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SL:TM

28 Jun 2023

Ingham Property Group

Suite 1.02, 4F Huntley Street,
Alexandria NSW 2015

Attn: Ash Bowman

Subject: 345 Appin Road, Appin Planning Proposal – Riparian Assessment

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Dear Ash

Thank you for the opportunity to prepare this riparian assessment of the watercourses at 345 Appin Road, Appin (the subject site) to support the planning proposal for the North Appin (Part) Precinct.

The proposed development site is intersected by a series of existing watercourses, many of which are located within environmental conservation areas within the site. In accordance with the '*Guidelines for controlled activities on waterfront land*' (NRAR, 2018), the watercourses have each been identified to range between 1st to 4th order riparian corridors based on the Strahler classification system using available 1:25,000 topographic maps. The guidelines state that where a watercourse does not exhibit the features of a defined channel with bed and banks, the Natural Resource Access Regulator (NRAR) may determine that the watercourse is not waterfront land for the purposes of the Water Management Act (2000) (WM Act). Refer to Plate 1 for an illustration of the Strahler classification of watercourse at the subject site.



Plate 1 – Strahler Classification of Watercourses

An assessment has been undertaken to determine whether these watercourses can be reclassified to not be considered waterfront land and, thus, remove the need for riparian corridor considerations. To support the proposed reclassification of these watercourses as waterfront land, a series of maps supported by a riparian assessment matrix, has been prepared to show the Strahler classifications and watercourses proposed to be reclassified. The outcomes of the riparian assessment have been reached with consideration of the '*Waterfront land tool*' (NRAR, 2020) which has been developed by NRAR to aid in the classification of "waterfront land" in accordance with the WM Act.

A site inspection was undertaken on the 25th of January and 1st of February 2023 by the project team which involved recording observed riparian characteristics and taking site photos at each of the visited watercourses. Each watercourse has been assessed against the '*Waterfront land tool*' to determine whether valuable riparian function exists. The watercourses not visited at the site visit have been assessed using available aerial imagery.

The riparian assessment concludes that some of the mapped watercourses across the site are not what would be classified as "rivers" under the WM Act. These watercourses do not display riparian characteristics and there is no defined creek bed / banks or preservable vegetation with biodiversity value. It is proposed that these watercourses will be replaced by traditional street minor/major drainage systems (where they are first order watercourses). Other second order watercourses are proposed to be realigned as overland flow paths to allow drainage to occur as it does under current conditions. In particular, the north-south watercourse 2A will be rejuvenated to provide riparian value to the waterway. The watercourses that are proposed to be retained are primarily situated in the conservation lands.

Refer to Figure 1 (Attachment A) for an illustration of the photo locations across the site and the watercourses proposed for removal, retention, and realignment. Refer to Attachment B for the riparian assessment matrix of all visited watercourses which have been tested against the Waterfront land tool.

The outcomes of this assessment are in accordance with NRAR's guidelines and preserves the riparian function and ecological value that is present on the sight. It is recommended that this assessment is referred to NRAR for formal endorsement.

Should you have any queries regarding this matter please do not hesitate to contact me.

Yours faithfully



SABINA LOHANI

Manager – Stormwater and Flooding

Attachment A – Figure 1 – Riparian Mapping

Attachment B – Riparian Assessment Matrix

LEGEND

- Site Boundary
- Photo Locations
- Riparian Buffers
- Retained Watercourse
- Proposed for Removal
- Proposed for Realignment
- Farm Dams
- Access Track & Chicken Pad



0 120 240 m

Scale 1: 8500 @ A3

Projection: GDA2020 / MGA zone 56

Figure 1

345 Appin Road, Appin Riparian Assessment

Riparian Mapping

Date: 15/06/2023

Revision: B



WATERCOURSE 1A



Location 1 (Looking Upstream)



Location 1 (Looking Downstream)

Description	The photos of watercourse 1A show an open clearing with tall pasture grass (no trees). Local depression in terrain with no defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1A is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1B



Location 2 (Looking upstream)



Location 2 (Looking downstream)



Location 3 (Looking upstream)



Location 3 (Looking downstream)



Location 4 (Looking downstream)



Location 5 (Looking upstream)

Description	The photos of watercourse 1B show a local depression connecting a series of man-made farm dams. The area consists of tall pasture grass (no trees) with no defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1B is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 2A



Location 6 (Looking at D3)



Location 6 (Looking at D4)



Location 7 (Looking downstream)



Location 8 (Looking upstream)



Location 8 (Looking downstream)



Location 9 (Looking upstream)



Location 10 (Looking downstream)



Location 11 (Looking upstream)



Location 12 (Looking downstream)



Location 12 (Looking upstream)



Location 13 (Looking upstream)



