

Memorandum

To: Mimouk Hassan and Russell Butchers

From: Phil Mitchell and Mason Jackson

Date: 21 May 2022

Re: BUN60393755 Muriwai Golf: P3 Option B Assessment

1. INTRODUCTION

As part of the Muriwai Downs Golf Project, the Applicant has sought resource consents to culvert the watercourse labelled “P3” in the consent application documentation. P3 has been the subject of ongoing discussions with Auckland Council (“**the Council**”) over the correct classification either as a natural inland wetland under the NPSFM/NESFW or a stream (river under the NPSFM/NESFW).

The Applicant’s expert’s opinion is that this watercourse should be classified as a stream, while the Council’s ecologist is of the opinion it is more likely to be a wetland. On the basis of this position, the Council considers the proposed culverting of P3 may lead to complete or partial drainage which would be a prohibited activity and, as a result, asserts that the Council cannot advance the application to the public notification stage as requested by the Applicant.

In an attempt to resolve this impasse, and as discussed with Council staff, the Applicant has now developed an alternative treatment of P3 for the golf course design using bridging structures (“**Option B**”). As with other wetland bridges proposed in the application, these bridging structures over P3 qualify as Wetland Utility Structures under the NESFW.

Option B is now proposed as part of application BUN60393755 and the Applicant requests this option be progressed to public notification as a possible alternative alongside the original culvert design. As discussed with Council staff, resolution of the status of P3 can be addressed following notification.

2. PURPOSE

The purpose of this memo is to present conceptual Option B design information along with associated legal, technical and planning assessments. To this end, the memo includes the following information, all of which is summarised further below:

- Concept design and construction methodology prepared by McKenzie and Co (Attachment A);
- Hydrological effects assessment prepared by Jon Williamson from Williamson Water and Land Advisory (Attachment B);

- Ecological effects assessment prepared by Graham Ussher from RMA Ecology (Attachment C);
- Landscape and visual assessment prepared by John Goodwin and Tom Lines from Boffa Miskell (Attachment D); and
- Planning matters.

3. CONCEPT DESIGN AND CONSTRUCTION METHODOLOGY

Conceptual design drawings for the Option B bridging structures, and methods proposed for their construction are presented in Attachment A of this memo. In summary:

- The structures are bridging structures;
- The design presented is not at detailed design stage;
- Assuming P3 is classified as a wetland, and acknowledging it has not yet been delineated, minor changes may be required to the design to ensure it avoids the final delineated wetland area;
- No earthworks, nor any taking, use, damming, diversion, or discharge of water within P3 will occur as a result of the structures' construction or use;
- The existing farm culvert currently enabling the existence of an upstream induced wetland will remain undisturbed;
- Excavation depths for structure footings will be no more than approximately 0.75m deep;
- The proposed construction methodology for Option B is achievable and uses sound construction practices;
- The use of experienced personnel and appropriate supervision will ensure the bridging structures can be constructed appropriately and without any disturbance or adverse impact on P3.

4. HYDROLOGICAL EFFECTS ASSESSMENT

An assessment of the effects Option B will have on local hydrology is provided in Attachment B of this memo. The following key aspects are noted:

- P3 is fed through a combination of surface water and groundwater contributions however, flows are predominantly provided as surface flows fed from an existing wetland above via a farm culvert.
- Earthworks above the structure will not alter the overall extent of the surface water catchment, and therefore the volume of surface water entering P3 will remain the same as at present.



- The culvert under the existing farm track (immediately south of the arch bridge structure) is proposed to remain. Therefore, water levels within the wetland to the south of the farm track will remain unaffected and continue to discharge to P3 unchanged.
- As the streambed of the P3 waterbody will remain open and unaltered, groundwater inflows from below will also remain unaltered. Provided the foundations are not required to extend a significant depth below the ground surface, groundwater flows will not be reduced, albeit the point of entry to the stream may change slightly.
- The structure will have drainage along the base that will enable any groundwater if intercepted by the structure during high groundwater conditions to pass through.
- Option B will not result in the partial drainage of P3.

5. ECOLOGICAL EFFECTS ASSESSMENT

RMA Ecology's current technical position on P3 is that it is a stream. Nevertheless, on the basis that P3 is assumed to be a wetland, an assessment of the ecological effects associated with Option B is provided in Attachment C of this memo. The key findings are summarised below:

- On the basis of hydrological assessment (summarised above) the structure will not result in the partial or complete drainage of the wetland, therefore, there will be no loss of wetland.
- A possible outcome of the bridging structure will be that the parts of the wetland under the bridging structure in very low light conditions will become un-vegetated. If this occurs, the wetland will still qualify as wetland on the basis of hydrology and the presence of hydric soils, and the environmental processes of both will remain unchanged.
- The adoption of Option B, in combination with Project's removal of stock in the vicinity of P3, may result in improvements to the state of water quality and instream habitats for native fish.
- The potential adverse effects of Option B on the current state of the stream are likely to be minor when balancing loss of vegetation and improvements to instream state are considered. Therefore, the offset proposed in the AEE, where culverting of the stream was assumed, will not be required under Option B.
- In conclusion, Option B will not result in loss of extent or values of a wetland (should the watercourse be classified as wetland), nor will it significantly impact upon the stream flowing through the alleged wetland.

6. LANDSCAPE AND VISUAL ASSESSMENT

A statement on Option B's impact on landscape values and associated visual effects is provided in Attachment D of this memo. A summary of the key findings is set out below:



- In relation to site wide landscape and visual amenity effects on the golf course and surrounding landscape, it is recognised that P3 is considered to be highly degraded and modified and overall of very poor ecological condition¹. Vegetation within parts of P3 will be impacted, however, a section of the stream will remain, with the opportunity to provide low riparian margin planting. Overall, it is considered that there will be a marginal improvement to landscape and visual amenity outcomes as a result of Option B.
- In terms of effects on natural character, as established the biophysical and experiential values of the stream have been impacted due to its modified and degraded condition. Option B will result in similar natural character effects to the culvert option when considering the biophysical and experiential values, however, it is considered there would be reduced effects on the hydrology of the stream when considering natural processes. Further, taking the retained portion of P3 into account, and with enhancement planting established, it is considered that overall, Option B would be a slight improvement over culverting a similar length of stream.
- In relation to site wide natural character, landscape and visual amenity effects on the golf course and surrounding landscape the proposed changes to P3, whether it is deemed to be a stream or wetland, and irrespective of which modification option is considered (culvert or bridge) will result in no more than low-moderate adverse effects.

7. LEGAL ADVICE

Buddle Findlay have provided a legal opinion which examines the activity status of Option B under the NESFW. Other process related legal matters are also raised in the advice.

A copy of this opinion is provided separate to this memo while the key conclusions in respect of Option B are set out below:

- Regarding the likely loss of some wetland vegetation as a result of Option B:
 - Vegetation clearance "*within, or within 10m set back from, a natural wetland*" is not a prohibited activity listed in Regulation 53 of the NESFW. Vegetation clearance within a wetland is either a restricted discretionary activity if it is for the purpose of constructing a wetland utility structure,² or a non-complying activity.
 - Vegetation clearance and its resulting impacts on P3, therefore, cannot be considered to be a prohibited activity under any circumstances.
- Regarding instances where Option B could potentially trigger prohibited activity status under Regulation 53 (earthworks and diversions):

¹ AEE Ecological Effects Assessment, Page 72

² Regulation 42(1).



- All earthworks associated with the construction of Option B will avoid P3 and its final delineation, therefore, it cannot be a prohibited activity;
- Option B will also not result in any potential diversion “within” a wetland. At most, any diversions outside the wetland would be a non-complying activity, even if it were to result in complete or partial drainage;³

8. NESFW DEFINITION, ACTIVITY STATUS ASSESSMENT AND PLANNING MATTERS

8.1 NESFW DEFINITIONS

Under the NESFW, a Wetland Utility Structure:

(a) means a structure placed in or adjacent to a wetland whose purpose, in relation to the wetland, is recreation, education, conservation, restoration, or monitoring; and

(b) for example, includes the following structures that are placed in or adjacent to a wetland for a purpose described in paragraph (a):

(i) jetties:

(ii) boardwalks and bridges connecting them:

(iii) walking tracks and bridges connecting them:

(iv) signs:

(v) bird-watching hides:

(vi) monitoring devices:

(vii) maimai

If P3 is classified as a wetland, like the other 10 wetland utility structures proposed in the original AEE, Option B would also be considered a wetland utility structure since it supports a recreation activity (golf). Also, as described in the AEE, as part of the golf experience, the Project will support education through the inclusion of signage and discrete information boards about the Site’s natural features and habitats (including wetlands). Option B will help enable this.

