BMT Commercial Australia Pty Ltd
Level 5, 348 Edward Street,
Brisbane, Qld, 4000
Australia

ABN: 54 010 830 421

Our ref: L.M21216.002.SHESP_Hydraulic_Report.docx

28 July 2022

Greater Shepparton City Council
90 Welsford Street
SHEPPARTON VICTORIA 3630

Attention: Michael MacDonagh

Dear Michael

RE: SHEPPARTON SOUTH EAST PSP – UPDATED FLOOD IMPACT ASSESSMENT

Introduction

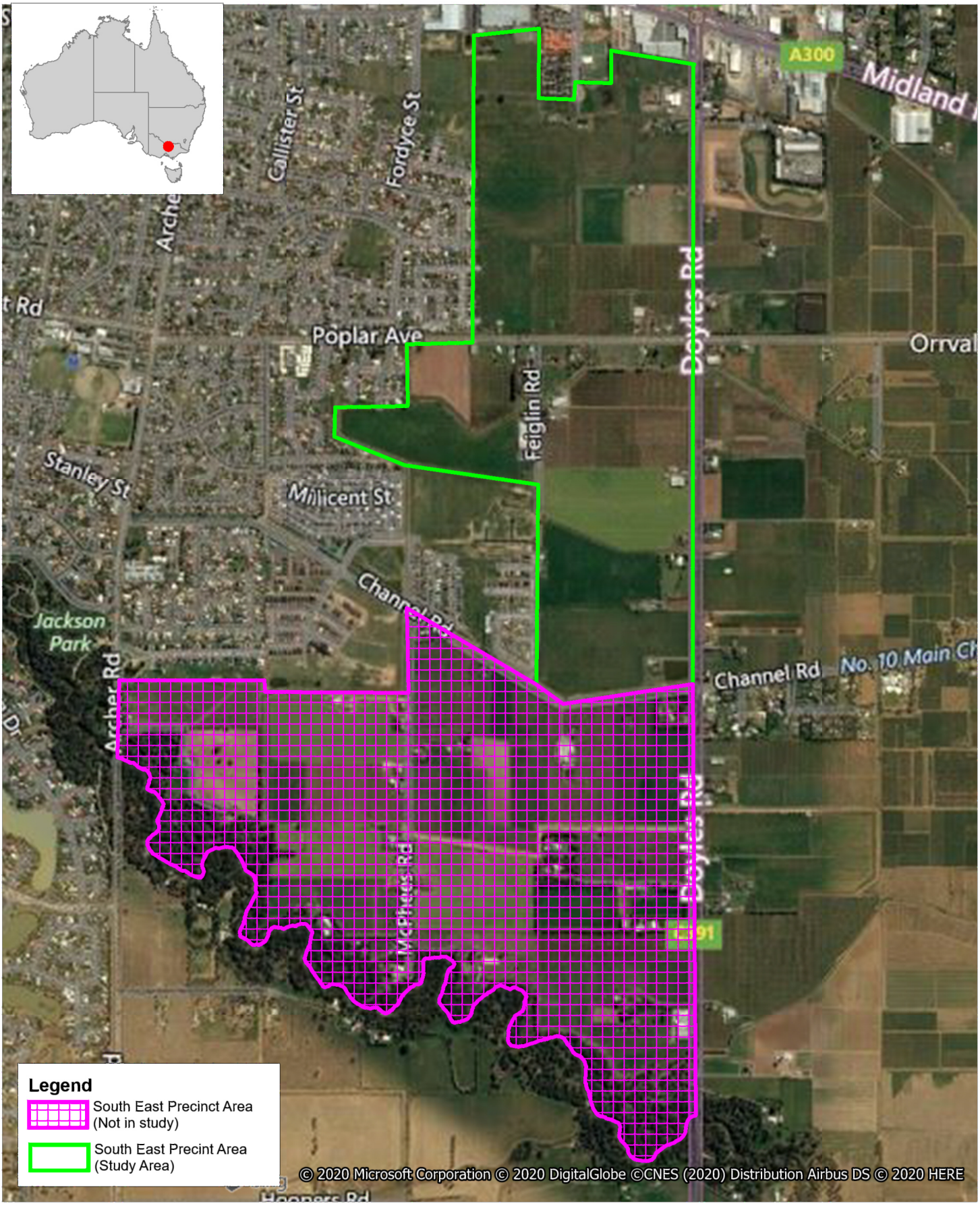
Greater Shepparton City Council (Council) are undertaking the development of the Precinct Structure Plan (PSP) for the Shepparton South East Precinct. In 2020 BMT undertook testing of the alternative stormwater drainage design for the PSP, as designed by Cardno. The Cardno report recommended further functional design work be undertaken. In 2022 Alluvium were engaged to undertake the further functional design work for the stormwater drainage scheme for the PSP. BMT have been engaged by Council to investigate the potential flood impacts that the Alluvium PSP design will have on the precinct.

