road, Wharf Road and Hope Street.
- Multi-storey buildings within the super-lots that are formed by the internal road network. Development within each super-lot will incorporate on-site detention facilities which will be sized in accordance with CoPC's requirements.
- An internal piped stormwater drainage system which has been sized to convey flows generated by storms that are up to 5% AEP in intensity.
- A detention basin which would be constructed adjacent to the natural low point in Wharf Road (**Wharf Road Detention Basin**). The purpose of the Wharf Road Detention Basin is to ensure that flood behaviour is not exacerbated in existing residential development that is located on the eastern side of Wharf Road in the City of Ryde Local Government Area (**LGA**).
- A detention basin in the south-west corner of Melrose Park North (**Hope Street Detention Basin**). The purpose of the Hope Street Detention Basin is to ensure that flood behaviour is not exacerbated in existing and future development that is located on the southern side of Hope Street in the CoPC LGA.

The following section sets out the changes that were made to the structure of the flood models to reflect these key features.

3. Background to the Update of the Flood Models

The following changes were made to the post-VRS development flood models in order that they reflected post-VRS and PP development conditions:

- A 3D design model which has been developed by CCHD for the widening of Victoria Road was incorporated in the TUFLOW model.
- Modifications were made to the configuration of the existing stormwater drainage system in Victoria Road which are aimed at improving the minimum hydrologic standard of the road to 5% AEP where practical while not exacerbating flooding conditions in adjacent development. Both the DRAINS and TUFLOW models were updated to reflect the upgraded stormwater drainage system in Victoria Road.
- A 3D design model which has been developed by Northrop of the internal road network was incorporated in the TUFLOW model.
- An internal pit and pipe network was developed for the PP site which had a minimum hydrologic standard of 5% AEP. As per CoPC's requirements, blockage factors of 20% and 50% were applied to on-grade and sag pits, respectively. Both the DRAINS and TUFLOW models were updated to reflect the new stormwater drainage system internal to the PP site.[2]
- The four temporary OSD tanks which are located along the southern side of East West Road 2 (**EWR2**) were removed from the model and the pipe drainage system beneath the southern kerbline of the road made continuous along its full length.
- The 1200 mm diameter pipe which crosses North South Road 4 (**NSR4**) was removed from the model and the upstream system connected into the new internal piped drainage system associated with the PP site.

[2] Note that the DRAINS model only incorporated sub-catchments which were representative of uncontrolled flow off the internal road network, as well as other areas which would not be controlled by a dedicated on-site detention facility (e.g. in public space areas).

- Steady-state peak flows were applied to the TUFLOW model to represent the flow which would discharge to the new stormwater drainage system from each super-lot. The peak flow from each super-lot was derived using CoPC's "*On-Site Detention Calculation Sheet – Version 9*", completed copies of which are contained in **Annexure A** of this letter. Note that similar to the approach that was adopted for the VRS site, the on-site detention facilities have been sized to take into account the uncontrolled flow which would be associated with runoff from the adjacent internal road network. Note also that these calculations are preliminary in nature and would need to be reviewed following further design development.
- A 3D design of both the Wharf Road and Hope Street Detention Basins that were developed by Lyall & Associates using the 12d software were incorporated in the TUFLOW model. Note that the basins were sized to ensure that the depth of ponding does not exceed a maximum of 0.6 m in a 1% AEP storm event.

Figure 1 shows the layout of the updated TUFLOW model representing post-VRS and PP development conditions, while the following section of this letter sets out the key findings of the flood modelling that was undertaken as part of the present investigation.

4. Key Findings of Flooding Investigation

Figures 2 and **3** (3 sheets each) show the indicative extent and depth of inundation in the vicinity of Melrose Park North under post-VRS and PP development conditions for the 5% and 1% AEP storm events, while **Figures 4** and **5** (3 sheets each) show the impact that the implementation of the proposed drainage strategy as part of the future development would have on flood behaviour.

The key findings of the investigation were as follows:

- While it is feasible to improve the flood immunity of Victoria Road to a minimum of 5% AEP along its southern kerbline west of Wharf Road and along its northern kerbline west of Fitzgerald Road, major drainage improvements would be required extending south into Ryde Parramatta Golf Club in order to improve its hydrologic standard to the east of these two locations.
- The proposed drainage strategy would prevent surcharge of the internal drainage system for all storms up to 5% AEP in intensity and also improve the flood immunity of Wharf Road along most of its length. The exception is a short section of NSR2 immediately north of Hope Street where minor surcharge of the internal stormwater drainage system downstream of the Hope Street Detention Basin is shown to occur. Refer **Section 5** of this letter that sets out further investigations that will be undertaken to prevent this surcharge from occurring for all storms up to 5% AEP in intensity.
- Only shallow inundation would be experienced in the internal road network during a 1% AEP storm event, with depths of ponding in the Wharf Road and Hope Street Detention Basins limited to a maximum of 0.6 m during a storm of this intensity.
- The provision of on-site detention within each super-lot in combination with the Wharf Road and Hope Street Detention Basins will ensure that flooding conditions are not exacerbated to the east and south of Melrose Park North. In fact, implementation of the assessed drainage strategy will significantly reduce the degree to which flooding impacts existing residential development that is located to the east of Wharf Road in the City of Ryde LGA during storms up to 1% AEP in intensity.

As requested by CoPC, an assessment was also undertaken whereby it was assumed that both the existing and proposed stormwater drainage systems experience a complete blockage during a 1% AEP storm event. Note that it has been assumed that the on-site detention facilities within each super-lot which principally control runoff from roofed areas would continue to function as designed,

with the outflow discharging onto the surface of the internal road network rather than directly into the stormwater drainage system due to it being 100% blocked. It is understood that these conditions will form the basis of setting the minimum floor level requirements within each super-lot.

Figure 6 (7 sheets) shows the indicative extent and depth of inundation in the vicinity of Melrose Park North under post-VRS and PP development and complete blockage conditions for the 1% AEP storm event. Included on **Figure 6** are maximum 1% AEP water surface elevation contours at 0.2 m intervals, as well as peak overland flow rates at key locations.

5. Further Investigations

In addition to the above assessment, further modelling is presently being undertaken to:

i. refine the proposed stormwater drainage strategy in the vicinity of the Hope Street Detention Basin so as to prevent surcharge of the internal stormwater drainage system for all storms up to 5% AEP in intensity;

ii. define the nature of flooding under post-VRS and PP development conditions for the Probable Maximum Flood, and

iii. assess the potential for future climate change to impact flood behaviour in and immediately adjacent to Melrose Park North.

We trust that the findings of the present investigation will assist the developers in completing the detailed design documentation for Melrose Park North. However, please do not hesitate to contact the undersigned should you have any queries or wish to discuss any aspect of our letter report.

Yours faithfully
Lyall & Associates Consulting Water Engineers

Scott Button
Principal

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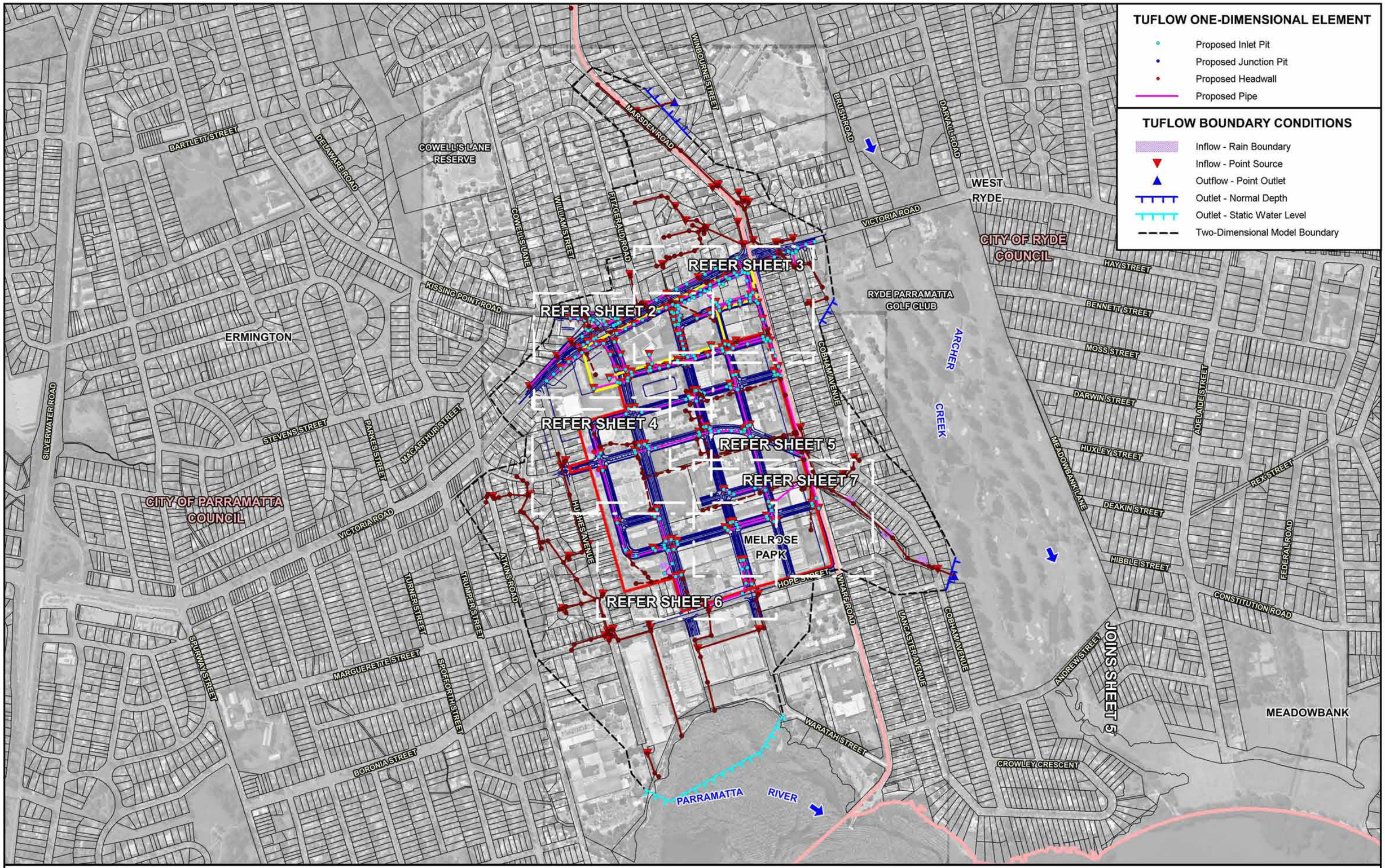

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MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 1 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS

TUFLOW ONE-DIMENSIONAL ELEMENT

- Proposed Junction Pit
- Proposed Headwall
- Proposed Unlimited Inlet Capacity Pit
- Proposed SO1 Inlet Pit
- Proposed 1m_G Inlet Pit
- Proposed SA3_G Inlet Pit
- Proposed KIP1_G Inlet Pit
- Proposed KIP2_G Inlet Pit
- Proposed KIP3_G Inlet Pit
- 600 Proposed Pipe and Diameter (mm)

