Waterways Impact Statement

337 Lower Plateau Rd, Bilgola Plateau NSW 2107

Prepared by Ecological Consultants Australia Pty Ltd TA Kingfisher Urban Ecology and Wetlands

November 2023



URBAN ECOLOGY WETLANDS

About this document



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Statement of Authorship

This study and report were undertaken by Ecological Consultants Australia for the client. The author of the report is Geraldene Dalby-Ball whose qualifications are BSc majoring in Ecology and Botany with over 25 years' experience in this field and specialising in projects within Sydney urban areas and Brooke Thompson whose qualifications are BSc majoring in Conservation Biology.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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Elaway G. Dalby-Ball – Director of Ecological Consultants Australia Pty Ltd

Summary

Introduction

Ecological Consultants Australia (ECA) trading as Kingfisher Urban Ecology & Wetlands has been contracted by Ray and Mary Trevisan to provide a **Waterway Impact Statement** for the proposal at 337 Lower Plateau Road, Bilgola Plateau NSW 2107 within the Northern Beaches Council LGA.

The proposed development is for a 3 lot subdivision at 337 Lower Plateau Road, Bilgola Plateau NSW 2107.

Methods

- On-ground site inspection took place on the 10 July 2023 by Principal Ecologist Elaway (Geraldene Dalby-Ball).
- Waterway examination was done to include the full waterway and drainage line. The author is also very familiar with this area and catchment having lived here over 40 yrs.
- Habitat assessment of the waterway and drainage line was included to add to knowledge on the ecological health and value of these.
- BioNet searches were performed for flora, fauna, endangered populations, and communities to identify if there were previous records of threatened species occurring within the local area using a 10 km radius around the site.
- Photos from the site in extreme rainfall conditions were reviewed to assist in seeing the maximum water levels, velocity and behaviour of the waterway.
- A Review of the proposed development was evaluated against the requirements of the Water Management Act and relevant Northern Beaches (Pittwater) Planning controls.

Results

- The waterway on the North side is mapped as a 1st order waterway on the MSW Hydroline. It's been formalised in sections (historically) with rock work.
- Sydney Sandstone rocky creeks are typically full flow, trickle and intermittent based on catchment falls. This waterway, although modified, provides this functionality and will continue to do so post development.
- The existing dwelling is within the zones of 10m form the top of the bank and the proposed new dwelling is in the same footprint. The average rule in the Water Mgt Act can be applied to have an average of 10m from top of bank as the lower section of the site is being retained as full bushland extending over 50m wide. Some encroachment will be in the inner 50% (5m) however as this is existing and there is no significant hydrological or ecological reasons not to grant existing use rights given:
 - \circ The riparian zone in this location is not a main corridor between core bushland,
 - Will not be compromised in terms of ecological functions such as sun light reaching the area.
 - Will not result in the removal of riparian vegetation (as already a dwelling).
 - The compensation downslope is 2x that required to offset an encroachment of this type.

- The **drainage line** on south side is not mapped on the NSW Hydroline mapping. It too is a typical Sydney Sandstone drainage line steep, rocky and ephemeral. At the time of surveys it had low water and review of past images shows it flows during rain and little after. On-site condition back this observation. A crossing is proposed over this waterway (and is permissible under the Water Mgt Act). By way of the steep drop the crossing will be well above the waterway and will follow the path of an existing pedestrian crossing.
- Greatest long term benefits to these waterways will come from:
 - retaining and where possibly increasing flows (to flus stagnant water) historically such lines would have had a greater volume of water however street curb and guttering has diverted much away from original lines. This will assist with managing mosquito habitat as well.
 - Enhancing habitat opportunities for native species (pools, riffles, sunny areas, habitat logs) and the removal of weed species (particularly Morning Glory). Noting the current residents have controlled much and it is on-going.
- A separate letter addresses Indigenous Heritage. It can be noted that no sharpening groves were seen on the exposed rock areas however they may be deep under leaf litter (as is the case with many waterway sites in Sydney and Central Coast).
- No activities are occurring, or proposed in this DA, in areas with potential sites and a future Indigenous and Ecology Management Plan should be conditioned with any future DAs for dwellings such that the existing management is on-going.
- Included in the ecology report (ECA Nov 2023) are the flora and fauna observations. Of note for the waterway and drainage lines are Water Dragons and areas of habitat for aquatic invertebrates adapted to intermittent flows including high velocity. Small pools (max 2 x4) along the lower end of the drainage line (currently mosquito habitat).

Mitigation Measures

Development approval is for subdivision and the potential to build 3 dwellings and associated infrastructure. Mitigation works are focused on protection of natural assets including water quality during works and ecology/waterways long term (see also recommendations in the Ecological Assessment).

Before works:

- Tree protection as per the Arboricultural Impact Assessment.
- Removal of weeds in works area to prevent spread of seed.
- Effective site management to minimise sediment and silt runoff.
- Finalisation of a riparian planting and management plan (for pre cc)

During works:

- Tree protection as per the Arboricultural Impact Assessment.
- Effective site management to stop silt and sediment runoff.

• Implementation of the riparian plan with planting, weed removal and habitat enhancement.

After completion of works:

- Water quality monitoring (O₂ and turbidity)
- Riparian native species maintenance and maintenance and renewal of riparian habitat areas.

Legislation: Various pieces of legislation apply to this location and the proposed works are in keeping with the objective of the Acts. Key acts are listed below.

- Water Mgt Act and associated Guidelines
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Biodiversity Conservation Act 2016 (BC Act).
- Biosecurity Act (superseding the Noxious Weed Act 1993) (NW Act).

Various SEPPs and Controls in the Northern Beaches (Pittwater) DCP and LEP (included in this WIS)

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Glossary

Connectivity means the interconnection of functionally related ecological elements of a landscape so that species can move amongst them.

Creek means any watercourse, whether ephemeral, intermittent or perennial, whether on its natural course or altered by human interference, whether channelled or not. It also includes any drainage lines able to be identified by a linear vegetation assemblage reflective of regularly moist soil conditions or by a weed plume consistent with regularly moist soil conditions.

Development means:-

- (a) the use of land, and
- (b) the subdivision of land, and
- (c) the erection of a building, and
- (d) the carrying out of a work, and
- (e) the demolition of a building or work, and

(f) any other act, matter or thing referred to in section 26 that is controlled by an environmental planning instrument, but does not include any development of a class or description prescribed by the regulations for the purposes of this definition (*Environmental Planning and Assessment Act, 1979*).

Riparian means occurring on the bank of a river (or other waterway, or waterbody). Usually refers to vegetation, "riparian land" (NSW Fisheries 1999, Policy and Guidelines Aquatic Habitat Management and Fish Conservation).

