Boffa Miskell

Tauriko West Urban Growth

DRAFT - Three landform options assessment - Ecology

Prepared for Tauranga City Council

21 August 2023

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Cover photograph: The northern gully system within the Tauriko West area © Boffa Miskell 2023

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1.0 Introduction

Tauranga City Council (TCC) is exploring the potential rezoning of the Tauriko West portion of the Tauranga Western Corridor urban growth to residential (Figure 1). As part of this process, three broad potential landform options have been generated to inform the structure plan. The landform options are as follows:

1. Avoid all streams and wetlands
2. Hybrid option (avoid some but not all wetland and stream features)
3. Maximised development options (no targeted wetland and/or stream avoidance).

A comparison of the three options is required to inform the best practicable development (earthworks) approach while balancing environmental effects with viable urban development, particularly under the more recent national freshwater (NPS-FM[1]) and indigenous biodiversity (NPS-IB[2]) management direction.

1.1 Background and scope

Boffa Miskell Ltd. (BML) have a longstanding ecological relationship with the Tauriko West area, including preliminary ecological feature identification, mapping, and effects management options to help inform preliminary exploration of rezoning the land. However, much of this work was completed either prior to the gazetting of the National Policy Statement on Freshwater Management (NPS-FM) and National Environmental Standards for Freshwater (NES-F) legislation in September 2020, or immediately following. Since then, the NPS-FM and NES-F have both been revised, with changes being gazetted in late 2022, and coming into effect on 5 January 2023. Therefore, BML have been engaged by TCC to provide an ecological comparison assessment of the three proposed landform options, with a particular focus on potential natural inland wetland and stream features and the implications of the NPS-FM and the NES-F requirements.

In addition, the NPS-IB has recently been gazetted and comes into effect on 4 August 2023. The three potential landform options were developed prior to the NPS-IB gazetting; however, this ecological comparison assessment also considers broad NPS-IB matters.

This comparison is intended to be high-level and include some recommendations on any reasonably anticipated effects management outcomes in relation to the NPS-FM / NES-F framework for freshwater management as well as preliminary interpretation of the NPS-IB management requirements. A separate and more comprehensive Detailed Ecological Assessment will address other ecological aspects, including the terrestrial environment, lizards, bats, and other avifauna.

[1] National Policy Statement for Freshwater Management 2020 (Ministry for the Environment, 2023b).

[2] National Policy Statement for Indigenous Biodiversity 2023 (Ministry for the Environment, 2023a)

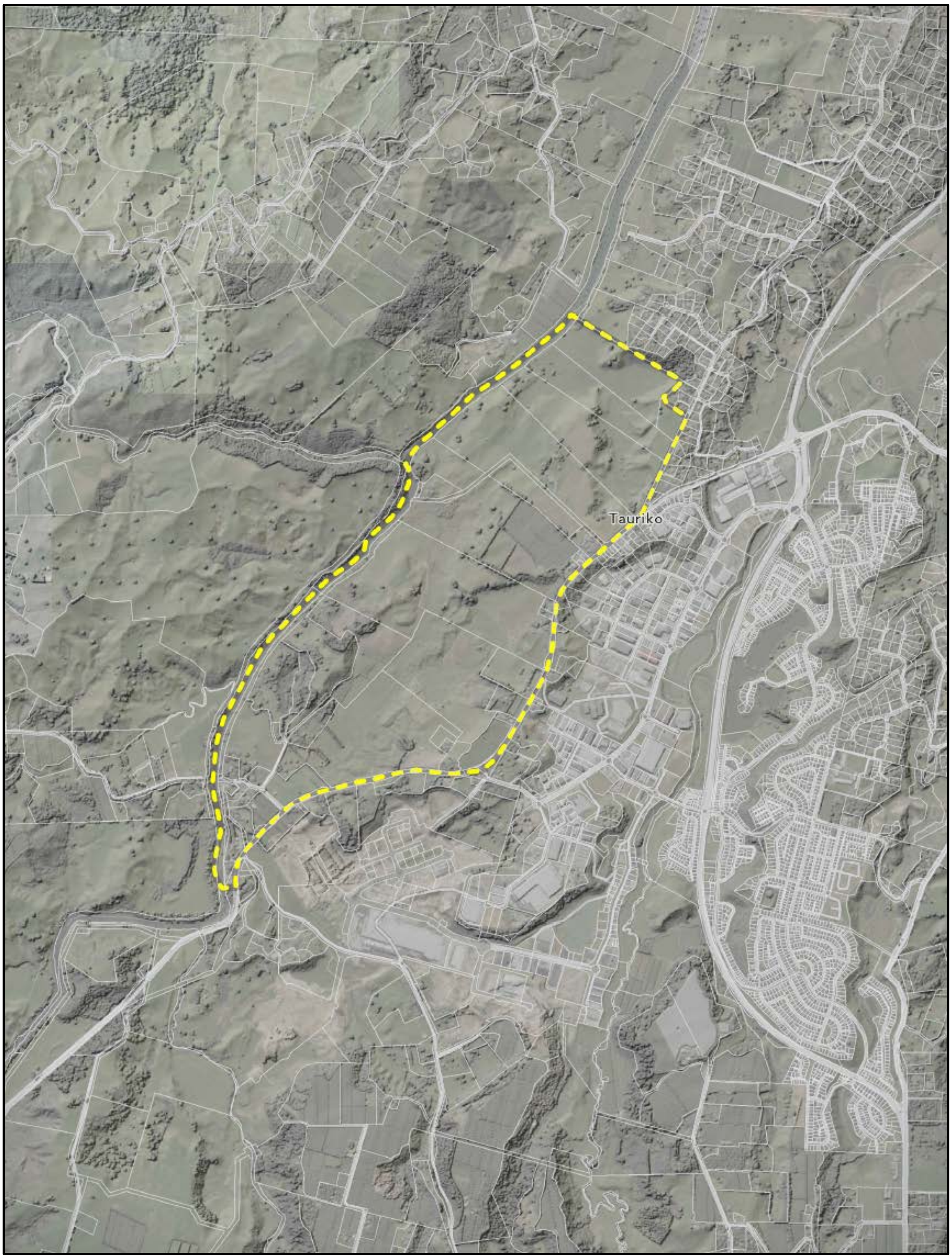

Figure 1: The Tauriko West urban growth area.

1.2 Report disclaimers

Below is a list of **important disclaimers** that should be considered when interpreting and using this report:

1. Figure 1 is an accurate representation of the area of assessment. Some of the following maps include a small section at the north-eastern corner that is not part of the project area; however, this has no impact on this options assessment, and has been discounted in all calculations
2. Only high and moderate likelihood wetland areas are considered here. Those areas that were found to have a low-likelihood of being wetlands, or areas that were ambiguous at the time of survey due to *a-typical* conditions and require further assessment, have not been included in this options assessment as their relevance is not yet clear. However, further assessment of those areas has been included in the Tauriko West Structure Plan Ecology Assessment. We note that while these may not be considered relevant in assessing which landform option is most suitable, these areas do have an associated level of risk when it comes to the resource consent phase and determining mitigation/offsetting requirements.
3. Constructed wetland/waterbody includes any wetland habitat "that has developed in or around a deliberately constructed water body, since the construction of the water body" (see clause 3.21(1) NPS FM (2020)) as these are excluded from being considered natural inland wetland(s) as per the NPS-FM. Therefore, we have not included any such constructed wetlands in this analysis, as they have no status under the NPS-FM.
4. Ground-truthing and updates to the NPS-FM and NES-F have occurred following development of this landform option which has introduced some minor interactions with potential natural inland wetland and modified watercourse features. NPS-FM updates includes alterations to the natural inland wetland definition, as well as changes to regulations under the NES-F regarding urban development activities as well as matters to consider within 10 m and 100 m of a natural inland wetland feature. Broadly, if the avoidance landform option design (see 3.2.1)) were to be updated, it would result in reduced development extent to ensure the avoidance intent was adhered to.

2.0 Methods / approach

This report includes the following:

- A summary of the freshwater and vegetation ecological features identified within the Tauriko West urban growth area.
- A summary of the broad intentions of each potential landform option.
- A high-level comparison of the three landform options against the identified ecological features that may be directly affected by each given option.
- Recommendations on potential ecological effects management approaches for each landform option.

To achieve this, this report has relied on detailed ecological investigations of the Tauriko West area undertaken in 2017 by BML, with subsequent site visits in 2019 (bat surveys) and 2021 (wetland investigation), and a final 'ground-truthing' exercise completed in 2023. The primary purpose of the 2023 ground-truthing exercise was to confirm, or otherwise, the likelihood of previously identified wetland features being considered 'natural inland wetlands' as per the revised NPS-FM definition. This update relies on rapid assessment methods, focusing on the 'likelihood' of a feature being determined a natural inland wetland at the time of resource consent application. No detailed wetland surveys were completed.

3.0 Summary of ecological features and landform options

3.1 Summary of the ecological features

Broadly, the Tauriko West growth area is dominated by agricultural land use including livestock farming, horticulture, and lifestyle blocks. While this landscape is dominated by exotic vegetation (e.g., pasture, shelterbelts, hedgerows, kiwifruit orchard, etc), there are several 'natural inland wetland' features, and natural (albeit modified) watercourses. Additionally, there are numerous artificial watercourse (farm drain) networks and constructed wetland/waterbody features. There are no indigenous or indigenous-dominated vegetation communities, but there are some mixed (indigenous and exotic) communities.

Detailed descriptions and interpretation(s) of ecological features is provided in the Tauriko West Structure Plan Ecology Assessment and so are not repeated here. However, the below includes a summary of the observed ecological features of the site that are relevant to this options assessment, including approximate quantification of extent, condition, value, etc. where possible.

Figure 2 shows the combined waterway and potential natural inland wetland features that have been considered in this assessment. Individual summaries and site maps of the wetland, stream/watercourse, and terrestrial environments are provided below.

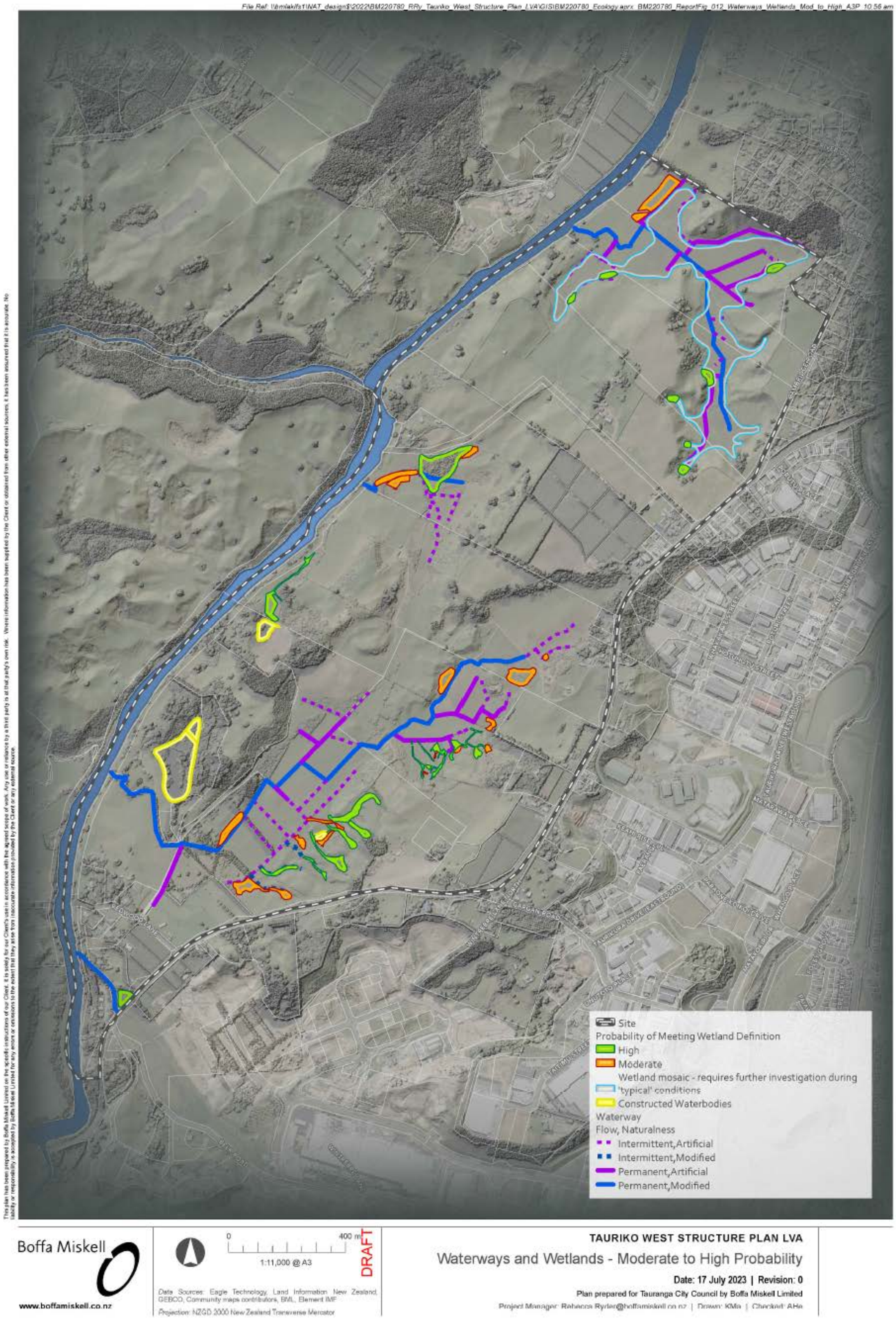

Figure 2: Map showing the extent of identified waterways and potential natural inland wetland features that have been included in this assessment.

