infrastructure & development consulting

# 172 Commercial Road, Vineyard

## Flood Analysis & Report

13 May 2024

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| **Project Number** | 22-529 | **Date** | 13 May 2024 |
| **Project Name** | EG Vineyard | **Status** | FEM Updated |
| **Client** | EG | **Revision** | B |
| **Author** | D Reilly | **Reviewed** | A Hilly |

# 1 Introduction

This report has been prepared by Infrastructure & Development Consulting (IDC) for EG to support an application for LEP amendments for an employment/industrial development site at 172 Commercial Road, Vineyard. It will outline the existing flooding behaviour on and around the site and provide commentary on compliance with Council's flooding requirements. As no new physical works are proposed within the zone of flooding for the 1% AEP plus freeboard, this report focuses on the management of the site in extreme flood events, up to the PMF.

## 1.1 The Existing Site

The subject site (Lots 2 & 3 DP229135), 172 Commercial Road Vineyard is approximately 44,969m$^2$ in size and is bound by Commercial Road to the north, Chapman Road to the east, Kilarney Chain of Ponds to the south and a rural residential site to the west. The existing site contains a number of rural/industrial buildings, hardstand areas, storage areas, etc.

It contains moderate falls from north to south, with a high point at RL.33.5 at the Commercial Road frontage and low point as Kilarney Chain of Ponds cuts through the southwestern corner of the site at RL.12.0. It is shown in Figure 1 below.

**Figure 1 - The Site**

## 1.2 The Proposal

The application seeks to amend the existing LEP to permit additional uses on site. This includes maintaining the existing site access points off Chapman and Commercial Roads, retaining the existing buildings on site and adding additional hardstand areas between the 1 in 20-year and 1 in 100-year flood levels and building areas above the 1 in 100-year flood level.

**Figure 2 - Proposed Site**


# 2 Flooding Conditions

The subject site is flood affected, both from "localised overland flow" flooding from the Killarney Chain of Ponds catchment upstream of the site and "regional backwater" flooding from the Hawkesbury-Nepean floodplain. Hawkesbury Council's *Floodplain Risk Management Study and Plan (2012)* document provides flood related controls for development within the floodplain including suitability of land uses, freeboard requirements, flood management requirements for sites, etc.

## Figure 3 - Hawkesbury Council Flood Risk Management Framework

| Planning Consideration | Low & Very Low Flood | | | | | | Medium Flood Risk | | | | | | | High Flood Risk | | | | | | | Extreme Flood Risk | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Critical Uses & Facilities | Sensitive Uses & Facilities | All Residential | All Commercial & Industrial | Recreation & Non-Urban | Concessional Development | Critical Uses & Facilities | Sensitive Uses & Facilities | Low Scale Residential | Other Residential | All Commercial & Industrial | Recreation & Non-Urban | Concessional Development | Critical Uses & Facilities | Sensitive Uses & Facilities | Low Scale Residential | Other Residential | HV Commercial & Industrial | Other Commercial & Industrial | Recreation & Non-Urban | Concessional Development | Critical Uses & Facilities | Sensitive Uses & Facilities | All Residential | All Commercial & Industrial | Recreation & Non-Urban | Concessional Development |
| Floor Level | 8 | 4 | | | | 5 | 8 | 4 | 3,6 | 2,6 | | | 5 | | | 3,6, 7 | 2,6, 7 | 2,6, 7 | 1,6, 7 | 1 | 5,7 | | | | | 1 | 5,7 |
| Building Components & Methods | 1 | 1 | | | | 1 | 1 | 1 | 2 | 2 | | | 1 | | | 2 | 2 | 1 | 1 | 1 | 1 | | | | | 1 | 1 |
| Structural Soundness | 2 | 2 | | | | 2 | 2 | 2 | 2 | 2 | | | 2 | | | 2 | 2 | 2 | 2 | 2 | 2 | | | | | 1 | 1 |
| Flood Affectation | | | | | | | 2 | 2 | 2 | 2 | | | 2 | | | 2 | 2 | 2 | 2 | 2 | 2 | | | | | 1 | 1 |
| Car Parking & Driveway Access | | | | | | | | | | | | | | | | 1,3, 5,6 | 1,3, 5,6 | 1,3, 5,6 | 1,3, 5,6 | 2,3, 4,6 | 6,7 | | | | | 2,3, 4,6 | 6,7 |
| Evacuation | 1,2 | 1,2 | | | | 1 | 1,2 | 1,2 | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | 1 | 1 |
| Management & Design | 1,2 | 1,2 | | | | 1,2 | 1,2 | 1,2 | 1,2 | 1,2 | | | 1,2 | | | 1,2 | 1,2 | 1,2, 3,4 | 1,2, 3,4 | 1,2, 3,4 | 1,2,3 ,4 | | | | | 1,2, 3,4 | 1,2, 3,4 |