8.2 OPTION B STATUS UNDER THE NESFW AND AUP (REASONS FOR CONSENT)

Table 1 summarises Option B’s potential reasons for consent (if considered on its own) when assessed against the NESFW and AUP.

³ Per regulation 52(2)(a).

In summary, Option B will be covered by the current suite of reasons for consent as detailed in the AEE, except that an additional Discretionary Activity consent is required under AUP Rule E3.3.1 (A44) for an activity not complying with the general permitted activity standards in E3.6.1.1 or the specific activity standards in E3.6.1.14 to E3.6.1.23.

It is noted that AUP Rule E3.3.1 (A44) rule has already been added to the agreed list of “reasons for consent” following lodgement of the application.

Table 1: Option B Implications on Reasons for Consent – NESFW and AUP

NESFW Regulations				
Regulation	Consent Already Applied For	Status	New Consent Required for Option B (Y/N)	Comments
42	Vegetation clearance and earthworks outside of but within 10m of a natural wetland and taking, using, damming, diverting and discharging of water within 100m setback from a natural wetland for the construction of wetland utility structures.	RD	N	Consent is already sought under Regulation 42 for the construction of 10 wetland utility structures associated with the Project. Option B therefore increases the number of proposed wetland utility structures from 10 to 11 (assuming both P3 structures are considered together as one). To this extent, Option B represents a broadening of scope of the application already sought.
54(a) & (b)	Vegetation clearance and earthworks within 10m of a natural wetland.	N/C	N	Option B may result in loss of vegetation within the wetland due to lack of sunlight. Although, this falls under Reg 54(a), for which consent is already sought, it does represent a broadening of scope noting the original application limited the proposed vegetation clearance activities to within a 10m setback from a wetland.
Reg 54(c)	Taking, using, damming, diversion and discharging of water within 100m setback from a natural wetland.	N/C	N	To the extent the Option B bridging structures divert stormwater and potentially result in diversion of groundwater around or through the structure’s footings (if below the water table),

				such activities are covered by the consent application already made for Reg 54(c) activities.
AUP				
Rule	Consent Already Applied For	Status	New Reason for Consent (Y/N)	Comments
E15.4.1 (A18)	Vegetation alteration or removal within 20m of a natural wetland and in the bed of a river or stream, or lake.	RD	N	The current application seeks consent under E15.4.1(A18), therefore, any vegetation alteration or removal in the P3 riparian area associated with Option B is already covered.
E3.4.1 (A29)	Bridges or pipe bridges in an overlay complying with the standards in E3.6.1.16	P	N	Option B is not in an overlay, but it does not comply with permitted activity standard E3.6.1.16. E3.6.1.16 refers to E3.6.1.16 (1) (a) which states “the total length of any extended structure must not exceed 30m measured parallel to the direction of water flow”.
E3.3.1 (A44) - Any activities not complying with the general permitted activity standards in E3.6.1.1 or the specific activity standards in E3.6.1.14 to E3.6.1.23	-	D	Y	Since Option B will include sections that exceed 30m in length, as measured parallel to the direction of water flow, an additional Discretionary consent is required under E3.3.1 (A44). It is noted that this rule has already been added to the list of “reasons for consent” as agreed with Council following lodgement of the application.

8.3 RELEVANT STATUTORY DOCUMENTS

8.3.1 Resource Management (National Environmental Standards for Freshwater)

Regulation 2020

As identified above, Option B is deemed to be a Wetland Utility Structure. Construction of Wetland Utility Structures is a Restricted Discretionary Activity under Regulation 42 of the NESFW.

Pursuant to Regulation 42(4), when considering activities associated with the construction of wetland utility structures the consent holder must:

- Limit the construction activities for only as long as necessary to achieve its purpose (Reg 42(4)(a));
- Before the activity starts, a record must be made (for example, by taking photographs) of the original condition of the natural wetland’s bed profile and hydrological regime that is sufficiently detailed to enable compliance with paragraph (c) to be verified purpose (Reg 42(4)(b)); and
- The bed profile and hydrological regime of the natural wetland must be returned to their original condition no later than 30 days after the start of the activity (Reg 42(4)(c)).

The construction methodology in Attachment A of this memo specifically addresses Regulation 42(4) conditions. Therefore, the construction of Option B will achieve compliance.

Further, pursuant to sub-clauses 42(6), the consent authority’s discretion is restricted to the matters listed at Regulation 56. These matters have been reviewed and presented in Table 27 of the AEE as they related to the 10 wetland utility structures originally proposed. Table 2 reviews these matters in respect of Option B.

Table 2: NESFW Regulation 56: Restricted discretionary activity – assessment matters for the construction of wetland utility structure Option B.

Provision	Assessment
(a) The extent to which the nature, scale, timing, intensity, and location of the activity may have adverse effects on:	
(i) the existing and potential values of the natural wetland, its catchment, and the coastal environment.	<p>With Option B, the golf course works will include the construction of 11 wetland utility structures (assuming both Option B structures are considered as one).</p> <p>Option B will be designed to avoid all wetland areas and avoids any need to enter P3. The construction activities may cause minor effects (e.g. sediment discharge) which will be temporary in nature and will not result in any ongoing adverse effects on</p>



Provision	Assessment
	<p>P3 values. These temporary construction effects will be minimised by implementing appropriate sediment controls.</p> <p>In addition, the Project involves extensive wetland restoration and enhancement works resulting in a net positive gain in wetland extent and wetland values.</p>
(ii) the extent of the natural wetland	<p>While the construction of Option B will require footings and other structural foundations close to P3, these will avoid P3's final delineation.</p> <p>As confirmed by Mr Williamson and Dr Ussher, the proposed construction of Option B will not result in a loss of extent of P3.</p>
(iii) the seasonal and annual hydrological regime of the natural wetland.	<p>The construction of Option B will have no effect on the hydrology of P3. Construction does not require any dewatering or diversions.</p>
(iv) the passage of fish in the natural wetland or another water body.	<p>The construction of Option B will have no effect on fish passage. Construction does not require any damming, dewatering or diversions.</p>
(b) whether there are practicable alternatives to undertaking the activity that would avoid those adverse effects.	<p>The construction avoids adverse effects on P3, therefore, it is not considered necessary to consider any practical alternatives.</p>
(c) the extent to which those adverse effects will be managed to avoid the loss of the extent of the natural wetland and its values.	<p>While there may be some short-term adverse effects of a no more than minor nature during construction (sediment), when considered alongside the wetland restoration and enhancement works proposed, the Project results in an increase in extent and values of wetlands within the Site.</p>
(d) other measures to minimise or remedy those adverse effects.	<p>Adverse effects will be avoided and minimised to the extent practicable through appropriate construction methodologies and sediment controls. Any residual adverse effects are at a level where they are no more than minor and therefore, do not warrant any further measures to minimise or remedy them.</p>
(e) how any of those adverse effects that are more than minor may be offset or	<p>N/A there will be no adverse effects which are more than minor.</p>



Provision	Assessment
compensated for if they cannot be avoided, minimised, or remedied.	
(f) the risk of flooding upstream or downstream of the natural wetland, and the measures to avoid, minimise, or remedy that risk.	<p>The final design of Option B will ensure it does not contribute to, or result in, a flood risk.</p> <p>The structures will be designed to enable the passing of flood flows in the event that floods are experienced within the P3 catchment.</p>
(g) the social, economic, environmental, and cultural benefits (if any) that are likely to result from the proposed activity (including the extent to which the activity may protect, maintain, or enhance ecosystems).	As discussed in the original AEE, the Project entails numerous social, economic, environmental, and cultural benefits.

8.3.2 Other Relevant Statutory Documents

As confirmed in the attached effects assessments, Option B will result in a better outcome to that of the originally proposed and assessed P3 culvert, therefore, a full analysis of relevant NPSFM and AUP objectives and policies is not presented here.

