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From	Sam Douglas	Project No.	12514693				
Project Name	NAPL Apron Expansion						
Subject	NAPL Apron - Stormwater Drainage Impacts						

1. Introduction

As part of the P0008 National Airfields Works (NAW) at RAAF Base Williamtown, GHD was engaged to undertake design services to extend Taxiway J to the existing Newcastle Airport Pty Ltd (NAPL) Code E Apron, with Code C taxiway realignment and apron extension works. In June 2023, the NAPL Apron and Taxiway J | Drainage & Flooding Report (GHD, 2023) was prepared to document the assessment of the design works and to quantify the impacts on stormwater and flooding associated with the proposed works.

Following the receipt of this report by NAPL, a change to the Project Scope and revised design was requested. The scope is broadly defined in Figure 1 as follows:





As described in the NAPL Apron and Taxiway J | Drainage & Flooding Report, the design criteria adopted for this project is consistent with the P0008 design criteria, which are shown below in Table 1

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 Table 1
 Flood Assessment Criteria (URB, BECA, 2019)

Location Criteria		Flood Assessment Criteria				
Taxiways	Level	No ponding in during the 1 in 50 AEP event				
Taxiway and apron flank	Duration	Duration of ponding within 1 m of pavement edge during the 1 in 5 AEP event not to exceed 12 hours				
Aprons	Level	No ponding during the 1 in 10 AEP event				
Aprons (within 65 m of buildings)	Level	No ponding during the 1 in 50 AEP event				
Discharge Locations	Discharge/Flow	No increase in peak flow during design storms				

For the purposes of this project, NAPL have requested an assessment of the revised NAPL apron design to assess these criteria can be met and that there would be no impacts to the RAAF Williamtown Airfield stormwater network.

1.1 Purpose of this Memorandum

The purpose of the memorandum is to demonstrate to Defence that the NAPL apron works do not increase flows to the culvert under Taxiway J, through the decreased catchment areas for the new NAPL Apron design offsetting the increased imperviousness through the new pavement widening to be constructed north of the catchment divide

1.2 Scope and limitations

This technical memorandum has been prepared by GHD for Newcastle Airport Pty Ltd. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

2. Methodology

For the purposes of this assessment, the following methodology was adopted:

- Existing Conditions: The updated DRAINS model prepared for the NAPL Apron and Taxiway J | Drainage & Flooding Report was adopted without amendment to reflect the predevelopment conditions at the NAPL Apron and the model was simulated for the 1 in 5 AEP, 1 in 20 AEP and 1 in 100 AEP design storm events to quantify flows from the existing NAPL Apron pavement areas and to the culvert bank under Taxiway J
- Design Conditions: The catchments were then amended to reflect the revised design works at the NAPL apron. The DRAINS model was re-simulated and the peak discharges compared to the existing discharges. It is noted that the NAPL apron catchment divide has shifted northwards, resulting in more catchment area draining southwards
- The assessment has been limited to a hydrological assessment of the catchments only. No flood modelling has been undertaken, which typically considers attenuation effects due to local storage effects and drainage elements.

2.1 Catchment Analysis

2.1.1 Predevelopment Conditions

The predevelopment conditions catchments are shown in Figure 2.

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Figure 2 NAPL Apron pre-development catchment plan

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2.1.2 Post development conditions

The catchment areas were updated using design contours for the Project Works prepared for the Development Approval Submission (dated 18/09/2023). The post-development conditions catchments are shown in Figure 3.

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Figure 3 NAPL Apron post-development catchment plan

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2.1.3 Changes in catchment area

Table 2 below summarises the changes in catchment area and impervious area because of the proposed works.

With reference to Table 2, the additional pavement widening and new Taxiway Crown location result in an increase in pavement area discharging to the existing NAPL apron drainage lines and a subsequent decrease in the total area to the north of the apron discharging to the culvert bank under Taxiway J.

A small increase in impervious area discharging towards the Taxiway J culvert bank occurs due to the relocation of the taxiway pavement crown and associated pavement widening.