Riparian Buffer means land which is additional to the riparian zone necessary to protect the values and health of the riparian zone. The primary purpose of the buffer is to protect the integrity of the riparian zone. The combined width of the buffer and riparian zone then constitute a key protective mechanism for the ecological values of waterway systems. The minimum width of a riparian buffer is generally 10 metres, and is dependent on the catchment characteristics, slope and environmental values associated with the riparian corridor. The buffer is primarily designed to:

(a) Prevent water from affecting riparian vegetation (e.g. additional moisture, local erosion, nutrients, toxicants);

(b) Prevent weeds from invading the riparian zone; and

(c) Provide habitat for native fauna (thereby protecting it from external threats such as domestic animals).

Riparian Zone means any land which adjoins, directly influences, or is influenced by a body of water. The width of the zone varies according to extent of riparian vegetation, flood levels, water quality, and channel form. This zone is taken to start at the highest bank of the watercourse (as defined in the Water Management Act, 2000). For ephemeral streams without a defined channel, the start of the riparian zone is the creek centre line. The riparian zone provides important habitat, protects the creek from water quality and hydrological impacts. It has other functions, including intrinsic value, as well as providing bed and bank stability, providing woody debris to the waterway and a buffer between development and waterways.

River includes:

(a) any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and

(b) any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows, and

(c) anything declared by the regulations to be a river, whether or not it also forms part of a lake or estuary, but does not include anything declared by the regulations not to be a river (Water Management Act 2000)

Waterbody (artificial) or **artificial waterbody** means an artificial body of water, including any constructed waterway, canal, inlet, bay, channel, dam, pond, lake or artificial wetland, but does not include a dry detention basin or other stormwater management construction that is only intended to hold water intermittently.

Waterbody (natural) or **natural waterbody** means a natural body of water, whether perennial or intermittent, fresh, brackish or saline, the course of which may have been artificially modified or diverted onto a new course, and includes a river, creek, stream, lake, lagoon, natural wetland, estuary, bay, inlet or tidal waters (including the sea).

Watercourse means any river, creek, stream or chain of ponds, whether artificially modified or not, in which water usually flows, either continuously or intermittently, in a defined bed or channel, but does not include a waterbody (artificial).

Waterway means the whole or any part of a watercourse, wetland, waterbody (artificial) or waterbody (natural).

Wetland means:

(a) natural wetland, including marshes, mangroves, backwaters, billabongs, swamps, sedgelands, wet meadows or wet heathlands that form a shallow waterbody (up to 2 metres in depth) when inundated cyclically, intermittently or permanently with fresh, brackish or salt water, and where the inundation determines the type and productivity of the soils and the plant and animal communities, or
(b) artificial wetland, including marshes, swamps, wet meadows, sedgelands or wet heathlands that form a shallow waterbody (up to 2 metres in depth) when inundated cyclically, intermittently or permanently with a shallow waterbody (up to 2 metres in depth) when inundated cyclically, intermittently or permanently with water, and are constructed and vegetated with wetland plant communities.

Wetland buffer means 100m buffer of land, measured from the shoreline, surrounding a wetland which directly influences and protects a wetland.

Waterways Impact Statement Preparation

This Waterway Impact Statement (WIS) has been prepared in response to Northern Beaches Council Natural Environment and Water Management Referral Responses as shown below.

Natural Environment Referral Response - Riparian

Application Number:	DA2023/0511
Proposed Development:	Demolition of existing structures, removal of trees and subdivision of one lot into three lots.
Date:	13/07/2023
То:	Nick Keeler
Land to be developed (Address):	Lot 5 DP 222134 , 337 Lower Plateau Road BILGOLA PLATEAU NSW 2107

Reasons for referral

This application seeks consent for the following:

- All Development Applications on land, and located within 40 metres of land, containing a watercourse, or
- All Development Applications on land containing a wetland, or located within 100m of land containing a wetland,
- All Development Applications on land that is mapped as "DCP Map Waterways and Riparian Land".

And as such, Council's Natural Environment Unit officers are required to consider the likely impacts on drainage regimes.

Officer comments

Unsupported

This application was assessed in consideration of but not limited to:

- Supplied plans and reports;
- · Relevant LEP and DCP clauses;
- Northern Beaches Water Management for Development Policy.

The proposal is for demolition of all existing site improvements, tree removal, subdivision of one lot into three, internal driveway, and infrastructure.

The proposal is on land within 40 metres of a waterway mapped under the Water Management (General) Regulation 2018 hydro line spatial data, and the Pittwater streams mapping. As such, the land is considered waterfront land and the applicant must obtain approval from the NSW Department of Planning & Environment – Water in the form of a controlled activity permit.

For all developments potentially impacting on Waterfront Land (as defined in the Water Management Act 2000) a Water Management Plan must be prepared to demonstrate compliance with clause B5.13 of the Pittwater 21 DCP. A Water Management Plan or Waterway Impact Statement may be required for unmapped waterways. In this case, the site includes two watercourses of which one is an unmapped waterway. As such, a Waterway Impact Statement (WIS) with supporting documentation is required to demonstrate the feasibility of any works near a watercourse, demonstrate that any potential environmental impacts will be mitigated, and address the requirements of the Pittwater LEP and DCP. Controlled Activities/Integrated Developments applicants are required to address the requirements of the DPI Water and Fisheries.

DA2023/0511

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The WIS is to show the location, description, design details (including cross sections and long-sections of drainage lines and watercourses), dimensions and discharge details for all proposed stormwater system work elements. The location and dimensions of all existing and proposed drainage easements, and easements to be extinguished is also to be shown. The WIS should demonstrate compliance with the Pittwater LEP and DCP requirements, particularly the following components:

Pittwater LEP 2014 C4 Environmental Living objective: to encourage development that retains and enhances riparian and foreshore vegetation and wildlife corridors.

Pittwater 21 DCP section B5.13 Outcome: An appropriate setback between waterways and development (En).

Pittwater 21 DCP sB5.13 Controls:

 Any waterfront land (as defined in the Water Management Act 2000) on the property shall be retained in their natural state to: carry stormwater/flood flows, maintain aquifers, retain stability, and provide habitat functions.

 Development within waterfront land shall incorporate appropriately sized riparian corridor zones into the design (now based on Controlled activities – Guidelines for riparian corridors on waterfront land (NSW DPE, May 2022)).

No encroachments or low lying overhangs of the development are permitted over natural water courses. Structural support elements are not permitted within the cross-sectional area of a natural watercourse. Structural support elements adjacent to a natural water course located on the development site or on adjacent lands must be founded on a stable foundation to the depth directed by a geotechnical engineer.