Overall, Option B does not change the assessments presented in the original AEE which concluded (in Section 6.8 of the AEE) that:

- The Project is demonstrably consistent with the relevant planning documents, including the NPSFM and the AUP. Of particular importance, the discharges and disturbance activities will remain fully protective of wetlands and predominantly protective of stream values of indigenous terrestrial ecosystems on the Site.





ATTACHMENT A

Option B Conceptual Design and
Construction Methodology

MEMO

To: The Bears Project Management Company Ltd
From: Scott McIntyre
Cc:
Date: 20/05/2022
Re: **Muriwai Downs Golf Project – Option B for P3 Watercourse Bridging Structure**

The Bears Home Project Management Ltd (the applicant) have commissioned McKenzie and Co to prepare a methodology for the construction of the proposed “Option B” bridging structures over P3 (Figure 1).

We understand P3 has been the subject of ongoing discussions with Auckland Council, with RMA Ecology considering it be a stream and the Council’s ecologist is considering it might be a wetland. The proposal put forward in the AEE as part of the application seeks to culvert parts of P3.

The applicant has recently proposed an alternative design to avoid P3 and build over it. That design is illustrated in drawings 1976-B1-SK210, 230, 400, 410 and 460.



Figure 1 - P3 Location

Please note that this methodology is to be read in conjunction with the concept engineering drawings attached to illustrate the process. The methodology also assumes P3 is classified as a wetland.

Construction Process

Prior to any works commencing on site, a detail design process of the bridging structure will have been undertaken which will include accurate delineation of the extent of any “wetland” at or near P3 to ensure the appropriate clearances are achieved.

Prior to works commencing on site, the contractor is to have reviewed the following construction methodology including any agreed or approved changes to ensure they understand the requirements specific to this location. They are also to operate in accordance with the final Construction and Environmental Management Plan (CEMP) and Kauri Die Back Management Plan (KDBMP).

It is noted that the construction methodology is essentially the same for both sections of bridging structure and they could be undertaken concurrently or in sequence. It is expected they will be undertaken semi concurrently with a slight lag between them to allow specialist construction crews to proceed from one structure to the other.

Construction Methodology/Sequence

1. Key stakeholder to meet on site prior to commencing works for a pre-start meeting. This will typically include Ecologist, Contractor (including operators undertaking the work), Council representative, Project Engineer. The methodology will be discussed and the extents of the wetland will be identified on site.

A representative of mana whenua will be invited to attend

As part of the pre-start meeting the required inspection hold points will be agreed with all parties.

The contractor is to confirm that all required materials are available and either on site or in their control to ensure the shortest practical construction timeframe.
2. The contractor will install temporary fencing around any wetland extent including signage indicating no access.
3. A record of the original condition of P3's bed profile and hydrological regime will be made (by taking photographs).
4. The foundations and key elements of the bridging structure will be setout by the project surveyor.
5. The contractor will then commence installation of the super-silt fence along both edges of P3 being mindful of both the future foundations and edge of any wetland. The silt fence is to be positioned between P3 and foundations to ensure that the foundations can be constructed without impact on P3.
6. Foundation excavation will commence once the super-silt fence is installed and inspected. This work will involve shallow strip footings installed on each side of P3, the

excavation will be undertaken by a hydraulic excavator which is to be positioned upslope of the super silt fence.

7. Once foundations are excavated the necessary reinforcing will be placed and concrete poured.
8. Once the foundations are completed the area around them will be stabilised, particularly below the foundations. Once this is complete the section of super-silt fence and safety fence that is beneath the bridging structure can be removed as once the bridging elements are installed it will be impractical to access the fence for removal. Note the balance sections of P3 will remain protected by the super silt fence.

Temporary bunds will be installed upslope of the foundations to contain machinery and materials.

Note at this time there is to be no bare ground left exposed in the immediate contributing catchment to P3.

9. Bridging elements will then be installed, these can be lifted over P3 via hydraulic excavator as they are not heavy elements. These are sectional corrugated steel sections which are bolted to foundations
10. Once bridging sections are installed, work on the abutments at the ends will commence in conjunction with installing the free draining hardfill layer over the structure.
11. As the abutments progress, fill will commence to be placed over the bridging structure in progressive lifts. Sediment control measures will be in place to ensure any runoff from the fill areas is directed away from P3 and towards the sediment control measures as shown on drawing 1976-B1-230
12. As the filling process is completed and the site is brought up to finished grade final topsoil will be spread and the area sown with grass and stabilised.
13. Sediment control measures on the open sections of P3 will remain in place until such time as the area is complete stabilised.

Key Points

The following key points relate to the construction of the bridging structure.

- The methodology of construction does not impact on the flow of water through P3 for small or large rainfall events at any stage. No pump over works, temporary diversions or lowering of adjacent wetland water levels are necessary.
- The bed profile and hydrological regime of P3 will be returned to their original condition no later than 30 days after the start of works.

- No earthworks or vegetation clearance will occur within any identified wetland during construction, but there will be earthworks required within a 10m setback from P3.
- Access across P3 is available via the existing farm race at the upstream end of the bridging structure, no temporary accesses are required.
- The existing culvert under the farm race at the upstream end is retained and not impacted by the works.

Conclusion

The preceding methodology is achievable and uses sound construction practices. The use of experienced personnel and appropriate supervision will ensure the bridging structure can be constructed in accordance with this methodology and without any disturbance or adverse impact on P3.

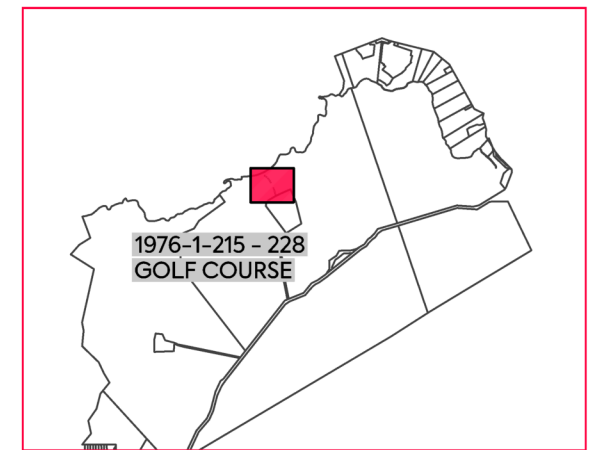


NOTES:

1. ALL LEVELS ARE IN TERMS OF AUCKLAND VERTICAL DATUM 1946 (MSL). THE CONTOUR INTERVAL IS: 1.0m
2. CUT / FILL BETWEEN EXISTING SURFACE AND FINISHED DESIGN SURFACE.

LEGEND:

EXTENT OF EARTHWORKS	
PROPOSED FILL	
PROPOSED CUT	
PROPOSED FILL (MAJOR CONTOUR)	
PROPOSED CUT (MAJOR CONTOUR)	
CUT/FILL (ZERO CONTOUR)	
EXISTING (5m) MAJOR CONTOUR	
EXISTING (1m) MINOR CONTOUR	
PERMANENT STREAM	
INTERMITTENT STREAM	
EXISTING WETLANDS (TO BE PROTECTED)	