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Catchment ID	Pre-development Conditions		Post-development Conditions		Design impacts o	n Catchments	Comment	
	Catchment Area (ha)	% Impervious	Catchment Area (ha)	% Impervious	Change in Area (Ha)	Change in Imperviousness (%)		
NAPL_WEST_01	0.034	100	0.039	100	+0.005	0	Western Apron	
NAPL_WEST_02	0.169	100	0.191	100	+0.022	0	Western Apron	
NAPL_WEST_03	0.181	100	0.212	100	+0.031	0	Western Apron	
NAPL_WEST_04	0.172	100	0.201	100	+0.029	0	Western Apron	
NAPL_EAST_01	0.415	100	0.411	100	-0.004	0	Eastern Apron	
NAPL_EAST_02	0.342	100	0.367	100	+0.025	0	Eastern Apron	
NAPL_EAST_03	0.336	100	0.363	100	+0.027	0	Eastern Apron	
NAPL_EAST_04	0.313	100	0.332	100	+0.019	0	Eastern Apron	
NAPL_EAST_05	0.696	100	0.778	100	+0.082	0	Eastern Apron	
CODEC_EAST_01	0.386	100	0.380	100	-0.006	0	Code C Apron	
CODEC_EAST_02	0.069	100	0.069	100	0.000	0	Code C Apron	
CODEC_EAST_03	0.022	100	0.022	100	0.000	0	Code C Apron	
CODEC_EAST_04	0.086	100	0.086	100	0.000	0	Code C Apron	
CAT74B	6.554	22.7	6.282	28.9	-0.272	+6.2	Catchment Upstream of Taxiway J Culvert	

 Table 2
 NAPL Apron catchment assessment

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3. Results

The revised catchments were re-simulated using the DRAINS hydrological model for the 1 in 5 AEP, 1 in 20 AEP and 1 in 100 AEP storm events for full ensembles of temporal patterns and for storm durations from 5 minutes up to 30 hours.

Table 3 below provides a summary of the pre and post development drains model results for each catchment and a comparison of peak discharge rates.

The following key points are noted:

- Peak flows to the local NAPL Apron catchments and apron drainage infrastructure generally increase for all events analysed due to the northward shift in the location of the Taxiway Centreline. GHD have been advised that management of the additional flows back to the now-south draining catchments towards the NAPL terminal are being managed by NAPL and further assessed by Others.
- Whilst the fraction of impervious area discharging towards the culvert bank under Taxiway J increases, this increase in imperviousness is offset by the reduction in total area discharging to the culvert, resulting in a decrease in peak flows towards the culvert bank for all events analysed and a neutral or beneficial outcome stormwater drainage on the RAAF Base Williamtown site
- GHD has not been engaged to further assess the impact of the now-south draining catchments back towards the NAPL terminal, nor the impact on the existing NAPL apron drainage infrastructure. GHD have been advised that NAPL are managing this assessment with Others.

Catchment ID	1 in 5 AEP		1 in 20 AEP			1 in 100 AEP			Comment	
	Pre-Development (m³/s)	Post-Development (m³/s)	Change in Flow (m³/s)	Pre-Development (m³/s)	Post-Development (m³/s)	Change in Flow (m³/s)	Pre-Development (m³/s)	Post-Development (m³/s)	Change in Flow (m³/s)	
CAT74B	0.983	0.952	-0.031	1.730	1.670	-0.060	2.857	2.740	-0.117	Catchment Upstream of Taxiway J Culvert

Table 3 - NAPL Apron - Comparison of Peak Discharges

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4. Summary and conclusion

- Following the submission of the NAPL Apron and Taxiway J | Drainage & Flooding Report to NAPL in June 2023, a change in design was requested by NAPL. A hydrological assessment of the revised NAPL apron design was required to assess whether there would be any impacts to the RAAF Williamtown Airfield stormwater network.
- Catchments were re-delineated using the design contours prepared for the DA submission (Dated 18/09/2023). The DRAINS model(s) prepared for the NAPL Apron and Taxiway J | Drainage & Flooding Report were then updated to reflect the updated design and assessed for the 1 in 5 AEP, 1 in 20 AEP and 1 in 100 AEP storm events.
- The results of the DRAINS assessment show that whilst the fraction impervious of the area discharging towards the culvert bank under Taxiway J increases, this increase in imperviousness is offset by the reduction in total area discharging to the culvert, resulting in a decrease in peak flows towards the culvert bank for all events analysed.

Regards

Sam Douglas Civil Engineer

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