In its current form, the proposal encroaches on riparian land, as does the concept building pad. The structural stability and environmental importance to the creek and riparian area of the 93 trees proposed for removal needs consideration, noting this consideration does not form part of the tree Retention Value (RV) criteria used in the provided arboricultural impact assessment. The proposal includes structural support elements within the cross-sectional area of a watercourse, which is not permitted under the DCP.

The proposal is therefore unsupported.

Note: Should you have any concerns with the referral comments above, please discuss these with the Responsible Officer.

Recommended Natural Environment Conditions:

Nil.

Water Management Referral Response

Application Number:	DA2023/0511
Proposed Development:	Demolition of existing structures, removal of trees and subdivision of one lot into three lots.
Date:	13/07/2023
To:	Nick Keeler
Land to be developed (Address):	Lot 5 DP 222134 , 337 Lower Plateau Road BILGOLA PLATEAU NSW 2107

easons for referral

Council's Water Management Officers are required to consider the likely impacts

Officer comments

Not supported

Not supported This application was assessed in consideration of but not limited to: • Supplied plans and reports;

Relevant LEP and DCP clauses;

Northern Beaches Water Management for Development Policy.

The proposal is for demolition of all existing site improvements, tree removal, subdivision of one lot into three,

Internal driveway, and infrastructure. The proposal is on land within 40 metres of a waterway mapped under the Water Management (General) Regulation 2018 hydro line spatial data, and the Pittwater streams mapping. As such, the land is considered waterfront land and the applicant must obtain approval from the NSW Department of Planning & Environment -Water in the form of a controlled activity permit.

Under the Northern Beaches Water Management for Development Policy (WM Policy), Table 5 - General Stormwater Quality Requirements apply. To demonstrate compliance with the relevant stormwater performance requirements, a model preferably through the Model for Urban Stormwater Improvement Conceptualisation (MUSIC), or an equivalent, widely accepted model or methodology must be provided. In this case, the applicant monstrate that the proposed lots would be able to achieve the required water quality parameters. A must de MUSIC model has not been provided.

All stormwater treatment measures must be designed in accordance with the requirements of this Policy and Northern Beaches Council's WSUD and MUSIC Modelling Guidelines (Appendix 1) and modified for local conditions as appropriate. Stormwater treatment measures must be part of a unified design for the project and contribute to a positive urban design outcome, visually and physically integrated with the adjacent built and natural environment. For guidance on integration with the natural environment, refer to the Guidelines for outlet Structures on waterfront land (May 2022). Note, Council is unlikely to support rock gabions as part of outlet design. No encroachments or low lying overhangs of the development are permitted over natural water courses.

The proposal is therefore unsupported.

Note: Should you have any concerns with the referral comments above, please discuss these with the Responsible Officer.

Recommended Water Management Conditions:

Nil

DA2023/0511

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1 Introduction

1.1 Scope of works

Ecological Consultants Australia (ECA) trading as Kingfisher Urban Ecology & Wetlands has been contracted by Ray and Mary Trevisan to provide a Waterway Impact Statement for a proposal at 337 Lower Plateau Road, Bilgola Plateau NSW 2107 within the Northern Beaches Council LGA.

Considering the site conditions and access to video during the flood period we are confident that this conclusions area representative of the waterway conditions and that future studies at other times would not change the conclusions in this report.

1.2 Site description

The Subject Site (the "Site") is the area of direct and likely indirect impacts and is defined as the whole of the property. The study area includes the site, as well as any additional surrounding land traversed during the site survey. The site is identified as 337 Lower Plateau Road, Bilgola Plateau NSW 2107. The site is approximately 0.47 ha in size and is zoned as C4 Environmental Living. The site is within the local

government area of Northern Beaches Council. The site fronts Barrenjoey Rd. The site contains an existing residential dwelling.

Table 1.1. Site administrative information.

Category	Details
Title Reference (Lot/DP)	5/DP 222134
Area (m²)	3,410
Street Address	337 Lower Plateau Road, Bilgola Plateau NSW 2107
LGA	Northern Beaches Council
Land Zoning	C4 Environmental Living



Figure 1.1. Site map. Source: SIX Maps. Date accessed: 4/09/2023.



1.2.1 Waterway

The site contains a 1st order watercourse (Figure 3.1) on the northern boundary. Figure 1.3 to 1.6 show the waterway location, riparian set-back, proposed works with riparian overlap and compensatory area.

The waterway is not clearly defined before or after the site and continues through residential dwellings including being piped under buildings and Hudson Parade (see Figure 1.4). Photos of the waterway located on site are provided below. This waterway enters Refuge Cove to the west.

Encroachment into the riparian area is in the outer 50% (5m) and totals $172m^2$. The riparian is 10m setback from top of bank (about 0.5m from hydroline) hydroline/waterway location to the boundary line of northern side. It totals $1280m^2$ including the proposed encroachment of $172m^2$. Encroachment is into an area with landscaping (inc pond) and the existing house. Encroachment into the out 50% is permissible in the Waer Mgt act providing the averaging rule is applied.

Area outside of the 10m setback and being retained and managed in accordance with the Objectives of the Water Mgt Act (green) 606m². This area provides ~3.5 x the area of encroachment as averaging out. The Act typically requires 1:1 so the sites compensation is more than required. The retained area also protects the lower end of the drainage line waterway and large sandstone boulders (see photos).

An ephemeral drainage line (not mapped) also exists on the south-western side of the property. This will be retained in its current form with the exception of the increase of the pedestrian bridge to a vehicle bridge and the third dwelling foot print being to the south of the drainage line (see photos).



Figure 1.3. Waterway. Source: SIX Maps.



Figure 1.4. Waterway, Site and vegetation retention / planting area – catchment context. Source: NearMap



Figure 1.5. Site and vegetation retention (green). Riparian 10m setback (blue) Source: NearMap



Figure 1.6 Impact areas

Encroachment into the riparian area 172m2 (red).

Riparian area being the 10m setback (blue) from hydroline (and on-site check if waterway location) and to the boundary line of northern side (1280m²).

Area outside of the 10m setback being retained and managed in accordance with the Objectives of the Water Mgt Act (green) 606m^{2.} Source: Base NearMap





Plate 1. Waterway lined by hard surface, concrete and rock within upper section.



Plate 2. Looking down into waterway from constructed freshwater pond. It is noted that during the super heavy rains of 2021, water stayed within the channel.



Plate 3. Existing waterway adjacent to the existing house.



Plate 4. Existing freshwater pond is constructed within 2 metres of the waterway



Plate 5. Location of pond relative to waterway with the waterway being on the other side of the railing fence.