TUFLOW BOUNDARY CONDITIONS

- Inflow - Point Source

WILLIAM STREET
FITZGERALD ROAD
KISSING POINT ROAD
VICTORIA ROAD
ERMINGTON
LOT AB
LOT AC
LOT AD
LOT AA
LOT BA
LOT A
MELROSE PARK
CITY OF PARRAMATTA COUNCIL
HUGHES AVENUE
JOINS SHEET 3
JOINS SHEET 4
JOINS SHEET 5

N
10 0 10 20 30 m
Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed MP Masterplan Design and Finished Road Level Contours (0.1m Interval)
- Existing Drainage Network to Remain
- Existing Drainage Network to be Removed
- Low Wall
- Developed Area

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 2 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS

TUFLOW ONE-DIMENSIONAL ELEMENT

- Proposed Junction Pit
- Proposed Headwall
- Proposed Unlimited Inlet Capacity Pit
- Proposed SO1 Inlet Pit
- Proposed 1m_G Inlet Pit
- Proposed SA3_G Inlet Pit
- Proposed KIP1_G Inlet Pit
- Proposed KIP2_G Inlet Pit
- Proposed KIP3_G Inlet Pit
- 600 Proposed Pipe and Diameter (mm)

TUFLOW BOUNDARY CONDITIONS

- Inflow - Point Source

ERMINGTON

CITY OF PARRAMATTA COUNCIL

VICTORIA ROAD

JOINS SHEET 2

LOT AC

LOT AD

LOT AB

FITZGERALD ROAD

WHARF ROAD

CITY OF RYDE COUNCIL

MELROSE PARK

8 WHARF ROAD

JOINS SHEET 5

N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed MP Masterplan Design and Finished Road Level Contours (0.1m Interval)
- Existing Drainage Network to Remain
- Existing Drainage Network to be Removed
- Developed Area

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 3 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS

TUFLOW ONE-DIMENSIONAL ELEMENT

- Proposed Junction Pit
- Proposed Headwall
- Proposed Unlimited Inlet Capacity Pit
- Proposed SO1 Inlet Pit
- Proposed 1m_G Inlet Pit
- Proposed SA3_G Inlet Pit
- Proposed KIP1_G Inlet Pit
- Proposed KIP2_G Inlet Pit
- Proposed KIP3_G Inlet Pit
- 600 Proposed Pipe and Diameter (mm)

TUFLOW BOUNDARY CONDITIONS

- Inflow - Rain Boundary
- Inflow - Point Source

JOINS SHEET 2

JOINS SHEET 5

JOINS SHEET 6

JOINS SHEET 7

LOT C

LOT D

LOT F

LOT G

HUGHES AVENUE

N

10 0 10 20 30 m

Scale: 1:1,000

LEGEND

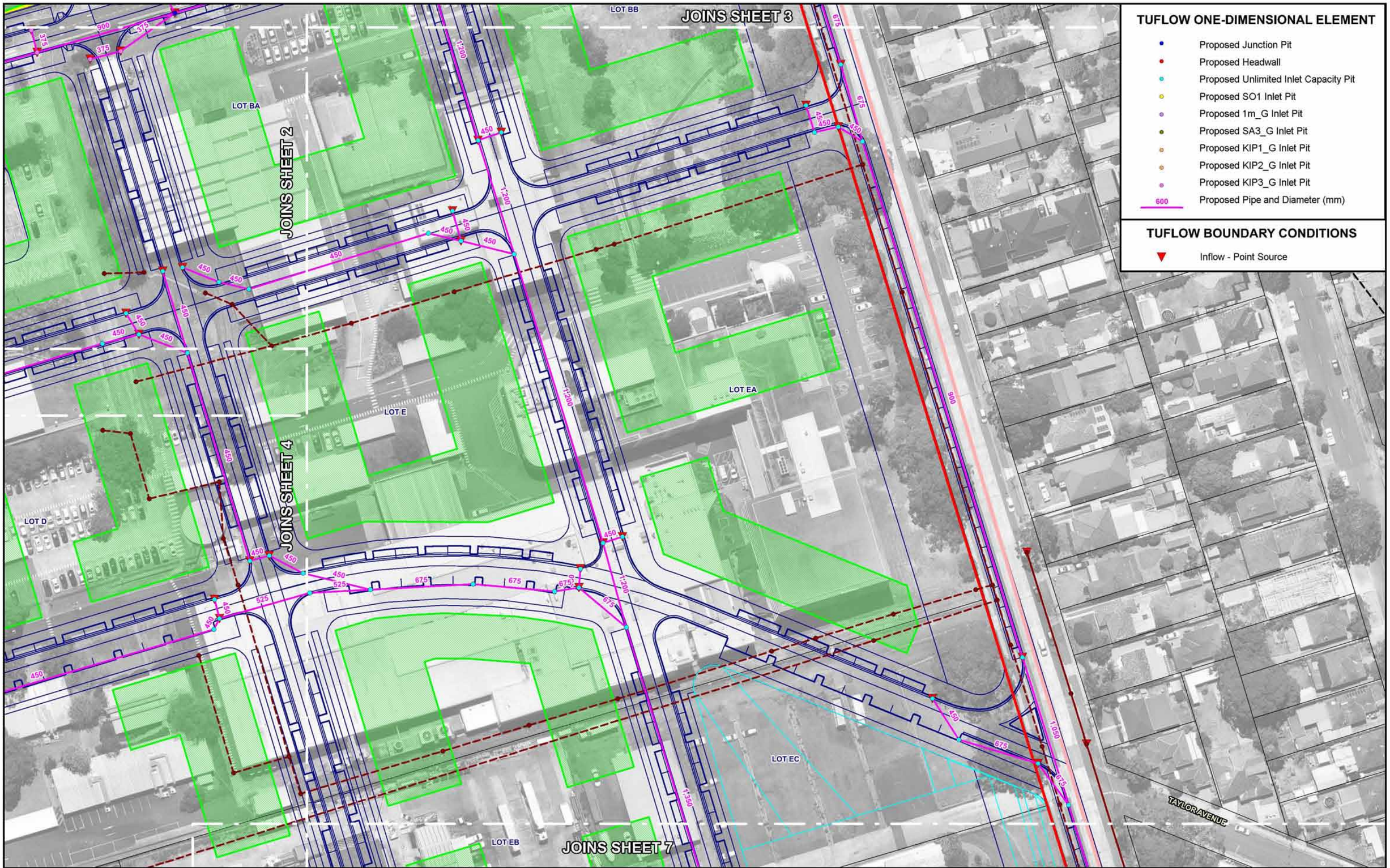
- LGA Boundary
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed MP Masterplan Design and Finished Road Level Contours (0.1m Interval)
- Existing Drainage Network to Remain
- Existing Drainage Network to be Removed
- Developed Area

Lyall & Associates

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 4 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS



N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed MP Masterplan Design and Finished Road Level Contours (0.1m Interval)
- Existing Drainage Network to Remain
- Existing Drainage Network to be Removed
- Developed Area
- Proposed Detention Basin

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 5 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS

JOINS SHEET 4

JOINS SHEET 7

CITY OF PARRAMATTA COUNCIL

MELROSE PARK

LOT G

LOT H

LOT K

LOT N

LOT O

TUFLOW ONE-DIMENSIONAL ELEMENT

- Proposed Junction Pit
- Proposed Headwall
- Proposed Unlimited Inlet Capacity Pit
- Proposed SO1 Inlet Pit
- Proposed 1m_G Inlet Pit
- Proposed SA3_G Inlet Pit
- Proposed KIP1_G Inlet Pit
- Proposed KIP2_G Inlet Pit
- Proposed KIP3_G Inlet Pit
- 600 Proposed Pipe and Diameter (mm)

TUFLOW BOUNDARY CONDITIONS

- Inflow - Rain Boundary
- Inflow - Point Source

N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

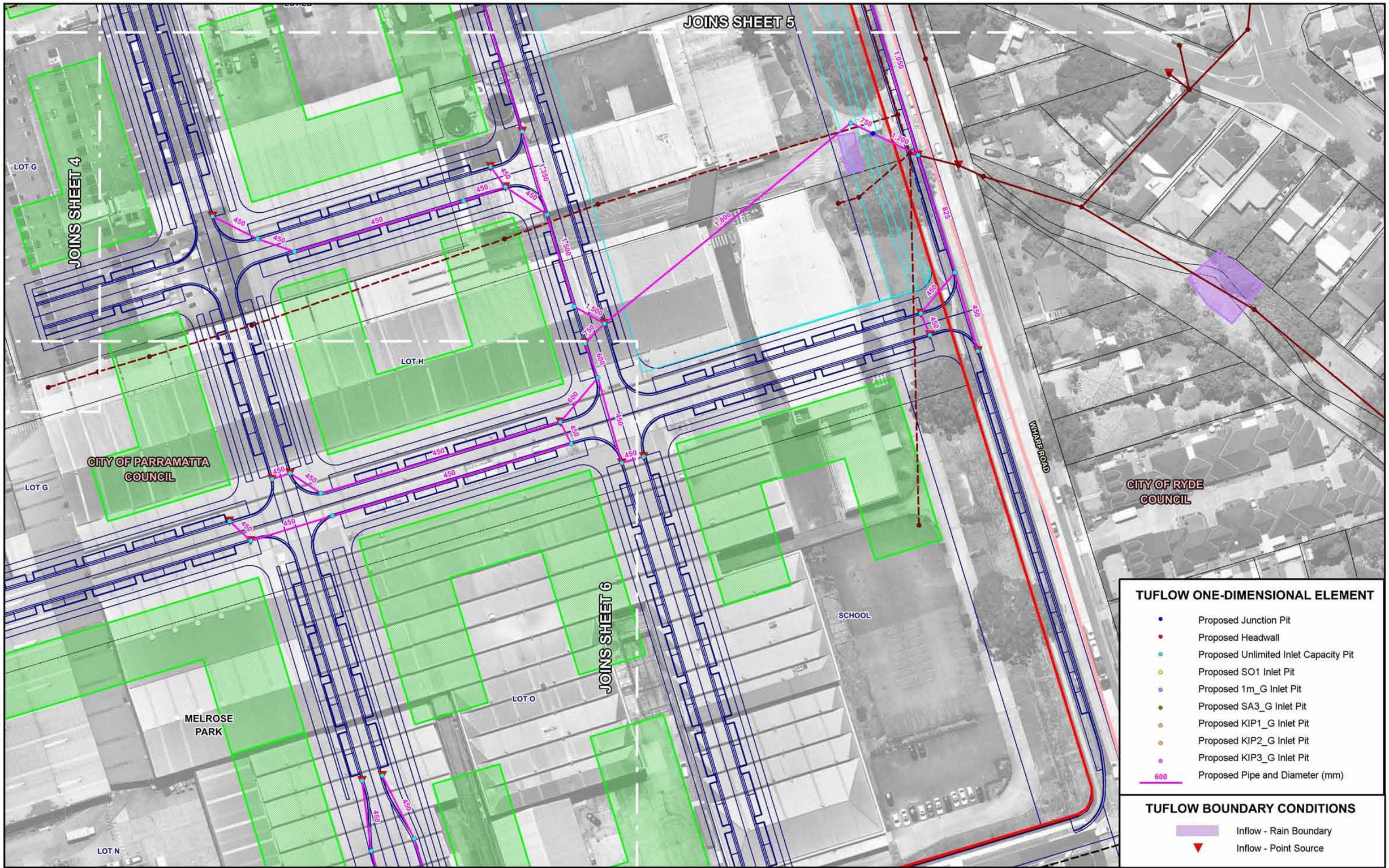
LEGEND

- LGA Boundary
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed MP Masterplan Design and Finished Road Level Contours (0.1m Interval)
- Existing Drainage Network to Remain
- Existing Drainage Network to be Removed
- Developed Area
- Proposed Detention Basin