The study area for this investigation is bounded by Doyles Road to the east, Channel Road to the south, the Midland Highway to the north, and residential properties to the west, as shown in Figure 1.1. The wider Shepparton South East Precinct also extends south to the Broken River. The PSP south of Channel Road is not included in this report and has been assessed by others.

The catchment for the Shepparton South East Precinct is predominantly rural farmland, with two irrigation channels bringing overland flows across Doyles Road into the precinct. Flooding within the catchment, including the extent of the Shepparton South East Precinct, was previously defined as part of the 'Shepparton East Overland Flow Urban Flood Study' that was prepared by BMT for Goulburn Broken Catchment Management Authority (GBCMA) in 2017. The results of this study indicate that localised rainfall drains overland across this farmland and into the irrigation drains to the west. These drains subsequently drain south into the Broken River. The South East Precinct in relation to the model boundary from the 'Shepparton East Overland Flow Urban Flood Study' is shown in Figure 1.2.

The development of the Shepparton South East Precinct has been set aside for predominantly medium density residential properties. However, the flat nature of the region calls for significant planning in developing the drainage for external flows entering the Precinct and urban stormwater generated from the development.

This assessment is based on the flood model previously updated by BMT for Council in 2020. The following report documents the methodology and findings of the flood mapping.



Title:

Shepparton South East Precinct Precinct and Study Boundary

Figure: 1-1

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

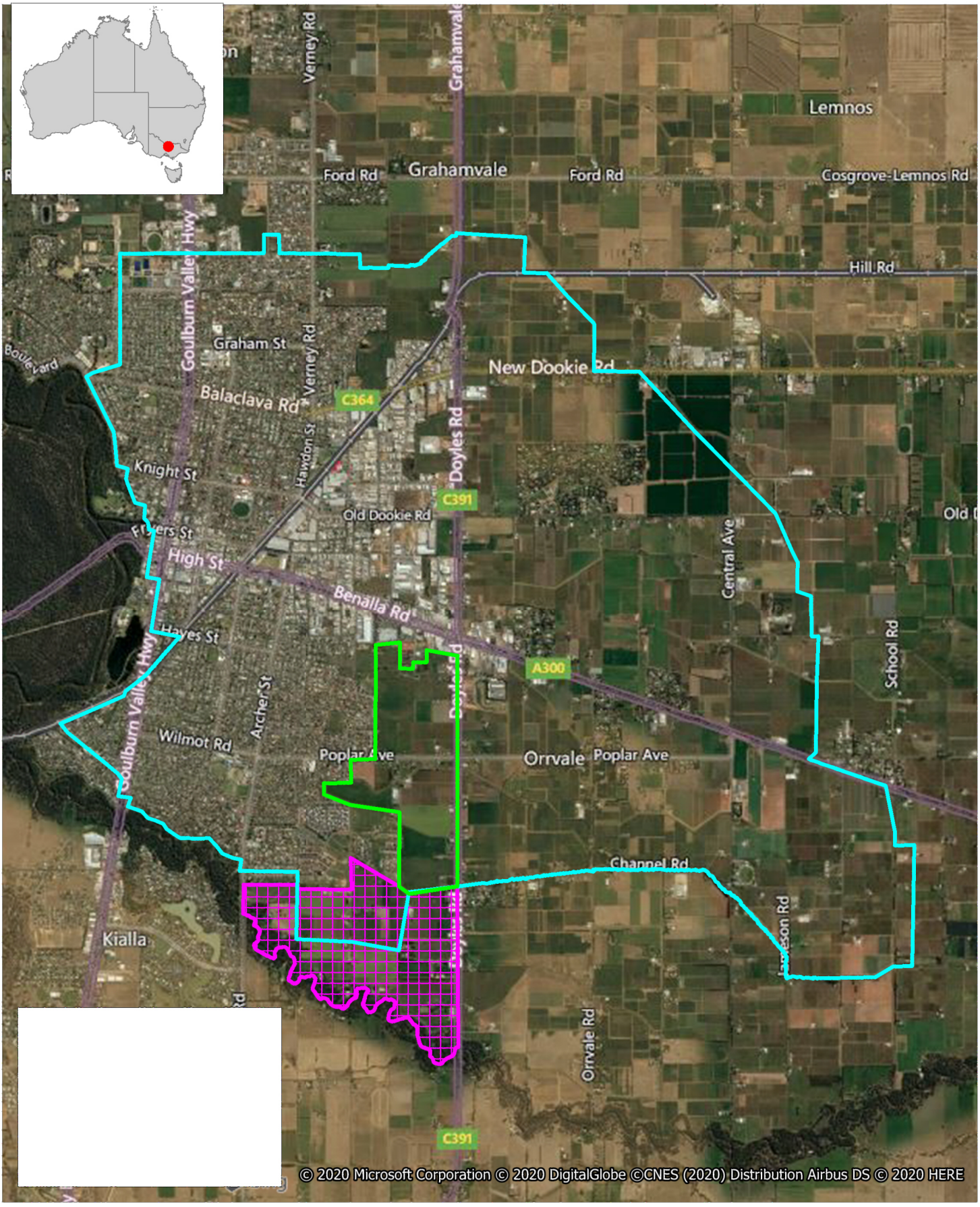
0 375 750m

Approx. Scale

BMT

www.bmt.org

Filepath : T:\M21216.JL.Shepparton_East_PSP\MapInfo\Drawings\20200519_R.M21216.001.00\Fig1-1_Precinct_Boundary.wor



Title:

Shepparton South East Precinct Precinct and TUFLOW Model Boundary

Figure: 1-2

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

0 375 750m

Approx. Scale

BMT

www.bmt.org

Filepath : T:\M21216.JL.Shepparton_East_PSP\MapInfo\Drawings\20200519_R.M21216.001.00\Fig1-2_Model_Boundary.wor

Hydraulic Model Update

The following changes have been made to the hydraulic model to reflect the proposed changes. The hydrologic modelling has not been updated from the 2020 modelling. The proposed design is shown in Figure 1.3.

Topographic Alterations

Modifications to the model topography were made to represent the design conditions of the developed scenario. Alterations made to the topography for the developed scenario include:

- Inclusion of the sedimentation basins through a DEM provided by Alluvium on 5 July 2022.
- Topographical polygons ('Z-Shapes' in the TUFLOW hydraulic model) were used to 'fill-in' the irrigation channels to be decommissioned as part of the development.

There have been no changes to topography across the remainder of the Precinct area to represent development (i.e. no land cut or fill) as design has not been completed for the individual developments within the Precinct.

Roughness Values

Roughness values were modified to represent the future residential development of the Precinct, including the sedimentation basins. Parameterisation remains consistent with the 2020 modelling.