= Unsuitable Land Use (refer to General Note b). = No controls.

**General Notes:**

**a.** The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site.

**b.** Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.

**c.** Refer to Section 9.7.1 of the DCP for planning considerations for proposals involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effects and Structural Soundness planning considerations of the applicable land use category.

**d.** Terms in italics are defined in Appendix A of the DCP.

**e.** Design floor level or ground level means the minimum floor level or ground level that applies to the development. If the development is concessional development, this level is determined based on what land use category would apply if it was not categorised as Concessional Development.

**f.** *Habitable* and *non-habitable* floor levels are typically subject to different controls in this Schedule. Unless otherwise stated, consideration of 'floor levels' implies separate consideration of *habitable* and *non-habitable* floor levels.

### Floor Level

1 Floor levels to be no lower than 20 year flood level unless justified by site specific assessment.

2 *Habitable floor* levels to be no lower than 100 year flood level. *Non-habitable floor* levels to be no lower than 20 year flood level unless justified by a site specific assessment.

3 *Habitable floor* levels to be no lower than 200 year flood level. *Non-habitable floor* levels to be no lower than 20 year flood level unless justified by a site specific assessment.

4 *Habitable floor* levels to be no lower than 500 year flood level unless justified by a site specific assessment.

5 Floor levels to be no lower than the *design floor level*. Where this is not *practical* due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as *practical*, and, when undertaking alterations or additions no lower than the existing floor level.

6 Where it is not *practical* to achieve the design floor levels for a development in a business zone (e.g. to provide suitable access to footpath level), the floor levels should be as high as possible.

7 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 above finished ground level, confirming that the undercroft area is not to be enclosed, where Council considers this may potentially occur.

8 *Habitable* floor levels to be no lower than PMF level unless justified by site specific assessment.

### Building Components & Method

1 All structures to have *flood compatible building components* and *flood compatible building methods* below design floor level or the 100 year flood level, whichever is higher.

2 All structures to have *flood compatible building components* and *flood compatible building methods* below 200 year flood level.

### Structural Soundness

1 Engineer's report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the design floor level or the 100 year flood level, whichever is higher. In the case of alterations or additions to an existing development, the structure to be certified is that which is proposed to be newly constructed or otherwise required to be of a specified standard to satisfy other controls.

2 Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the design floor level or the 100 year flood level, whichever is higher.

### Flood Affectation

1 Engineers report required to certify that the development will not increase *flood* affectation elsewhere.

2 The impact of development on flooding elsewhere to be considered. An engineer's report may be required at Council's discretion.

**Note:** When assessing *flood* affectation the following must be considered:

**1.** Loss of net storage of *flood* waters in the *floodplain*. For example compensatory cut and fill earthworks in the *floodplain* may be a means to ensure no loss of net *flood* water storage.

**2.** Changes in flood levels & velocities caused by alteration of conveyance of *flood* waters. For example by limiting additional obstructions in the *floodway*.