3.1.1 Wetland environment

Overall, there are 41 features considered likely to meet the natural inland wetland definition, including 25 that have a high likelihood and an additional 16 that have a moderate likelihood (Table 1, Figure 3). In some cases, it is expected the 'moderate likelihood' areas contain patches of natural inland wetland and patches of non-natural wetland. Of the identified features the majority (38; excluding the wetland mosaic feature) are actively grazed and are dominated by pasture species palatable to livestock (i.e., not just the dry-affiliated pasture species presented by MfE).

Irrespective of whether the identified features can be defined as 'natural inland wetland' as per the NPS-FM, no features are considered to have high ecological value. However, some of the high and moderate likelihood features may have moderate ecological value. These features are typically those that are not considered induced and include multiple vegetation layers.

The following has been considered when identifying and qualifying potential natural inland wetland features:

- The wetland environment has primarily been quantified by their likelihood of being identified as 'natural inland wetlands' when it comes to the resource consenting phase.
- The 2023 ground-truthing exercise was done following a record-wet summer, with signs of abnormally high groundwater levels and altered grazing / farm-management patterns.
- A large wetland mosaic feature exists within the northern gully system. In the analyses below, we have considered it as a single, uniform feature; however realistically, this is not the case. Therefore, the following basic description(s) is of relevance when understanding and interpreting the ensuing analyses:
    - It is a mosaic of wet and dry features. These features have not been delineated at this stage; however, it is likely >50% of the area would be considered natural inland wetland habitat if detailed delineation were to occur.
    - It is actively grazed and includes palatable pasture, including wet-tolerant species that are not included on the MfE pasture list. Willow weed (*Persicaria maculosa*) is prominent, particularly in the lower reaches.
    - There is a network of artificial straight drainage channels throughout the feature.
    - There is very limited tall growing and/or woody vegetation, with much of it confined to the upper reaches. Woody vegetation is primarily willow species

Table 1: General statistics relating to potential wetland habitat extent within the Tauriko West area.

Feature	Number of feature(s)	Total area of feature(s)
High likelihood natural inland wetlands	25	4.61 ha
Moderate likelihood natural inland wetlands	16	2.53 ha
Northern wetland mosaic feature[3]	1 location	16.84 ha

[3] As per the note above, for analyses we have taken a conservative approach meaning the wetland mosaic features have been considered as if they are 100% wetland, whereas realistically there will be patches within that do not satisfy the natural inland wetland definition.

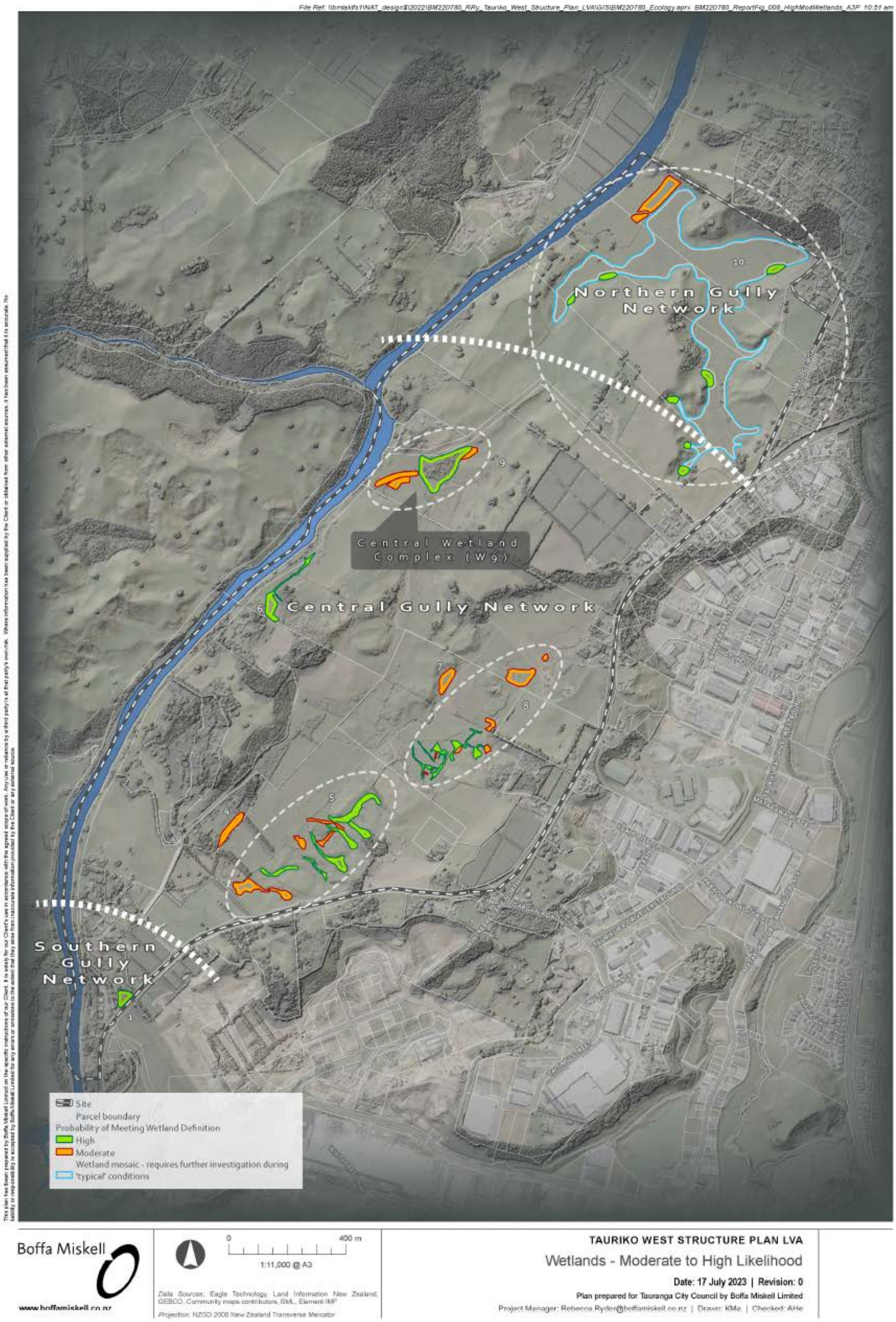

Figure 3: Map showing the high and moderate likelihood wetland features within the Site. The wetland mosaic feature within the Northern gully network is also included.

3.1.2 Stream / watercourse environment

There are a number of watercourses within the Tauriko West site; however, the majority (61.1% length) are considered to be artificial watercourses / farm drains (Table 2, Figure 4). The remaining ‘natural’ watercourses are highly modified, frequently resembling straightened and incised channels. Beneficial, functional riparian vegetation is largely absent for all watercourses, though many of the watercourses in lowland areas have been fenced to exclude stock access. Irrespective of whether the watercourses are considered natural or artificial, inanga (*Galaxias maculatus*; At Risk – Declining) were observed throughout the site suggesting adequate connectivity with the downstream Wairoa River and interconnectedness between the various watercourses. At this stage of the process, only perennial and intermittent watercourses have been considered due to their elevated regulatory/statutory recognition, but realistically there will be a large number of ephemeral and watershed/gully head features throughout the landscape.

Table 2: Stream / watercourse summary extent information within the Tauriko West area.

Feature	Total length of feature(s)
Natural / Modified watercourse	4.266 km
Artificial watercourse / farm drain	6.697 km

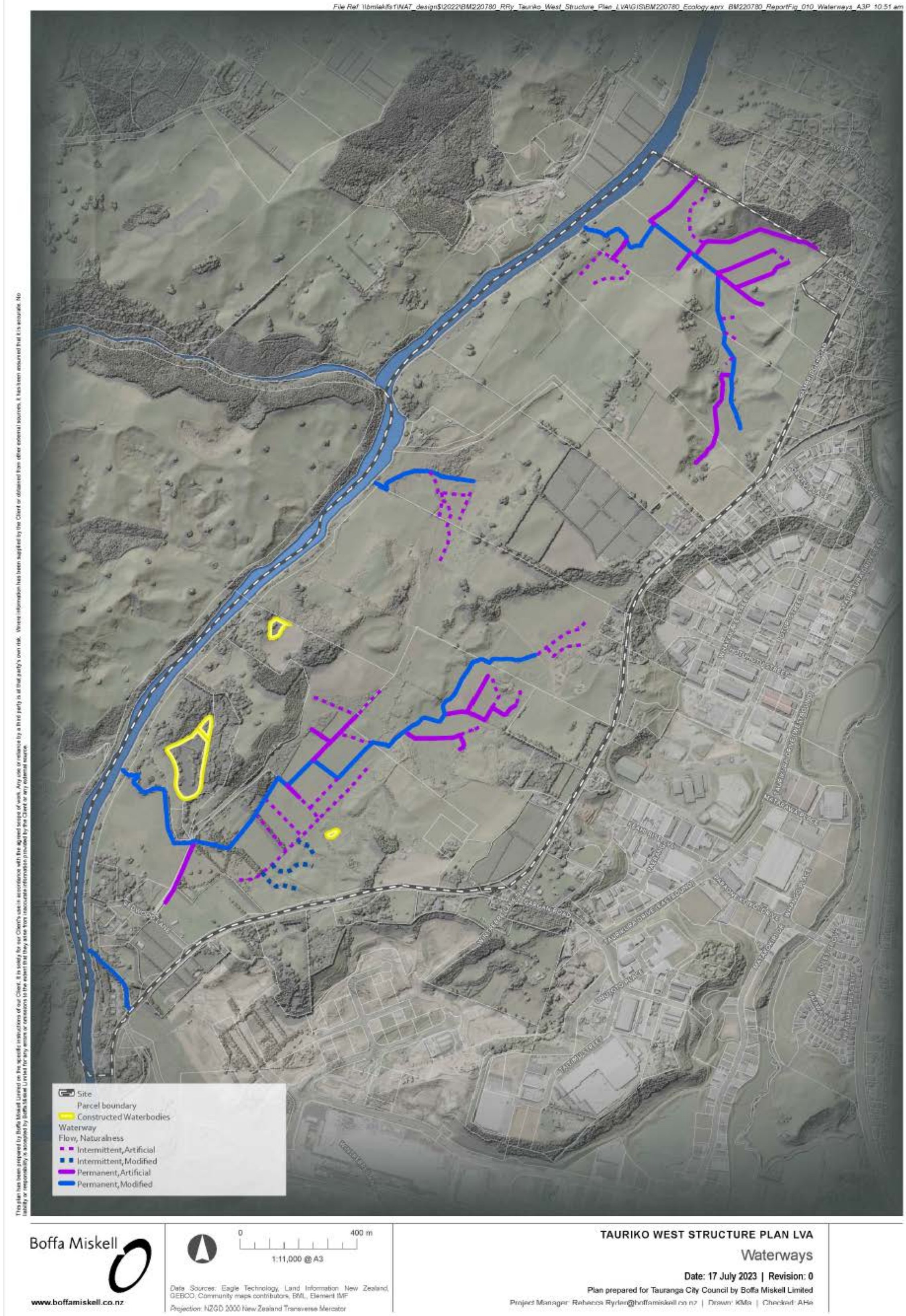

Figure 4: Perennial and intermittent streams and watercourses within the Tauriko West site.