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 6 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS



N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed MP Masterplan Design and Finished Road Level Contours (0.1m Interval)
- Existing Drainage Network to Remain
- Existing Drainage Network to be Removed
- Developed Area
- Proposed Detention Basin

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 1
(Sheet 7 of 7)

TUFLOW MODEL LAYOUT
POST-VRS AND PP DEVELOPMENT CONDITIONS

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

REFER SHEET 2

REFER SHEET 3

COWELL'S LANE RESERVE

ERMINGTON

CITY OF PARRAMATTA COUNCIL

WEST RYDE

CITY OF RYDE COUNCIL

RYDE PARRAMATTA GOLF CLUB

MELROSE PARK

MEADOWBANK

ARCHER CREEK

PARRAMATTA RIVER

BARTLETT STREET
DELAWARE ROAD
MARSDEN ROAD
WINBOURNE STREET
BRUSH ROAD
DARVALL ROAD
VICTORIA ROAD
COWELLS LANE
WILLIAM STREET
FITZGERALD ROAD
KISSING POINT ROAD
COBHAM AVENUE
HAY STREET
BENNETT STREET
MOSS STREET
DARWIN STREET
ADELAIDE STREET
HUXLEY STREET
REX STREET
MEADOWBANK LANE
DEAKIN STREET
HIBBLE STREET
FEDERAL ROAD
CONSTITUTION ROAD
ANDREW STREET
SILVERWATER ROAD
STEVENS STREET
PARKES STREET
MACARTHUR STREET
HUGHES AVENUE
ATKINS ROAD
TURNER STREET
TRUMPER STREET
HOPE STREET
WHARF ROAD
LANCASTER AVENUE
SPURWAY STREET
MARGUERETTE STREET
SOFFORTH STREET
BORONIA STREET
WARATAH STREET
CROWLEY CRESCENT

N

80 0 80 160 240

Scale: 1:8,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 2
(Sheet 1 of 3)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT CONDITIONS - 5% AEP

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

CITY OF PARRAMATTA COUNCIL

ERMINGTON

CITY OF RYDE COUNCIL

MELROSE PARK

GOWELLS LANE

WILLIAM STREET

FITZGERALD ROAD

VICTORIA ROAD

KISSING POINT ROAD

HUGHES AVENUE

COBHAM AVENUE

WHARF ROAD

8 WHARF ROAD

LOT AA

LOT AB

LOT AC

LOT AD

LOT A

LOT BA

LOT BB

LOT C

LOT D

LOT E

LOT EA

JOINS SHEET 3

N

20 0 20 40 60

Scale: 1:2,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- 1.05 Peak Piped Flow (m³/s)
- 0.00 Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 2
(Sheet 2 of 3)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT CONDITIONS - 5% AEP

JOINS SHEET 2

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

MELROSE PARK

CITY OF PARRAMATTA COUNCIL

CITY OF RYDE COUNCIL

LOT EC

LOT EB

LOT G

LOT F

LOT H

LOT K

LOT O

LOT N

LOT C

SCHOOL

WHARF ROAD DETENTION BASIN

HOPE STREET DETENTION BASIN

HUGHES AVENUE

TAYLOR AVENUE

WHARF ROAD

HOPE STREET

LANCASTER AVENUE

MELROSE PARK PUBLIC SCHOOL

0.40
0.00
0.00
0.21
0.00
0.81
0.00
1.49
0.00
0.80
3.84
0.00
0.02
4.20
0.15
0.50
0.64

N

20 0 20 40 60

Scale: 1:2,000

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LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- 1.05 Peak Piped Flow (m³/s)
- 0.00 Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 2
(Sheet 3 of 3)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT CONDITIONS - 5% AEP

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

REFER SHEET 2

REFER SHEET 3

COWELL'S LANE RESERVE

ERMINGTON

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CITY OF RYDE COUNCIL

WEST RYDE

RYDE PARRAMATTA GOLF CLUB

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BARTLETT STREET
DELAWARE ROAD
MARSDEN ROAD
WINBOURNE STREET
BRUSH ROAD
DARVALL ROAD
VICTORIA ROAD
COWELLS LANE
WILLIAM STREET
FITZGERALD ROAD
KISSING POINT ROAD
COBHAM AVENUE
HAY STREET
BENNETT STREET
MOSS STREET
DARWIN STREET
ADELAIDE STREET
HUXLEY STREET
REX STREET
MEADOWBANK LANE
DEAKIN STREET
HIBBLE STREET
FEDERAL ROAD
CONSTITUTION ROAD
ANDREW STREET
CROWLEY CRESCENT
WARATAH STREET
LANCASTER AVENUE
WHARF ROAD
HOPE STREET
HUGHES AVENUE
ATKINS ROAD
TRUMPER STREET
TURNER STREET
SPOFFORTH STREET
MARGUERETTE STREET
BORONIA STREET
SPURWAY STREET
SILVERWATER ROAD
STEVENS STREET
PARKES STREET
MACARTHUR STREET
VICTORIA ROAD
KISSING POINT ROAD

N

80 0 80 160 240

Scale: 1:8,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 3
(Sheet 1 of 3)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT CONDITIONS - 1% AEP

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

GOWELLS LANE
WILLIAM STREET
FITZGERALD ROAD
CITY OF PARRAMATTA COUNCIL
ERMINGTON
VICTORIA ROAD
KISSING POINT ROAD
LOT AC
8 WHARF ROAD
LOT AD
LOT AB
LOT AA
LOT A
LOT BA
LOT BB
MELROSE PARK
LOT E
LOT EA
LOT D
LOT C
CITY OF RYDE COUNCIL
COBHAM AVENUE
WHARF ROAD
HUGHES AVENUE
JOINS SHEET 3

0.30 0.60 0.33 0.00 0.67 0.00 2.63 0.63 2.00 1.00
0.53 0.12 0.01.00
0.11 0.00
0.08 0.80 0.80 0.10 0.14 0.01
0.23 2.45 0.00 0.00 1.09 0.07
0.69 0.26
2.63 0.00 1.17 0.07
0.27 0.00

N
20 0 20 40 60
Scale: 1:2,000

LEGEND

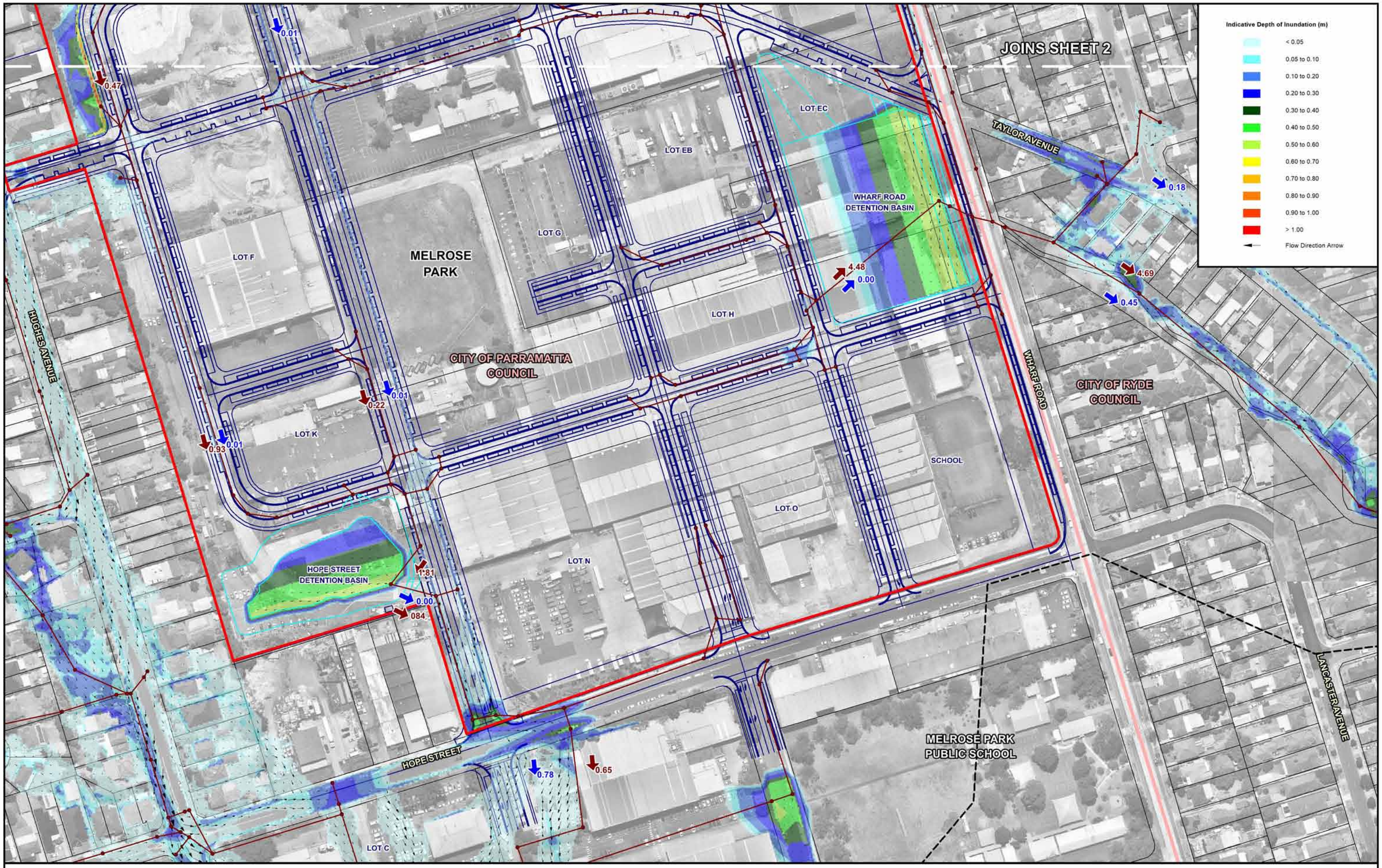
- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- 0.99 Peak Piped Flow (m³/s)
- 0.00 Peak Overland Flow (m³/s)

Lyall & Associates

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 3
(Sheet 2 of 3)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT CONDITIONS - 1% AEP



