NORTHROP



Flood Assessment Report for Planning Proposal

for

Bushells Concord

for New Concord Development Pty Ltd

NL220245 / 9 May 2022 / Revision B

Page 1



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Acronyms and Abbreviations

AEP Annual Exceedance Probability

AHD Australian Height Datum

ALS Airborne Laser Survey (LiDAR)

ARI Average Recurrence Interval

ARR Australian Rainfall and Runoff

BoM Bureau of Meteorology

Council City of Canada Bay Council

DCP Development Control Plan

FPL Flood Planning Level

LGA Local Government Area

LiDAR Light Detection and Ranging (also see ALS)

m Measure of length / height / distance (metres)

m AHD Meters above Australian High Datum

m/s Measure of velocity (metres per second)

m³/s Measure of flow rate (cubic metres per second)

OSD On-Site Detention

PMF Probable Maximum Flood

PMP Probable Maximum Precipitation

PSD Permissible Site Discharge

SES NSW State Emergency Service

TUFLOW A 1D and 2D hydraulic modelling software



Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged to prepare a flood assessment report for a planning proposal for the proposed development of 160 Burwood Road, Concord (the subject site).

The planning proposal seeks to facilitate the urban renewal of the subject site from an industrial site into a mixed-use, riverside village offering a mix of land uses that are complementary to the existing surrounding residential area.

It provides approximately 400 new dwellings (including 10% as affordable housing), comprising a mix of shop top housing and residential flat buildings up to 6 storeys and terrace housing up to 3 storeys. A maximum of 7,000m² of retail/ commercial uses will be provided (including a 1,000m² small-format supermarket), together with a minimum 3,000 m² of light industry/ urban services uses that will be located in the Bushells Factory building, which is proposed for heritage listing and adaptive re-use. The 10,000 m² of non-residential uses will create approximately 281 new jobs. The proposed uses will be supported by 5,900m² of new public open space, including a new plaza and foreshore park to Exile Bay, and publicly accessible internal streets including a vehicular connection between Burwood Road and Zoeller Street.

Included herein is a:

- List of related drawings and documents.
- Description of the subject site and proposed development.
- Existing flood behaviour.
- Outline of the Ministerial Directions Flooding, City of Canada Bay (Council) LEP and DCP requirements and development response.

Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

- 1. Illustrative concept plans prepared by AJC and BVN included in Appendix A.
- 2. City of Canada Bay Exile Bay Catchment Flood Study prepared by GRC Hydro, 2022.

		Date
Prepared by	DD	09/05/2022
Checked by	GB	09/05/2022
Admin	GB	09/05/2022



Subject Site and Proposed Development

Subject Site

The subject site is located at Lot 5 DP 129325, Lot 399 DP 752023 and Lot 2 DP 230294 and is bounded by Burwood Road to the south, residential development on the east and west, Exile Bay to the northeast and Zoller Street on the northwest.

The existing site includes a coffee manufacturing plant and associated car parking. Elevations on-site ranges from approximately 3.4 to 8.4m AHD.

Characteristics of the area are presented below in Photo 1 and Photo 2.



Photo 1 - Looking north along Burwood Road (©Google Maps, 2021)



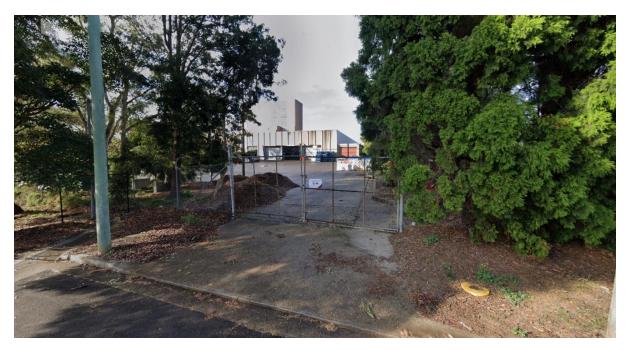


Photo 2 - Looking South-East along Zoller Street (©Google Maps, 2021)

Proposed Development

The planning proposal seeks to facilitate the urban renewal of the subject site from an industrial site into a mixed-use, riverside village offering a mix of land uses that are complimentary to the existing surrounding residential area.