3.1.3 Terrestrial environment

The terrestrial environment is dominated by exotic vegetation, including grazed pasture, planted exotics (plantation/woodlots, shelterbelt, orchard, garden/amenity), and exotic-dominated scrub (Table 3, Figure 5). Generally, these communities have very low or negligible community or habitat value. There are some areas of mixed native and exotic vegetation, which are considered to be of low value.

The grazed pasture has minimal complexity and provides no habitat for herpetofauna or bats. It does provide potential foraging habitat for the At-Risk pipit (nesting is considered unlikely due to regular disturbance from farm management practices), but there are ample alternative foraging opportunities in the surrounding landscape and so any effect of displacement would be minimal.

The plantation and shelterbelt vegetation (primarily pine) also has very little complexity and does not provide good habitat for lizards or birds. More mature woodlots or shelterbelts are more suitable habitat for long-tailed bats; however, it should be noted that several previous bat surveys have been carried out on the site and there is no indication that bats are inhabiting these communities. The other planted vegetation communities (garden, orchard, etc) provide very little habitat value, except perhaps very limited potential lizard habitat.

The scrubland communities (mixed or exotic) are typically very weedy and of low or negligible value – they are not mature enough to provide bat habitat, and only provide habitat to common and robust bird species. The weedier margins may provide a small amount of habitat to native lizards; however, the ongoing grazing and disturbance reduces the likelihood of this.

Generally, all of the vegetation communities are of low or very low value and will not be a primary constraint in determining the most suitable landform option.

Table 3: Vegetation communities present within the Tauriko West area and their habitat values.

	Number of feature(s)	**Total area of feature(s)**	**Potential habitat for threatened / at risk avifauna**	**Potential habitat for indigenous herpetofauna**	**Potential habitat for bats**	**General complexity of feature(s)**
Mixed scrubland	3	6.5 ha	Low	Low-moderate (at margins)	Low	Low
Exotic-dominated scrubland/forest	12	28.5 ha	Low	Low-Moderate (at margins)	Low	Low
Planted exotic vegetation – garden/amenity, hedgerows, orchards	17	28 ha	Very Low	Low	Very Low	Very Low
Planted exotic vegetation – mature	20	17.5 ha	Very Low	Very Low	Moderate	Very Low

	Number of feature(s)	Total area of feature(s)	Potential habitat for threatened / at risk avifauna	Potential habitat for indigenous herpetofauna	Potential habitat for bats	General complexity of feature(s)
shelterbelts and woodlots						
Pasture (with pasture weed species and lone scattered trees)	1 (majority of site)	~250 ha	Low	Very Low	Very Low	Very Low
Exotic-dominated wetland vegetation	N/A (captured in Wetland section)	N/A (captured in Wetland section)	Low	Low	Very Low	Very Low

3.1.3.1 NPS-IB matters

The NPS-IB requires the identification of Significant Natural Areas (SNAs), and Highly Mobile Fauna areas (HBFAs). The matters used to identify SNAs are broadly comparable to those already outlined in the District Plan, against which this site has already been assessed – no significant areas have been found within the project area.

The Highly Mobile Fauna areas are a new consideration, and require assessment of habitat use by those species listed on the specified highly mobile fauna list (Appendix 2 of the NPS-IB). Of those listed, the only species that may have an intermittent presence the site in areas that may be impacted is the New Zealand pipit. It is not considered likely that pipit use the site as a primary habitat, and given the ongoing disturbance through grazing and farm management, the site is not expected to provide stable, permanent foraging habitat in any given location. Any impacts to the site are also unlikely to have a measurable effect on foraging pipits, as there is ample alternative foraging habitat in the surrounding landscape. As such, we do not consider this site to be a “highly mobile fauna area” for pipit.

However, given that the NPS-IB is so far untested, it is possible that local authorities will have a different interpretation of the NPS. It is expected that this will be assessed at the resource consent phase.

It is also worth noting that long-tailed bat are listed as specified highly mobile fauna; however, given that targeted surveys indicate that they are not inhabiting the site, we have not considered this further.

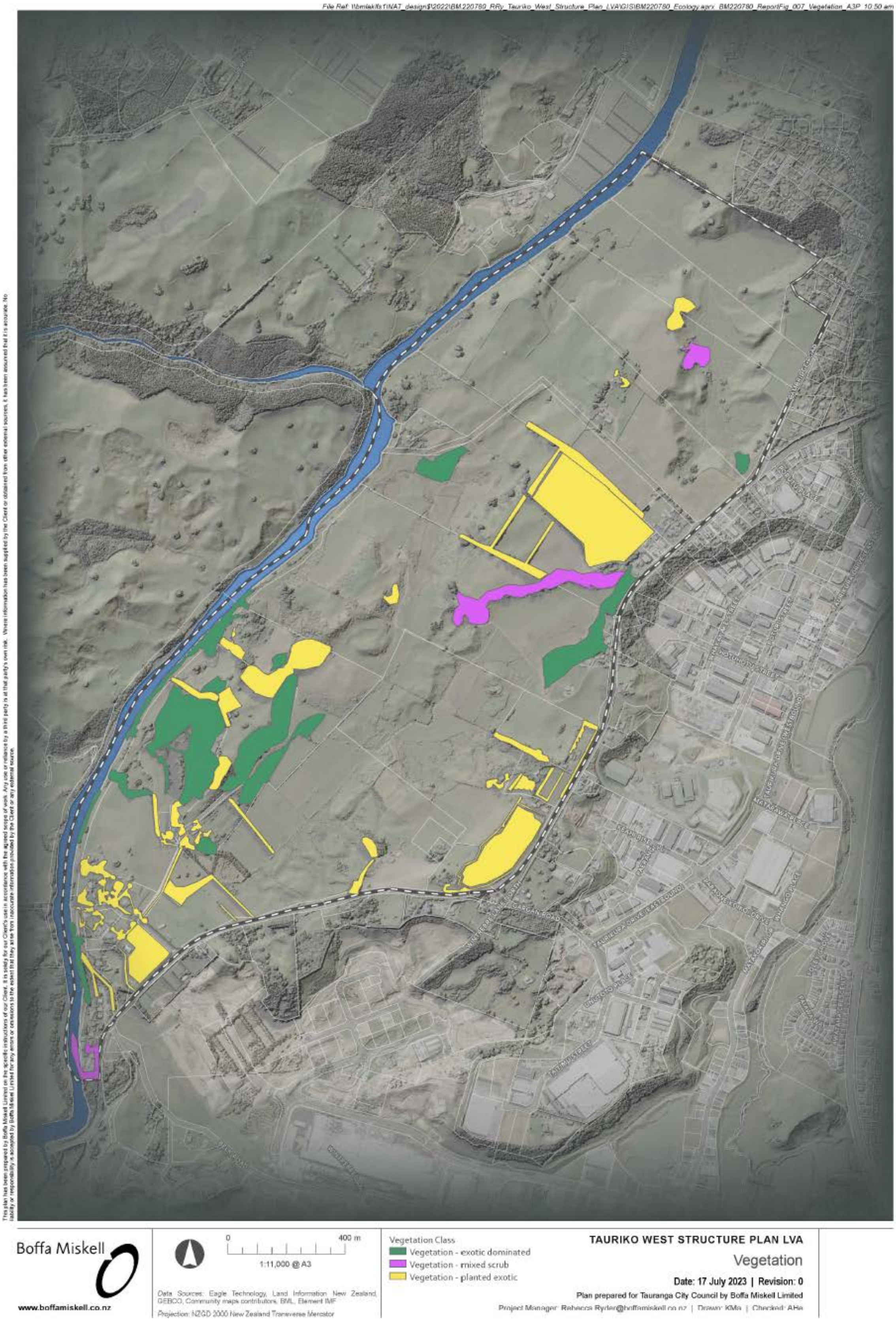

Figure 5: Vegetation types observed within the Tauriko West site. Note: pasture has not been highlighted.

3.2 Summary of the landform options

The following descriptions have been provided by Tauranga City Council.

3.2.1 Avoid all natural watercourses and wetlands option

The definitions under the National Policy Statement for Freshwater Management (NPS-FM) and Resource Management Act 1991 (RMA) for streams and natural inland wetlands have been used to prepare this scenario. The setbacks identified under the National Environmental Standards for Freshwater (NES-F) have then been applied where earthworks that affect wetlands' drainage are not permitted as of right. In some cases this requires a 100m setback where there is no certainty for any such earthworks proposed being a permitted activity – i.e. they would require a resource consent process and trigger the need to step through the effects management hierarchy. Where modified watercourses are affected, there is also a functional need test to address. Hence this option was originally designed to completely avoids all streams and wetlands and thereby avoids triggering further consent considerations under the NPS-FM and NES-F requirements.

Note: as described in section 1.2, ground-truthing and updates to the NPS-FM have occurred following development of this landform option which has introduced some minor interactions with potential natural inland wetland and modified watercourse features. If the potential landform were to be updated, it would result in reduced extent to ensure the avoidance intent was adhered to.

This option does not necessarily avoid artificially constructed watercourses, such as farm drains, nor constructed ponds as they have no status under the NPS-FM, nor trigger a resource consent under the NES-F regulations.

3.2.2 Hybrid option

All three main landowners have developed concept plans requiring large scale cut and fill earthworks for recontouring purposes – to provide for developable land areas suitable for housing at a medium density as far as possible, taking into account sites of cultural importance, ecological aspects, topography, natural hazards and the like. Some wetland areas are to be kept intact near the Wairoa River margin, and the modified watercourse in the southern/central area to be replaced by a recreated stream. This concept landform is known as Option 5, prepared in January 2023. This landform scenario combines the provision of developable land with a recreated stream (where a modified watercourse has been identified), as well as protecting much of the wetlands originally identified prior to new NPS-FM provisions, and requiring some offsetting where wetland paddocks are to be filled in. Areas of low lying (floodable) land need to be raised high above certain flood hazard levels for housing development. Hence filling in some watercourses (modified stream and farm drains) and paddock wetlands is necessary; thereby triggering the need to consider wetland offsetting and the recreated stream.

3.2.3 Maximised development option

This scenario demonstrates how the whole growth area could be totally recontoured to maximise yield for housing development - by cutting all high hills and escarpments, and by filling in all low-lying paddocks and gullies, to achieve a very large-scale developable area platform. This alternative landform achieves maximum urban development; however it also triggers the need for off-site offsetting or compensation for all the wetlands lost to earthworks for housing. This option helps address consideration of other practicable locations in the area of the development and whether they would likely have equal or greater adverse effects on a natural inland wetland under the NPS-FM and NES-F provisions.

4.0 Landform comparison – high-level direct effects

The following compares the three potential landform options against the three main groups of ecological features – wetland, stream/watercourse, and terrestrial vegetation.

Note: When estimating the potential extent of direct impacts, only features that fall within the 'recontoured' extent of each landform has been included; however, there may be additional features/impacts that will be impacted in areas where no recontouring of the landscape is required to facilitate development. We have assumed these extents are minimal and that features within the recontoured extent is enough to approximate the likely extent and scale of direct ecological effect.