N

20 0 20 40 60

Scale: 1:2,000

Lyall & Associates

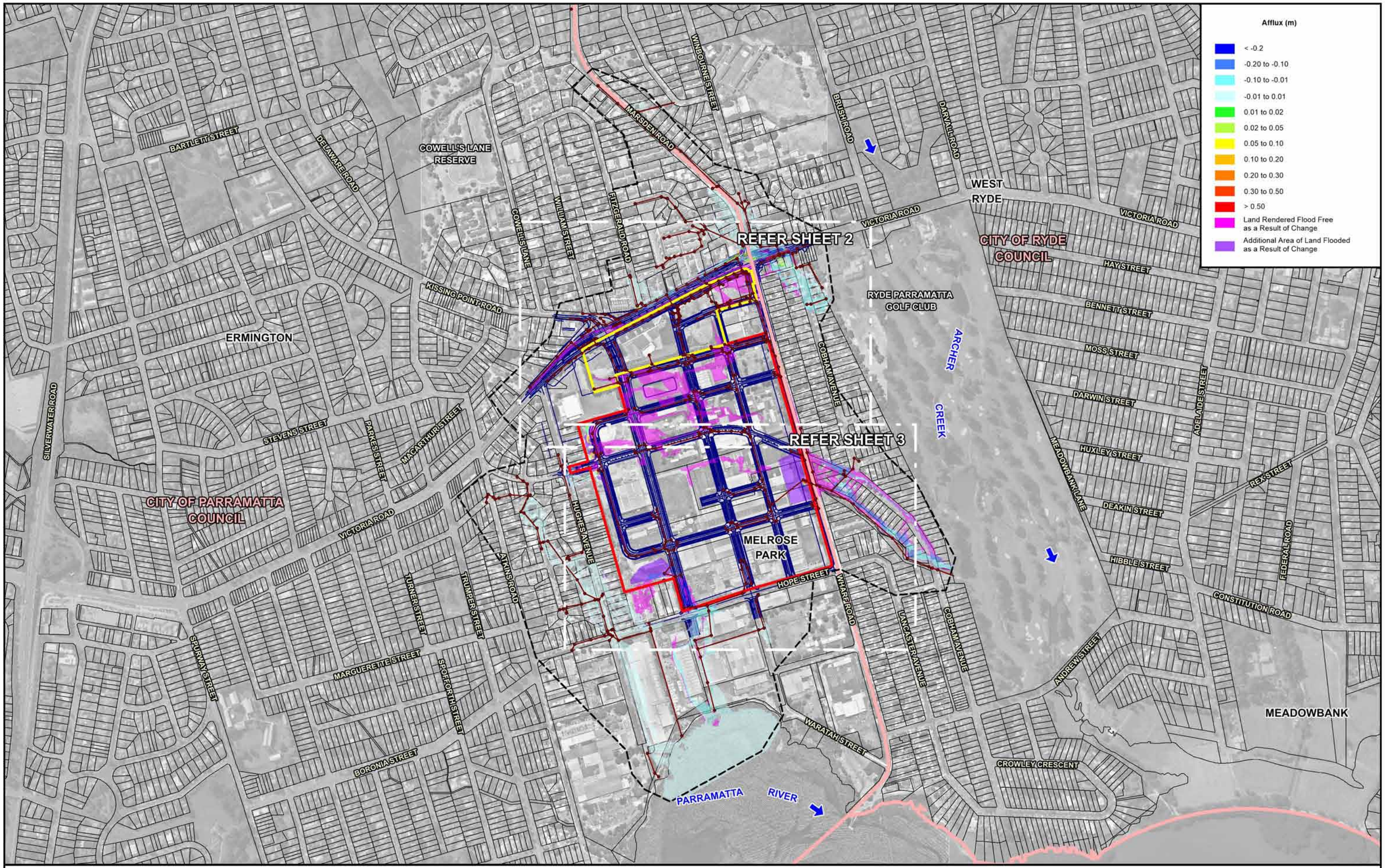
LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- 0.99 Peak Piped Flow (m³/s)
- 0.00 Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 3
(Sheet 3 of 3)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT CONDITIONS - 1% AEP



N

80 0 80 160 240

Scale: 1:8,000

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design

Lyall & Associates

Note
1. A positive value represents an increase, and conversely a negative value represents a decrease in peak flow when compared to baseline conditions.

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 4
(Sheet 1 of 3)

IMPACT OF PROPOSED VRS AND PP DEVELOPMENT ON FLOOD BEHAVIOUR
5% AEP

Afflux (m)

- < -0.2
- -0.20 to -0.10
- -0.10 to -0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land Rendered Flood Free as a Result of Change
- Additional Area of Land Flooded as a Result of Change

COWELLS LANE
WILLIAM STREET
FITZGERALD ROAD
CITY OF PARRAMATTA COUNCIL
ERMINGTON
VICTORIA ROAD
KISSING POINT ROAD
LOT AC
8 WHARF ROAD
LOT AD
LOT AB
LOT AA
LOT A
LOT BA
LOT BB
MELROSE PARK
LOT E
LOT EA
LOT D
LOT C
HUGHES AVENUE
CITY OF RYDE COUNCIL
WHARF ROAD
COBHAM AVENUE
JOINS SHEET 3

+0.04 -0.16
-1.13
-0.97 +0.52
-0.11
+0.12 -0.42
+0.44 -0.28
+0.37 -0.08
-0.16 -0.08
-0.09
+0.67
+0.69 -0.27
-0.09 -0.23
-0.84 -0.21

N

20 0 20 40 60

Scale: 1:2,000

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- +0.29 Change in Peak Piped Flow (m³/s)
- -0.36 Change in Peak Overland Flow (m³/s)

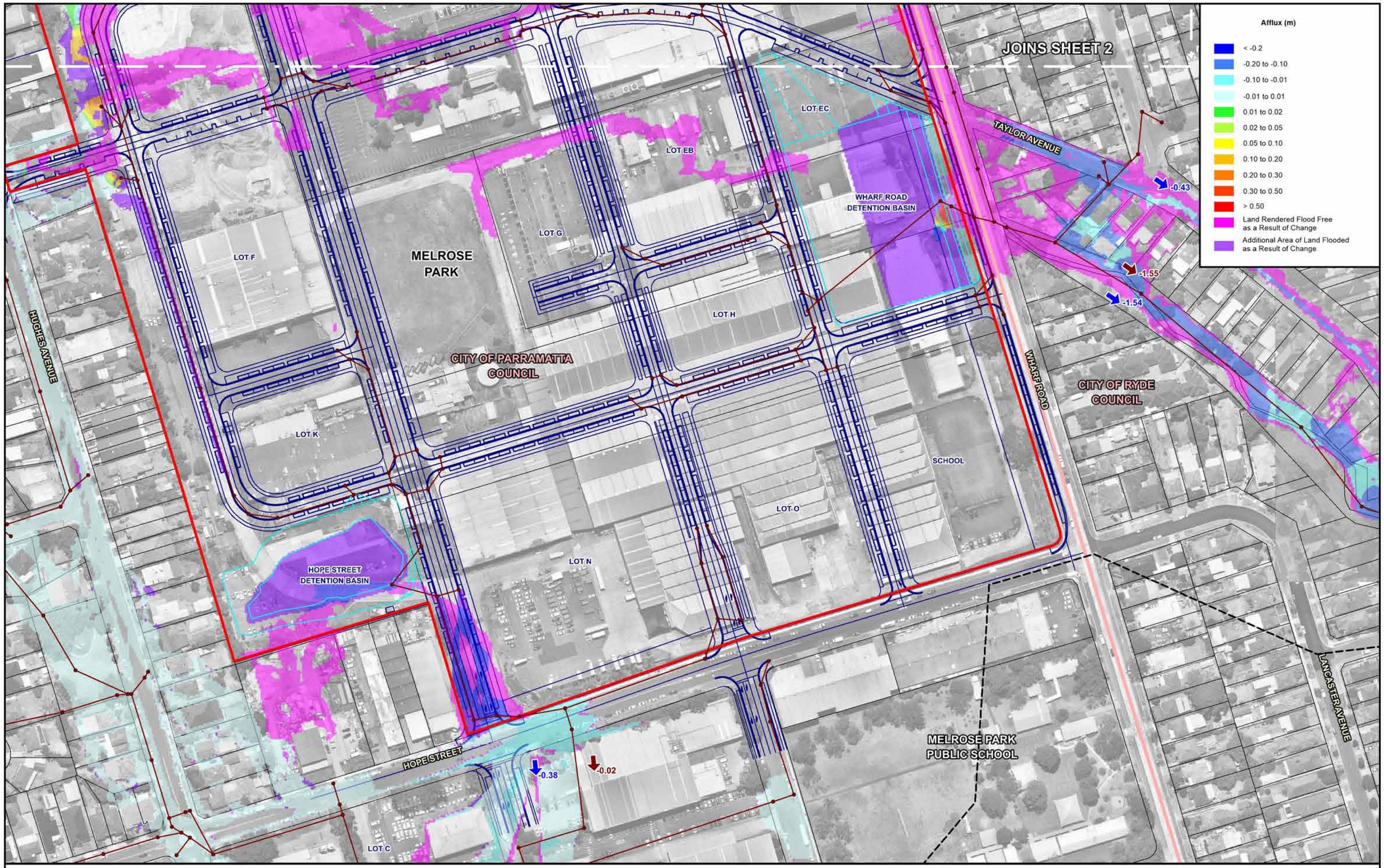
Lyall & Associates

Note
1. A positive value represents an increase, and conversely a negative value represents a decrease in peak flow when compared to baseline conditions.

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 4
(Sheet 2 of 3)

IMPACT OF PROPOSED VRS AND PP DEVELOPMENT ON FLOOD BEHAVIOUR
5% AEP



N

20 0 20 40 60

Scale: 1:2,000

Lyall & Associates

LEGEND

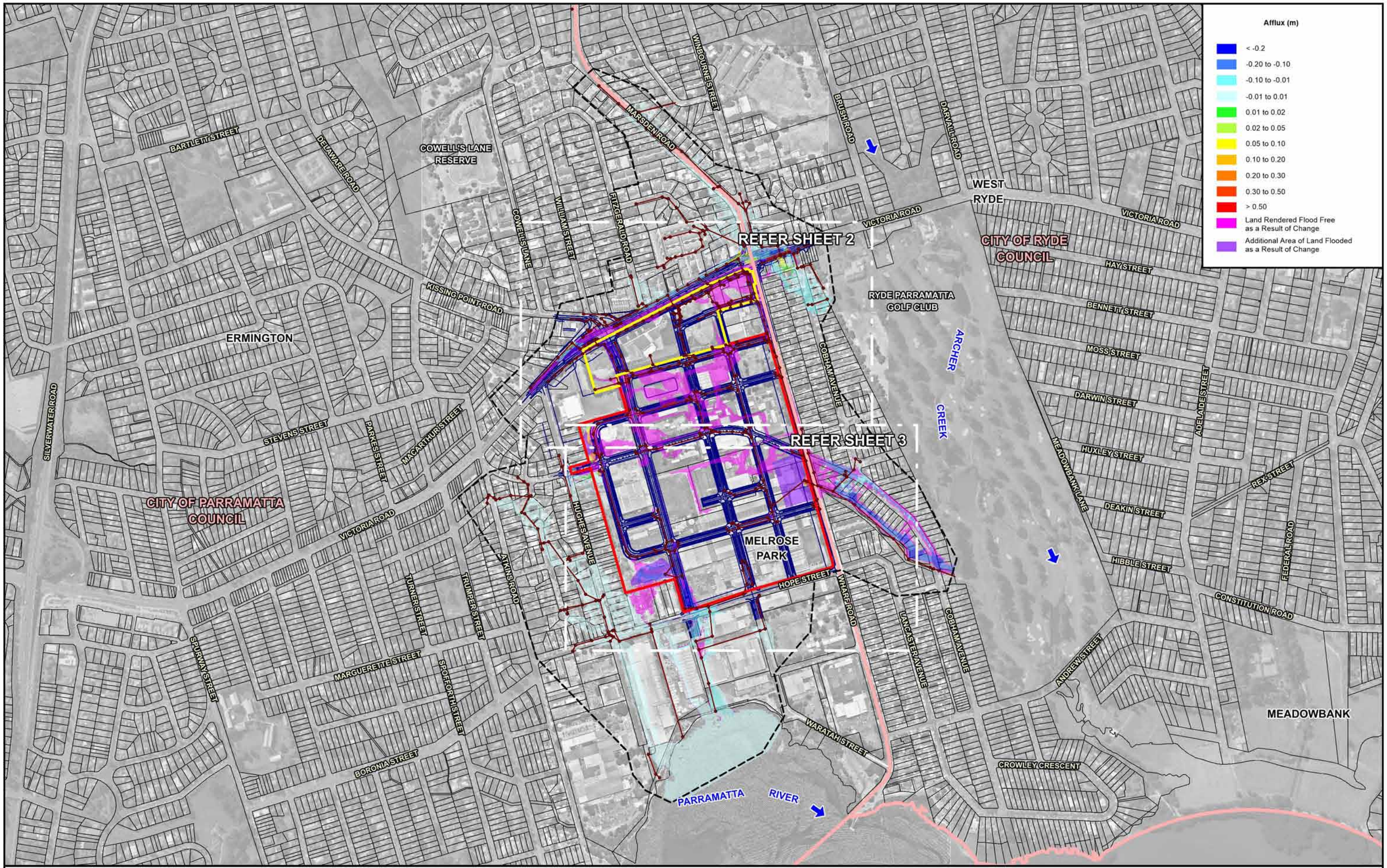
- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- +0.29 Change in Peak Piped Flow (m^3/s)
- -0.36 Change in Peak Overland Flow (m^3/s)