Plate 6. To the south of the existing dwelling is a gully that occasionally collects rainwater during very high events. A wooden bridge currently connects the existing dwelling to this area of the property. This is not recognised as a waterway on the NSW Hydro Line spatial map.

1.2.2 Geology and soils

The property is situated upon a Narrabeen Group of sediments consisting of mostly interbedded laminate and shale with quartz to lithic quartz sandstone, minor sedimentary breccia, claystone, and conglomerate. The dominant soil landscape identified on the site is Watagan soil landscape. See Figure 1.4.

Watagan– rolling to very steep hills on fine-grained Narrabeen Group sediments. Local relief 60–120 m, slopes >25%. Narrow, convex crests and ridges, steep colluvial sideslopes, occasional sandstone boulders and benches. Tall eucalypt open-forest with closed-forest (rainforest) in sheltered positions.



1.3 Proposed development

The proposal is for demolition of all existing site improvements, tree removal, subdivision of one lot into three, internal driveway, and infrastructure (Figure 1.4). The future view of the site has been taken into account with the design of the three residential dwellings. Footprints and construction methods have been taken into consideration in order to determine the impacts of the potential future builds and indirect impacts of having 3 residential properties on the site. Proposed Lot 1 and 2 are largely within the footprint of the existing dwelling. Lot 3 is in an area dominated by weeds and not impacting the drainage gully (not a creek).

The proposal is on land within 40 metres of a waterway mapped under the Water Management (General) regulation 2018 hydro line spatial data, and the Pittwater streams mapping. As such, the land is considered waterfront land and the applicant must obtain approval from the NSW Department of Planning & Environment – Water in the form of a controlled activity permit.

Ecological Consultants Australia Pty Ltd. Sydney, Melbourne, Brisbane Ph: 0488 481 929, ABN: 166 535 39



Figure 1.5. Site Plan. Source: Proposed Subdivision. Gartner Trovato. 30/08/2022.

1.4 Sources of information used in the assessment

Records from the following databases were collated and reviewed:

- Atlas of NSW Wildlife (BioNet) Office of Environment and Heritage (OEH).
- https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap
- eSPADE v2.2 <u>https://www.environment.nsw.gov.au/eSpade2Webapp/</u>
- Nearmap, SEED Maps, SIX Maps.

Plans and drawings specific to this development:

- Arboricultural Impact Assessment by Urban Forestry Australia. December 2022.
- DA-01 Survey. Gartner Trovato Architects, 30/08/2022.
- DA-02 Site Plan. Gartner Trovato Architects, 30/08/2022.
- Guidelines for controlled activity approvals were used in particular:

Guidelines for riparian corridors on waterfront land DPE Factsheet <u>https://water.nsw.gov.au/__data/assets/pdf_file/0008/386207/licensing_approvals_controlled_ac</u> <u>tivities_riparian_corridors.pdf</u>

Guidelines for vegetation management plans on waterfront land DPE Factsheet

<u>https://water.nsw.gov.au/__data/assets/pdf_file/0009/386208/Fact-sheet-Guidelines-for-</u> vegetation-management-plans-on-waterfront-land-May-2022.pdf

Guidelines for instream works on waterfront land DPE Factsheet

<u>https://water.nsw.gov.au/ data/assets/pdf_file/0005/386204/licensing_approvals_controlled_ac</u> <u>tivities_instream_works.pdf</u>

Guidelines for outlet structures on waterfront land DPE Factsheet

<u>https://water.nsw.gov.au/ data/assets/pdf_file/0007/386206/licensing_approvals_controlled_ac</u> <u>tivities_outlet_structures.pdf</u>

Guidelines for watercourse crossings on waterfront land DPE Factsheet

https://water.nsw.gov.au/__data/assets/pdf_file/0010/386209/licensing_approvals_controlled_ac tivities_watercourse_crossings.pdf

1.5 Aboriginal Heritage AHIMS

Aboriginal Heritage is not part of a Flora and Fauna however the principles are considered to ensure recommendations in the WIS are in keeping with appropriate care for country. Aboriginal Heritage has been included in the WIS in relation to the Waterway, drainage line, exposed sandstone and general area.

 Sent:
 10/07/2023 11:56:12 AM

 Subject:
 DA2023/0511 - 337 Lower Plateau Road BILGOLA PLATEAU

Attn: Nick Keeler

Dear Nick,

Development Application No. DA2023/0511

Description: Demolition of existing structures, removal of trees and subdivision of one lot into three lots. Address: 337 Lower Plateau Road BILGOLA PLATEAU

Reference is made to the proposed development at the above area and Aboriginal heritage.

There are known Aboriginal sites in the area. No sites are recorded in the current development area, however, the area of the proposed development is identified as having high potential for unrecorded Aboriginal sites.

The Aboriginal Heritage Office recommends a preliminary inspection ('due diligence' under the *National Parks and Wildlife Act 1974*) by a qualified Aboriginal heritage professional. The assessment would provide information on what potential Aboriginal heritage issues exist on the land and recommendations for any further action if required.

Under the National Parks and Wildlife Act 1974 (NPW Act) all Aboriginal objects are protected. Should any Aboriginal Cultural Heritage items be uncovered during earthworks, works should cease in the area and the Aboriginal Heritage Office assess the finds. Under Section 89a of the NPW Act should the objects be found to be Aboriginal, Heritage NSW and the Metropolitan Local Aboriginal Land Council (MLALC) should be contacted.

Kind regards Susan Whitby Aboriginal Heritage Office m 0435 643 205 www.aboriginalheritage.org



Impact Permits (AHIP) application and determination process requires an assessment (by the proponent) and evaluation of the Aboriginal heritage values of Aboriginal object(s) and place(s) potentially harmed by an activity. The *Due Diligence Code of Practice for the Protection of Aboriginal Objectives in NSW* (the Code) explains and provides practical guidance about what due diligence means http://www.environment.nsw.gov.au/legislation/NPWamendmentAct2010.

The Code provides practical steps which individuals and organisations who own, manage or use land need to take in order to:

- Identify whether or not Aboriginal objects are, or are likely to be, present in an area;
- Determine whether or not their activities are likely to harm Aboriginal objects; and
- Determine whether an Aboriginal Heritage Impact Permit (AHIP) is required.

There are several benefits to having a due diligence process for assessing potential harm to Aboriginal objects:

- Assists in avoiding unintended harm to Aboriginal objects;
- Provides certainty to land managers and developers about appropriate measures for them to take;
- Encourages a precautionary approach;
- Provides a defence against prosecution if the process is followed; and
- Results in more effective conservation outcomes for Aboriginal cultural heritage.

Due diligence obliges people whose actions may affect Aboriginal cultural heritage to take reasonable steps to consider if Aboriginal objects may be present and avoid harm to that heritage. If harm cannot be avoided, they are required to apply for an AHIP.