4.1 Wetland features – options comparison

The following has been considered and/or assumed when comparing the wetland environment between the three landform options:

- No detailed wetland plots have been recently undertaken – while best endeavours have been made for 'accurate' mapping, a 5 m buffer has been included as a separate 'feature' to accommodate for potential fluctuation in wetland extent – both in response to hydrology and following detailed investigation.
- The 'avoidance' model was generated prior to the natural inland wetland definition revision which has been in place since December 2022; therefore, there may be some potential natural inland wetlands (as per the Dec 2022 definition) that have not been 'avoided' under this model.
- Natural wetland refers to moderate and high likelihood features.
    - It also includes the northern gully mosaic though some patches of this are expected to not key out as wetland.
- Grazed refers to high and moderate likelihood features that are effectively grazed pasture in an ecological sense.
- Where design impacts *part* of a wetland feature, only cases where overlap >1 m² are included.

Table 4 and Figures 6, 7, and 8 provide a high-level indication of the potential direct effects on the wetland environment from the three potential landform options. It is evident the 'avoidance' landform option results in the least direct effects on potential natural inland wetland features; however, it is noted that both the avoid and the hybrid landform options are expected to directly avoid a large majority of the wetland features (>200,000 m² each). This is compared to the maximise landform option which is estimated to directly impact >200,000 m² of natural inland wetland habitat.

We note that the total avoidance model also does not result in any effects management benefits (e.g., creation and enhancement) and the benefits associated with the hybrid and maximise are considered in section 5.1 rather than in the table below.

Table 4: Wetland environment comparison between the three potential landform options.

Landform option	Avoid[4]	Hybrid	Maximise
Wetland habitat impact - number of wetlands			
No. potential impacted <u>natural inland wetlands (moderate and high likelihood) – incl. KO gully mosaic</u> *Note: this can include instances where part of a feature is included*	2	38	48
Wetland habitat impact - area of wetland			
Total area of potential natural inland wetland habitat (high and moderate likelihood)	0.44 ha	3.44 ha	20.78 ha
Area of potential impacted <u>“high-likelihood” natural inland wetlands</u>	0.15 ha	1.56 ha	18.7 ha
Area of potential impacted <u>“moderate-likelihood” natural inland wetlands</u>	0.29 ha	1.89 ha	2.08 ha
Wetland habitat avoidance – area of wetland			
Area of **avoided** natural inland wetlands (moderate and high likelihood) – incl. northern gully mosaic	24.22 ha	21.22 ha	3.88 ha

[4] Ground-truthing and updates to the NPS-FM have occurred following development of this landform option which has introduced some minor interactions with potential natural inland wetland and modified watercourse features. If the potential landform were to be updated, it would result in reduced extent to ensure the avoidance intent was adhered to.

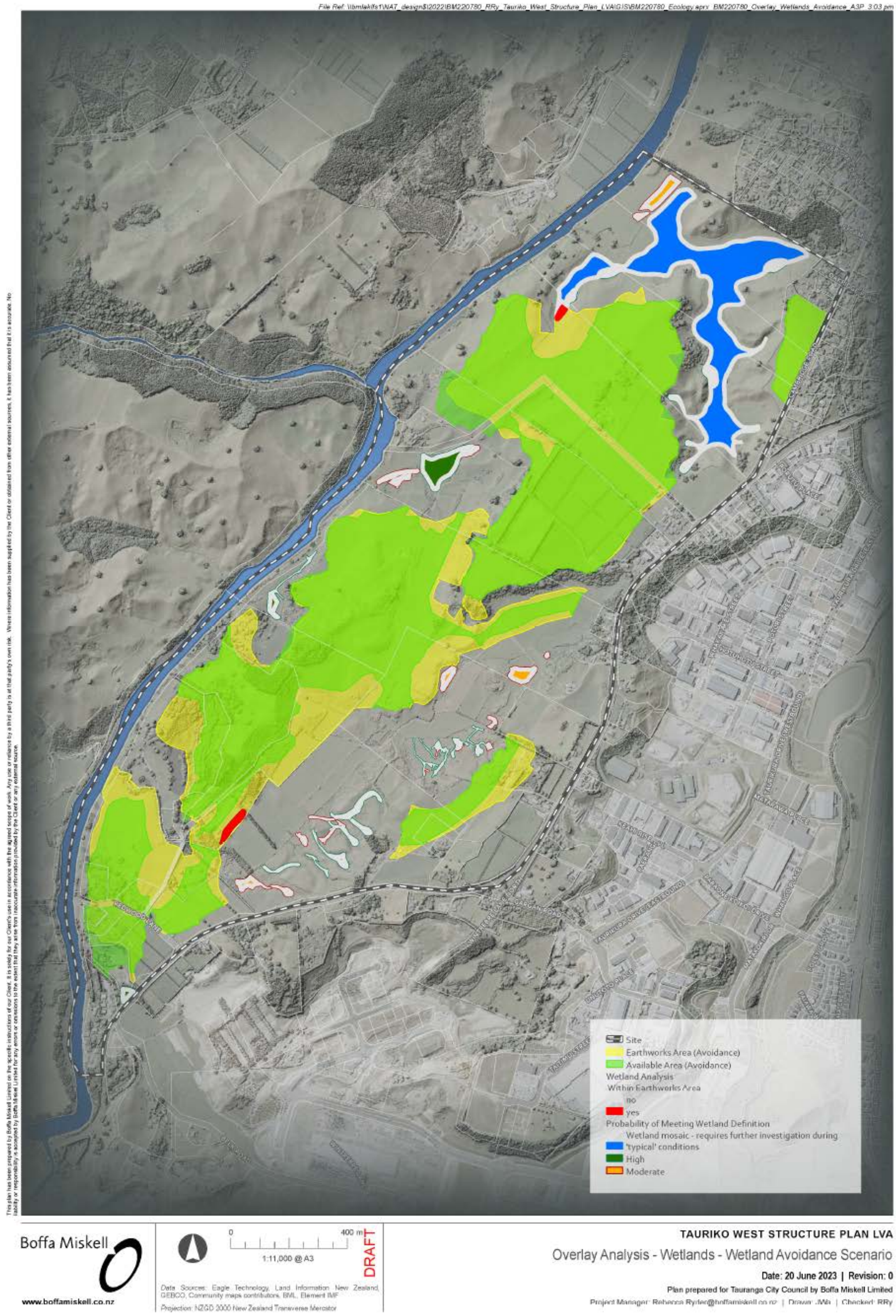

Figure 6: Location of the high and moderate likelihood natural inland wetland features in relation to the 'avoid landform option'. The wetland mosaic within the northern gully network is included.

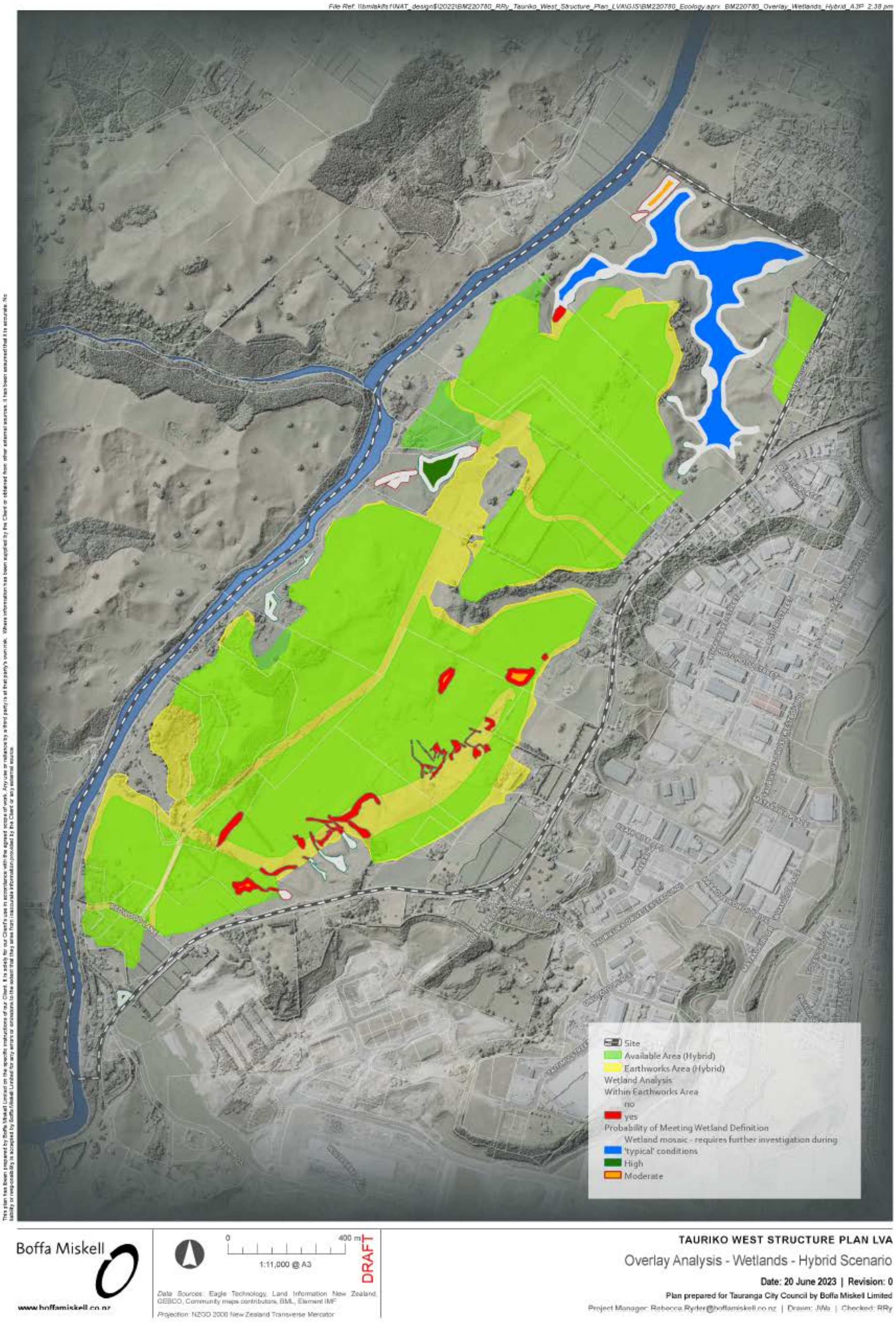

Figure 7: Location of the high and moderate likelihood natural inland wetland features in relation to the 'hybrid landform option'. The wetland mosaic within the northern gully network is included.