Drains

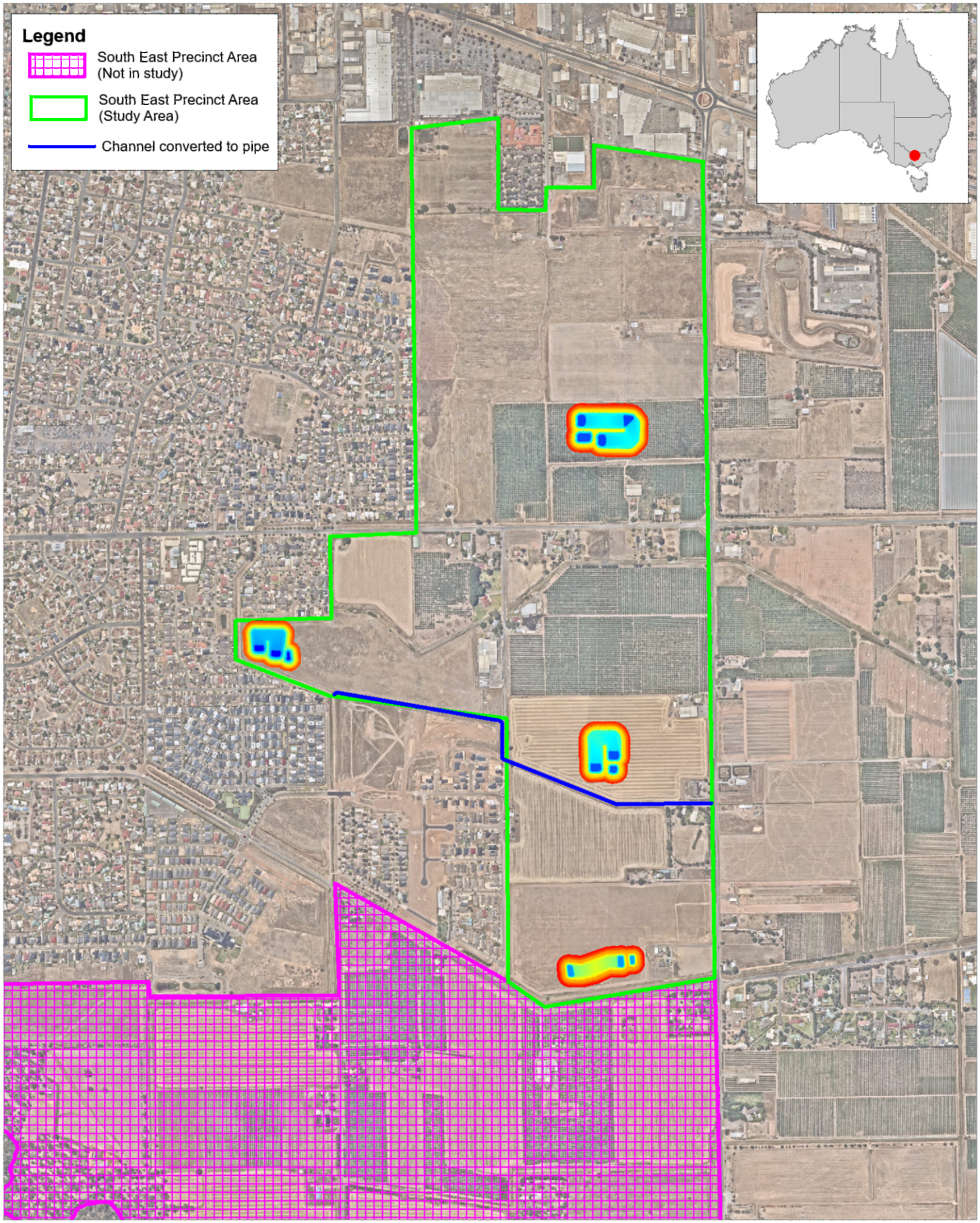
The proposed development states that some of the existing drains will be converted to pipes. Full details of these pipes are not currently available. Therefore, it has been assumed that the flow area of the pipe will be similar to the existing channel. This may need to be refined once the final design for these features has been completed.