The Aboriginal Heritage Information Management System (AHIMS) was used to search for Aboriginal Places, objects and other significant sites <u>https://www.environment.nsw.gov.au/topics/heritage/search-heritage-databases/aboriginal-heritage-information-management-system</u>.

The 'AHIMS Basic Search' indicated that there three (3) Aboriginal Places, objects or other significant sites occur on or within 200 m of 337 Lower Plateau Rd, Bilgola Plateau. See Figure 1.9.

Given that there are Aboriginal Places, objects or other significant sites occur on or within 200 m of the site, an extensive search has been included in the Heritage report.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown



If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of
 practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal
 places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are
 recorded as grid references and it is important to note that there may be errors or omissions in these recordings.
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as
 a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Figure 1.9. Extract from AHIMS for 337 Lower Plateau Rd, Bilgola Plateau. Source: AHIMS 2023.

2 Methods

2.1 Site survey

On-ground site inspection took place in July and September 2023 by Ecologist Elaway (G. Dalby-Ball). During this time, weather conditions were overcast and temperate with rain in previous days. Noted the author is very familiar with the area and ecology having lived in Bilgola and Avalon for over 40years.

2.2 Site photos

The following photos were taken during the July and September 2023 site inspection.

Plate 1. Existing house and lawn.



Plate 2. Existing small freshwater pond created by the current owners. Note any native plants are to be rehomed and locals with freshwater ponds have already requested these. No noxious aquatic plants are present.



Plate 5. Existing drainage line with hard surface, concrete and rock lined in this upper section. Area covered by Waterway Impact Statement. This is marked as a first order creek on the NSW hydroline.



Plate 6. Along the edge of the existing, constructed freshwater pond looking down into the ephemeral Creek line. It is noted that during the super heavy rains of 2021, water stayed within the channel. See additional photos.



Plate 7. Existing waterway on the right hand side of the existing house.



Plate 8. Existing constructed pond that is constructed within 2m of the ephemeral watercourse.



Plate 9. Location of pond relative to ephemeral watercourse. With the water course being on the other side of the railing fence.



Plate 10. To the left-hand side of the existing dwelling is a gully that occasionally has rainwater during very high events. A wooden bridge currently connect the existing dwelling to this area of the property. This is not recognised as a waterway on the NSW hydroline mapping.



Plate 16. The area down slope of the existing dwellings will not be disturbed. This includes the exposed rock boulders and the gully and all associated vegetation. A vegetation management plan has been recommended, and this will detail the weed management works and translocation of tree ferns at which ever time in future, the subdivision becomes request for specific development of lots.

Images of the waterway during heavy rain conditions of 3 years ago are included below. These are from videos that are available to Council assessing officers if required.

Ecological Consultants Australia Pty Ltd. Sydney, Melbourne, Brisbane Ph: 0488 481 929, ABN: 166 535 39

3 Waterway Assessment

Controlled activities on waterfront land - *Guidelines for riparian corridors on waterfront land NSW Office of Water* include where how offsetting is to be applied and what can be built on/over waterways. Being a first order waterway there is a 5m inner (core) riparian zone) and an out 5m riparian zone (10m total from top of bank).

3.1 Riparian corridor width

The riparian zone has been calculated from the edge of the stone wall in higher section and bank in lower section. As per the Guideline: The department recommends a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses (see Figure 3.1). This was applied and the waterway is a 1st Order creek.

Figure 2. The Strahler system



Table 1. Recommended riparian corridor widths							
Watercourse type	VRZ width (each side of watercourse)	Total RC width					
1 st order	10 metres	20 m + channel width					
2 nd order	20 metres	40 m + channel width					
3 rd order	30 metres	60 m + channel width					
4 th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width					

Note: where a watercourse does not exhibit the features of a defined channel with bed and banks, the department may determine that the watercourse is not waterfront land for the purposes of the WM Act.

Figure 3.1 the Strahler System of ordering watercourses. Source: DPE Controlled activities – Guidelines for riparian corridors on waterfront land

3.2 Off-setting

Where a structure (as defined in Guidelines and includes dwellings) is proposed in the outer 50% the riparian zone that area can be offset within the same watercourse providing an existing native vegetation riparian zone is not already present (see Figure will show where the offset will be located. The site condition is covered by this due to the area of proposed encroachment not being an existing vegetated riparian area.

Bridges, cycleways, paths, stormwater outlets and other essential services do not need to be offset but must comply with the requirements set out in the riparian corridor matrix (Table 2) and other relevant departmental controlled activities guidelines. Offline detention basins do not need to be offset so long as there is an equivalent VRZ for the corresponding watercourse and they are built in compliance with the department's Guidelines for watercourse crossings and Guidelines for instream works. If a proposed basin will not have an equivalent VRZ for the corresponding watercourse, it may still be built in the outer 50% of the VRZ but must be offset.

Averaging has focused on consolidating areas of natural vegetation – lower portion of the site.

Figure 3. Averaging rule



Figure 3.1. Offsetting process (Guidelines Office of Water).

Extract from the Guideline

- the core riparian zone and vegetated buffer have been combined into a single vegetated riparian zone (VRZ)
- the width of the VRZ within the riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses
- where suitable, applicants may undertake non-riparian corridor works or development within the outer 50% of a VRZ, as long as they offset this activity by connecting an equivalent area to the RC within the development site
- a 'riparian corridors matrix' enables applicants to determine what activities can be considered in riparian corridors.

https://water.dpie.nsw.gov.au/ data/assets/pdf file/0008/386207/licensing approvals controlled activities riparian corridors.pdf

3.3 What is Permitted in a First Order Waterway

Riparian corridor matrix. Source: NSW Office of Water

Table 2: R	iparian	corridor matri	x									
Stream order	VRZ	VRZ	Z RC offsetting for non- RC uses	RZ RC offsetting	Cycleways and paths	Detenti Basins	on	Stormwater outlet	Stream realignment	Road	crossings	;
					Only within 50% outer VRZ	Online	and essential services		Any	Culvert	Bridge	
1ªt	10m	•	•	•	•	•	•	•				
2 nd	20m	•	•	•	•	•		•				
3rd	30m	•	•	•		•			•	•		
4 th +	40m	•	•	•		•			•	•		

activities on waterfront land - Guidelines for riparian corridors on waterfront land NSW Office of Water