It provides approximately 400 new dwellings (including 10% as affordable housing), comprising a mix of shop top housing and residential flat buildings up to 6 storeys and terrace housing up to 3 storeys. A maximum 7,000m² of retail/ commercial uses will be provided (including a 1,000m² small- format supermarket), together with a minimum 3,000 m² of light industry/ urban services uses that will be located in the Bushells Factory building, which is proposed for heritage listing and adaptive re-use. The 10,000 m² of non-residential uses will create approximately 281 new jobs. The proposed uses will be supported by 5,900m² of new public open space, including a new plaza and foreshore park to Exile Bay, and publicly accessible internal streets including a vehicular connection between Burwood Road and Zoeller Street.

Illustrative concept plans provided in Appendix A.



Legend

Subject Site

Figure 1

Locality

160 Burwood Road, Concord





Existing Flood Behaviour

Flooding of the subject site and vicinity is derived from local catchment overland flow. This has been quantified as part of the Exile Bay Catchment Flood Study 2020. Peak flood levels in the vicinity of the development are summarised in Table 1 below.

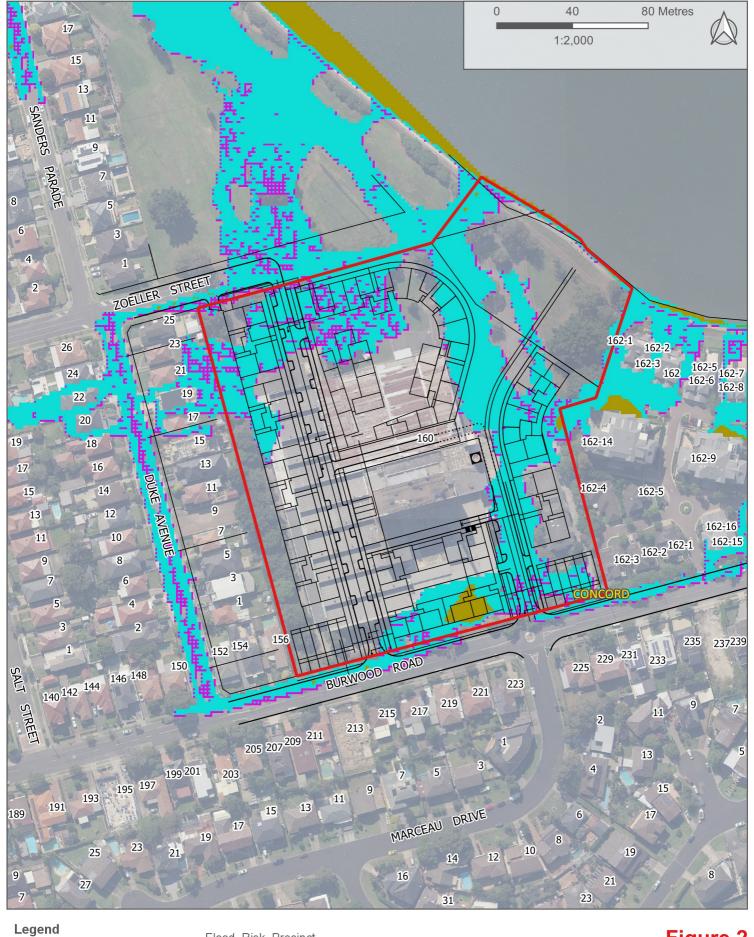
Table 1 - Existing flood levels

Flood Event	Flood Level (m AHD)
1%AEP	3.6 – 8.4
PMF	3.7 – 8.6

Flood risk precincts have been calculated based on the criteria outlined in the DCP. A figure showing the flood risk precincts is presented overleaf in Figure 2.

For the purposes of assessment against prescriptive controls, a **medium** flood risk precinct is assumed. Isolated areas of high are observed which are due to hydraulic hazard category. This is unlikely to change the overall risk of the development area.

Figures showing the existing flood behaviour are presented in Figures 3 - 7 overleaf.