Location 13 (Looking downstream)



Location 14 (Looking downstream)



Location 15 (Looking downstream)



Location 16 (Looking upstream, away from mapped hydroline)



Location 16 (Looking downstream)



Location 17 (Looking towards chicken shed pad)



Location 17 (Looking downstream)

Description	The photos of watercourse 2A generally show limited signs of riparian function. Majority of the watercourse consists of natural depressions (no creek bed or banks) which in a lot of cases do not align with the mapped hydrolines.
Watercourse order	2 nd order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 2A is proposed to be realigned and rejuvenated to provide an improved ecological value to the waterway

WATERCOURSE 1C



Location 18 (Looking downstream)



Location 19 (Looking downstream)



Location 20 (Looking upstream)



Location 20 (Looking downstream)

Description

The photos of watercourse 1C show an open clearing with tall pasture grass (no tree). Local depression in terrain with no defined

	creek bed or banks. A series of farm dams are online to the watercourse. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1C is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1D



Location 21 (Looking downstream)



Location 22 (Looking downstream)

Description	The photos of watercourse 1D show cascading farm dams D9 and D10 with minimal riparian connectivity in between. No defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1D is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 2B



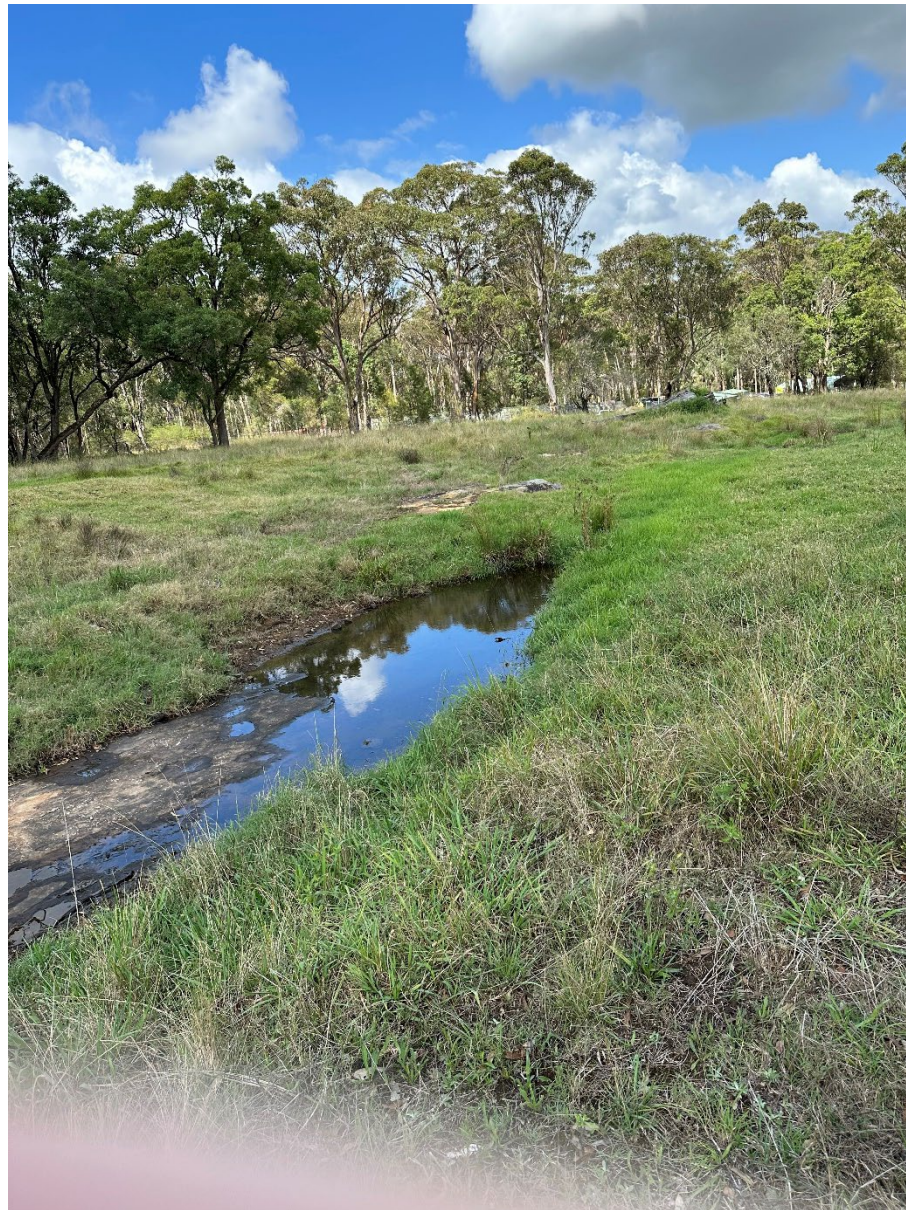
Location 23 (Looking upstream)