Key

- Stream order: The watercourse order as classified under the Strahler System based on 1:25,000, 1:50,000 or 1:100,000 topographic maps whichever is the smallest scale available. A full list is provided at Part 2, Schedule 2 of the Water Management (General) Regulation 2011.
- Vegetated riparian zone (VRZ): The required width of the VRZ measured from the top of the high bank on each side of the watercourse.
- Riparian corridor (RC) off-setting for non RC uses: Non-riparian uses, such as Asset Protection Zones are allowed within the outer 50 per cent of the VRZ, so long as offsets are provided in accordance with the averaging rule as seen in Figure 3.
- Cycleways and paths: Cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50 per cent of the VRZ.
- Detention basins: Detention basins can be built in the outer 50 per cent of the VRZ or online where indicated. Refer to the Office of Water's *Controlled activities. Guidelines for outlet structures* and *Controlled activities. Guidelines for instream works.* Online basins must:
 - be dry and vegetated
 - be for temporary flood detention only with no permanent water holding
 - have an equivalent VRZ for the corresponding watercourse order
 - not be used for water quality treatment purposes.
- Stormwater outlet structures and essential services: Stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be undertaken by directional drilling or tied to existing crossings. Refer to the Office of Water's *Controlled activities*.
- Guidelines for laying pipes and cables in watercourses and Controlled activities. Guidelines for outlet structures.
- Stream realignment: Indicates that a watercourse may be realigned. Refer to the Office of Water's
- Controlled activities. Guidelines for instream works.
- Road crossings: Indicates permitted road crossing methods. Refer to the Office of Water's *Controlled activities. Guidelines for watercourse crossings* and NSW DPI policy and guidelines for fish friendly waterway crossings for Class 1 and 2 waterways.

Thus for the Waterway (marked hydroline) the works proposed are consistent with the guidelines.

3.4 Direct impacts on the mapped waterway

Figure 1.6 shows the encroachment into the into the 10m zone and this is consistent with the Guidelines listed above.



Figure 3.6. Areas

Encroachment into the riparian area 172m² (red).

Riparian area being the 10m setback (blue) from hydroline (and on-site check if waterway location) and to the boundary line of northern side (1280m²).

Area outside of the 10m setback being retained and managed in accordance with the Objectives of the Water Mgt Act (green) 606m^{2.} Source: Base NearMap

3.5 Indirect impacts

The proposed actions may result in a range of minor indirect impacts affecting species and communities.

3.5.1 Increased flows

This could be positive and balance some of the impacts of water historically diverted from waterways due to curb and guttering. There is no indication that flows will increase and any development will need to have its own detention capacity. The "worst-case" scenario has been assumed of increased flow (duration and volume).

3.5.2 Weed growth and invasion

Excessive or biosecurity weeds must be managed to stop the spread into other areas – this has started and would be part of the on-going riparian management .

3.5.3 Run-off and sedimentation

The proposed actions must manage sediment / silt in all sages of works and after.

3.6 Re-vegetation Works and habitat enhancement

Revegetation works will consists of assisted natural regeneration, weed removal to prompt native species to grow and, where required, planting to achieve the desired density, diversity and strata.

Species recommended for planting from the existing vegetation communities and would be included in a Riparian Plan. Habitat enhancement is recommended and will benefits local species including the below.



Beaded Dragon Cameron Radford



Water Dragon image EDB

4 Compliance with the Pittwater LEP and DCP

4.1 Pittwater Local Environmental Plan 2014

4.1.1 Zone C4 Environmental Living

The planning documents have covered the compliance with the C4 zoning.

Zone C4 Environmental Living

1 Objectives of zone

• To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values.

• To ensure that residential development does not have an adverse effect on those values.

• To provide for residential development of a low density and scale integrated with the landform and landscape.

• To encourage development that retains and enhances riparian and foreshore vegetation and wildlife corridors.

2 Permitted without consent

Home businesses; Home occupations

3 Permitted with consent

Bed and breakfast accommodation; Boat sheds; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dwelling houses; Environmental protection works; Group homes; Health consulting rooms; Home-based child care; Home industries; Jetties; Oyster aquaculture; Places of public worship; Pond-based aquaculture; Respite day care centres; Roads; Secondary dwellings; Tank-based aquaculture; Water recreation structures

4 Prohibited

Industries; Local distribution premises; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3

4.1.2 Biodiversity

The development is compliant with biodiversity – particularly if weeds are removed and a full suite of Sydney Sandstone Gully and Littoral Rainforest specie are planted and established here.

The site is classified as "Biodiversity" on the Pittwater Biodiversity Map (Figure 5.1) and therefore subject to Clause 7.6 of the Pittwater Local Environmental Plan (LEP) 2014.

The objective of this clause is to maintain terrestrial, riparian and aquatic biodiversity by-

- (a) protecting native fauna and flora, and
- (b) protecting the ecological processes necessary for their continued existence, and
- (c) encouraging the conservation and recovery of native fauna and flora and their habitats.

Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—

- (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
- (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or
- (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.



icongis.azurewebsites.net/index.html

4.2 Pittwater 21 Development Control Plan

4.2.1 B5.13 Development on Waterfront Land

The development is compliant with clause B5.13

B5.13 Development on Waterfront Land

Land to which this control applies

All land in the Pittwater LGA not including the Pittwater waterway or Warriewood Valley land release area - P21DCP-BCMDCP037

Uses to which this control applies

Attached dwelling; Boarding house; Business Development; Child care centre; Development ancillary to residential accommodation; Dual occupancy (attached); Dual occupancy (detached); Dwelling house; Exhibition home; Group home; Hospital; Hostel; Industrial Development; Multi dwelling housing; Other Development; Residential flat building; Rural industry; Rural worker's dwelling; Secondary dwelling; Semi-detached dwelling; Seniors housing; Shop top housing; Subdivision

Outcomes

- Protection of waterways and improved riparian health (En)
- Stormwater and creek flows are safely managed (S)
- Appropriate setback between waterways and development (En)
- •

Controls

- Any waterfront land (as defined in the Water Management Act 2000) on the property shall be retained in their natural state to: carry stormwater/flood flows, maintain aquifers, retain stability, and provide habitat functions.
- Natural or artificially modified water courses cannot be diverted onto adjoining lands, filled, channelised and/or dammed.
- Waterfront land in a degraded state, should be restored and rehabilitated.
- Development within waterfront land shall incorporate appropriately sized riparian corridor zones into the design based on Controlled Activities on Waterfront Land: Guideline for outlet structures on waterfront land (NSW Office of Water, July 2012).
- Development adjoining waterfront land is to be landscaped with local native plants.
- Council encourages the replacement of a piped stormwater system where appropriate with a restored watercourse with appropriate flow carrying capacity, wherever feasible.
- The piping or artificial channelling of natural watercourses and drainage channels is not permitted.
- A Water Management Plan with supporting documentation is to be submitted demonstrating the feasibility of the proposed watercourse works within the site.
- <u>Structures Over and Adjacent to Easements, Piped Drainage System or Natural Watercourses</u>

No encroachments or low lying overhangs of the development are permitted over natural water courses. Structural support elements are not permitted within the cross sectional area of a natural watercourse. Structural support elements adjacent to a natural water course located on the development site or on adjacent lands must be founded on a stable foundation to the depth directed by a geotechnical engineer.