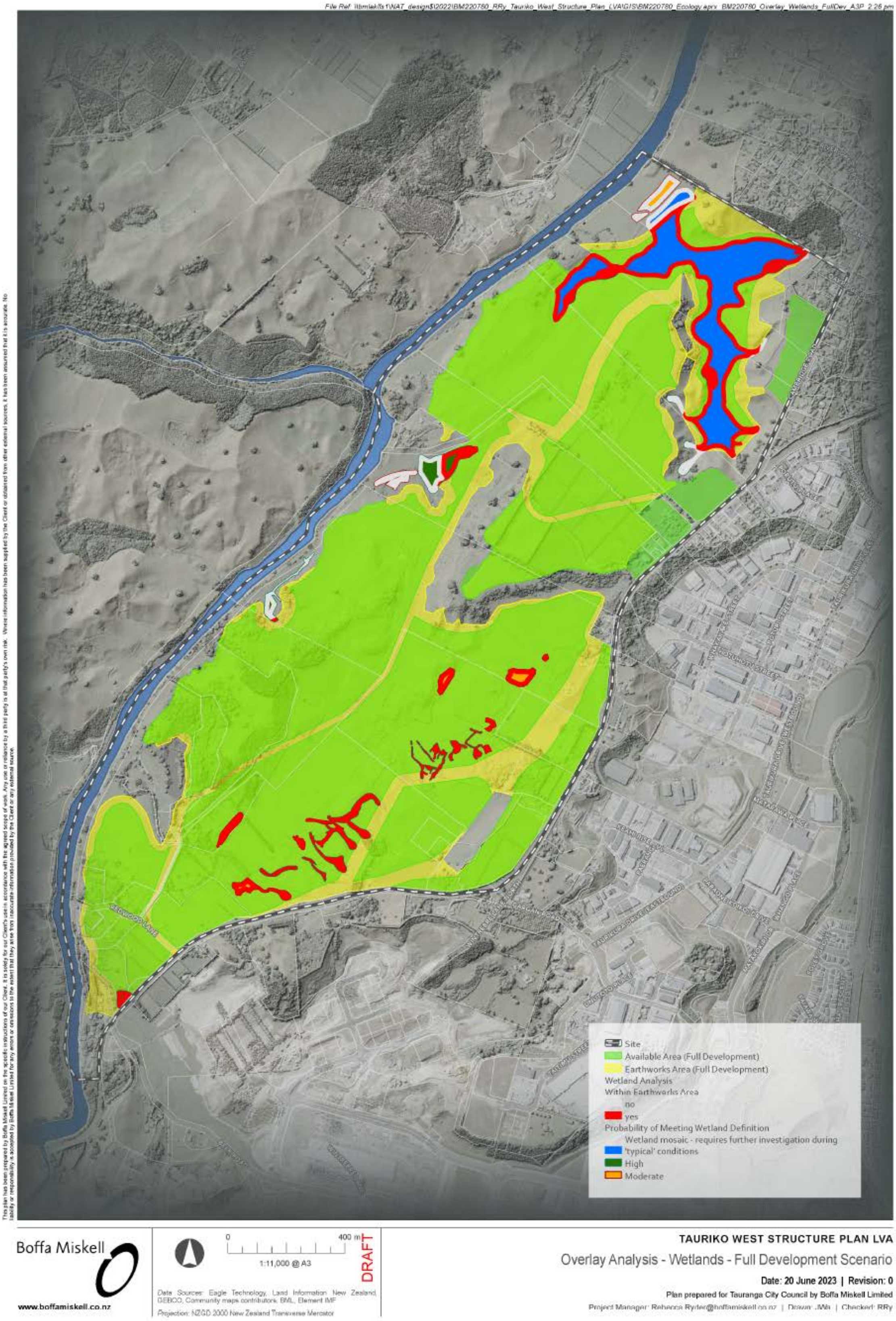

Figure 8: Location of the high and moderate likelihood natural inland wetland features in relation to the 'maximise landform option'. The wetland mosaic within the northern gully network is included.

4.1.1 Wetland effects summary

For the avoidance and hybrid landform options, it is expected effects can be reasonably and confidently managed by way of offsetting[5], including achieving offsetting within 'undeveloped' areas of the Tauriko West site. Where offsetting is required, including enhancement of existing wetland areas, they can be "on site" and are likely to provide ecological benefits that would otherwise not be realised under the current land use(s). This will increase the ability of any ecological effects to be addressed in close proximity to the site of impact.

The large "acreage" of natural inland wetland habitat affected by the maximise earthworks options would result in a large quantum of offsetting, regardless of the offset ratio. This quantum is unlikely to be achieved within the Tauriko West Site, meaning offsite offsetting can be reasonably expected. Offsite offsetting, while it can still result in good ecological outcomes, introduces potential third parties, etc, into the decision making and site-selection process which increases complexity.

Preliminary consideration of offsite offset sites have highlighted the following potential options:

1. <u>Teihana Road</u> – The Teihana Road site (Figure 9) is located at the river mouth of the Wairoa River and approximately 6km downstream of the proposed development site. Based on aerial photography, the mitigation site has similarities to the development site, being a floodplain of the Wairoa River, comprising predominant agricultural land use and consisting of waterways used to drain the surrounding land (and connected to the Wairoa River). Based on these parameters the site appears to be suitable for stream (enhancement and potentially habitat creation) mitigation and may also be suitable for wetland mitigation.

   The influence of the surrounding marine environment (proximity to Tauranga Harbour) may reduce the suitability of this site as the habitats may be reflective of more marine or estuarine habitat instead of freshwater and/or wetland (having said that, there would likely be an opportunity for enhancing/ creating inanga spawning habitat).

   A site visit (and potentially field investigations) would be required to further determine the suitability of the site for mitigation. It would be advantageous to undertake any site visit(s) during the summer period to identify permanent waterways from intermittent, as well as during high tide and low tide to assess the influence of the surrounding coastal environment.

[5] While based on our current understanding of the site it is considered very likely that effects can be managed, there are a number of ambiguous areas (low-likelihood wetlands) or areas that require further investigation that were not incorporated into this assessment (but were incorporated in the wider ecology assessment for the site). In the unlikely scenario that many or all of those areas are found to be wetlands, the required offset would be much higher. It is still very likely that in this scenario it would be feasible to find suitable offsetting locations when considering the avoidance and hybrid landform options.

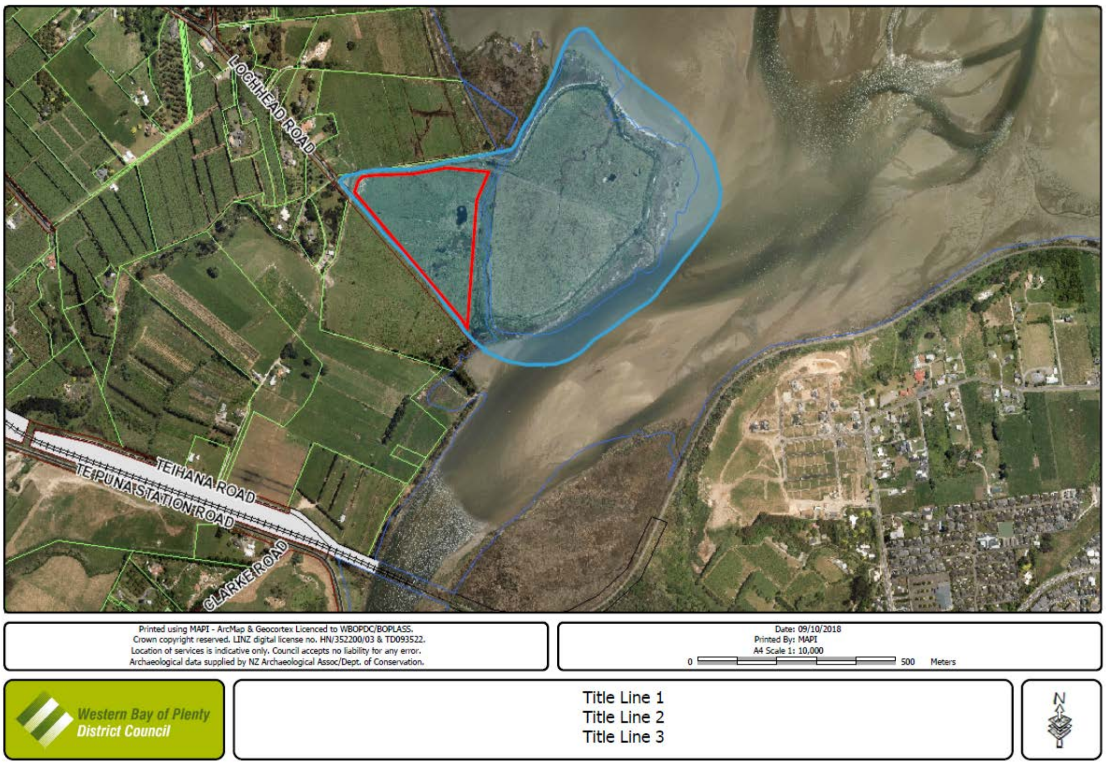

Figure 9: Possible offsite offset location near Teihana Road.

2. Approx. 385 Matakokiri Drive (Figure 10)

   This site has not been assessed or visited; however, aerial imagery suggests it may contain a groundwater table and topography suitable for wetland creation purposes. The small scale of the site likely limits the ability to achieve multiple offset requirements within it (e.g., terrestrial vegetation and wetland creation). Additionally, there are unlikely to be prominent/beneficial watercourse mitigation/offset capability at this site.

   A site visit (and potentially field investigations) would be required to determine the suitability of the site for mitigation. A site visit(s) during summer and winter would be advantageous to identify the presence, extent, and potential fluctuations of any natural inland wetland(s) that pre-exist on site.

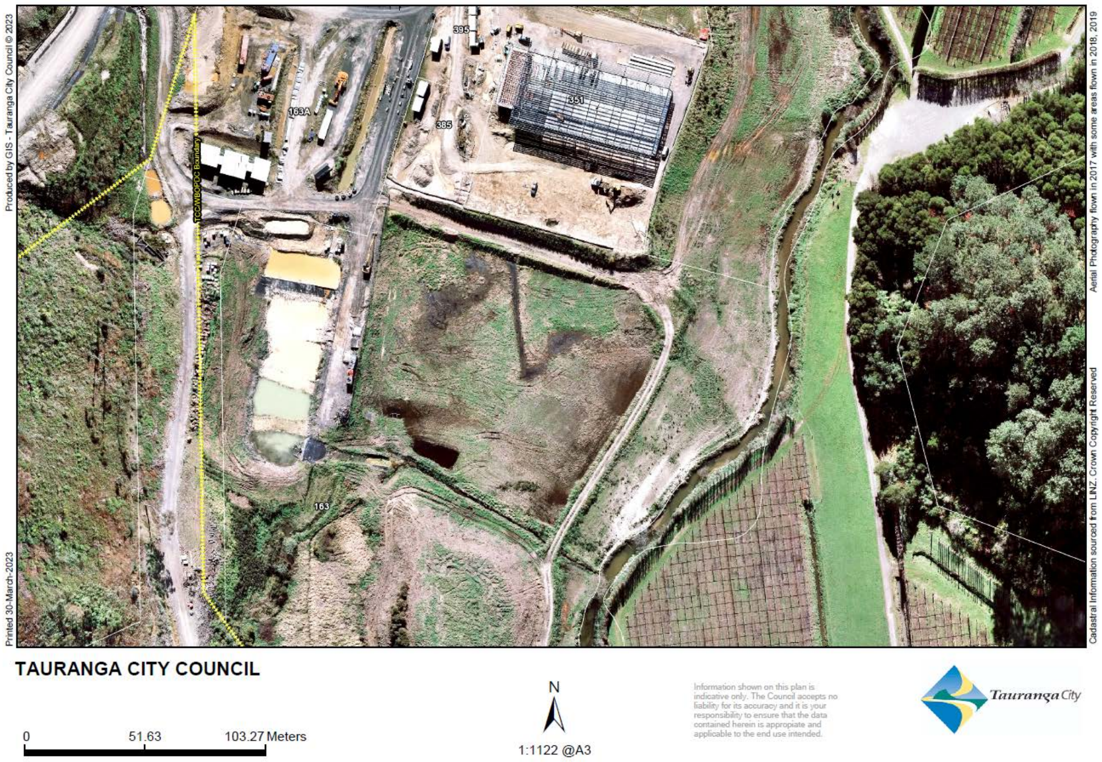

Figure 10: Possible offsite offset location near 385 Matakokiri Drive.

4.2 Stream/watercourse environment – options comparison

The following has been considered and/or assumed when comparing the stream/watercourse environment between the three landform options:

- It is assumed there will be no statutory stream recreation requirements for the artificial watercourses / farm drains on site; however, it is acknowledged that these features do provide aquatic habitat so some level of construction effects management can be expected.
- As stated above, ephemeral and watershed features have not been included at this stage, but it is assumed ephemeral reaches exist toward the head of most, if not all, watercourses. Unless natural inland wetland habitat(s) is observed within ephemeral/watershed reaches, they are not expected to pose a notable constraint to any development (largely as they contain negligible/low ecological value and do not have constraining regulatory recognition). Only their role in the system's hydrology is typically required to be managed.
- The streams and watercourses are typically homogenous; therefore, they have not been considered/differentiated based on value, condition, or other ecological considerations (e.g., riparian vegetated).