DRAWING LAYOUT PLAN

CLIENT:
**THE BEARS HOME
PROJECT MANAGEMENT LTD**

PROJECT:
**MURIWAI DOWNS GOLF PROJECT
610 & 697 MURIWAI ROAD
MURIWAI VALLEY**

TITLE:
**CONCEPT BRIDGING STRUCTURE
PROPOSED EARTHWORKS
CUT/FILL PLAN**

PURPOSE OF ISSUE:
FOR CONSENT

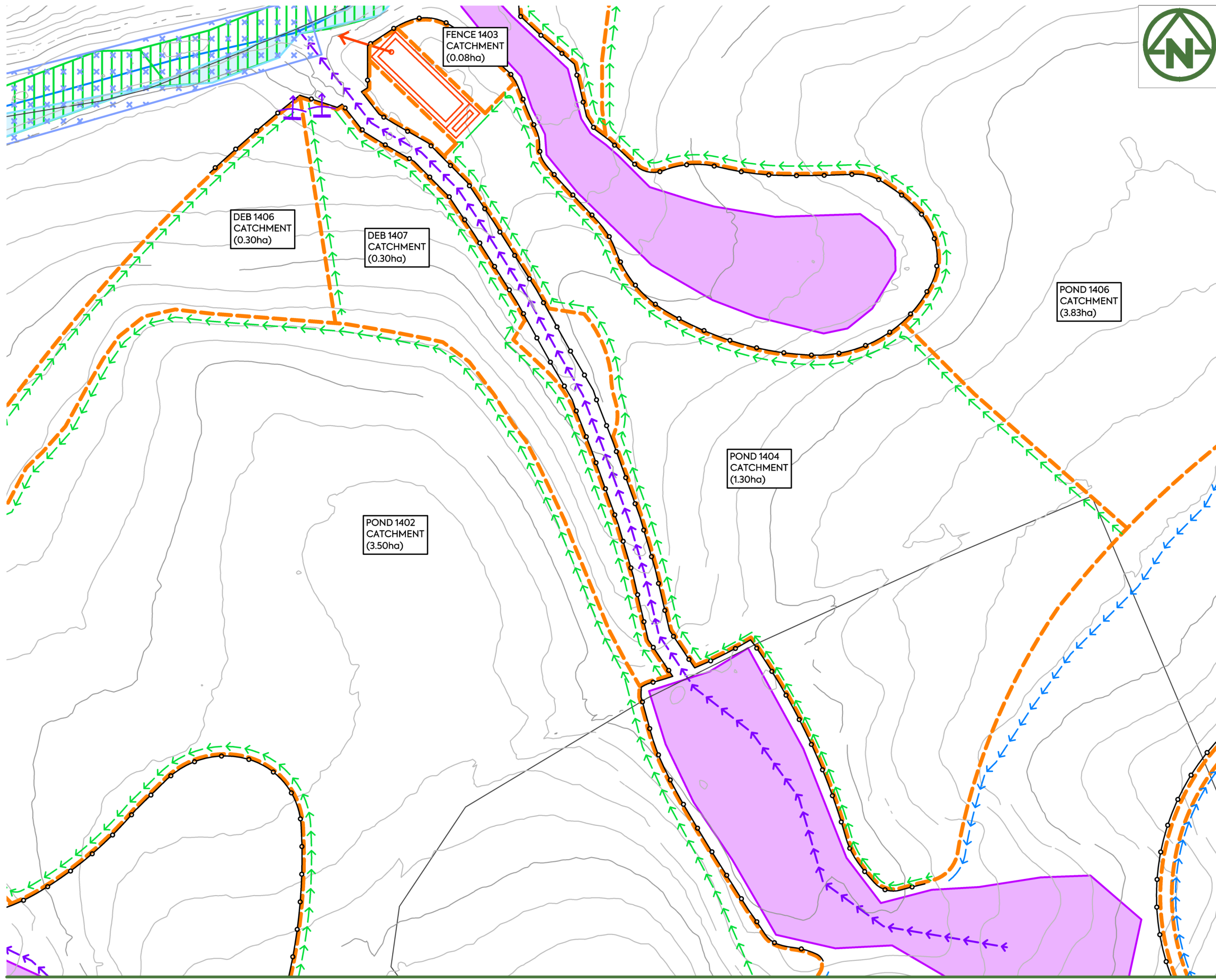
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1976-B1-210

REV:
A



REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	CIM	SM	JD	19/05/22



NOTES:

1. ALL LEVELS ARE IN TERMS OF AUCKLAND VERTICAL DATUM 1946 (MSL). THE CONTOUR INTERVAL IS: 1.0m
2. ALL EARTHWORKS SHALL COMPLY WITH COUNCIL'S EROSION AND SEDIMENT CONTROL GUIDE FOR LAND DISTURBING ACTIVITIES IN THE AUCKLAND REGION GD 2016/005.
3. ALL UNSUITABLE MATERIALS AS DEFINED IN THE CONTRACT SPECIFICATION IS TO BE REMOVED AND STRIPPED AREAS INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO ANY FILLING TAKING PLACE.
4. EARTHWORKS SHALL NOT EXTEND PAST THE AREA SHOWN ON THE PLANS WITHOUT PRIOR APPROVAL FROM THE ENGINEER.
5. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING AND PROTECTING EXISTING SERVICES AND DRAINAGE ON SITE.

LEGEND:

STANDARD SILT FENCE	
DIVERSION BUND/ CONTOUR DRAIN	
CLEANWATER DIVERSION	
CATCHMENT BOUNDARIES	
DECANTING EARTH BUND	
STABILISED ENTRANCE	
SEDIMENT RETENTION POND	
EXISTING (5m) MAJOR CONTOUR	
EXISTING (1m) MINOR CONTOUR	
EXISTING WETLANDS (TO BE PROTECTED)	



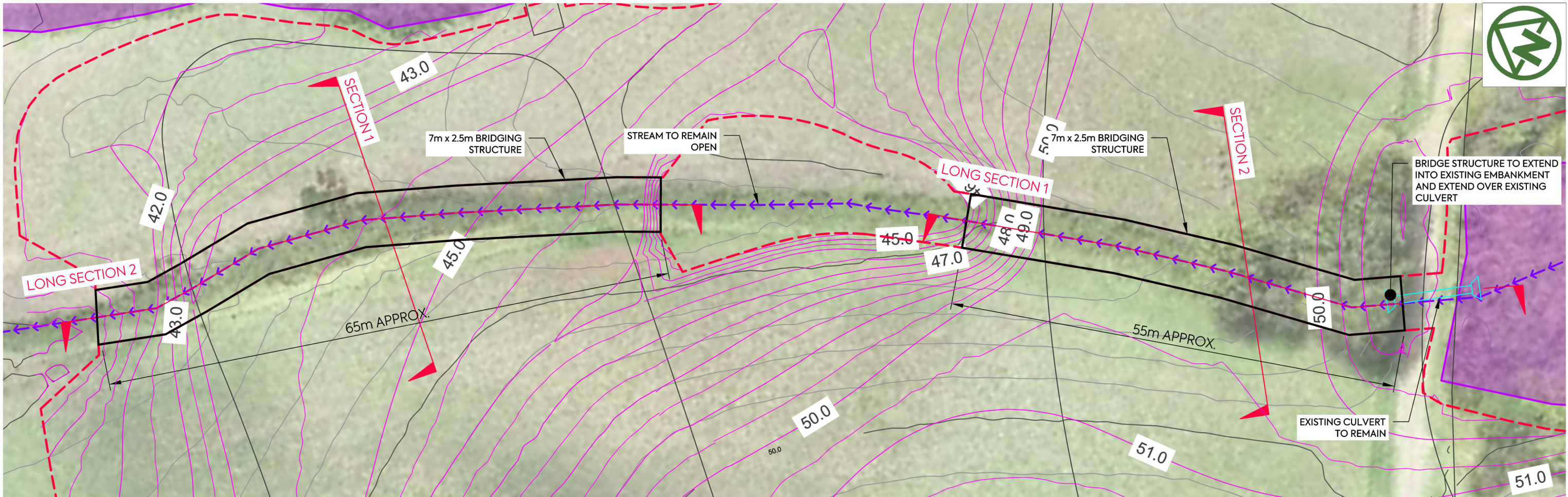
DRAWING LAYOUT PLAN

CLIENT: THE BEARS HOME PROJECT MANAGEMENT LTD PROJECT: MURIWAI DOWNS GOLF PROJECT TITLE: CONCEPT BRIDGING STRUCTURE
 PURPOSE OF ISSUE: FOR CONSENT