Location 23 (Looking downstream)



Location 24 (Looking upstream)



Location 24 (Looking downstream)



Location 25 (Looking upstream)



Location 25 (Looking downstream)

Description	The photos of watercourse 2B show signs of a watercourse with evidence of erosion in the creek bed and pools of stagnant water. It should be noted that rainfall occurred in the days prior to the site visit. There is minimal riparian vegetation in the creek bed.
Watercourse order	2 nd order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	Yes – Pools and erosion
High bank of the watercourse (NRAR Waterfront Land Tool – Appendix 8)	Type 4 – Laterally Unconfined Discontinuous
Are the proposed works located within 40 metres of the high bank?	Yes

Result: Controlled activity approval is required
One or more of the following features are on this property or a neighbouring property:

- Watercourse
- Lake
- Wetland
- Mapped 3rd order or greater hydro line

The proposed works are located within 40 metres of the high bank of the watercourse

Outcome: Watercourse 2B is proposed to be realigned in the proposed development and will be replaced by a linear open space alongside Brian Road which will include an overland flowpath. Given the limited ecological value in the location of the existing watercourse, this realignment is considered to be a suitable outcome.

WATERCOURSE 3A



Location 26 (Looking upstream)



Location 26 (Looking downstream)

Description	The photos of watercourse 3A show clear signs of a watercourse with evidence of erosion in the creek bed with exposed rock outcrops. The watercourse has clear bed and banks.
Watercourse order	3 rd order
High bank of the watercourse (NRAR Waterfront Land Tool – Appendix 8)	Type 4 – Laterally Unconfined Discontinuous
Are the proposed works located within 40 metres of the high bank?	Yes

Result: Controlled activity approval is required
One or more of the following features are on this property or a neighbouring property:

- Watercourse
- Lake
- Wetland
- Mapped 3rd order or greater hydro line

The proposed works are located within 40 metres of the high bank of the watercourse

Outcome: Watercourse 3A is proposed to be retained in the proposed development

WATERCOURSE 1F



Location 27 (Looking Upstream)



Location 27 (Looking Downstream)

Description	The photos of watercourse 1F show an open clearing with tall pasture grass (no trees). Local depression in terrain with no defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1F is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1G



Location 28 (Looking Upstream)

Description	The photos of watercourse 1G show an open clearing with tall pasture grass (no trees). Local depression in terrain with no defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1G is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1H



Location 29 (Looking Upstream)



Location 29 (Looking Downstream)



Location 30 (Looking Upstream)



Location 30 (Looking Downstream)

Description

The photos of watercourse 1H show an open clearing with tall pasture grass (no trees). Local depression in terrain with no defined

	creek bed or banks. Minimal riparian connectivity between farm dams.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1H is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 2C



Location 31 (Looking Upstream)



Location 31 (Looking Downstream)



Location 32 (Looking Upstream)



Location 32 (Looking Downstream)

Description

The photos of watercourse 2C show an open clearing with tall pasture grass (no trees). Local depression in terrain with no defined creek bed or banks. Minor pool of water evident at location 32,

	though it is noted that rainfall had occurred in the days prior to the site visit. No riparian function evident.
Watercourse order	2 nd order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 2C is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1I



Location 33 (Looking Upstream)



Location 33 (Looking Downstream)



Location 34 (Looking Upstream)



Location 34 (Looking Downstream)

Description

The photos of watercourse 1I show an open clearing with tall pasture grass (no trees) upstream of photo location 33. Local depression in terrain with no defined creek bed or banks. No riparian function

	evident. The natural watercourse appears to have been disconnected by the chicken farm pads and replaced by a channel as pictured at location 34. This is an unmapped channel with no signs of riparian function.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1l is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1J



Location 35 (Looking Upstream)



Location 35 (Looking Downstream)



Location 36 (Looking Upstream)



Location 36 (Looking Downstream)



Location 37 (Looking downstream)



Location 38 (Looking upstream)

Description	The photos of watercourse 1J show an open clearing with tall pasture grass (no trees). Local depression in terrain with no defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1J is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 2D



Location 39 (Looking Upstream)



Location 40 (Looking Downstream)



Location 41 (Looking Upstream)



Location 41 (Looking Downstream)

Description

The photos of watercourse 2D some evidence of riparian vegetation upstream of Dam 15. Signs of scouring at the dam outlet. Clear

	evidence of bed and bank downstream of location 41 with permanent water pools.
Watercourse order	2nd order
Does the watercourse have a defined bed or bank?	Upstream of 41 – No Downstream of 41 - Yes
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	Yes – Pools and erosion
High bank of the watercourse (NRAR Waterfront Land Tool – Appendix 8)	Type 4 – Laterally Unconfined Discontinuous
Are the proposed works located within 40 metres of the high bank?	Yes

