Our Ref: AWE200083-L01: BCP/bcp
Contact: Dr Brett C. Phillips

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Dear Russell,

RESPONSES TO FLOODING SUBMISSIONS, ASPECT INDUSTRIAL ESTATE, KEMPS CREEK, NSW

The EIS for Aspect Industrial Estate was publicly exhibited from 18 November 2020 to 15 December 2020. Mirvac received the Response to Submissions (RTS) from the Department of Planning Industry and Environment on Aspect Industrial Estate SSD DA (SSD-10448) on 22 December 2020.

The Department requires a response to the issues raised in those submissions in accordance with clause 85A(2) of the Environmental Planning and Assessment Regulation 2000. DPIE requested that additional information be submitted that effectively addresses the issues identified in Attachment 1 to the DPIE letter.

The following responses are provided to each of the submission which raised flooding issues.

1. DPIE SUBMISSION

17. The Department notes the Flood Impact Assessment (FIA) does not include an assessment of the Concept Proposal when all 11 warehouses are constructed during all ARI events and the PMF event. The FIA must be updated to include the assessment.

The Final Masterplan has been assessed and the results of the assessment have been incorporated into an updated version of the FIA Report. The updated FIA Report addresses this requirement.

2. DPIE EES SUBMISSION

The consultant needs to revisit the flood impact assessment to provide sound information for the developed scenario. The developed scenario maps should be updated to present the ultimate developed scenario.

The Final Masterplan has been assessed and the results of the assessment have been incorporated into an updated version of the FIA Report. The updated FIA Report addresses this comment.

Comments on the Flood Risk Assessment and Flood Impact Assessment (Cardno, October 2020)

The site is in the Kemps Creek catchment but located outside the probable maximum flood extent of Kemps Creek mainstream flooding. The site is impacted by local overland flow.

EES comments on Cardno's assessments are generally confined to the methodology used for the assessment.

- *For the base case conditions discussed in the Flood Risk Assessment report, it is not clear why the consultant undertook multiple scenarios and comparisons for a simple local overlandflow study instead of using the properly verified existing up-to-date hydrological flood model.*

  not clear why the consultant undertook multiple scenarios

  Hydrological modelling of the South Creek catchment was undertaken in 2015 at the catchment scale using XP-RAFTS. The hydrological model assembled by Worley Parsons in 2015 was based on ARR1987 IFD[1].

  More recently the 2020 Wianamatta (South) Creek Catchment Flood Study updated the 2015 assessments[2]. The hydrological assessments were described, in part, as follows:

  The XP-RAFTS hydrologic model that was applied as part of the 2015 Flood Study has also been updated. The results of simulations undertaken using the updated XP-RAFTS model indicate that peak flows for the 1% AEP 36 hour critical duration event are similar to those determined as part of the modelling completed for the 2015 Flood Study. Peak flows along South Creek are generally within 2% of the corresponding flows determined in 2015, with a maximum change of up to 8% near the downstream boundary at Richmond Road. Changes along tributaries have greater variability with a maximum change of up to 15% (refer Figure 4.9).

  Assessments of the sensitivity of 100 yr ARI peak runoff to storm burst rainfall losses were therefore undertaken for 2 hour, 9 hour and 36 hour storm bursts (under ARR1987 IFD and temporal patterns).

  At the time the flooding assessments were commissioned, Mirvac received, in part, the following advice from Sydney Water:

  Until the transition to ARR2019 is completed, we'd recommend that flood impact assessments consider both ARR1987 and ARR2019 hydrology.

  Consequently, an additional assessment was undertaken using ARR2019 IFD and burst losses.

[1] Worley Parsons (2015) "Updated South Creek Flood Study", *Final Report*, 2 Vols, prepared for Penrith City Council, acting in association with Liverpool, Blacktown and Fairfield City Councils, 74 pp + Apps

[2] Advisian (2020) "Wianamatta (South) Creek Catchment Flood Study – Existing Conditions", *Final Report*, Rev H, prepared for Infrastructure NSW, November, 27 pp + Maps + Apps

properly verified existing up-to-date hydrological flood model

As described by Worley Parsons, 2015:

The validation of the updated XP-RAFTS model was based on a comparison between the peak discharge and hydrograph shape produced by the RAFTS model developed for the 1990 Flood Study and the results of the latest XP-RAFTS model. ….