**3.** The *flood affectation* assessment will often require flood modelling. This will be at Council's discretion.

### Car Parking and Driveway Access

1. The minimum surface level of open car parking spaces or carports shall be as high as *practical*, and not below: (i) 20 year flood level; or (ii) the level of the crest of the road at the location where the site has access; (whichever is the lower). In the case of garages, the minimum surface level shall be as high as *practical*, but no lower than the 20 year flood level.
2. The minimum surface level of open car parking spaces, carports or garages, shall be as high as *practical*.
3. Enclosed car parking must be protected from inundation by flood waters up to the 100 year flood level. Where the floor of these areas is more than 0.8m below the 100 year flood level, an aural and visual flood warning system is to be provided.
4. The driveway providing access between the road and parking space shall be as high as practical and generally rising in the egress direction.
5. Where the level of the driveway providing access between the road and parking space is lower than 0.3m below the 100 year flood level, the following condition must be satisfied - when the *flood* levels reach 100 year flood level, the depth of inundation on the driveway shall not exceed: (i) the depth at the road; or (ii) the depth at the car parking space. (Refer to Schedule D). A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.
6. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year *flood*.
7. Driveway and parking space levels to be no lower than the *design floor level or ground level*. Where this is not *practical*, a lower level may be considered. In these circumstances, the level is to be as high as *practical*, and, when undertaking alterations or additions, no lower than the existing level.

**Note**

**a.** A *flood* depth of 0.3m is sufficient to cause a small vehicle to float.

**b.** *Enclosed car parking* means car parking which is potentially subject to rapid inundation, which consequently increases danger to human life and property damage (such as basement of bunded car parking areas). The following criteria apply for the purposes of determining what is enclosed car parking:

i. Flooding of surrounding areas may raise water levels above the perimeter which encloses the car park (normally the entrance), resulting in rapid inundation of the car park to depths greater than 0.8m, and

ii. Drainage of accumulated water in the car park has an outflow discharge capacity significantly less than the potential inflow capacity.

### Evacuation

1 The ability to safely evacuate from the development to the defined regional evacuation route, in accordance with any applicable flood evacuation strategy, is to be demonstrated. An engineer's report will be required if circumstances are possible where the evacuation of persons to this regional route might not be achieved within the *effective warning time*.

2 Ability to access development during a flood, where relevant, to be considered. An engineer's report may be required.

### Management and Design

1 If the application involves subdivision, the applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this Plan.

2 *Site Emergency Response Flood plan* required where floor levels are below the *design floor level* (except for single dwelling-houses).

3 Applicant to demonstrate that area is available to store goods above the 100 year flood level.

4 No external storage of materials below the *design floor level* which may cause pollution or be potentially hazardous during any *flood*.

This report is based on the detailed flood studies undertaken by Mott MacDonald in 2014 for the rezoning of the Vineyard Precinct. This report showed that the regional backwater flooding was considerably higher the localised flooding events and as such, this report is based on the regional flooding events. Excerpts from this report showing regional inundation maps are shown below.