Note
1. A positive value represents an increase, and conversely a negative value represents a decrease in peak flow when compared to baseline conditions.

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 4
(Sheet 3 of 3)

IMPACT OF PROPOSED VRS AND PP DEVELOPMENT ON FLOOD BEHAVIOUR
5% AEP



N

80 0 80 160 240

Scale: 1:8,000

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LEGEND

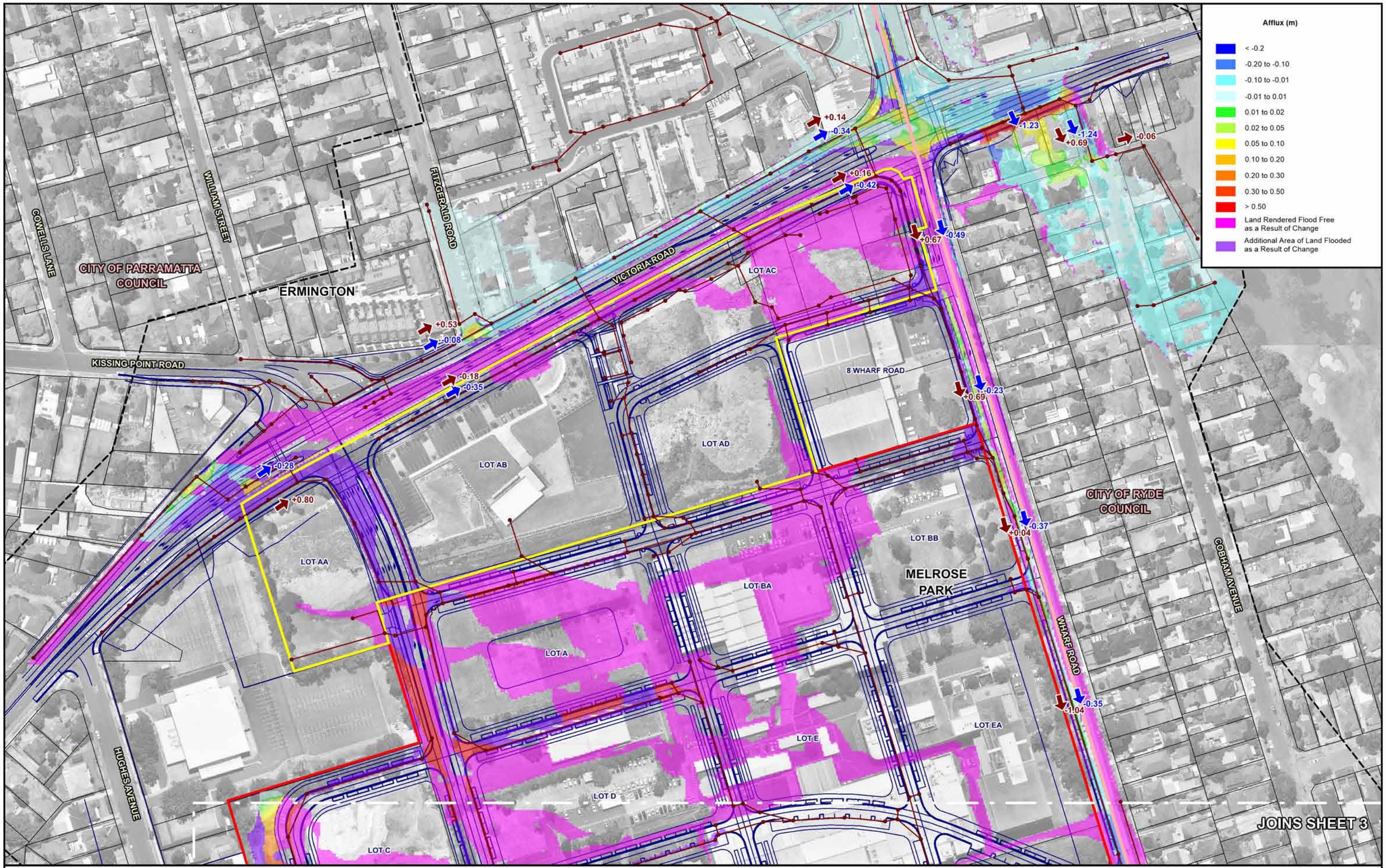
- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design

Note
1. A positive value represents an increase, and conversely a negative value represents a decrease in peak flow when compared to baseline conditions.

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 5
(Sheet 1 of 3)

IMPACT OF PROPOSED VRS AND PP DEVELOPMENT ON FLOOD BEHAVIOUR
1% AEP



N

20 0 20 40 60

Scale: 1:2,000

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- +0.25 Change in Peak Piped Flow (m³/s)
- -0.31 Change in Peak Overland Flow (m³/s)

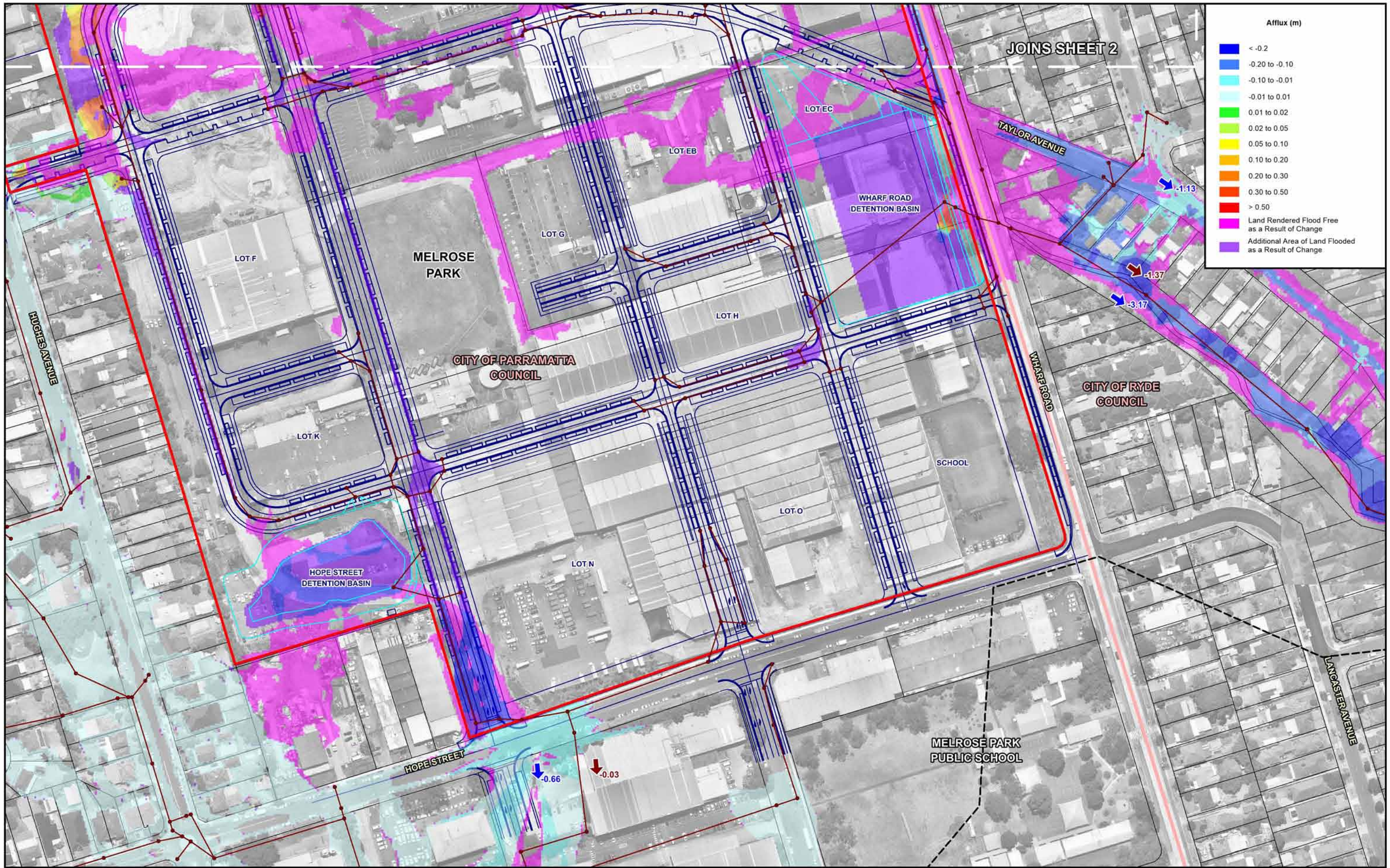
Lyall & Associates

Note
1. A positive value represents an increase, and conversely a negative value represents a decrease in peak flow when compared to baseline conditions.

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 5
(Sheet 2 of 3)

IMPACT OF PROPOSED VRS AND PP DEVELOPMENT ON FLOOD BEHAVIOUR
1% AEP



N

20 0 20 40 60

Scale: 1:2,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- +0.25 Change in Peak Piped Flow (m^3/s)
- -0.31 Change in Peak Overland Flow (m^3/s)

Note
1. A positive value represents an increase, and conversely a negative value represents a decrease in peak flow when compared to baseline conditions.