Variations

- Variations may be considered when an activity or work is permissible with a controlled activity approval from the NSW Office of Water.
- Variations will be considered where the activity or work is required to mitigate risk including: landslip; geotechnical risk; flooding; erosion; risk to utilities; and bushfire hazard.

Advisory Notes

- Waterway design is to be in accordance with guidelines such as:
- Controlled Activities on Waterfront Land: Guideline for instream works on waterfront land (NSW Office of Water, July 2012).
- Controlled Activities on Waterfront Land: Guideline for riparian corridors on waterfront land (Natural Resources Access Regulator May 2018).
- Controlled Activities on Waterfront Land: Guideline for vegetation management plans on waterfront land (NSW Office of Water, July 2012).

- Natural Channel Design (Brisbane City Council, 2003)
- Constructed Waterways in Urban Developments Guidelines (Melbourne Water Corporation, 2009).

Estuarine Hazard Controls

Reference is made to Estuarine Hazard Controls in this DCP and Appendix 7 Estuarine Risk Management Policy for Development in Pittwater

Landslip Controls

Reference is made to Landslip Controls in this DCP and Appendix 5 Geotechnical Risk Management Policy for Pittwater

Flood Controls

Reference is also made to Flood Controls of this DCP and Flood Risk Management Policy.

Information to be shown on the Development Drawings

The Water Management Plan is to show the location, description, design details (including cross sections and longsections of drainage lines and watercourses), dimensions and discharge details for all proposed stormwater system work elements. The location and dimensions of all existing and proposed drainage easements, and easements to be extinguished is also to be shown.

4.3 Northern Beaches Water Management for Development Policy

The stormwater plan to accompany this proposal includes assessment of the water quality aspects and details all aspects of stormwater from the development reaching the waterway and the drainage line. The Waterway has been historically altered in the upper portion (near existing dwelling and above to road) with rock lining and low walls. Keying in of stormwater will be in keep with this and the Guidelines https://water.dpie.nsw.gov.au/ data/assets/pdf file/0007/386206/licensing approvals controlled activities outlet structures.pdf

Implementation of the guidelines also takes into account the retention of native vegetation within the corridor and the already human altered rock lined sections of the creek. In general the erosive force from water out of an inlet pipe is x13 the diameter of the pipe – hence the inlet needs to be 13x back and / or have sufficient protection between outlet and waterway to stop such erosion potential. The Guidelines show this set back and describe it. Designed for a large and more natural creek the guidelines have been adapted to achieve the best on-ground environmental outcomes. It's noted that the Guidelines are based on information from the author over the past 20 yrs working in urban waterways.

Aims and objectives for outlet structures

The design and construction of stormwater outlets should aim to be natural yet provide a stable transition from a constructed drainage system to a natural flow regime as seen in Figure 1. Figure 1: Natural outlet structure



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While the above is ideal in areas that do not yet have vegetated riparian corridors it is being modified to retain native vegetation while achieving the erosion mgt and biodiversity outcomes.

Under the Northern Beaches Water Management for Development Policy (WM Policy), Table 5 – General Stormwater Quality Requirements apply (see below).

The water way is a collector for the catchment as well as from the existing and proposed dwellings.

Pollutant	Performance Requirements
Total Phosphorous	65% reduction in the post development mean annual load ¹
Total Nitrogen	45% reduction in the post development mean annual load ¹
Total Suspended Solids	85% reduction in the post development mean annual load ¹
Gross Pollutants	90% reduction in the post development mean annual load ¹ (for pollutants greater than 5mm in diameter)
рН	6.5 - 8.5
Hydrology	The post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 50% AEP

Under the Northern Beaches Water Management for Development Policy (WM Policy), Table 5 – General Stormwater Quality Requirements apply. To demonstrate compliance with the relevant stormwater performance requirements, a model preferably through the Model for Urban Stormwater Improvement Conceptualisation (MUSIC), or an equivalent, widely accepted model or methodology must be provided. In this case, the applicant must demonstrate that the proposed lots would be able to achieve the required water quality parameters. A MUSIC model has not been provided.

All stormwater treatment measures must be designed in accordance with the requirements of this Policy and Northern Beaches Council's WSUD and MUSIC Modelling Guidelines (Appendix 1) and modified for local conditions as appropriate. Stormwater treatment measures must be part of a unified design for the project and contribute to a positive urban design outcome, visually and physically integrated with the adjacent built and natural environment. For guidance on integration with the natural environment, refer to the Guidelines for outlet structures on waterfront land (May 2022).

Note, Council is unlikely to support rock gabions as part of outlet design.

No encroachments or low lying overhangs of the development are permitted over natural water courses.

The stormwater plan to accompany this proposal includes assessment of the water quality and modelling. From site inspections and review of live footage during the flood times I'm confident the waterway will handle flows (and reduced porous area) that will come from the increase development area. Sydney Sandstone rocky creeks are typically full flow, trickle and intermittent based on catchment falls. This waterway, although modified, provides this functionality and will continue to do so post development.

4.3.1 Other relevant clauses

The site is classified as "Area 1" on the Pittwater Landscaped Area Map (Figure 1.7) and therefore subject to Control D4.10 of the Pittwater 21 Development Control Plan (DCP).

Controls

- The total landscaped area on land zoned R2 Low Density Residential or E4 Environmental Living shall be 60% of the site area.
- The use of porous materials and finishes is encouraged where appropriate.
- Any alterations or additions to an existing dwelling shall provide a minimum 60% of the site area as landscaped area.



The relevant environmental (B4) DCP Controls (B4.2, 4.2 and 4.22) have been addressed in the Flora and Fauna report. As they relate to the Waterway the implementation of the *Waterway Plan* will contribute to compliance with the Outcomes of those controls (summarised below).