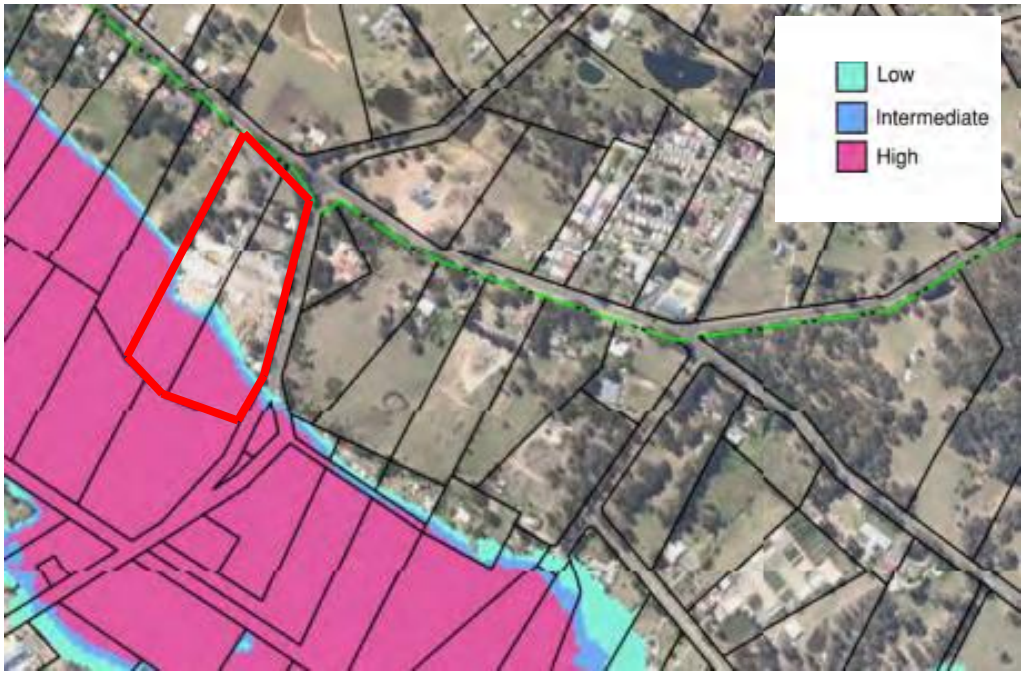
**Figure 4 - 1% AEP Local Flooding (with Tailwater RL.11.1m AHD)**


**Figure 5 - 1% AEP Regional Flooding (with Tailwater RL.17.3m AHD)**

The above maps show that the localised 1% AEP flood levels on site range from RL.15.0m AHD to RL.15.5m AHD, while the regional 1% AEP flood level is a "static" RL.17.3m AHD. Similarly, the localised PMF flood levels range from RL.16.5m AHD to RL.17.4m AHD, whilst the regional PMF level sits at RL.26.4m AHD. As mentioned above, for the purposes of site flood planning, the regional flood levels have been used for this analysis.

**Figure 6 - PMF Regional Flooding (with Tailwater RL.26.4m AHD)**


**Figure 7 - 2014 Mott MacDonald Flood Risk Mapping (1% AEP with Tailwater 17.3m AHD)**



## 2.1 Site Flood Management Compliance

The following section follows the Hawkesbury Council flood risk management framework shown in Figure 3. The table provides a commentary on the specific controls that relate to this site as *Other Commercial and Industrial* land (i.e. not high value).

| Control | | Comment |
|---|---|---|
| **Floor Levels** | | |
| 1. | Floor levels to be no lower that 20-year flood level unless justified by site specific assessment | Two existing buildings on site will remain affected by flooding in the 1 in 20-year and 1 in 100-year flood levels.<br>All new building footprints have been cited above the 100-year flood level. |
| 6. | Where it is not practical to achieve the design floor levels for a development in a business zone (e.g. to provide suitable access to footpath level), the floor levels should be as high as possible. | Not Applicable. All new floor levels are above the regional 1 in 100-year flood level. |
| 7. | 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 above finished ground level, confirming that the under croft area is not to be enclosed, where Council considers this may potentially occur | Not Applicable. No habitable spaces are proposed on site. |
| **Building Components & Methods** | | |
| 1. | All structures to have flood compatible building components and flood compatible building methods below design floor level or the 100-year flood level, whichever is higher. | This control will be addressed in future Development Applications, but as the new building floor levels are above the 1 in 100-year flood level this may not be applicable. |
| **Structural Soundness** | | |
| 2. | Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the design floor level or the 100-year flood level, whichever is higher | This control will be addressed in future Development Applications, but as the new building floor levels are above the 1 in 100-year flood level this may not be applicable. |
| **Flood Affectation** | | |
| 2. | The impact of development on flooding elsewhere to be considered: | |
| i | Loss of net storage of flood waters in the floodplain. For example, compensatory cut and fill earthworks in the floodplain may be a means to ensure no loss of net flood water storage | No earthworks, structures, etc. are proposed within the areas of inundation in the 1 in 100-year flood event and as such no further analysis is expected to be required. |
| ii | Changes in flood levels & velocities caused by alteration of conveyance of flood waters. For example, by limiting additional obstructions in the floodway | |
| iii | The flood affectation assessment will often require flood modelling. This will be at Council's discretion. | |
| **Car Parking and Driveway Access** | | |
| 1. | The minimum surface level of open car parking spaces or carports shall be as high as practical, and not below: (i) 20-year flood level; or (ii) the level of the crest of the road at the location where the site has access; (whichever is the lower). In the | Carpark access is provided from both Commercial Road (above the PMF level) and Chapman Road which sits at, or just below the 1 in 20-year flood level. |