Result: Controlled activity approval is required

One or more of the following features are on this property or a neighbouring property:

- Watercourse
- Lake
- Wetland
- Mapped 3rd order or greater hydro line

The proposed works are located within 40 metres of the high bank of the watercourse

Outcome: Watercourse 2D is proposed to be retained in its existing alignment and rejuvenated to provide an improved ecological value to the waterway

WATERCOURSE 2E



Location 42 (Looking Upstream)



Location 42 (Looking Downstream)

Description	The photos of watercourse 2E show a defined creek with bed and banks. Riparian vegetation of overbanks and permanent pools and exposed rocks in creek bed.
Watercourse order	2 nd order
Does the watercourse have a defined bed or bank?	Yes
Watercourse Types (NRAR Waterfront Land Tool – Appendix 5)	Type 1 – Confined Valley Headwater
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	Yes – Pools and erosion
High bank of the watercourse (NRAR Waterfront Land Tool – Appendix 8)	Type 1 – Confined Valley Headwater
Are the proposed works located within 40 metres of the high bank?	Yes

Result: Controlled activity approval is required
One or more of the following features are on this property or a neighbouring property:

- Watercourse
- Lake
- Wetland
- Mapped 3rd order or greater hydro line

The proposed works are located within 40 metres of the high bank of the watercourse

Outcome: Watercourse 2E is proposed to be retained within the conservation zone

WATERCOURSE 1L



Location 43 (Looking Upstream)



Location 43 (Looking Downstream)



Location 44 (Looking Upstream)



Location 44 (Looking Downstream)

Description

The photos of watercourse 1L show an open clearing with tall pasture grass (sparse trees). Local depression in terrain with no defined creek bed or banks. No riparian function evident.

Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1L is proposed to be removed in the proposed development and will be replaced by traditional road drainage networks

WATERCOURSE 1M



Location 45 (Looking downstream)



Location 45 (Looking Downstream)

Description	The photos of watercourse 1M shows a clear transition in vegetation looking downstream where the watercourse begins. The existing farm dam is disconnected from the downstream watercourse.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1J is proposed to be removed in the proposed development

WATERCOURSE 1N



Location 46 (Looking upstream)



Location 46 (Looking downstream)

Description	The photos of watercourse 1N shows no sign of a watercourse (no creek bed or banks). Dense vegetation with trees.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1N is proposed to be retained in the conservation zone

WATERCOURSE 10



Location 47 (Looking upstream)



Location 47 (Looking downstream)

Description	The photos of watercourse 1O shows a clear transition in vegetation looking upstream versus downstream. Looking upstream there is tall pasture grass with no riparian vegetation evident and no creek bed or banks. Looking downstream there is clear vegetation change within the existing electrical easement.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1O is proposed to be removed upstream of Location 47 and will be replaced by traditional road drainage networks. Watercourse 1O is proposed to be retained within the electrical easement and conservation zone further downstream.

WATERCOURSE 1P



Location 48 (Looking downstream)

Description	The photos of watercourse 1P show an open clearing with tall pasture grass (sparse trees). Local depression in terrain with no defined creek bed or banks. No riparian function evident.
Watercourse order	1 st order
Does the watercourse have a defined bed or bank?	No
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	None

Result: Controlled activity approval not required–No watercourse

- There is no bed or bank
- There are no watercourse features

Outcome: Watercourse 1P is proposed to be retained within the electrical easement and conservation zone further downstream.

WATERCOURSE 2F



Location 49 (Looking upstream)



Location 49 (Looking downstream)

Description	The photos of watercourse 2F show a defined creek with bed and banks. Riparian vegetation on overbanks and within creek bed.
Watercourse order	2 nd order
Does the watercourse have a defined bed or bank?	Yes
Watercourse Types (NRAR Waterfront Land Tool – Appendix 5)	Type 1 – Confined Valley Headwater
Watercourse Features (NRAR Waterfront Land Tool – Appendix 6)	Yes – Pools and erosion
High bank of the watercourse (NRAR Waterfront Land Tool – Appendix 8)	Type 1 – Confined Valley Headwater
Are the proposed works located within 40 metres of the high bank?	Yes

Result: Controlled activity approval is required
One or more of the following features are on this property or a neighbouring property:

- Watercourse
- Lake
- Wetland
- Mapped 3rd order or greater hydro line

The proposed works are located within 40 metres of the high bank of the watercourse

Outcome: Watercourse 2F is proposed to be retained within the conservation zone