Table 5 and Figures 11, 12, and 13 provide a high-level indication of the potential direct effects on the stream/watercourse environment from the three potential landform options. The avoidance landform option was developed in part to avoid watercourses as well as natural inland wetland habitat; therefore, this option results in the least length of affected watercourse, including natural and artificial. Conversely, the maximise option results in the greatest length of watercourse effect. For both the avoid and hybrid landform options, there are considerable lengths of both natural and artificial watercourse that are avoided, providing ample opportunity for enhancement and/or re-alignment to result in an overall improvement in watercourse ecological condition and habitat availability/suitability. As with the wetlands, we note that avoidance does not lead, through effects management, to substantive recreation or enhancement and those balancing elements are not factored into the table below.

Table 5: Stream/watercourse environment comparison between the three potential landform options.

Landform option	Avoid[6]	Hybrid	Maximise
Watercourse habitat impact			
Total length of potential impacted watercourse	1.92 km	6.24 km	9.28 km
Length of potential impacted natural/modified watercourse	0.98 km	2.37 km	3.21 km
Watercourse habitat avoidance			
Length of untouched (total) watercourse	9.04 km	4.72 km	1.69 km
Length of untouched natural/modified watercourse	3.29 km	1.89 km	1.05 km

[6] Ground-truthing and updates to the NPS-FM have occurred following development of this landform option which has introduced some minor interactions with potential natural inland wetland and modified watercourse features. If the potential landform were to be updated, it would result in reduced extent to ensure the avoidance intent was adhered to.

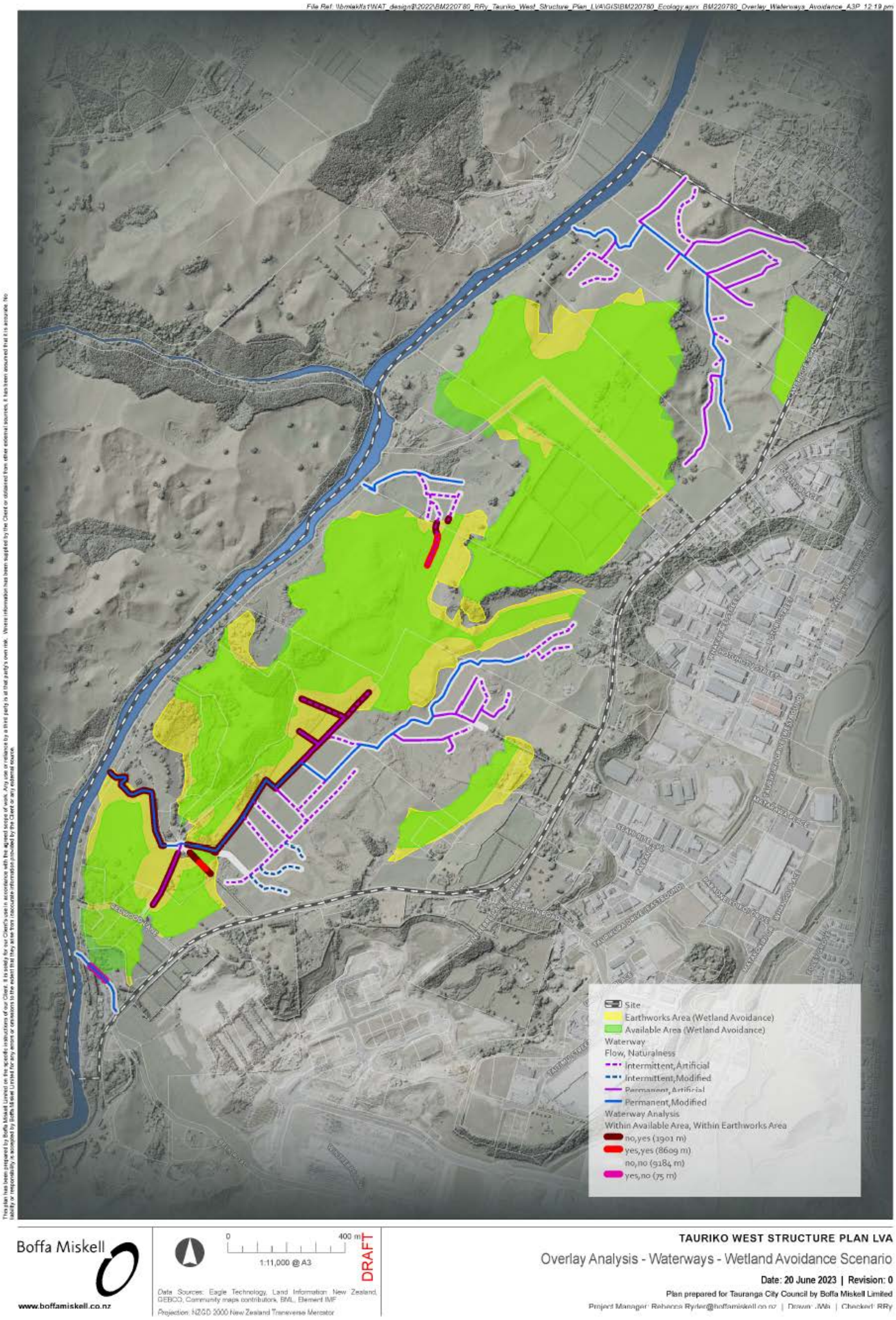

Figure 11: the location of the various perennial and intermittent watercourse, including modified and artificial, in relation to the 'avoid landform option'.

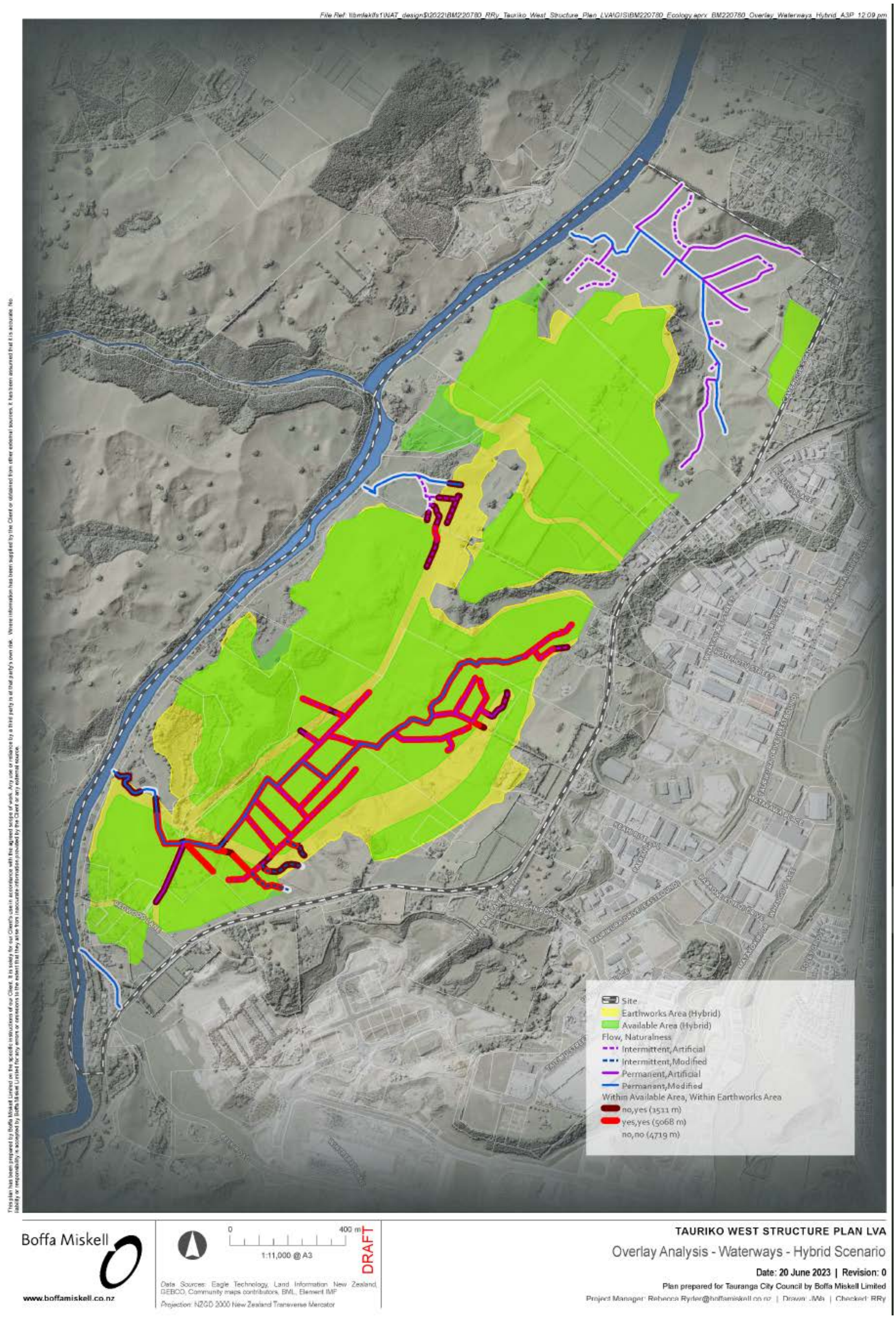

Figure 12: the location of the various perennial and intermittent watercourse, including modified and artificial, in relation to the 'hybrid landform option'.

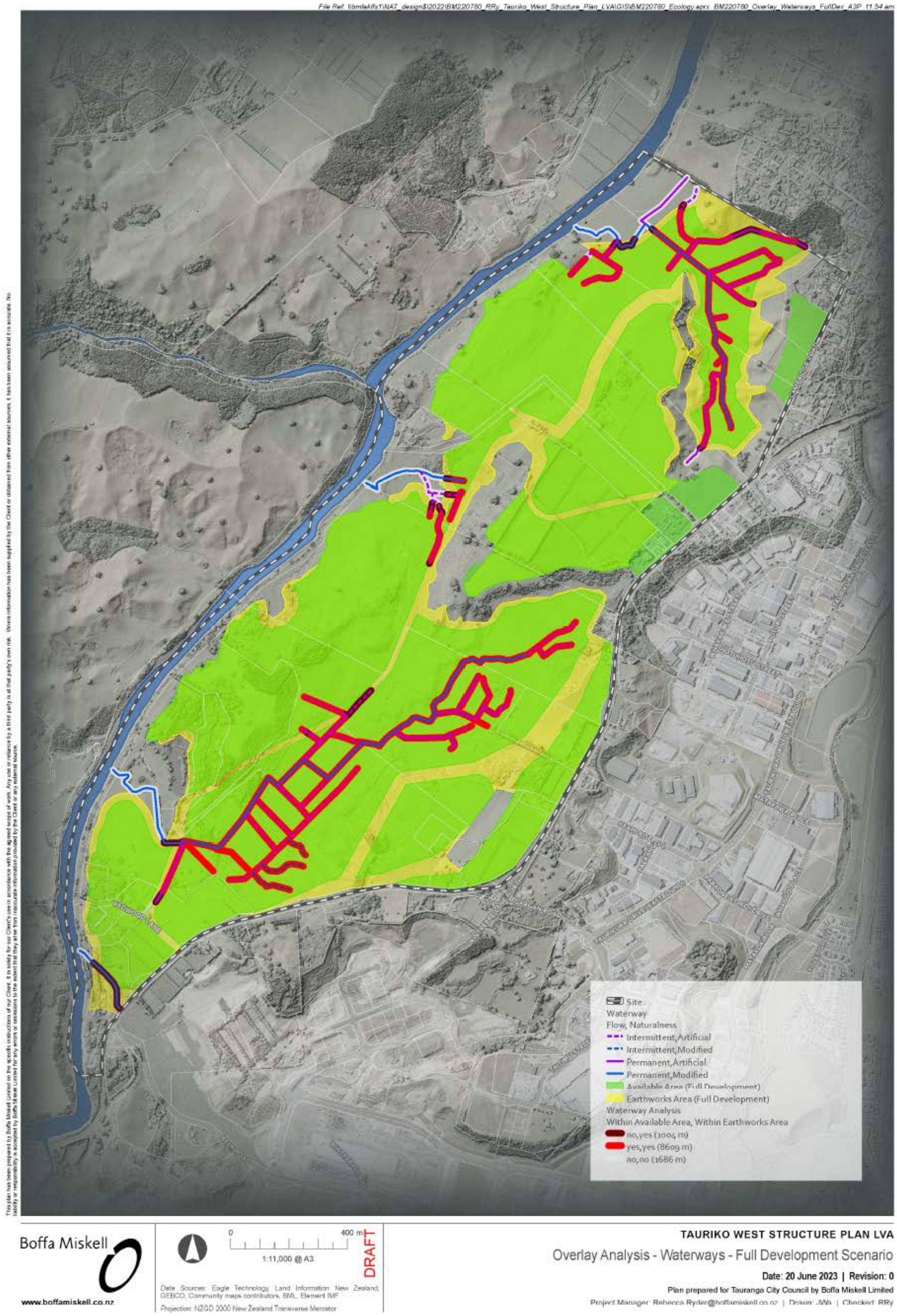

Figure 13: the location of the various perennial and intermittent watercourse, including modified and artificial, in relation to the 'maximise landform option'.