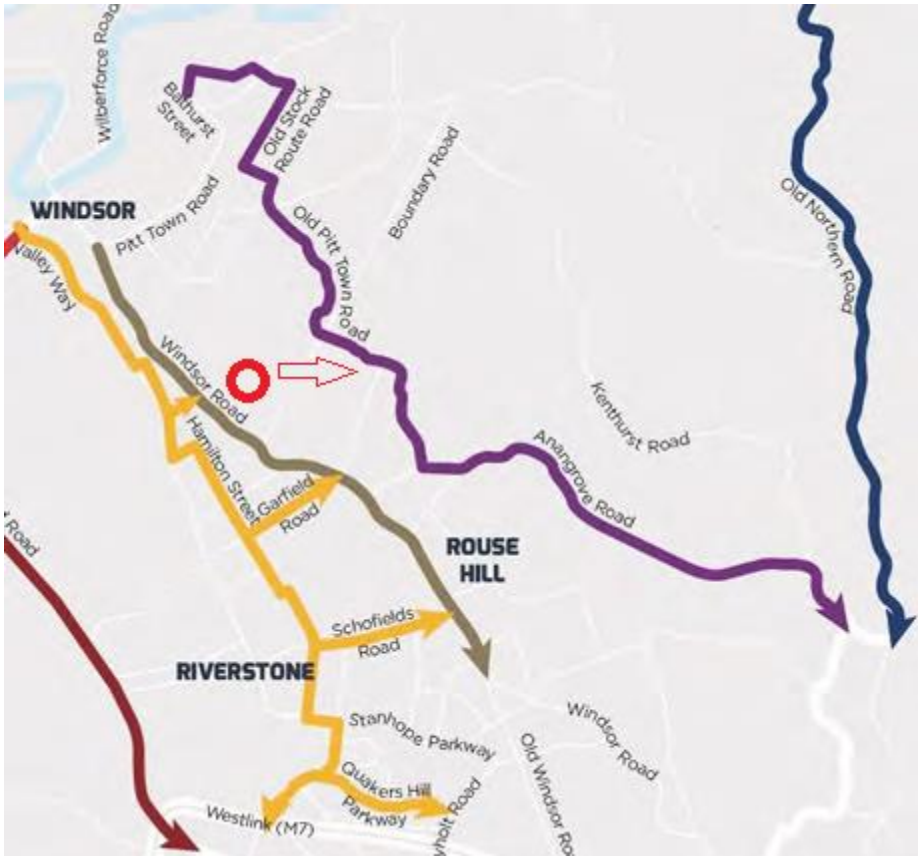
| | | |
|---|---|---|
| | case of garages, the minimum surface level shall be as high as practical, but no lower than the 20-year flood level. | At the development Application phase for future built form, a detailed site flood management plan will be prepared that details how access/egress to the lower Chapman Road driveway would be prevented in advance of and during flooding events. |
| 3. | Enclosed car parking must be protected from inundation by flood waters up to the 100-year flood level. Where the floor of these areas is more than 0.8m below the 100-year flood level, an aural and visual flood warning system is to be provided. | No enclosed carparking is proposed as part of this development |
| 5. | Where the level of a driveway providing access between the road and parking space is lower than 0.3m below the 100-year flood level, the following condition must be satisfied:<br>When the flood levels reach 100-year flood level, the depth of inundation on the driveway shall not exceed:<br>(i) the depth at the road; or<br>(ii) the depth at the car parking space. | This condition can be addressed in detail as part of a future Development Application for built form. It is expected that the closure of the Chapman Road driveway during flooding events will form part of a detailed site flood management plan that will satisfy this condition. |
| 6. | Restraints or vehicle barriers to be provided to prevent vehicles leaving the site in a 100-year flood. | This will be detailed, if required as part of a future Development Application for built form. |
| **Evacuation** | | |
| 1. | The ability to safely evacuate from the development to the defined regional evacuation route, in accordance with any applicate flood evacuation strategy, is to the demonstrated. An engineer's report will be required if circumstances are possible where the evacuation of persons to this regional route might not be achieved within the effective warning time. | Above the regional PMF level, Commercial Road at the northern frontage of the site is the logical flood evacuation point for the site. Workers would likely be directed to travel east and join up with the Old Pitt Town Road – Annangrove Road primary regional evacuation route.<br>Once more details on specific driveway levels and access as part of a future DA, this would be addressed in detail. |
| **Management and Design** | | |
| 1. | If the application involves subdivision, the applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this plan | Not Applicable. This application does not involve the subdivision of land. |
| 2. | Site Emergency Response Flood plan required where floor levels are below the design floor level (except for single dwelling houses) | This will be provided with future, more detailed Development Applications for built form. |
| 3. | Applicant to demonstrate that area is available to store goods above the 1 in 100-year flood level | With approximately 70% of the site above the 1 in 100-year flood level, the site has the ability to store goods above that flood level, including the proposed new building areas. |
| 4. | No external storage of materials below the design floor level which may cause pollution or be potentially hazardous during any flood | We would expect that this requirement will be addressed via conditions of consent for future Development Application. |