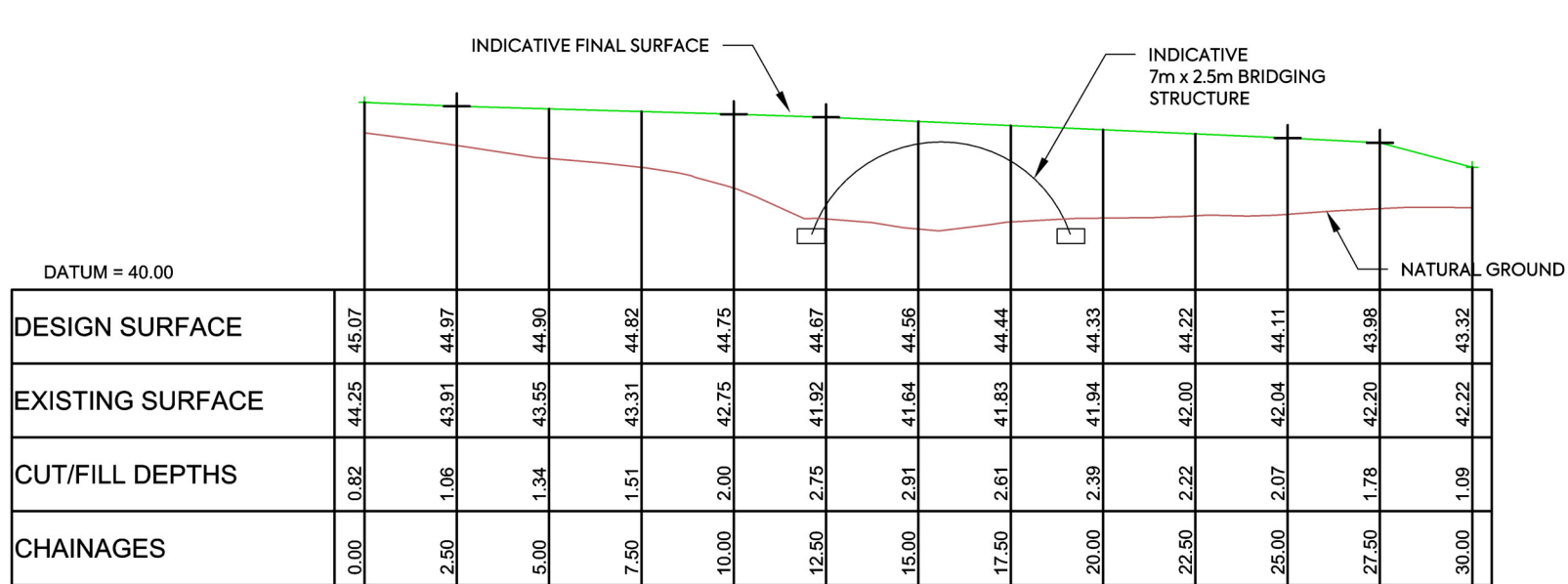


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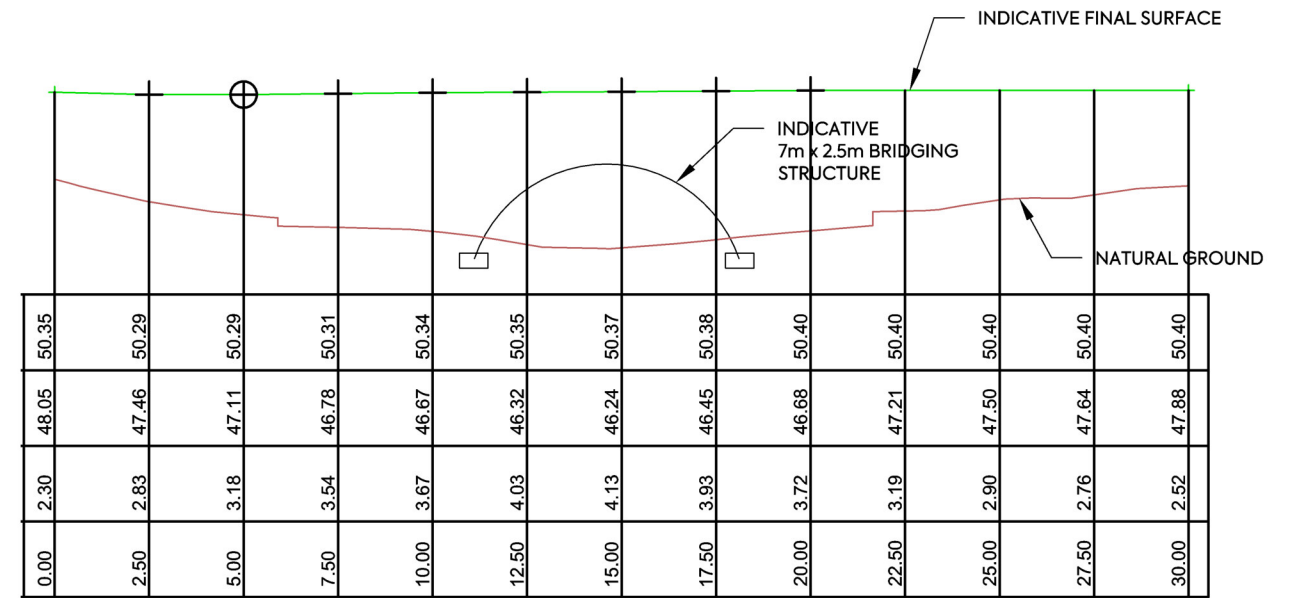
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PROPOSED STRUCTURE PLAN VIEW
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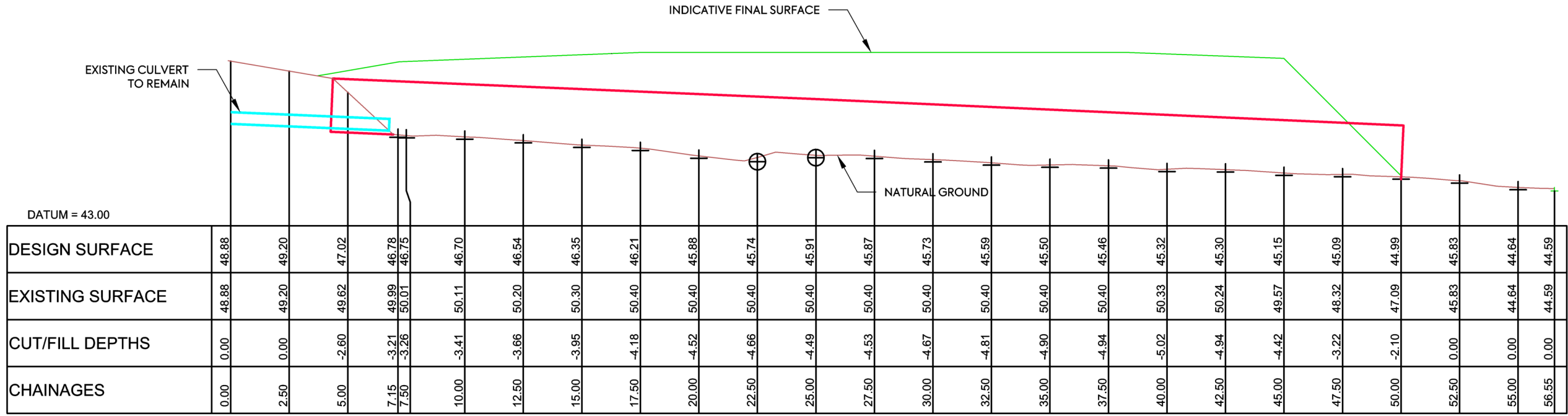


CROSS SECTION - SECTION 1
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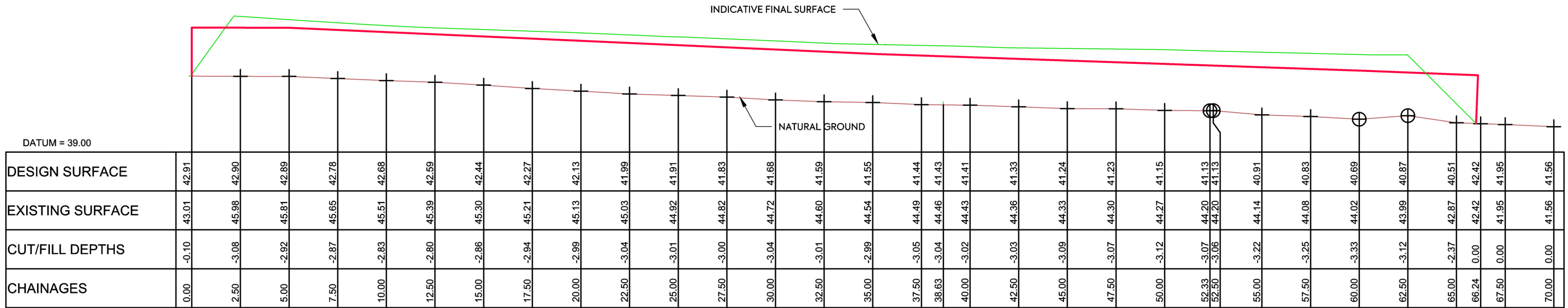