Subject Site

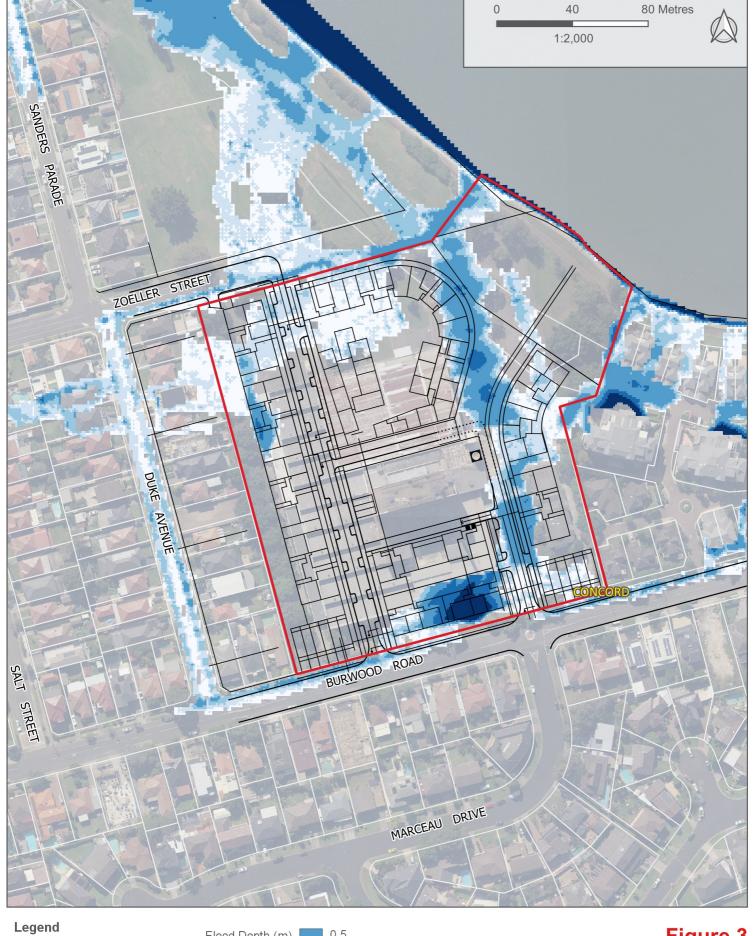
Proposed Development

Flood_Risk_Precinct Low Medium High

Figure 2

Flood Risk Precincts





Subject Site 0.05 - Proposed Development

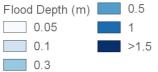


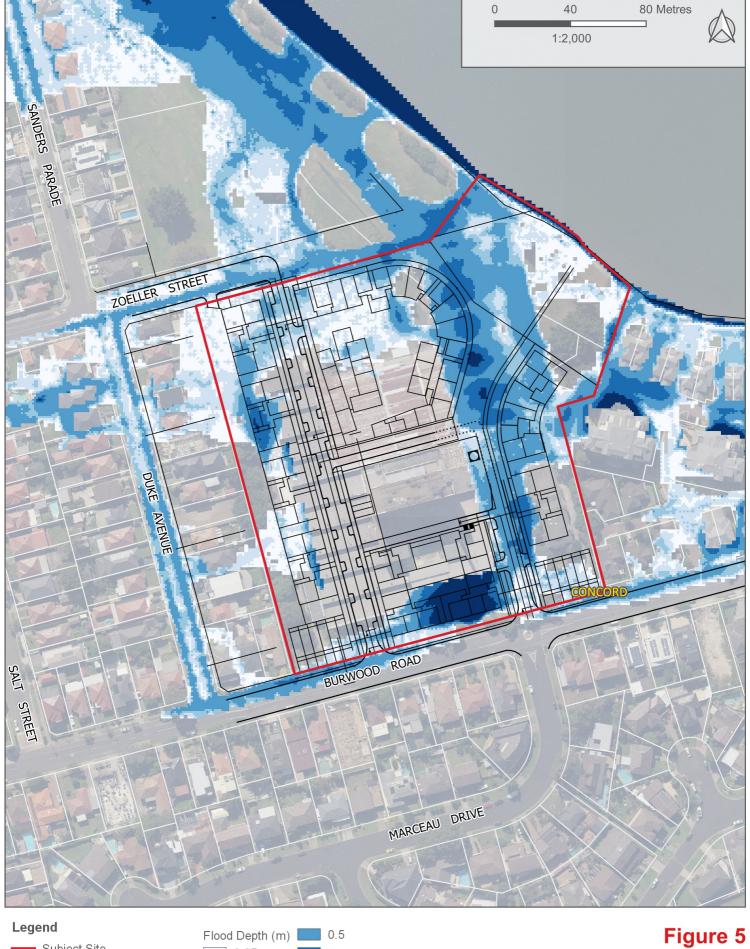
Figure 3

1%AEP Flood Depth









Flood Depth (m) 0.5 Subject Site 0.05 Proposed Development 0.1 O.3 Figure 5 PMF Flood Depth Mixed Use Development





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160 Burwood Road, Concord



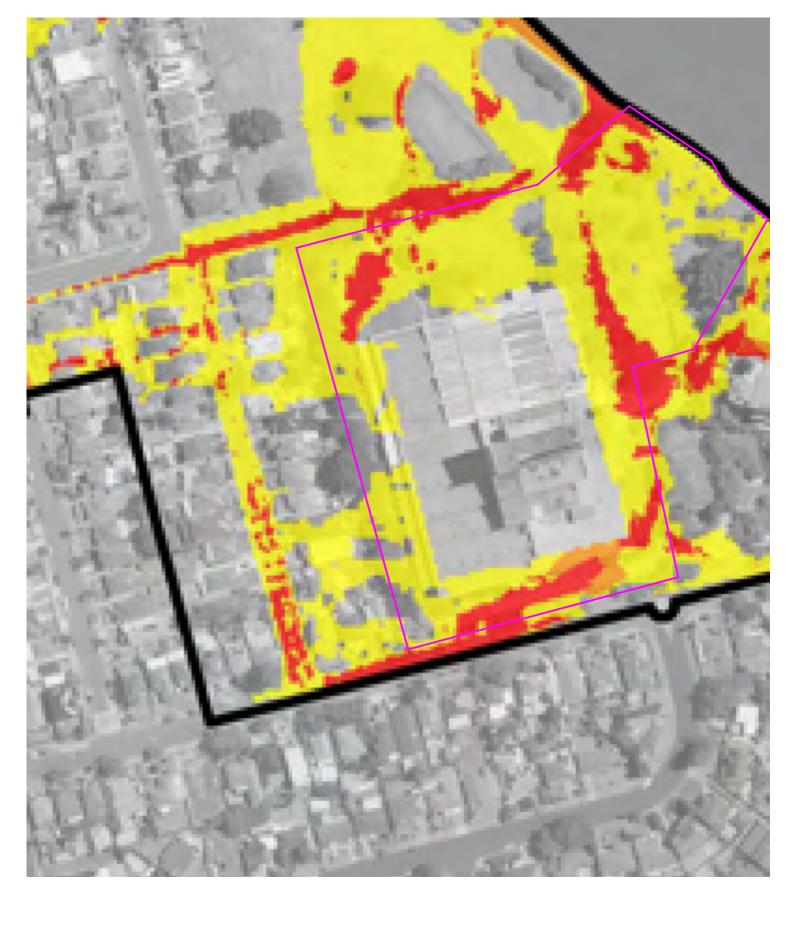


Flow Conveyance
Flood Storage
Flood Fringe

Figure 7

1% AEP Flood Hydraulic Classification







Subject Site

Flow Conveyance

Flood Storage

Flood Fringe



Figure 8

PMF Flood Hydraulic Classification





Ministerial Directions Requirements and Response

The Local Planning Directions - Section 4.1 Flooding have been summarised and addressed in Table 2 below. The City of Canada Bay Council LEP requirements have been addressed in Table 3 overleaf. The City of Canada Bay Council DCP requirements (Table C-K) have been addressed in Table 4 overleaf.