Inflow Boundaries

For the developed case, the same infllow boundary conditions have been used (i.e., '2d_sa' boundaries from the existing TUFLOW model were used for most of the catchment). However, the inflow boundaries within the Precinct were introduced within the sedimentation basins. The exception to this is in the northern extent of the precinct where flows were applied to existing storage areas.

Downstream Boundaries

There are a number of 1D and 2D downstream boundaries along the western and southern extents of the model in the existing conditions. These boundaries do not change between the TUFLOW models of the existing and developed cases.



Title:

Shepparton South East Precinct Stormwater Design

Figure: 1-3

Rev: A

N

0 300 600m

Approx.Scale

BMT

www.bmt.org

Filepath: "I:\M21216\DRG\Fig3-1_Watercourse.WOR"

Flood Impact Assessment

The relative impact of the Precinct Structure Plan design, including the proposed stormwater drainage, has been considered in terms of potential changes to existing flood behaviour. Flood level difference mapping for the 1% AEP design flood event was prepared to quantify the potential for the proposed works to impact on existing flood levels, as shown in Figure 1.4. The difference mapping was prepared by subtracting peak existing water levels from peak proposed water levels.

Reduction in Peak Flood Level

The proposed stormwater design has aided in removing a significant amount of overland flow area in the 1% AEP event, as shown by the 'was wet now dry' portions of Figure 1.4 and throughout most of the Precinct, there has been a reduction in peak flood levels. There is also a reduction in peak flood levels in lands to the west of the Precinct.

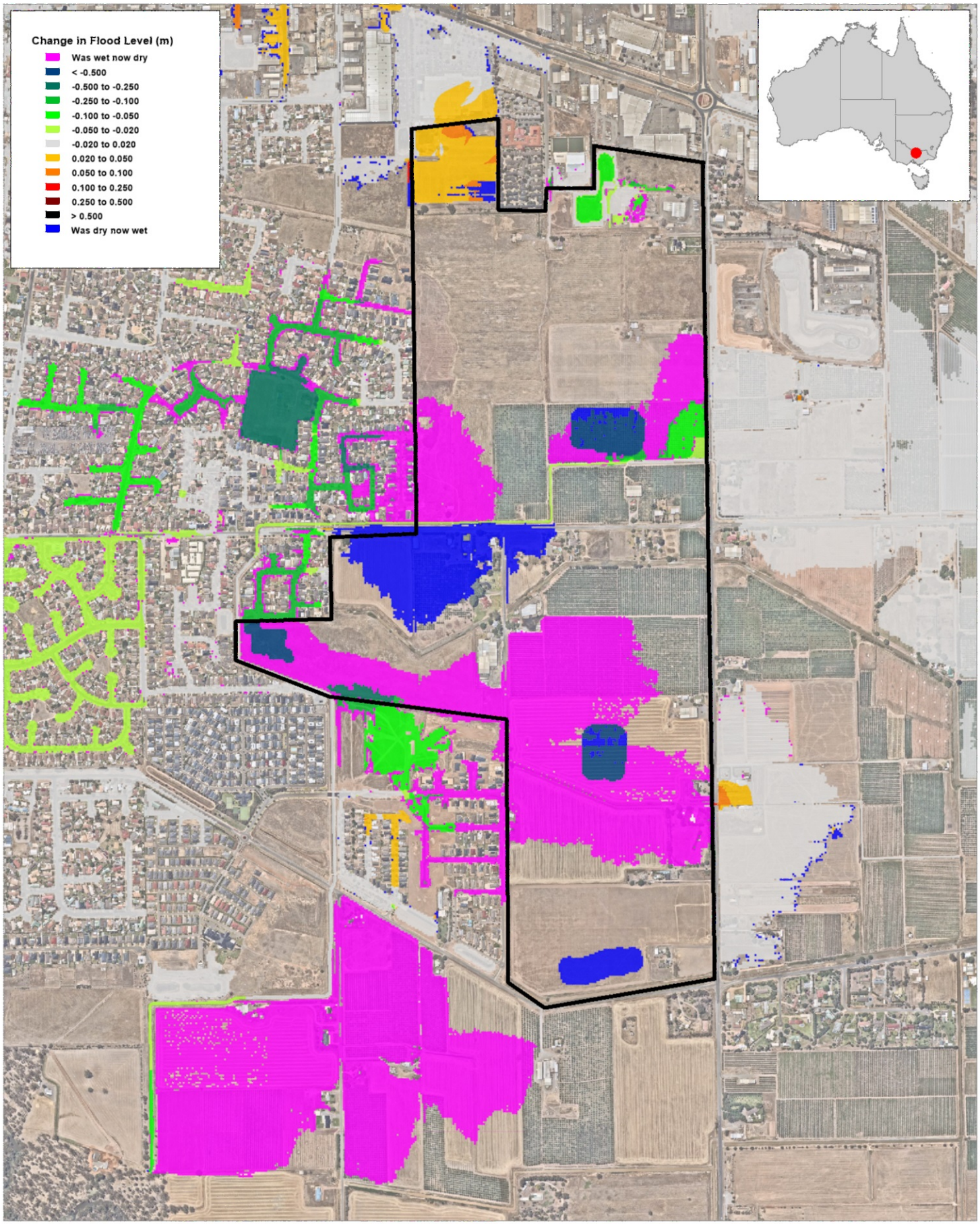
The conversion of 'Drain 2-2' to a pipe has resulted in flow throughout that area being contained within the piped network. This means that there is a significant reduction in areas that are impacted by flooding within the 1% AEP event.