CROSS SECTION - SECTION 2
SCALE HORIZ=1:100 @ A1 VERT=1:100 @ A1

	<p>CLIENT:</p> <p>THE BEARS HOME PROJECT MANAGEMENT LTD</p>	<p>PROJECT:</p> <p>MURIWAI DOWNS GOLF PROJECT 610 & 697 MURIWAI ROAD MURIWAI VALLEY</p>	<p>TITLE:</p> <p>CONCEPT BRIDGING STRUCTURE WETLAND CONVEYANCE HOLES 14 & 16 DETAILS PLAN SHEET 1</p>	<p>PURPOSE OF ISSUE:</p> <p>FOR CONSENT</p>
				<p>SCALE:</p> <p>1:500m</p> <p>DO NOT SCALE</p>
<p>A FIRST ISSUE</p> <p>REV DESCRIPTION DRN BY CHK BY APP BY DATE</p>				<p>DRAWING NO:</p> <p>1976-B1-400</p>



LONG SECTION - BRIDGING STRUCTURE 1
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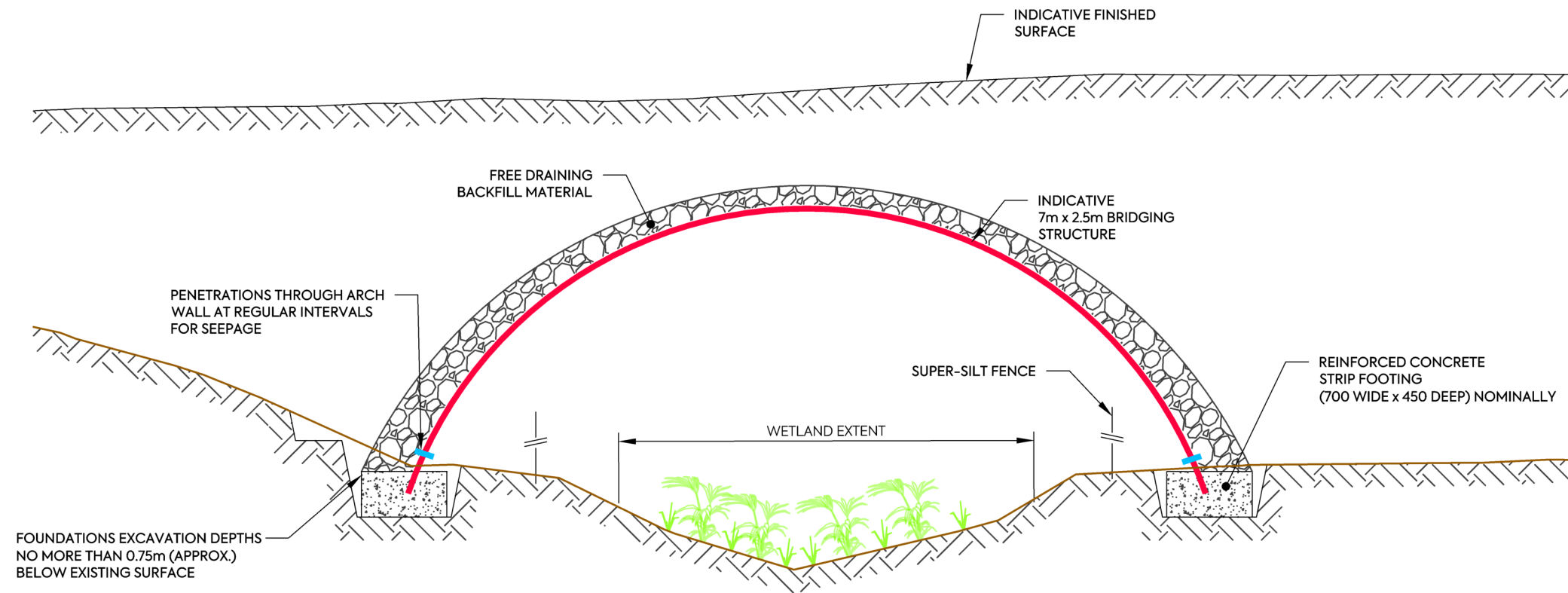


LONG SECTION - BRIDGING STRUCTURE 2
SCALE HORIZ=1:100 @ A1 VERT=1:100 @ A1

		<p>CLIENT: THE BEARS HOME PROJECT MANAGEMENT LTD</p>	<p>PROJECT: MURIWAI DOWNS GOLF PROJECT 610 & 697 MURIWAI ROAD MURIWAI VALLEY</p>	<p>TITLE: WETL WETLAND CONVEYANCE HOLES 14 & 16 DETAILS PLAN SHEET 2</p>	<p>PURPOSE OF ISSUE: FOR CONSENT</p>
<p>A FIRST ISSUE CIM SM JD 19/05/22</p>					<p>SCALE: AS SHOWN DO NOT SCALE</p>
<p>REV DESCRIPTION DRN BY CHK BY APP BY DATE</p>					<p>DRAWING NO: 1976-B1-410</p>

CONSTRUCTION METHODOLOGY:

1. IDENTIFY EXTENT OF EXISTING WETLAND WITH ECOLOGIST SUPERVISION.
2. BRIEF CONTRACTOR ON ACCESS LIMITATIONS OF WETLAND.
3. INSTALL SUPER-SILT FENCES.
4. EXCAVATE AND INSTALL ARCH FOOTINGS.
5. REMOVE SUPER-SILT FENCES.
6. ASSEMBLE ARCH SECTIONS FOR FULL SPAN AND LIFT INTO PLACE.
7. INSTALL DRAINAGE PENETRATIONS.
8. INSTALL FREE DRAINING MATERIAL AND GENERAL BACKFILL.



BRIDGING STRUCTURE - CONCEPT CONSTRUCTION DETAIL

SCALE = 1:50 @ A1

CONCEPT DESIGN ONLY, BRIDGING STRUCTURE DIMENSIONS ARE INDICATIVE AND MAY CHANGE SUBJECT TO DETAILED DESIGN



CLIENT:
**THE BEARS HOME
PROJECT MANAGEMENT LTD**

PROJECT:
**MURIWAI DOWNS GOLF PROJECT
610 & 697 MURIWAI ROAD
MURIWAI VALLEY**

TITLE:
**CONCEPT BRIDGING STRUCTURE
WETLAND CONVEYANCE
HOLES 14 & 16 DETAILS PLAN
SHEET 3**

PURPOSE OF ISSUE:
FOR CONSENT

SCALE:
AS SHOWN

DRAWING NO:
1976-B1-460

REV:
A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	CIM	SM	JD	19/05/22



ATTACHMENT B

Hydrological Effects Assessment



The Bears Home Project Management Limited

Attention: Ryan Brandeberg
 ryan@golfstrategygroup.com
 Cc: Mason Jackson
 mason.jackson@mitchelldays.co.nz

20 May 2022

WWLA0321

Muriwai Golf Project:

P3 – Option B Arch Bridging Structure Hydrology

1. Overview

Williamson Water & Land Advisory (WWLA) were requested to provide a high-level assessment of a potential hydrological effects associated with a proposed bridging structure (referred to as Option B) over the P3 waterbody for the Muriwai Golf Project.

Preliminary design plans for Option B are presented in McKenzie and Co. Drawings 1976-0-SK430 and 1976-0-SK431, and extracts of these presented in **Figure 1**, and **Figure 2**.