# 3 2022 NSW Flood Inquiry and 2023 Hawkesbury Nepean Valley Flood Evacuation Model (FEM)

The 2022 NSW Flood Inquiry made several recommendations ranging from flood education to regional disaster management plans. The inquiry was reasonably high-level in nature and did not have any direct consequences for the site.

However, the 2023 Hawkesbury Nepean Valley Flood Evacuation Model (FEM) does directly relate to the subject site. Of particular importance is Figure *1.6 Major and secondary evacuation routes out of the Hawkesbury-Nepean Valley* which shows the regional primary evacuation route for the subject site being Old Pitt Town Road-Annangrove (see below).

**Figure 8 - Flood Evacuation Routes from FEM 2023**




As outlined briefly in part 2.1 of this report, safe evacuation from the site would be to the north and west along Commercial Road, Boundary Road and then to Old Pitt Town Road. This route is

shown in Figure 9 below for clarity and would be subject to confirmation during the subsequent, more detailed DA phase.

**Figure 9 - Concept Flood Evacuation Route to Old Pitt Town Road**

# 4 Conclusion

The site is affected by mainstream flooding from both the upstream catchment and regional backwater flooding from the Hawkesbury-Nepean floodplain. The regional backwater flooding is more severe than the localised flooding and exhibits high depths, with little to no velocity.

The proposed site design has taken Council's flooding requirements for *other commercial and industrial land* into account including:

- Citing new buildings above the 100-year flood level.
- Avoiding earthworks, structures, etc. within the 100-year flood extents to eliminate affectation to any neighbouring properties.
- Providing a continuously rising driveway to Commercial Road and access to PMF Flood free regional evacuation routes.

The above analysis is sufficient to demonstrate that compliance is readily achievable to support the proposed LEP amendments, while future Development Applications for the built form will need to be supported with additional detail including a Site-Specific Flood Management and Evacuation Plan.