Table 2 - Ministerial Directions Requirements

Requirement		Response	
The objectives of this clause are as follows			
1.	A planning proposal must include provisions that give effect to and are consistent with: a) The NSW Flood Prone Land Policy,	The planning proposal has considered these documents and is generally consistent with their requirements.	
	b) The principles of the Floodplain Development Manual 2005,		
	c) The considering folding in land use planning guideline 2021, and		
	 d) Any adopted flood study and/or floodplain risk management plan prepared in accordance with the principles of the Floodplain Development Manual 2005 and adopted by the relevant council. 		
A planning proposal must not rezone land within the flood planning area from Recreation, Rural, Special Purpose or Conservation Zones to a Residential, Business, Industrial or Special Purpose Zones.		The development does not propose any rezoning of Recreation, Rural, Special Purpose or Conservation Zones to a Residential, Business, Industrial or Special Purpose Zones.	
3.	A planning proposal must not contain provisions that apply to the flood planning area which:		
a)	Permit development in floodway areas,	Hydraulic categories determined in the Exile Bay Catchment Flood Study (2020), are reproduced in Figure 7 and Figure 8. The subject site is largely flood fringe with a small section noted as "Flood Conveyance".	
		Based on preliminary calculations, it is considered feasible for divert approach flow in the 1% AEP around future development of the site.	
b)	Permit development that will result in significant flood impacts to other properties,	The development is not expected to result in any impact to flood behaviour or impacts	



	Requirement	Response
		neighbouring properties due to the magnitude of approach flow. It is considered feasible in future design development to incorporate elements to manage diversion of this approach flow.
c)	Permit development for the purpose of residential accommodation in high hazard areas,	Hydraulic hazard is outlined in Figure 4 and Figure 6. The majority of the site is located outside high hazard areas. It is considered feasible to reduce this hazard categorisation by including stormwater diversion infrastructure as part of design development.
d)	Permit a significant increase in the development and/or dwelling density of that land,	The proposed planning proposal is considered acceptable as it is considered feasible to comply with the City of Canady Bay Council's DCP for development of this type, despite the increase in dwelling density. It is considered feasible to divert runoff and provide flood protection measures so the areas earmarked for increased dwelling density are
		outside the flood planning area.
e)	Permit development for the purpose of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and senior housing, in areas where the occupants of the development cannot effectively evacuate,	The development does not propose any of the aforementioned facilities.
f)	permit development to be carried out without development consent except for the purposes of exempt development or agriculture. Dams, drainage canals, levees, still require development consent,	Not applicable.
g)	are likely to result in a significantly increased requirement for government spending on emergency management services, flood mitigation and emergency response measures, which can include but are not limited to the provision of road infrastructure, flood mitigation infrastructure and utilities, or	The site has no reliable evacuation routes during a 1%AEP flood event because the regional road network is compromised. The flood emergency strategy for the development is to shelter in place. The planning proposal will not substantially increase the requirements for government spending on flood mitigation measures, infrastructure or services. It is likely the cost of required stormwater infrastructure will be borne by the development.



		Requirement	Response
h)	stora	it hazardous industries or hazardous ge establishments where hazardous rials cannot be effectively contained g the occurrence of a flood event.	It is considered feasible to store hazardous materials above the 1% AEP plus 500mm free board.
4.	. A planning proposal must not contain provisions that apply to areas between the flood planning area and probable maximum flood to which Special Flood Considerations apply which:		Special Flood Considerations are not adopted by the City of Canada Bay Council.
	a)	permit development in floodway areas	
	b)	permit development that will result in significant flood impacts to other properties,	
	c)	permit a significant increase in the dwelling density of that land,	
	d)	permit the development of centre- based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate,	
	e)	are likely to affect the safe occupation of and efficient evacuation of the lot, or	
	f)	are likely to result in a significantly increased requirement for government spending on emergency management services, and flood mitigation and emergency response measures, which can include but not limited to road infrastructure, flood mitigation infrastructure and utilities	
5.	5. For the purposes of preparing a planning proposal, the flood planning area must be consistent with the principles of the Floodplain Development Manual 2005 or as otherwise determined by a Floodplain Risk Management Study or Plan adopted by the relevant council.		The planning proposal is informed by the Exile Bay Flood Catchment Study 2020 which is a study prepared through the NSW floodplain management process. This is considered consistent with the principles of the Floodplain Development Manual 2005.