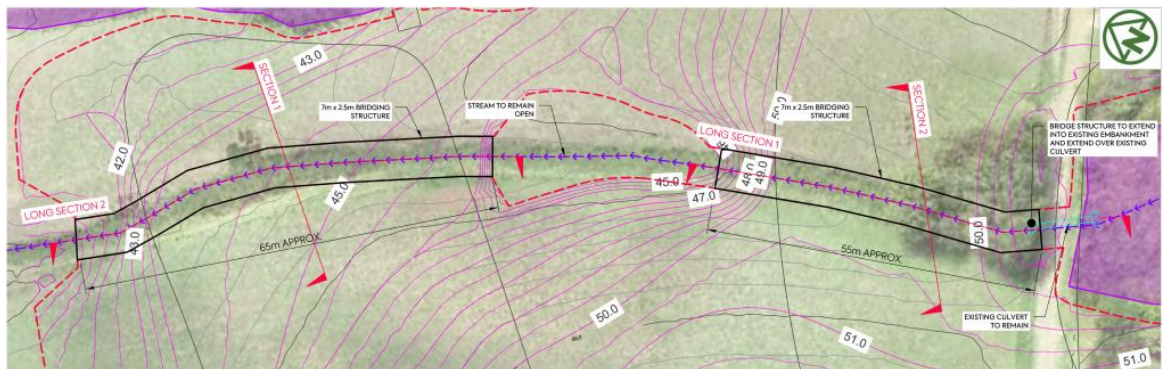
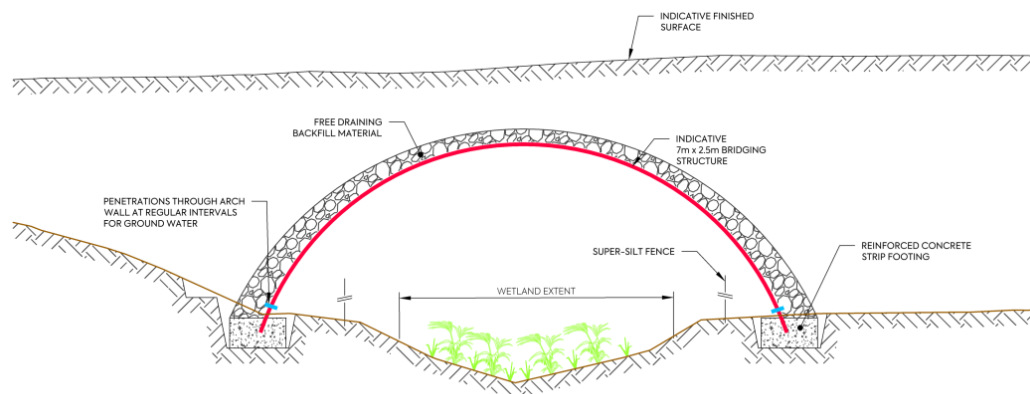


Figure 1. Option B design plan overview.



BRIDGING STRUCTURE - CONCEPT CONSTRUCTION DETAIL

Figure 2. Option B design plan cross-section.

2. Existing Hydrology

P3 is fed through a combination of surface water and groundwater contributions. The waterbody receives surface runoff (surface water) from the upstream catchment (**Figure 3**), which builds up behind a culvert, located under the farm crossing, during periods of rainfall. The culvert provides an overflow structure for water that slowly drains from Raupo swamp upstream of the culvert.

Shallow groundwater likely flows into the Raupo swamp year-round, which provides the observed baseflow. WWLA installed a shallow groundwater piezometer approximately 250 metres east of P3 in July 2021 (**Figure 3** – location 6). The piezometer shows groundwater levels within 0.4-0.75 m of the surface throughout summer.

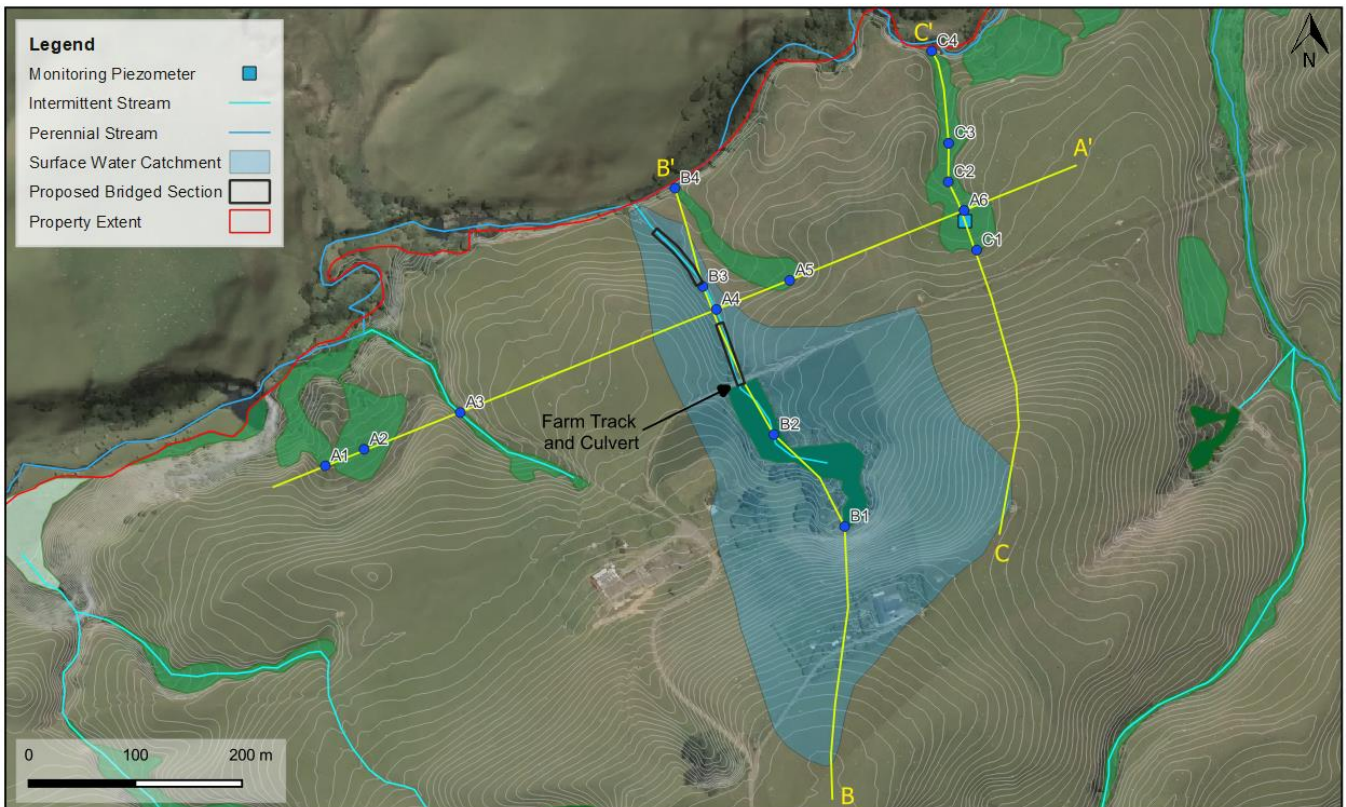


Figure 3. Surface water catchment.

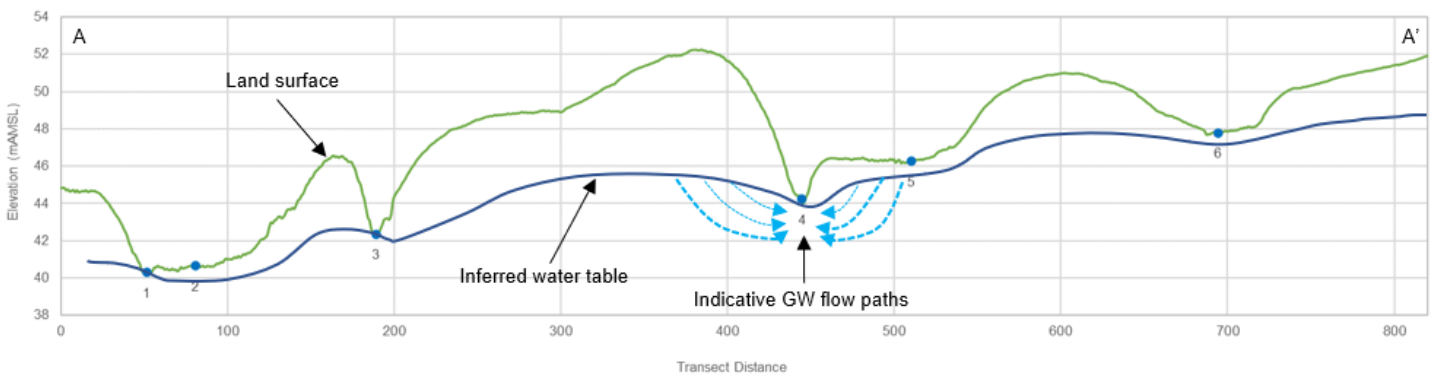


Figure 4. Conceptual hydrogeological cross-section A to A'.