Increases in Peak Flood Level

An increase in peak flood levels can be seen within the north of the Precinct (between the western boundary and Zurcas Lane). This is attributed to increases in impervious area roughness increasing runoff volumes in this region. Furthermore, the drainage path of the area into RBWL3 have not been formalised in the model. Including this feature in the model may aid in reducing impacts in this area.

There is also an increase in flood levels to the east of 'Drain 2-2'. This is attributed to a combination of the connection between the pipe replacing 'Drain 2-2' and the remaining open drain and the sizing of the pipe replacing 'Drain 2-2'. Refinement of these features may reduce predicted increases in peak flood levels in the area.

An increase in peak flood levels is also seen to the south-west of the Precinct. This is attributed to the removal of the irrigation channels to the west of Doyles Road. The irrigation channels are though to act as an outlet for flows from the Precinct in existing conditions. No underground drainage network has been modelled for this section of the model as this area of the floodplain was developed post-2017 (i.e., since the completion of the 'Shepparton East Overland Flood Urban Flood Study' (BMT WBM, 2017)). It is expected that with the inclusion of drainage infrastructure in this area, the overall flooding and associated impacts will be reduced and potentially removed.



Title:

Shepparton South East Precinct
1% AEP Event - Flood Height Impact

Figure: 1-4

Rev: A

N

0 300 600m

Approx.Scale

BMT

www.bmt.org

Filepath: I:\M21216\DRG\Fig4-2_1%_Impact.WOR

Conclusion

This report has summarised the outcomes of a flood impact assessment that was completed for the updated stormwater design of the Shepparton South East Precinct.

The assessment was completed using updated and modified versions of the RORB and TUFLOW models originally developed for the 'Shepparton East Overland Flood Study' (BMT WBM, 2017). The modelling of proposed conditions included the increased imperviousness and modified roughness values associated with the change in land use within the study area, as well as the inclusion of the sedimentation basins and the conversion of 'Drain 2-2' to a pipe. The models existing and post-development scenarios were used to simulate flood conditions for the 1% AEP design flood event.

Overall, the proposed development and stormwater design causes a reduction of flood levels outside of the Precinct. There are a few areas that have an increase in peak flood levels outside of the Precinct boundary. It is believed that further refinement of stormwater drainage, namely pipe sizes, will assist to resolve these impacts.

Yours Sincerely,

BMT

Melissa Blum
Senior Flood Engineer