Table 3 - LEP Requirements

Requirement	Response	
(1) The objectives of this clause are as follows		
(a) to minimise the flood risk to life and property associated with the use of land,	The proposed development is in within a medium flood risk precinct. It is considered feasible to mitigate increases in risk to property and life through design of future development.	
(b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,	Section 11 of the Exile Bay Catchment Flood Study (2020) considers the impact of climate change. Generally, this results in an increase in the order of a 100mm. This increase can be considered in the final design of the development.	
(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,	The proposed planning proposal is expected not to result in any impact to flood behaviour or the environment or contribute to cumulative impacts. Due to the magnitude of peak flows approaching the site we consider it feasible to manage any increases as part of design development.	
(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.	The planning proposal has adequate space for occupants to shelter in place in an event of a flood.	
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development		
(a) is compatible with the flood function and behaviour on the land, and	The flood hazard is generally low (H2 and lower) in the 1% AEP. It is considered feasible to divert approach flows around or through the development.	
(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and	The proposed planning proposal is unlikely to cause significant adverse impacts. Due to the magnitude of peak flows approaching the site we consider it feasible to manage any increases as part of design development.	
(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	The proposed development itself acts as a refuge in the PMF event.	
(d) incorporates appropriate measures to manage risk to life in the event of a flood, and	Appropriate floor levels shall be adopted to minimise risk to property.	



Requirement	Response	
(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	The planning proposal shall not result in any detrimental impact on the environment, nor will it cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses. We expect stormwater quality improvement devices will be included during design development which will improve the site in comparison to current conditions.	
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters		
(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	It is considered feasible to incorporate climate change requirements into the future design. This is not expected to alter our assessment that diversion of upstream approach flows is feasible.	
(b) the intended design and scale of buildings resulting from the development,	The proposed planning proposal is a redevelopment of an existing industrial development to a mixed-use development and will not have any significant impact from a floodplain management perspective.	
(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	Refuge is available in the PMF to manage risk to life.	
(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	Given the context of the site it is unlikely to be significantly impacted by coastal erosion. The planning proposal does not provide construction approval and it would be feasible to relocated buildings during a later approval stage if required by these mechanisms.	



Table 4 – DCP requirements

Requirement	Response
Floor Level Habitable floor levels to be equal to or greater than the 1% AEP flood level plus freeboard.	It will be feasible to set finished floor levels at the 1% AEP plus freeboard to mainstream and Exile Bay flooding.
A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest habitable floor area is elevated more than 1.5m above finished ground level, confirming that the subfloor space is not to be enclosed.	The planning proposal does not seek to introduce any habitable floor areas elevated more than 1.5m above the finished ground level. It is to be noted that if a change is made to the proposed development which results in an elevated habitable floor area of 1.5m above finished ground level, then a restriction shall be placed on the title of the land, in accordance with S.88B of the conveyancing Act.
Building Components and Method All structures to have flood compatible building components below the 100-year ARI (1% AEP) flood level plus freeboard.	It is feasible to construct areas below the 1% AEP plus 500mm freeboard with flood compatible building material.
Structural Soundness An Engineer's report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year ARI flood level (1% AEP) plus freeboard.	Given the type of construction, this is considered likely to be satisfied and will be confirmed by a suitably qualified engineer post DA approval.
Flood Affection An Engineer's report is required to demonstrate how and certify that the development will not increase flood affectation elsewhere, having regard to:	This report can be provided at DA stage and it is considered feasible to meet these requirements.
Loss of flood storage;	Based on the preliminary analysis of the site, the overland flow in the 1% AEP is generally flood fringe and will not be affected by reconfiguration of site levels. This will be confirmed at DA stage with stormwater design and flood analysis, as required.
Change in flood levels, flows and velocity caused by alterations to flood flows; and	Per the above.