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 5
(Sheet 3 of 3)

IMPACT OF PROPOSED VRS AND PP DEVELOPMENT ON FLOOD BEHAVIOUR
1% AEP

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

REFER SHEET 2
REFER SHEET 3
REFER SHEET 4
REFER SHEET 5
REFER SHEET 6
REFER SHEET 7

COWELL'S LANE RESERVE
BARTLETT STREET
DELAWARE ROAD
MARSDEN ROAD
WINBOURNE STREET
BRUSH ROAD
DARVALL ROAD
WEST RYDE
VICTORIA ROAD
CITY OF RYDE COUNCIL
HAY STREET
BENNETT STREET
MOSS STREET
DARWIN STREET
HUXLEY STREET
DEAKIN STREET
HIBBLE STREET
CONSTITUTION ROAD
REX STREET
FEDERAL ROAD
ADELAIDE STREET
MEADOWBANK LANE
ANDREW STREET
MEADOWBANK
CROWLEY CRESCENT
RYDE PARRAMATTA GOLF CLUB
ARCHER CREEK
COBHAM AVENUE
LANCASTER AVENUE
WHARF ROAD
WARATAH STREET
PARRAMATTA RIVER
COWELLS LANE
WILLIAM STREET
FITZGERALD ROAD
KISSING POINT ROAD
ERMINGTON
SILVERWATER ROAD
STEVENS STREET
PARKES STREET
MACARTHUR STREET
CITY OF PARRAMATTA COUNCIL
VICTORIA ROAD
TURNER STREET
TRUMPER STREET
ATKINS ROAD
HUGHES AVENUE
HOPE STREET
MELROSE PARK
SPURWAY STREET
MARGUERETTE STREET
SPOFFORTH STREET
BORONIA STREET

N

80 0 80 160 240

Scale: 1:8,000

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design

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MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 1 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

WILLIAM STREET
FITZGERALD ROAD
KISSING POINT ROAD
VICTORIA ROAD
ERMINGTON
LOT AC
LOT AD
LOT AB
LOT AA
LOT BA
LOT A
MELROSE PARK
CITY OF PARRAMATTA COUNCIL
HUGHES AVENUE
JOINS SHEET 3
JOINS SHEET 4
JOINS SHEET 5
0.50
0.01
0.02
0.25
1.07
0.09
1.28
0.34
0.21
1.16
0.12

N
10 0 10 20 30 m
Scale: 1:1,000

Lyall & Associates

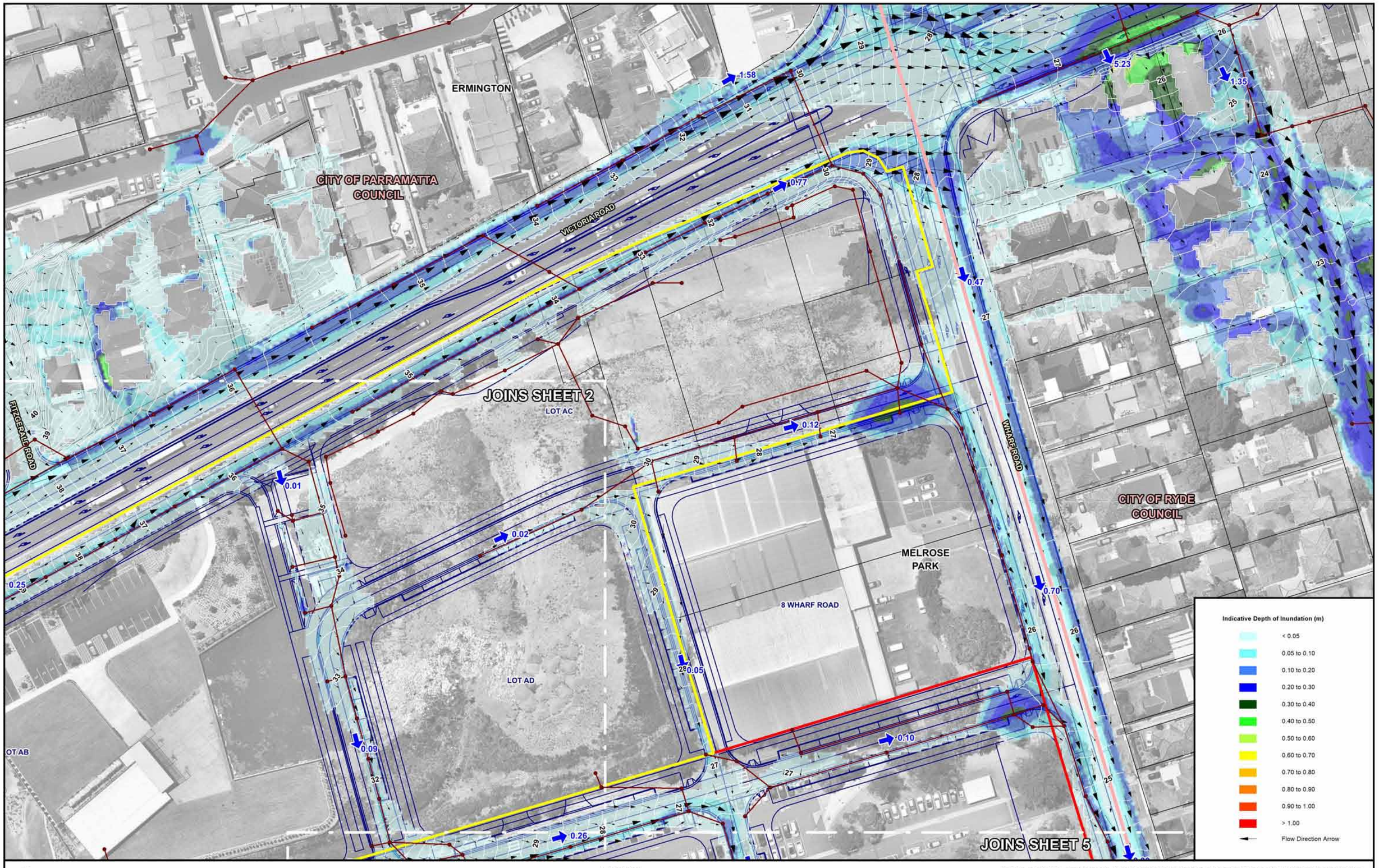
LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Water Surface Elevation Contours (0.2m Interval)
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- 1.58 Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 2 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP



N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Water Surface Elevation Contours (0.2m Interval)
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- 1.58 ← Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 3 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

JOINS SHEET 2

JOINS SHEET 5

JOINS SHEET 6

JOINS SHEET 7

LOT C

LOT D

LOT F

LOT G

HUGHES AVE

0.34

0.12

0.44

0.78

0.07

0.26

0.42

1.10

N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

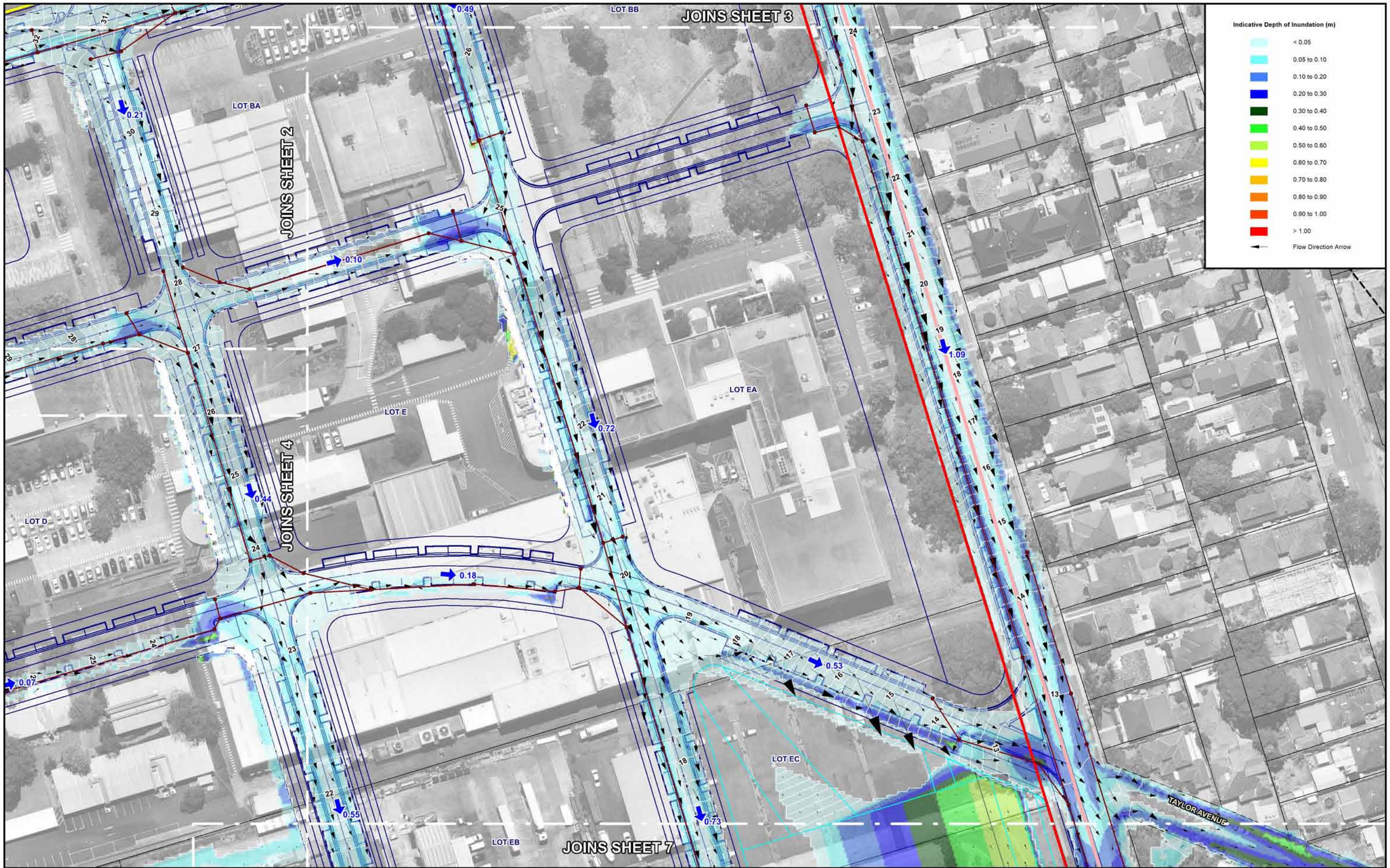
LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Water Surface Elevation Contours (0.2m Interval)
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- 1.58 Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 4 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP



N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Water Surface Elevation Contours (0.2m Interval)
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- 1.58 ← Peak Overland Flow (m³/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 5 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP

JOINS SHEET 4

JOINS SHEET 7

CITY OF PARRAMATTA COUNCIL

LOT G

LOT H

LOT K

LOT N

LOT O

MELROSE PARK

1.33

0.53

0.39

0.15

0.49

0.01

2.48

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

N

10 0 10 20 30 m

Scale: 1:1,000

Lyall & Associates

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Water Surface Elevation Contours (0.2m Interval)
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- 1.58 Peak Overland Flow (m^3/s)

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 6 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP

JOINS SHEET 5

JOINS SHEET 4

JOINS SHEET 6

LOT G

LOT H

LOT G

LOT O

LOT N

CITY OF PARRAMATTA COUNCIL

CITY OF RYDE COUNCIL

MELROSE PARK

SCHOOL

WHARF ROAD

0.21

1.11

1.50

0.99

2.28

0.39

0.15

0.49

21

20

19

18

17

16

15

12

11

Indicative Depth of Inundation (m)