4.3 Terrestrial environment – options comparison

The following has been considered and/or assumed when comparing the terrestrial environment between the three landform options:

- Exotic vegetation loss only considered where it has functional/contextual value – i.e. the exotic-dominated scrub may still provide some habitat to native fauna species, and provide a (marginal quality) habitat corridor through a largely inhospitable (for indigenous wildlife) landscape, or has riparian value.
- Planted exotic vegetation loss is also provided below in Table 6, mainly due to the risk of bat presence in the shelterbelt/woodlot/plantation areas. However, given that previous targeted surveys have shown that it is very unlikely that bats are present on the site, this is considered low risk and so at this stage has not been incorporated into the potential mitigation requirements.
- It is expected, at minimum, that offset requirements for terrestrial vegetation removal would be an at least 1:1 ecological compensation ratio (ECR) for mixed scrub. Offsetting should be carried out because of the potential (though marginal) habitat and functional value provided by the mixed vegetation; however, a ratio of 1:1 is considered sufficient given the low value and weediness of this community. It is also possible that the exotic dominated scrub will be incorporated into this offset ratio, given that it has similar, though reduced, functional and habitat value. This is explored further in Section 5.3

Table 6 and Figures 14, 15, and 16 provide a high-level indication of the potential direct effects on the terrestrial environment from the three potential landform options. Of the three landform options the hybrid option requires the least clearance of mixed native and exotic scrub (the highest value vegetation community present on the site), followed by the maximise option. The avoid option results in the most clearance as a by-product of attempting to avoid watercourses and natural inland wetland habitat.

For terrestrial communities, it is expected that any of the three landform options will provide sufficient offset/mitigation opportunities, and so vegetation clearance is not considered to be a major constraint for this assessment.

Table 6: Terrestrial environment comparison between the three potential landform options.

Landform option	Avoid	Hybrid	Maximise
Terrestrial features impacted (area)			
Mixed scrub vegetation / habitat impacted	1.27 ha	0.3 ha	0.78 ha
Exotic dominated scrub / habitat impacted	17.06 ha	17.4 ha	20.06 ha
Planted exotic vegetation / habitat impacted	28.9 ha	31.72 ha	42.12 ha
Terrestrial features avoided (area)			
Mixed scrub vegetation / habitat **avoided**	5.37 ha	6.34 ha	5.85 ha
Exotic dominated vegetation / habitat **avoided**	11.33 ha	10.99 ha	8.32 ha
Planted exotic vegetation / habitat **avoided**	17.12 ha	14.31ha	3.91 ha

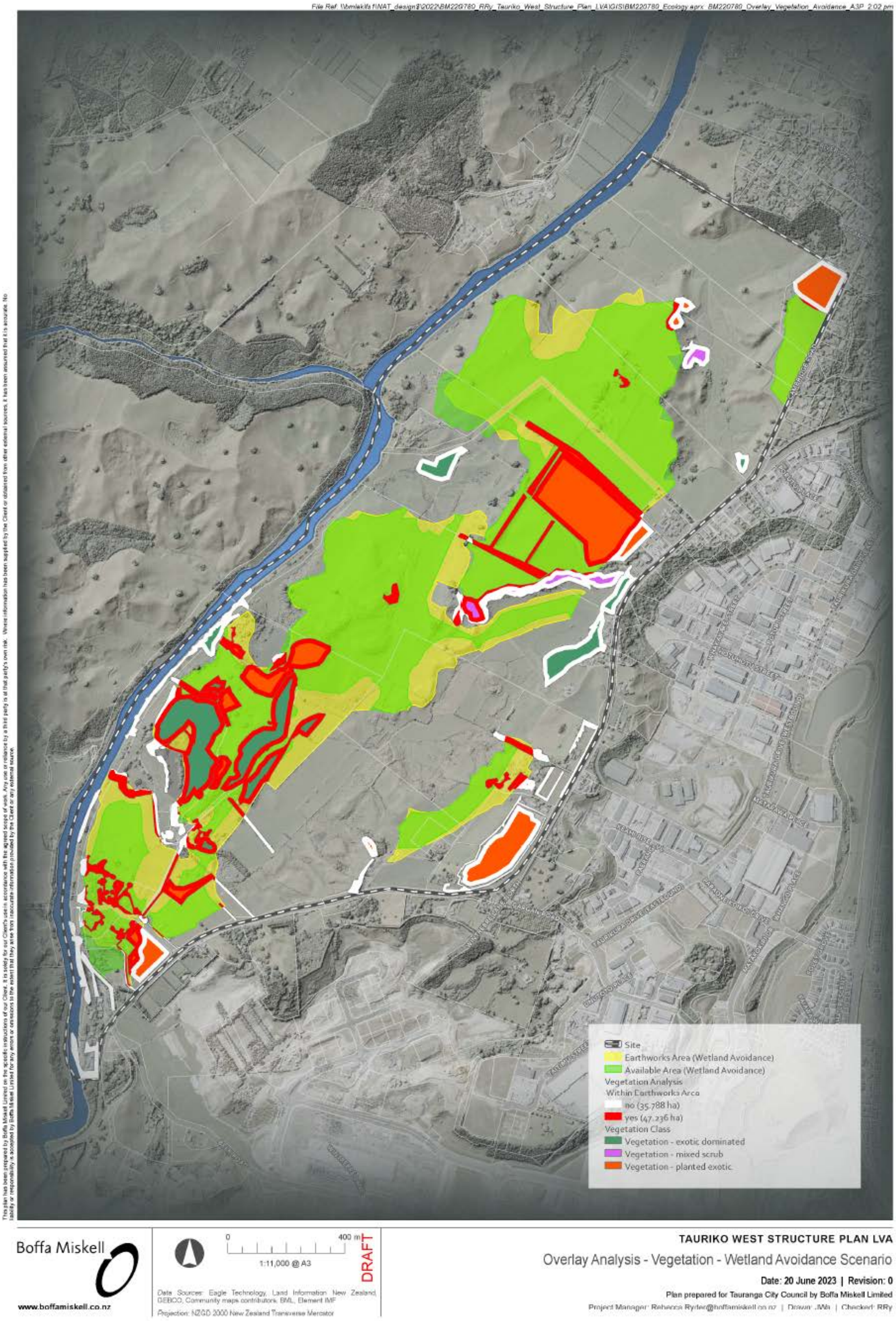

Figure 14: the location of the different vegetation types (excluding pasture) in relation to the 'avoid landform option'. The planted exotic vegetation at the north-eastern corner can be disregarded.

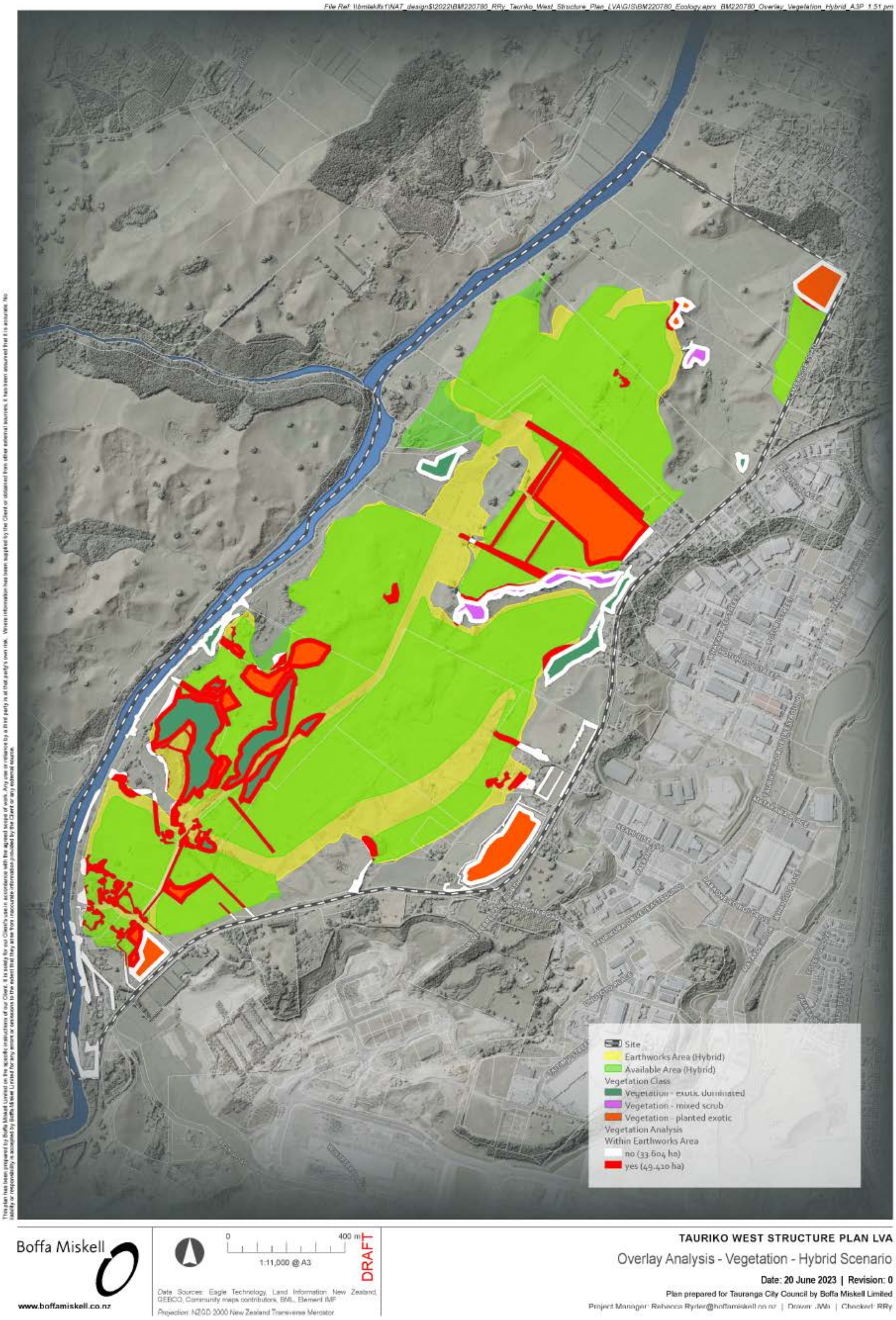

Figure 15: the location of the different vegetation types (excluding pasture) in relation to the 'hybrid landform option'.