Requirement	Response
The cumulative impact of multiple potential developments in the vicinity.	Given the context of the local area, cumulative impacts is not expected to apply.
Car Parking and Driveway Access The minimum surface level of open parking space or carports shall be as high as practical, but no lower than 0.1m below the 100-year ARI (1% AEP) flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 100-year ARI flood level.	The site is impacted by local overland flow. This will be investigated further at DA stage.
Garages capable of accommodating more than 3 motor vehicles on land zone for urban purposes, or enclosed car parking, must be protected from inundation by flood equal to or greater than the 100-year ARI(1% AEP) flood. Ramp level to be no lower than 0.5m above the 100-year ARI flood level.	This is considered feasible and will be further investigated at DA stage.
The level of the driveway providing access between the road and parking spaces shall be no lower than 0.2m below the 100-year ARI (1% AEP) flood level.	This is considered feasible and will be further investigated at DA stage.
Enclosed car parking and car parking areas accommodating more than 3 vehicles, with a floor below the 100-year ARI (1% AEP) flood level, shall have adequate warning system, signage, exits and evacuation routes.	This is considered feasible and will be further investigated at DA stage.
Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during 100-year ARI (1% AEP) flood.	This is considered feasible and will be further investigated at DA stage.



Requirement	Response
Enclosed underground car parks shall have all potential water entry points protected from the PMF. The intent of this requirement is to mitigate the creation of life-threatening circumstances and very high economic loss such as many occur with the complete inundation of an underground car park. Council may consider relaxation of this requirement if it can be shown by modelling that the catchment characteristics of the concord west precinct, an additional requirement within that precinct is for habitable floor levels to be at a minimum of RL.9.3.3, 9.3.6, and 10.2.3 of the CWFS.	This is considered feasible and will be further investigated at DA stage.
Evacuation Reliable access for pedestrians and vehicles is required from the site to an area of refuge above the PMF level, either on site (e.g., Second storey) or off site.	It is considered feasible to shelter in place for this development.
Applicant is to demonstrate the development is consistent with any relevant flood evacuation strategy or similar plan.	The recommended flood evacuation strategy stated in the Exile Bay Catchment Study (2020) is shelter in place.
Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon SES or other authorised emergency services personnel.	The Exile Bay catchment is predominantly affected by overland flash flooding. Preventive actions cannot be undertaken due to a lack of flood warning time. Shelter in place is recommended in Section 9.7 of the Exile Bay Catchment Flood Study (2020).
Management Site Emergency Response Flood plan required where the site is affected by the 100 year ARI flood level (1%AEP) (except for single dwellinghouse).	A concept emergency response plan can be provided at DA stage.
Applicant is to demonstrate that area is available to store goods above the 100 year ARI flood level (1%AEP)plus freeboard.	This is considered feasible and will be further investigated at DA stage.
No storage of materials below the 100 year ARI flood level (1%AEP).	This is considered feasible and will be further investigated at DA stage.



Discussion

Type of Inundation

The majority of the development is subject to low hazard flooding and is affected by low magnitude overland flow. In the 1% AEP event this is in the order of 1.6 m³/s which is feasible to convey in either an above or below ground stormwater system.

Further Approvals Required

This assessment has considered the feasibility of implementing the Ministerial Directions on Flooding and Council's LEP and DCP requirements for floodplain management. Based on the supplied plans we generally believe this is feasible and will be subject to further design development and assessment as part of Development Application (DA) or State Significant Development Application (SSDA) approval processes. A Flood Imapct and Risk Assessment (FIRA) is likely to be included as part of this documentation.



Conclusions

Northrop Consulting Engineers were engaged by New Concord Development Pty Ltd to complete the Planning proposal Application documentation for the proposed redevelopment at 160 Burwood Road Concord.

It was concluded from the assessment it is feasible to implement the requirements of the Ministerial Directions for Flooding and Council's LEP and DCP floodplain management requirements in the future design of the site.



Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by New Concord Development Pty Ltd. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

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Document Register

Rev	Status	Prepared	Approved	Date
Α	Client Review	DD	GB	26 April 2022
В	Approval	DD	GB	9 May 2022



Appendix A – Illustrative Concept Plans