- < 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00
- Flow Direction Arrow

N

10 0 10 20 30 m

Scale: 1:1,000

LEGEND

- LGA Boundary
- Modelled Stormwater Drainage Network
- Two-Dimensional Model Extent
- Water Surface Elevation Contours (0.2m Interval)
- Proposed VRS Development Site
- Proposed PP Development Site
- Proposed VRS and PP Road Design
- Proposed Detention Basin
- 1.58 Peak Overland Flow (m³/s)

Lyall & Associates

MELROSE PARK STORMWATER DRAINAGE STRATEGY

Figure 6
(Sheet 7 of 7)

INDICATIVE EXTENT AND DEPTH OF INUNDATION
POST-VRS AND PP DEVELOPMENT AND COMPLETE BLOCKAGE CONDITIONS - 1% AEP

ANNEXURE A

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block A**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.3297**	ha	**13,297**	m^2			
Total Roof Area	**0.4683**	ha	**4,683**	m^2			
Area of Site draining to OSD Storage	**0.851**	ha	**8,510**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.861**	ha					
Area Bypassing Storage	**0.4787**	ha					
Area Bypassing / Residual Site Area	**55.6%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**5**				**Satisfactory**		
Site Area per Dwelling	**0.266**	ha					
Roof Area per Dwelling	**0.094**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**44%**				
Adjusted SRDs	**23**	L/s/ha		**39**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**325.78**	m^3		Total Storage	**526.56**	m^3
Total Rainwater Tank Credits		**0.29**	m^3			**0.27**	m^3
Storage Volume					Total	**526.29**	m^3
Storage Volume	Ext Detention Storage	**325.49**	m^3		Flood Detention Storage	**200.81**	m^3
OSD Discharges	Primary Outlet	**31.02**	L/s		Secondary Outlet	**51.67**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**122**	mm	**Satisfactory**	**Satisfactory**	**154**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block BA**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.8441**	ha	**8,441**	m^2			
Total Roof Area	**0.3093**	ha	**3,093**	m^2			
Area of Site draining to OSD Storage	**0.4988**	ha	**4,988**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.535**	ha					
Area Bypassing Storage	**0.3453**	ha					
Area Bypassing / Residual Site Area	**64.6%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**3**				**Satisfactory**		
Site Area per Dwelling	**0.281**	ha					
Roof Area per Dwelling	**0.103**	ha					

Basic OSD Parameters

		Extended Detention				Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha	
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha	

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**35%**				
Adjusted SRDs	**21**	L/s/ha		**21**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**206.80**	m^3	Total Storage	**334.26**	m^3	
Total Rainwater Tank Credits		**0.14**	m^3		**0.13**	m^3	
Storage Volume				Total	**334.13**	m^3	
Storage Volume	Ext Detention Storage	**206.66**	m^3	Flood Detention Storage	**127.47**	m^3	
OSD Discharges	Primary Outlet	**17.41**	L/s	Secondary Outlet	**17.61**	L/s	
RL of Top Water Level of Storage		**10.100**	m		**10.300**	m	
RL of Orifice Centre-line		**9.100**	m		**9.000**	m	
Number of Orifices		**1**			**1**		
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI		**9.00**	100 yr ARI	
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**	**Satisfactory**	**0.00**	m	
Design Head to Orifice Centre		**1.000**	m	TWL Ext Detn Storage - RL Orifice	**1.100**	m	
Calculated Orifice Diameter		**91**	mm	**Satisfactory**	**Satisfactory**	**90**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block BB**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.8204**	ha	**8,204**	m^2			
Total Roof Area	**0.2742**	ha	**2,742**	m^2			
Area of Site draining to OSD Storage	**0.4499**	ha	**4,499**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.546**	ha					
Area Bypassing Storage	**0.3705**	ha					
Area Bypassing / Residual Site Area	**67.8%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**3**				**Satisfactory**		
Site Area per Dwelling	**0.273**	ha					
Roof Area per Dwelling	**0.091**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank		**32%**				
Adjusted SRDs		**20**	L/s/ha		**14**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**201.00**	m^3		Total Storage	**324.88**	m^3
Total Rainwater Tank Credits		**0.19**	m^3			**0.18**	m^3
Storage Volume					Total	**324.70**	m^3
Storage Volume	Ext Detention Storage	**200.81**	m^3		Flood Detention Storage	**123.90**	m^3
OSD Discharges	Primary Outlet	**16.12**	L/s		Secondary Outlet	**11.76**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**88**	mm	**Satisfactory**	**Satisfactory**	**73**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block C**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.8484**	ha	**8,484**	m^2			
Total Roof Area	**0.2851**	ha	**2,851**	m^2			
Area of Site draining to OSD Storage	**0.5099**	ha	**5,099**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.563**	ha					
Area Bypassing Storage	**0.3385**	ha					
Area Bypassing / Residual Site Area	**60.1%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**3**				**Satisfactory**		
Site Area per Dwelling	**0.283**	ha					
Roof Area per Dwelling	**0.095**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**40%**				
Adjusted SRDs	**22**	L/s/ha		**30**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**207.86**	m^3		Total Storage	**335.97**	m^3
Total Rainwater Tank Credits		**0.18**	m^3			**0.16**	m^3
Storage Volume					Total	**335.80**	m^3
Storage Volume	Ext Detention Storage	**207.68**	m^3		Flood Detention Storage	**128.12**	m^3
OSD Discharges	Primary Outlet	**18.64**	L/s		Secondary Outlet	**25.30**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**95**	mm	**Satisfactory**	**Satisfactory**	**107**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block D**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.3294**	ha	**13,294**	m^2			
Total Roof Area	**0.4648**	ha	**4,648**	m^2			
Area of Site draining to OSD Storage	**0.8639**	ha	**8,639**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.865**	ha					
Area Bypassing Storage	**0.4655**	ha					
Area Bypassing / Residual Site Area	**53.8%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**5**				**Satisfactory**		
Site Area per Dwelling	**0.266**	ha					
Roof Area per Dwelling	**0.093**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**46%**					
Adjusted SRDs	**24**	L/s/ha			**42**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**325.70**	m^3		Total Storage	**526.44**	m^3
Total Rainwater Tank Credits		**0.30**	m^3			**0.27**	m^3
Storage Volume					Total	**526.17**	m^3
Storage Volume	Ext Detention Storage	**325.41**	m^3		Flood Detention Storage	**200.76**	m^3
OSD Discharges	Primary Outlet	**31.70**	L/s		Secondary Outlet	**56.26**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**123**	mm	**Satisfactory**	**Satisfactory**	**160**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block E**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.9496**	ha	**9,496**	m^2			
Total Roof Area	**0.3431**	ha	**3,431**	m^2			
Area of Site draining to OSD Storage	**0.5741**	ha	**5,741**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.607**	ha					
Area Bypassing Storage	**0.3755**	ha					
Area Bypassing / Residual Site Area	**61.9%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**3**				**Satisfactory**		
Site Area per Dwelling	**0.317**	ha					
Roof Area per Dwelling	**0.114**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**38%**				
Adjusted SRDs	**21**	L/s/ha		**26**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**232.65**	m^3		Total Storage	**376.04**	m^3
Total Rainwater Tank Credits		**0.12**	m^3			**0.11**	m^3
Storage Volume					Total	**375.93**	m^3
Storage Volume	Ext Detention Storage	**232.53**	m^3		Flood Detention Storage	**143.40**	m^3
OSD Discharges	Primary Outlet	**20.35**	L/s		Secondary Outlet	**24.86**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**99**	mm	**Satisfactory**	**Satisfactory**	**107**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block EA**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.5012**	ha	**15,012**	m^2			
Total Roof Area	**0.4376**	ha	**4,376**	m^2			
Area of Site draining to OSD Storage	**0.8992**	ha	**8,992**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**1.064**	ha					
Area Bypassing Storage	**0.602**	ha					
Area Bypassing / Residual Site Area	**56.6%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**5**				**Satisfactory**		
Site Area per Dwelling	**0.300**	ha					
Roof Area per Dwelling	**0.088**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**43%**					
Adjusted SRDs	**23**	L/s/ha			**37**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**367.79**	m^3		Total Storage	**594.48**	m^3
Total Rainwater Tank Credits		**0.39**	m^3			**0.36**	m^3
Storage Volume					Total	**594.12**	m^3
Storage Volume	Ext Detention Storage	**367.40**	m^3		Flood Detention Storage	**226.71**	m^3
OSD Discharges	Primary Outlet	**34.56**	L/s		Secondary Outlet	**55.24**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**129**	mm	**Satisfactory**	**Satisfactory**	**159**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block EB**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.3975**	ha	**13,975**	m^2			
Total Roof Area	**0.5079**	ha	**5,079**	m^2			
Area of Site draining to OSD Storage	**0.9387**	ha	**9,387**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.890**	ha					
Area Bypassing Storage	**0.4588**	ha					
Area Bypassing / Residual Site Area	**51.6%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**6**				**Satisfactory**		
Site Area per Dwelling	**0.233**	ha					
Roof Area per Dwelling	**0.085**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank		**48%**				
Adjusted SRDs		**25**	L/s/ha		**47**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**342.39**	m^3		Total Storage	**553.41**	m^3
Total Rainwater Tank Credits		**0.40**	m^3			**0.37**	m^3
Storage Volume					Total	**553.04**	m^3
Storage Volume	Ext Detention Storage	**341.99**	m^3		Flood Detention Storage	**211.05**	m^3
OSD Discharges	Primary Outlet	**34.28**	L/s		Secondary Outlet	**65.48**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**128**	mm	**Satisfactory**	**Satisfactory**	**173**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block EC**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.4060533**	ha	**4,061**	m^2			
Total Roof Area	**0.11**	ha	**1,100**	m^2			
Area of Site draining to OSD Storage	**0.22647037**	ha	**2,265**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.296**	ha					
Area Bypassing Storage	**0.17958292**	ha					
Area Bypassing / Residual Site Area	**60.7%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**1**				**Satisfactory**		
Site Area per Dwelling	**0.406**	ha					
Roof Area per Dwelling	**0.110**	ha					

Basic OSD Parameters

		Extended Detention				Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha	
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha	