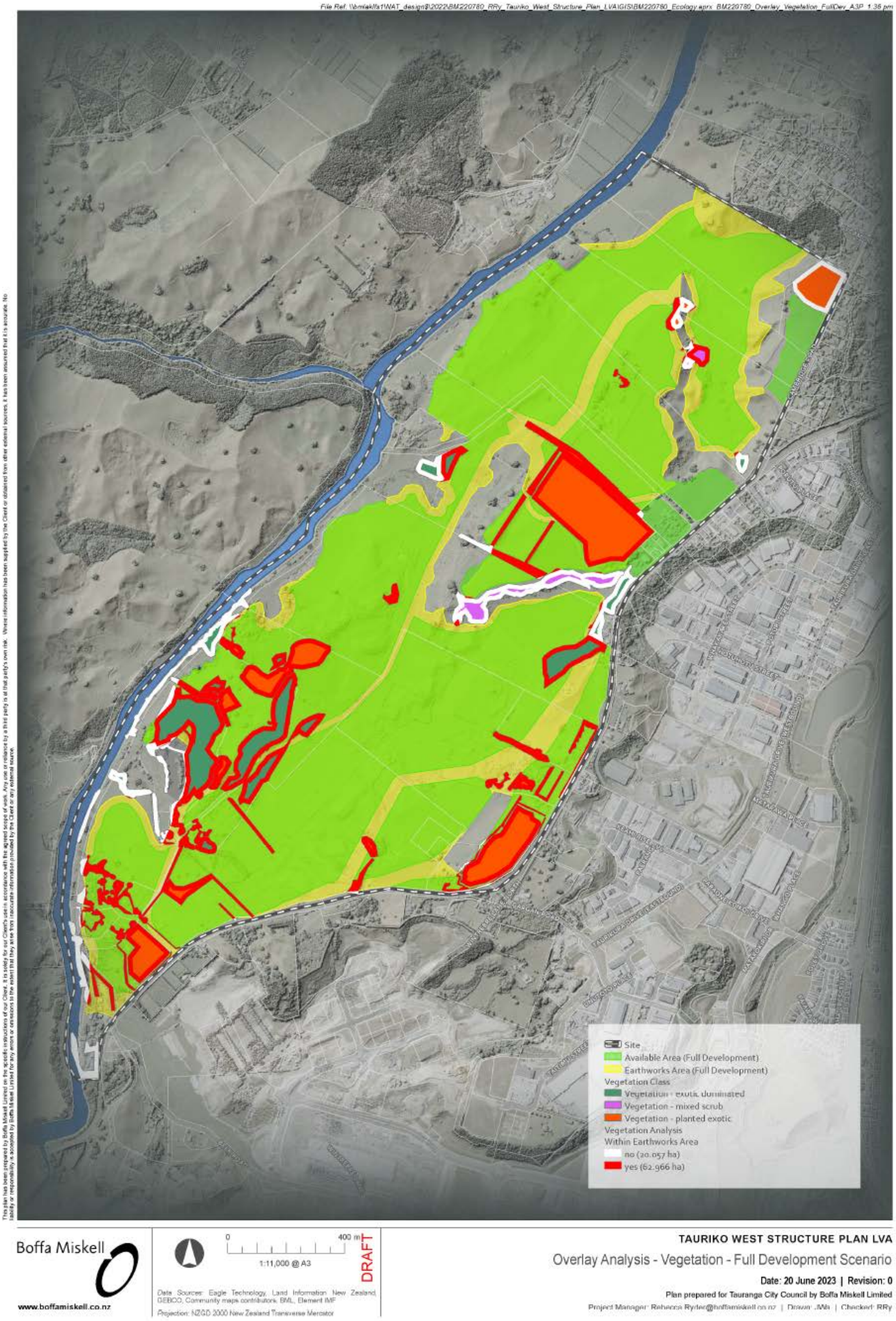

Figure 16: the location of the different vegetation types (excluding pasture) in relation to the 'maximise landform option'.

5.0 High-level effects management outcomes and opportunities

The overlap between the three potential landform options and the considered ecological features are provided in Appendix 1.

5.1 Wetland environment

A number of the wetland features are considered to be induced, largely in response to the long-term agricultural land use. The current condition and location of these features provides little certainty to their resilience and permanence within the landscape. Furthermore, it greatly limits their ecological diversity and functioning as wetland features. The hybrid and maximise landform options requires some of these features to be impacted with the requirement of the effects management hierarchy to be adopted as per the NPS-FM. This provides an opportunity to create wetland features in locations better suited to permanence, diversity, and functioning.

Where wetland offsetting is required, the anticipated quantum of offset required increases the likelihood of the offset being contained within the Tauriko West growth area, particularly for the hybrid option. This may include the enhancement and/or expansion of natural inland wetland habitat(s) within the northern gully system, as well as the establishment of wetland(s) along the Wairoa River floodplain corridor. These locations should allow for good quality and diverse wetlands to be created, providing additional ecosystem function and service provisions. Additionally, this is likely to benefit the receiving Wairoa River and estuarine environments by way of additional filtration of discharges from the Tauriko West area, as well as flood storage capacity for the Wairoa River floodplain.

The maximise development option results in large-scale direct wetland effects, with a correspondingly large offset package required, including the likely necessity to undertake some offsite wetland creation. Offsite offsetting, while it can still achieve beneficial ecological outcomes, does introduce added complexities if/when third parties become involved.

To assist with understanding the potential spatial extent to address natural inland wetland effects, the following scenarios have been developed:

- **Scenario A** – enhancement / offset hybrid
    - Up to 3:1 enhancement and offset ratio – split into:
        - 1:1 unit area offset via wetland creation (to satisfy no overall loss of extent)
        - Any remaining 2:1 offset (i.e., up to 2:1) achieved via onsite enhancement opportunities (to address effects on ecosystem values, lag times, and potential partial success).
- **Scenario B** – Up to 3:1 blanket offset ratio with:
    - a focus on like-for-like
    - no opportunity to enhance existing features

The approximate spatial requirements of these outcomes, using the anticipated direct effects detailed in Table 4 above, are provided in Table 7 below. Scenario A can be viably achieved within the Tauriko West area under the avoidance and hybrid landform options; however, there is not enough remaining/avoided wetland habitat under the maximise landform option to achieve the amount of enhancement (41.56 ha) that will be required if 3:1 offset is required. Additionally, the level of wetland creation that will be required under Scenario B resulting from the maximise landform option is substantial and cannot be achieved within the unimpacted remaining areas within the Site under the maximise landform option. Under the hybrid scenario, the approximate 10 ha of wetland creation that would be required under Scenario B could potentially be accommodated within the Tauriko West area but would require careful design and consultation with, for example, a hydrologist, engineer, etc.

Note, the offset amounts discussed above are considered as guidance only and detailed offset/mitigation packages will need to be developed as part of the resource consent phase.

Table 7: approximate spatial requirements for three different offset scenarios according to the three potential landform options.

	Landform options		
Effects management possible outcomes	Avoid[7]	Hybrid	Maximise
Enhancement opportunities remain	Yes	Yes	Very limited if any
Approximate offset area required – Scenario A	New wetland: 0.44 ha Enhanced wetland area: 0.88 ha	New wetland: 3.44 ha Enhanced wetland area: 6.88 ha	New wetland: 20.78 ha Enhanced wetland area: 41.56 ha
Approximate offset required – scenario B	1.32 ha	10.32 ha	62.34 ha
Offsite offset locations required	No	Unlikely	Yes

5.2 Stream / watercourse environment

As touched on in Section 4.2 above, there is considerable watercourse length that is not directly impacted by the avoid and hybrid landform options. Currently these watercourses, whether natural or artificial, are in poor condition, providing limited habitat variability and availability. Therefore, the avoided watercourses would provide a good opportunity for managing any adverse effects within the proposed landform footprints through enhancement and/or realignment, although we note that the avoid option does not result in much required ecological enhancement / offset because of a lack of effect. Given the reasonable and largely unrestricted connectivity between waterways within the Tauriko West area, the currently artificial watercourses (that have no regulatory protection over them) could be included in any effects management package.

[7] Ground-truthing and updates to the NPS-FM have occurred following development of this landform option which has introduced some minor interactions with potential natural inland wetland and modified watercourse features. If the potential landform were to be updated, it would result in reduced extent to ensure the avoidance intent was adhered to.

5.3 Terrestrial environment

Table 8 provides expected replanting ratios for each landform option. The minimum proposed restoration planting area assumes that a 1:1 replanting ration will be required for at least any mixed scrub clearance, whereas the potential maximum replanting area also incorporates the loss of the exotic-dominated scrub (but not planted exotics), which also has a small native component and provides some functional/contextual value. This would account for the loss of riparian function and habitat corridors on the site and would result in a net gain for biodiversity. As with the minimum area, the maximum assumes a 1:1 Replanting ratio.

The potential offset planting areas are similar across all three options, with a minimum area between 0.3 and 1.27 ha, and a maximum area between 17.7 and 20.85 ha. All options are considered achievable within the Site.

Table 8: Estimated minimum revegetation / offset planting required for each of the three landform options.

	Landform option		
Effects management possible outcomes	Avoid	Hybrid	Maximise
Minimum proposed restoration planting area	1.27 ha	0.3 ha	0.78 ha
Potential maximum restoration planting area	18.33 ha	17.7 ha	20.85 ha

5.4 Effects summary – preferred option(s)

The NPS-FM provides a strong policy directive to avoid effects on natural inland wetlands and permanent/intermittent natural watercourses, and that any effects that cannot/are not avoided (if consentable) require managing under the effects management hierarchy. Under this regime, the avoidance landform option would suit the NPS-FM policy framework but would not create a pathway for ecological enhancement and recreation of these features. The wetland and stream/watercourse environment within the Tauriko West area are primarily of low value, induced, in poor condition, and of limited complexity and habitat suitability. Therefore, allowance of some effect and adoption of the effects management hierarchy (as per the NPS-FM) would result in an overall improved wetland and stream/watercourse environment in the long-run. This outcome is unlikely to be realised if the avoidance landform option is adopted.

When considering ecosystem health and outcomes, as opposed to policy, the hybrid option becomes the preferred ecological option for both the stream and wetland environment. Overall, the hybrid option allows for better effects management that is likely to be contained within the Tauriko West growth area and results in better functioning and ecologically valuable wetlands after the development than currently exist. Additionally, the features avoided as part of the hybrid landform option ensures some existing features (the better features) remain within the landscape to provide wetland habitat until such time that any offset wetlands are considered fully functional.

For managing effects on natural inland wetlands, Scenario A is the preferred offset package approach as it allows for a 1:1 replacement of extent will achieve a no net loss of wetland habitat (as required by the NPS-FM), with any subsequent enhancement providing opportunity for an overall net gain. The recommended approach ensures improved wetland values and conditions will result. The location of the retained wetland features provides an appropriate opportunity for wetland enhancement that allows for improved biodiversity values as well as increased wetland function(s) and service(s). For example, enhancement can also improve flood attenuation and filtration services for discharges prior to entering the Wairoa River, whilst also providing habitat for cryptic bird species, etc. Effectively, this outcome results in wetland features that focus on wetland condition, value, services, function, etc rather than the more basic criteria of satisfying the NPS-FM definition of 'natural inland wetland' (which does not require a values-based assessment).This is preferred to a 'blanket' 3:1 (or 2:1) offset which does not provide a focus on improving wetland conditions and values across the landscape, rather a blanket 3:1 ratio of wetland recreation will likely result in an overall increase in low-value and poorly functioning wetland extent (i.e., like-for-like wetland creation). In the terrestrial environment, there are no terrestrial features that have values and/or policy considerations that would result in substantial ecological gain if the effects management hierarchy is adopted. Therefore, the option that requires the least mixed scrub and exotic dominated scrub clearance is considered the preferred option. The retention of these features ensures some vegetation remains within the Tauriko West area and are anticipated to be readily enhanced through reasonably anticipated management approaches, such as pest plant and animal control.

Therefore, **when considering the potential ecological outcomes of the three potential landform options, the hybrid option, known as Concept Landform Option 5 is preferred.**

6.0 References

Ministry for the Environment. (2022). *National list of exotic pasture species*. Ministry for the Environment. https://environment.govt.nz/assets/publications/National-list-of-exotic-pasture-species.pdf

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Ministry for the Environment. (2023b). *National policy statement freshwater management 2020*. Ministry for the Environment.

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Boffa Miskell is a leading New Zealand professional services consultancy with offices in Whangarei, Auckland, Hamilton, Tauranga, Wellington, Nelson, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics and mapping. Over the past four decades we have built a reputation for professionalism, innovation and excellence. During this time we have been associated with a significant number of projects that have shaped New Zealand's environment.

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