In 2015, the validation of the model was simply by matching the 1990 design flood hydrographs.

As described by Advisian, 2020:

The XP-RAFTS hydrologic model that was applied as part of the 2015 Flood Study has also been updated. The results of simulations undertaken using the updated XP-RAFTS model indicate that peak flows for the 1% AEP 36 hour critical duration event are similar to those determined as part of the modelling completed for the 2015 Flood Study. Peak flows along South Creek are generally within 2% of the corresponding flows determined in 2015, with a maximum change of up to 8% near the downstream boundary at Richmond Road. Changes along tributaries have greater variability with a maximum change of up to 15% (refer Figure 4.9).

While the level of subcatchment discretisation increased elsewhere in the hydrological model there is no change in the subcatchment discretisation downstream of Elizabeth Drive. As noted in the FRA Report[3] (Cardno, 2020a)

> *The local catchment is located within the larger South Creek subcatchment 1.17.*

Consequently, the 2015 and 2020 XP-RAFTS catchment-scale XP-RAFTS models were unsuitable for hydrological assessments in the local catchment. Consequently, a local hydrological model with increased subcatchment discretisation was assembled.

As noted previously by Worley Parsons, 2015 and most recently by Advisian, 2020:

The 36 hour storm duration has been confirmed to be critical for the study area generating the largest peak flows along South Creek and at many of the major bridge crossings. Although shorter storm durations such as the 2 and 9 hour storms generate the largest flows along many of the smaller tributaries such as Thompsons, Bonds, Claremont and Werrington creeks (refer Table 4.3), the 36 hour duration is considered most relevant to the study and the assessment of impacts along the length of South Creek.

Assessments of the sensitivity of 100 yr ARI peak runoff to storm burst rainfall losses were therefore undertaken for 2 hour, 9 hour and 36 hour storm bursts (under ARR1987 IFD and temporal patterns).

[3] Cardno (2020) "Flood Risk Assessment, Aspect Industrial Estate (AIE)", *Final Report*, Version 4, prepared for Mirvac, 22 pp + Apps

As described in Section 3.3 of the FRA report (Cardno, 2020a):

The sensitivity of the adopted pervious area rainfall losses was assessed for two sets of values as follows:

- *Initial loss = 37.1 mm and continuing loss = 0.94 mm/h (adopted by Worley Parsons, 2015 in the vicinity of the Mamre Road local catchment); and*
- *Initial loss = 15 mm and continuing loss = 1.5 mm/h (adopted by WMAwater, 2012 for the Upper South Creek catchment)*

The sensitivity of the 100 yr ARI peak flows to the roughness vale and BX value was assessed for two sets of values as follows:

- *Roughness value = 0.025 and BX = 1.3 (adopted by Worley Parsons, 2015); and*
- *Roughness value = 0.04 and BX = 1.0 (guided by the preliminary farm dam assessment by Cardno, 2015 for Upper South Creek catchment)*

***Attachment B1** summarises the estimated 100 yr ARI peak flows at all nodes for storm burst durations ranging from 30 minutes to 36 hours for Scenarios 1, 2, 3 and 4.*

It was noted that

(i) *The rainfall losses adopted by Worley Parsons, 2015 give critical storm burst durations that range between 4.5 hours to 12 hours depending on location;*

(ii) *The rainfall losses adopted by WMAwater, 2012 give critical storm burst durations of 2 hours in almost all locations; and*

(iii) *The adjustment of BX and pervious roughness values only has a small impact on the estimated peak flows.*

It was also noted that the 1% AEP storm burst initial loss and continuing rainfall losses advised by the ARR2019 data hub are around 10 mm and 2.3 mm/h respectively. This suggested that greater weight should be given to the results of Scenarios 2 and 4.

For subsequent ARR1987 assessment purposes the benchmark conditions were based on Scenario 2.

It was concluded that the adopted hydrological model parameters gave:

- storm burst durations which were more uniform and aligned with the expected critical storm burst durations for small local catchments;
- conservative estimates of peak flows in comparison to the peak flows estimated using parameter values from Worley Parsons, 2015.

As described by Advisian, 2020:

The updated XP-RAFTS hydrologic model was also used to simulate the 1% AEP flood based on ARR 2019 inputs and procedures. Peak flows at the Elizabeth Drive crossing were derived based on both ARR 1987 and ARR 2019 inputs and procedures, and the results were compared to peak flows derived at Elizabeth Drive from Flood Frequency Analysis (FFA).