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**39%**				
Adjusted SRDs	**22**	L/s/ha		**29**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**99.48**	m^3	Total Storage	**160.80**	m^3	
Total Rainwater Tank Credits		**0.06**	m^3		**0.05**	m^3	
Storage Volume				Total	**160.74**	m^3	
Storage Volume	Ext Detention Storage	**99.42**	m^3	Flood Detention Storage	**61.32**	m^3	
OSD Discharges	Primary Outlet	**8.85**	L/s	Secondary Outlet	**11.65**	L/s	
RL of Top Water Level of Storage		**10.100**	m		**10.300**	m	
RL of Orifice Centre-line		**9.100**	m		**9.000**	m	
Number of Orifices		**1**			**1**		
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI		**9.00**	100 yr ARI	
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**	**Satisfactory**	**0.00**	m	
Design Head to Orifice Centre		**1.000**	m	TWL Ext Detn Storage - RL Orifice	**1.100**	m	
Calculated Orifice Diameter		**65**	mm	**Satisfactory**	**Satisfactory**	**73**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block F**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.5071**	ha	**15,071**	m^2			
Total Roof Area	**0.5552**	ha	**5,552**	m^2			
Area of Site draining to OSD Storage	**1.0097**	ha	**10,097**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.952**	ha					
Area Bypassing Storage	**0.4974**	ha					
Area Bypassing / Residual Site Area	**52.3%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**6**				**Satisfactory**		
Site Area per Dwelling	**0.251**	ha					
Roof Area per Dwelling	**0.093**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**48%**				
Adjusted SRDs	**24**	L/s/ha		**45**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**369.24**	m^3		Total Storage	**596.81**	m^3
Total Rainwater Tank Credits		**0.34**	m^3			**0.31**	m^3
Storage Volume					Total	**596.50**	m^3
Storage Volume	Ext Detention Storage	**368.90**	m^3		Flood Detention Storage	**227.60**	m^3
OSD Discharges	Primary Outlet	**36.66**	L/s		Secondary Outlet	**68.56**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**133**	mm	**Satisfactory**	**Satisfactory**	**177**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block G**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.24651879**	ha	**12,465**	m^2			
Total Roof Area	**0.431**	ha	**4,310**	m^2			
Area of Site draining to OSD Storage	**0.88674177**	ha	**8,867**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.816**	ha					
Area Bypassing Storage	**0.35977701**	ha					
Area Bypassing / Residual Site Area	**44.1%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**6**				**Satisfactory**		
Site Area per Dwelling	**0.208**	ha					
Roof Area per Dwelling	**0.072**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**56%**				
Adjusted SRDs	**27**	L/s/ha		**62**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**305.40**	m^3		Total Storage	**493.62**	m^3
Total Rainwater Tank Credits		**0.54**	m^3			**0.50**	m^3
Storage Volume					Total	**493.12**	m^3
Storage Volume	Ext Detention Storage	**304.86**	m^3		Flood Detention Storage	**188.26**	m^3
OSD Discharges	Primary Outlet	**33.36**	L/s		Secondary Outlet	**76.99**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**126**	mm	**Satisfactory**	**Satisfactory**	**188**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block H**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.745**	ha	**7,450**	m^2			
Total Roof Area	**0.26204701**	ha	**2,620**	m^2			
Area of Site draining to OSD Storage	**0.427**	ha	**4,270**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.483**	ha					
Area Bypassing Storage	**0.318**	ha					
Area Bypassing / Residual Site Area	**65.8%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**3**				**Satisfactory**		
Site Area per Dwelling	**0.248**	ha					
Roof Area per Dwelling	**0.087**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**34%**				
Adjusted SRDs	**20**	L/s/ha		**18**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**182.53**	m^3		Total Storage	**295.02**	m^3
Total Rainwater Tank Credits		**0.19**	m^3			**0.18**	m^3
Storage Volume					Total	**294.84**	m^3
Storage Volume	Ext Detention Storage	**182.33**	m^3		Flood Detention Storage	**112.51**	m^3
OSD Discharges	Primary Outlet	**15.08**	L/s		Secondary Outlet	**13.64**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**85**	mm	**Satisfactory**	**Satisfactory**	**79**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block K**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**0.7427**	ha	**7,427**	m^2			
Total Roof Area	**0.2406**	ha	**2,406**	m^2			
Area of Site draining to OSD Storage	**0.4237**	ha	**4,237**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.502**	ha					
Area Bypassing Storage	**0.319**	ha					
Area Bypassing / Residual Site Area	**63.5%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**3**				**Satisfactory**		
Site Area per Dwelling	**0.248**	ha					
Roof Area per Dwelling	**0.080**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**36%**				
Adjusted SRDs	**21**	L/s/ha		**23**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**181.96**	m^3		Total Storage	**294.11**	m^3
Total Rainwater Tank Credits		**0.24**	m^3			**0.22**	m^3
Storage Volume					Total	**293.88**	m^3
Storage Volume	Ext Detention Storage	**181.72**	m^3		Flood Detention Storage	**112.16**	m^3
OSD Discharges	Primary Outlet	**15.55**	L/s		Secondary Outlet	**17.03**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**86**	mm	**Satisfactory**	**Satisfactory**	**88**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block N**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**2.3152**	ha	**23,152**	m^2			
Total Roof Area	**0.7446**	ha	**7,446**	m^2			
Area of Site draining to OSD Storage	**1.8068**	ha	**18,068**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**1.571**	ha					
Area Bypassing Storage	**0.5084**	ha					
Area Bypassing / Residual Site Area	**32.4%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**7**				**Satisfactory**		
Site Area per Dwelling	**0.331**	ha					
Roof Area per Dwelling	**0.106**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**68%**				
Adjusted SRDs	**30**	L/s/ha		**85**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**567.22**	m^3		Total Storage	**916.82**	m^3
Total Rainwater Tank Credits		**0.37**	m^3			**0.33**	m^3
Storage Volume					Total	**916.49**	m^3
Storage Volume	Ext Detention Storage	**566.86**	m^3		Flood Detention Storage	**349.63**	m^3
OSD Discharges	Primary Outlet	**70.13**	L/s		Secondary Outlet	**197.39**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**183**	mm	**Satisfactory**	**Satisfactory**	**300**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block N1**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.08080953**	ha	**10,808**	m^2			
Total Roof Area	**0.35472725**	ha	**3,547**	m^2			
Area of Site draining to OSD Storage	**0.782411**	ha	**7,824**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.726**	ha					
Area Bypassing Storage	**0.29839854**	ha					
Area Bypassing / Residual Site Area	**41.1%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**7**				**Satisfactory**		
Site Area per Dwelling	**0.154**	ha					
Roof Area per Dwelling	**0.051**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**59%**				
Adjusted SRDs	**28**	L/s/ha		**68**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**264.80**	m^3		Total Storage	**428.00**	m^3
Total Rainwater Tank Credits		**1.13**	m^3			**1.10**	m^3
Storage Volume					Total	**426.90**	m^3
Storage Volume	Ext Detention Storage	**263.67**	m^3		Flood Detention Storage	**163.23**	m^3
OSD Discharges	Primary Outlet	**29.91**	L/s		Secondary Outlet	**73.29**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**120**	mm	**Satisfactory**	**Satisfactory**	**183**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block N2**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.24568959**	ha	**12,457**	m^2			
Total Roof Area	**0.38980452**	ha	**3,898**	m^2			
Area of Site draining to OSD Storage	**1.02436938**	ha	**10,244**	m^2	**Satisfactory**		
Residual Site Area (Lot Area - Roof Area)	**0.856**	ha					
Area Bypassing Storage	**0.2213202**	ha					
Area Bypassing / Residual Site Area	**25.9%**				**Satisfactory**		**30% Max**
No. of Dwellings on Site	**7**				**Satisfactory**		
Site Area per Dwelling	**0.178**	ha					
Roof Area per Dwelling	**0.056**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**74%**				
Adjusted SRDs	**32**	L/s/ha		**98**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**305.19**	m^3		Total Storage	**493.29**	m^3
Total Rainwater Tank Credits		**1.03**	m^3			**0.99**	m^3
Storage Volume					Total	**492.30**	m^3
Storage Volume	Ext Detention Storage	**304.17**	m^3		Flood Detention Storage	**188.14**	m^3
OSD Discharges	Primary Outlet	**40.16**	L/s		Secondary Outlet	**122.43**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**139**	mm	**Satisfactory**	**Satisfactory**	**236**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**Building Block O**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.4532**	ha	**14,532**	m^2			
Total Roof Area	**0.5657**	ha	**5,657**	m^2			
Area of Site draining to OSD Storage	**1.0393**	ha	**10,393**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**0.888**	ha					
Area Bypassing Storage	**0.4139**	ha					
Area Bypassing / Residual Site Area	**46.6%**				**Unacceptable - Exceeds 30%**		**30% Max**
No. of Dwellings on Site	**6**				**Satisfactory**		
Site Area per Dwelling	**0.242**	ha					
Roof Area per Dwelling	**0.094**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**53%**					
Adjusted SRDs	**26**	L/s/ha			**57**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**356.03**	m^3		Total Storage	**575.47**	m^3
Total Rainwater Tank Credits		**0.31**	m^3			**0.29**	m^3
Storage Volume					Total	**575.18**	m^3
Storage Volume	Ext Detention Storage	**355.72**	m^3		Flood Detention Storage	**219.46**	m^3
OSD Discharges	Primary Outlet	**37.80**	L/s		Secondary Outlet	**82.44**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**135**	mm	**Satisfactory**	**Satisfactory**	**194**	mm

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment
HED Secondary Outlet

Project:	**Melrose Park PP Site OSD Requirements**
Site Address	**School**
Job No:	**FG486**
Designer:	**SAB**
Telephone:	**(02) 9929 4466**

Site Data

OSD Area:	**Upper Parramatta River Catchment**						
L.G.A	**Parramatta City Council**						
Site Area	**1.45991356**	ha	**14,599**	m^2			
Total Roof Area	**0.23982888**	ha	**2,398**	m^2			
Area of Site draining to OSD Storage	**0.99161949**	ha	**9,916**	m^2	**Increase Area to Reduce Bypass**		
Residual Site Area (Lot Area - Roof Area)	**1.220**	ha					
Area Bypassing Storage	**0.46829407**	ha					
Area Bypassing / Residual Site Area	**38.4%**				**Unacceptable - Exceeds 30%**	**30% Max**	
No. of Dwellings on Site	**1**				**Satisfactory**		
Site Area per Dwelling	**1.460**	ha					
Roof Area per Dwelling	**0.240**	ha					

Basic OSD Parameters

		Extended Detention			Detention	
Basic SSR Vols	Ext Detention Storage	**245**	m^3/ha	Total Storage	**396**	m^3/ha
Basic SRDs	Primary Outlet	**40**	L/s/ha	Secondary Outlet	**150**	L/s/ha

OSD Tank Bypass

Residual Lot Capture in OSD Tank	**62%**				
Adjusted SRDs	**28**	L/s/ha		**73**	L/s/ha

OSD Calculations

		Extended Detention				Detention	
Basic SSR Volume	Ext Detention Storage	**357.68**	m^3		Total Storage	**578.13**	m^3
Total Rainwater Tank Credits		**0.03**	m^3			**0.02**	m^3
Storage Volume					Total	**578.10**	m^3
Storage Volume	Ext Detention Storage	**357.65**	m^3		Flood Detention Storage	**220.45**	m^3
OSD Discharges	Primary Outlet	**41.59**	L/s		Secondary Outlet	**106.92**	L/s
RL of Top Water Level of Storage		**10.100**	m			**10.300**	m
RL of Orifice Centre-line		**9.100**	m			**9.000**	m
Number of Orifices		**1**				**1**	
Estimated Downstream Flood Level		**9.00**	1.5 yr ARI			**9.00**	100 yr ARI
Downstream FL - RL of Orifice Cente-line		**-0.10**	**Satisfactory**		**Satisfactory**	**0.00**	m
Design Head to Orifice Centre		**1.000**	m		TWL Ext Detn Storage - RL Orifice	**1.100**	m
Calculated Orifice Diameter		**141**	mm	**Satisfactory**	**Satisfactory**	**221**	mm