Outcomes (Summary from B4.2, 4.2 and 4.22)

The long-term viability of locally native flora and fauna and their habitats and the retention and enhancement of wildlife corridors in the Pittwater LGA. (En)

Conservation, enhancement and/or creation of habitats for locally native flora and fauna to ensure the long-term viability of locally native flora and fauna and their habitats. (En)

Controls

- 1. Development shall retain and enhance habitat for threatened species, endangered populations, endangered ecological communities and other locally native species.
- 2. Development shall provide wildlife corridors via creation, restoration, and / or regeneration of habitat.
- 3. Development shall result in no significant onsite loss of canopy cover and no net loss in native canopy trees.
- 4. Development shall ensure that at least 80% of any new planting incorporates native vegetation (as per species listed in Native Plants for Your Garden available on the Council website or the Plant Community Type (PCT)).
- 5. Landscaping is to be outside areas of existing bushland and should not include environmental weeds.
- 6. Planting is to maximise linkage to the wildlife corridor.
- 7. Development shall not negatively impact on threatened species, endangered populations or endangered ecological communities.
- 8. Development shall provide an adequate buffer to wildlife corridors.
- 9. Caretakers of domestic animals shall prevent them from entering wildlife habitat areas.
- 10. Fencing, where permitted, shall be passable by native wildlife.

5 Mitigation Measures

5.1 Management tasks

5.1.1 Delineation of work areas

During the development, impacts to the site and the vegetation to be retained should be minimised by the delineation of work areas. Access to the site would be best restricted to the development footprint only. An exclusion zone will be established for the vegetation outside the work areas.

5.1.2 Tree protection

Tree protection is to be consistent with industry standards. It is recommended to seek advice from a qualified arborist or ecologist when installing tree protection measures. The main trees to be protected are those within proximity to the proposed works.

5.1.3 Preservation of Habitat Features

The project should salvage and reuse any existing logs on the ground.

5.1.4 Native species planting and natural regeneration in Riparian Zone

The Planting schedule will include a diversity of local provenance species from the relevant native vegetation communities that occur, or once occurred on site. The plan can be commissioned for pre CC and will be in accordance with the Guidelines for plans from DPE (Office of Water) Guidelines and these are consistent with Council's requirements for VMPs. Currently there are palms exotic to the location that can be either replaces or plated around to increase the diversity and have species representative of the appropriate community.

5.1.5 Erosion and sediment control

Where required, erosion and sediment control measures are to be implemented. These include, but are not limited to, sediment fencing, jute mating, crushed sandstone, or coir logs. Erosion and sediment controls measures are to be revised during site inspections and/or after significant rainfall (more than 10mm in 24 hours resulting in site runoff). Control measures must ensure that no settlement of sediment or silt occurs within areas of vegetation to be retained. Sediment fencing should be retained for a long as practicable. If removed, then monitoring is required to ensure flows do not concentrate and cause further erosion. If concentrated flows do occur and/or erosion gullies develop then coir log baffles are required.

5.1.6 Weed control

Weeds must be managed to prevent further spread. There must be continuous maintenance of the vegetation on-site otherwise increase weed growth may result. Weeds will colonize and pioneer on any cleared grounds, therefore must be managed during works as well as ongoing post-works.

It is recommended to seek advice from a qualified bush regenerator or ecologist prior to conducting weed removal works.

All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW *Pesticides Act* 1999. Herbicides must not be applied whilst exotic plants are setting seed. The weed removal program aims to be broad in approach and sustained in application to provide the best possible conditions for natural regeneration and to control weeds within the site.

5.1.7 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix III should be followed. The site is considered to be an area that may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to the drainage channel. It is recommended that Bushland Hygiene Protocols be followed closely.

6 Appendices

6.1 Appendix II – Key Weed Removal Methods

Technique	Method	Equipment
Hand Removal	Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked, and stems and plants parts rolled. The clump of weed material can then be bagged and removed from site.	Tools: Gloves, Rakes, Knife and Weed Bags

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Crowning EG Asparagus Fern	 Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility. Soil disturbance is to be kept to a minimum when using this technique. 	Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.
Cut and Paint Stems Eg for Morning Glory	 Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants. 	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup [®] Biactive Herbicide and all other required P.P.E.
Scrape and Painting	More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plant height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk.	Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

	Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	
Cut with a Chainsaw and Paint	Larger size weed species (including Privet and Coral Trees), too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant. If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants. Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

7 Expertise of authors

Brooke is a passionate and dedicated ecologist with valuable on ground experience working on bush regeneration projects throughout the Sydney Region. She has worked with various stakeholders across both public and private sectors to deliver sustainable and achievable environmental outcomes. She has worked on major construction contractors as well as smaller contractors to deliver tailored environmental solutions on time and within budget.

Brooke completed her Bachelor of Science at the University of Wollongong and is currently expanding her skills and knowledge undertaking Cert III in Conservation and Ecosystem Management at TAFE.

Brooke has experience conducting fieldwork and preparing a range of reports including the Waterway Impact Statement, Vegetation Management Plan (VMP), Biodiversity Development Assessment Report (BDAR), Certification Certification, Construction Environmental Management Plan (CEMP), Review of Environmental Factors (REF), and Environmental Impact Assessment (EIA).

Brooke has exceptional communication and customer service skills and can deliver professional ecological assessments.

Key Projects:

- Threatened species surveys.
- Flora and fauna surveys.
- Fauna spotter and handler.
- Aquatic fauna relocation.

Brooke Thompson ECOLOGIST



SPECIALISATIONS

- GIS mapping
- Fauna spotting
- Aquatic fauna relocation and handling
- Habitat tree assessment, marking and mapping
- Floristic plot surveys
- Flora and fauna field surveys

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia. June 2022present
- Natural Area Specialist, Dragonfly Environmental.
 January 2022-present
- Volunteer, Microplastic Surveying, University of Wollongong 2021
- Volunteer, Frog Surveying, Chad Beranek B EnvSc (Hons) UTS 2016

QUALIFICATIONS AND MEMBERSHIPS

- BSc Conservation Biology, University of Wollongong.
- Currently undertaking Cert III Conservation and Ecosystem Management.
- WHS General Induction of Construction Industry NSW White Card.
- Early Career Ecologist Consultant, Ecological Consultants Association of NSW.

With over 25 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Elaway a valuable contribution to any project.

Elaway has over 8 years local government experience as manager of environment and education for Pittwater Council. Elaway presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Elaway is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Elaway has up to date knowledge of environmental policies and frequently provides input to such works. Elaway was a key contributor to the recent set of Guidelines commissioned by Southeast Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Elaway's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Elaway is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Elaway is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Elaway's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Elaway is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

Geraldene Dalby-Ball (Elaway) DIRECTOR

SPECIALISATIONS

- Urban Ecology and habitat rehabilitation and recreation.
- Urban waterway management assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- **Director and Ecologist**, Dragonfly Environmental. 1998-present
- Manager Natural Resources and Education, Pittwater Council 2002-2010
- Wetland Ecologist Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- Bachelor of Science with 1st Class Honors, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.
- **Professional member** Ecological Consultants Association of NSW
- Accredited Biobank Assessor (in renewal)