The comparison established that the modelling based on ARR 1987 generated a peak flow for the 1% AEP event that matched more closely (9% lower) to the FFA than was the case based on ARR 2019 (29% lower) (refer Table 4.5). Hence, it was determined that the assessment of flood hydrology for the South Creek catchment should continue to be based on ARR 1987 temporal patterns and Intensity-Frequency-Duration (IFD) data. This is consistent with the 'Updated South Creek Flood Study' (Advisian, 2015).

It is concluded that the adoption of ARR1987 for the assessments of the Stage 1 and the Final Masterplan was supported by the outcome of the assessment of ARR1987 and ARR2019 reported by Advisian, 2020.

- *The Flood Risk Assessment report refers to the updated Flood Prone Land Package as approved and being in action. It should be noted that the package was on public exhibition as a draft for consultation and it has not been finalised. The current planning circular, guideline, LEP flood clauses and planning direction under section 9.1 of the Environmental Planning and Assessment Act 1979 remain relevant.*

  It is acknowledged that current planning circular, guideline, LEP flood clauses and planning direction under section 9.1 of the Environmental Planning and Assessment Act 1979 remain relevant. These are overviewed in Section 1.3 Planning Context in the 2020 FRA Report (Cardno, 2020a).

- *The Flood Impact Assessment report needs to adequately describe the Stage 1 development and the ultimate developed conditions including the proposed development, earthworks and proposed drainage system.*

  The descriptions of the Stage 1 development and the Final Masterplan have been amended as needed in the updated version of the FIA report. Available details on the proposed drainage system are given in 2020 Stormwater Management Report prepared by AT&L.

Comments on developed conditions maps

- *The developed scenario maps present local overland flow for Stage 1 which comprises of two industrial lots on the northern part of the site. However, from a flow management perspective, an overland flow study should consider the ultimate developed scenario of the site instead of considering each progressive development independently.*

  The final masterplan has been assessed and the results of the assessment have been incorporated into an updated version of the FIA report.

- *All maps for developed conditions should properly depict the layout of the development, locations of proposed constructed channels and the location of the proposed detention basin.*

  The updated Figures have been incorporated into an updated version of the FIA report.

Comments on the EIS

Drainage design consideration

1st paragraph states 'The design of the stormwater system for AIE aims to match post-development flows as close as possible to pre-development flows across the site to ensure that downstream catchments will not be adversely affected in terms of flooding.' *The use of the term flooding* 'In terms of flooding' *is inaccurate, it should be 'in terms of runoff' because a stormwater system alone cannot mitigate flood impacts.*

The preferred terminology is noted.

The site is partially affected by local overland flow. Section 5.7.5 of the EIS indicates that the major/minor drainage system would be designed to accommodate runoff produced from rainfall events up to and including the 1% AEP event in the ultimate developed scenario (i.e. runoff produced in the existing scenario plus excess runoff due to the increase in imperviousness). The major/minor drainage system is not designed to manage overland flooding for events greater than the 1% AEP up to the full range of flooding (PMF).

It is agreed that the major/minor drainage system is not designed to manage overland flooding for events greater than the 1% AEP up to the full range of flooding (PMF). While not formally designed to convey flows greater than 1% AEP overland flows is expected however that the major drainage system will provide preferred flowpaths for overland flows greater than the 1% AEP up to the PMF given the obstruction to overland flows offered by the buildings which will be constructed on the Estate.

Key standard requirements

Dot point 5 states "OSD is to mitigate post development flows to pre-development flows for peak Average Reoccurrence Interval (ARI) events". *The dot point should specify the limit of OSD capacity is up to and includes the 1% AEP event.*

It is agreed that the limit of OSD capacity is up to and includes the 1% AEP event.

Dot point 6 states "All OSD basins have been designed with a 3.0m wide stabilised ….". *This dot point indicates there would be multiple basins which is inconsistent with the Flood Impact report and with previous dot points of this Section, which specify that one OSD basin is proposed to serve as estate-based measure and to be designed for the ultimate developed scenario.*

It is confirmed that only one OSD basin is proposed to serve as estate-based measure designed for the Final Masterplan conditions.

Yours faithfully

Brett C. Phillips

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Dr Brett C. Phillips
Senior Principal
for **Cardno**