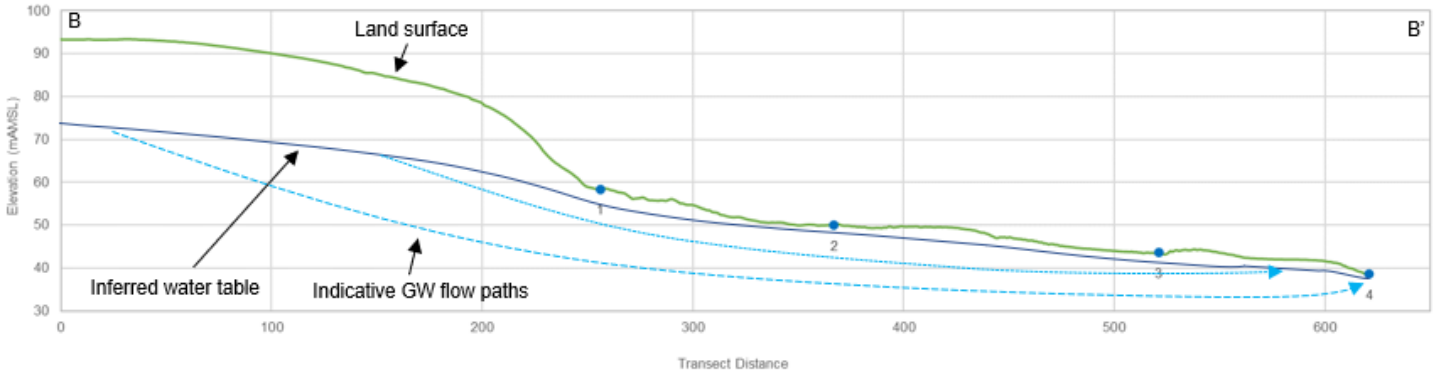


Figure 5. Conceptual hydrogeological cross-section B to B'.

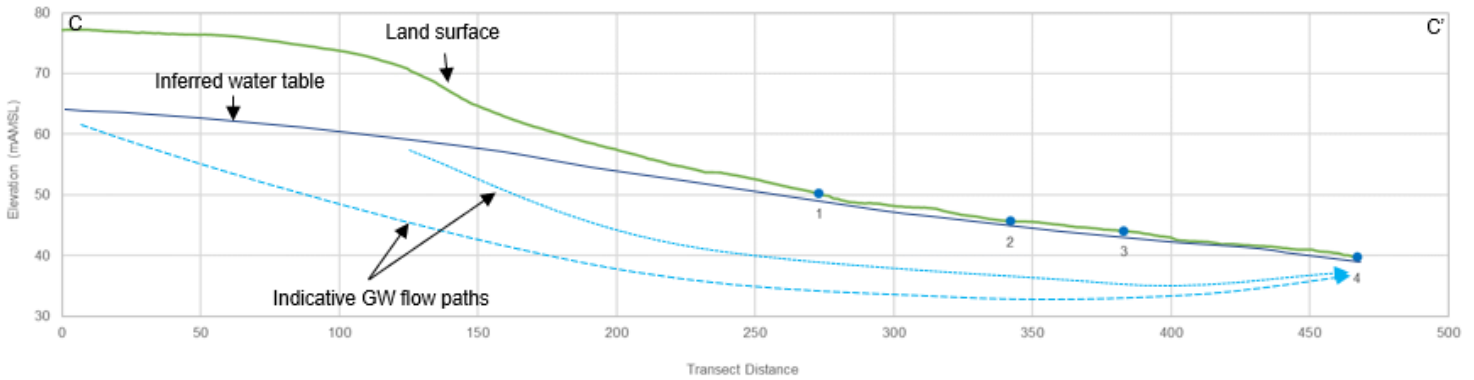


Figure 6. Conceptual hydrogeological cross-section C to C'.

Based on the known summer groundwater level at this location (6), and the land surface topographical cross-sections, the water table level and indicative groundwater flow paths were inferred (Figure 1 to Figure 6). Groundwater levels were inferred from a combination of shallow piezometer measurements, outputs from the groundwater model and based on local topographical features.

As alluded to above, P3 is located at a lower elevation than the shallow groundwater piezometer (Figure 3 – Locations 4 and 6, respectively), where summer groundwater levels are known. Therefore, shallow groundwater likely moves from higher elevations (i.e., both northwards, westward and eastward of P3), to the lower elevations within P3.

WWLA’s Soil Moisture Water Balance Model¹ (SMWBM) was used to provide an estimate of the proportional contribution of surface water and groundwater flows to the Raupo swamp upstream of P3. The SMWBM indicated on a long-term average, approximately 75% of flow to the Raupo swamp is from surface water, and 25% from groundwater. During dry summer periods, the baseflow in P3 consists of a combination of surface water stored in the Raupo swamp, and groundwater inflows.

3. Potential Changes in Hydrology

The proposed Option B bridging structure consists of two segments, and covers approximately 130 metres of P3. The earthworks surrounding the structure will not alter the overall extent of the

¹ Full detailed of the SMWBM are provided in WWLA. 2022. Muriwai Downs Golf Project. Appendix C – Surface Water Effect Assessment.

surface water catchment, and therefore the volume of surface water entering P3 will remain the same as present. While the presence of the arch bridging structure may cause minor diversion of temporary overland flows (i.e., during storm rainfall events), these flows will enter the waterway downstream, and therefore there will be no change in net volume entering the waterway.


The culvert under the existing farm track (immediately upstream of the arch bridge structure) is proposed to remain. Therefore, water levels within the Raupo swamp to the south of the farm track will remain unaffected (i.e., will not result in drainage or partial drainage of the wetland), and continue to slowly discharge to P3, as currently occurs.

As the streambed of P3 will remain open and unaltered, groundwater inflows from below will also remain unaltered. Foundations are proposed to extend approximately 0.75 m below the natural ground surface. Groundwater flows will not be reduced, albeit the point of entry to the stream may change slightly. The structure will have drainage along the base that will enable any groundwater if intercepted by the structure during high groundwater conditions to pass through.

4. Concluding Statement

Potential changes to surface water and groundwater flows into P3 associated with the proposed bridging structure are considered to be no more than minor. Based on the preliminary conceptual designs, the structure will not result in the partial drainage of P3, if it is to be classified as a wetland, or the Raupo swamp located upstream.

Yours sincerely,



Jon Williamson
Managing Director | +64 21 65 44 22
jon.williamson@wwla.kiwi | www.wwla.kiwi



ATTACHMENT C

Ecological Assessment

20 May 2022

The Bears Home Project Management Ltd

710 Muriwai Road

Muriwai Valley 0881

Attention: Mimouk Hannan, Auckland Council
Copy: Muriwai Golf Project Team

To whom it may concern

Muriwai Downs: Stream P3 alternative arch-bridging structure design: ecology assessment

As part of the Muriwai Downs Golf Course project, the applicant (The Bears Home Project Management Ltd) seeks to culvert the watercourse labelled as P3 on the ecology mapping layers provided by RMA Ecology Ltd in our ecological effects assessment report.

Watercourse P3 has been the subject of ongoing discussions with Auckland Council, which has requested clarification over its classification as a natural inland wetland under the NPS-FM. Our opinion is that this watercourse should be classified as a stream, while Council's ecologist is of the opinion that it is a wetland. The AEE anticipates culverting parts of P3, which would require works within the bed and banks of P3. The ecology assessment for this provides for an offset by way of stream enhancement elsewhere on site, and treats P3 as a stream for this purpose.

The applicant has recently proposed an alternative design to cross P3. That design is illustrated in drawings 1976-0-SK430 and 1976-0-SK431 dated 12 May 2022 by McKenzie & Co, and shows two sections of 65 m long arch-bridging structures over P3 (Option B) (**Appendix A**).

We have been asked to provide a brief assessment of the potential ecological effects of Option B if it is assumed that P3 is a natural inland wetland (as defined in the NPS-FM). We note that our technical position on P3 is that it is a stream. That position may or may not change once field data from the recent site visit on 11 May 2022 is considered.

If P3 is assumed to be a wetland, then:

1. The extent of the wetland will be defined by the steep-sided excavated banks that confine the sediment-slurry vegetation dominated by *Isolepis prolifer* and Mercer grass. The narrow strip of soft rush set back from this bank on either side of P3 is a mix of soft rush and pasture grasses, and the soils are not hydric – therefore this rush margin is not wetland and is not included as wetland in our assessment;
2. The width of wetland is 4 – 5 m wide along the length of P3;
3. The lower part of P3 on the true right where the natural contour is less steep has soils that are strongly hydric and indicates the past presence of wetland. This area of margin has been infilled many decades ago with imported clay/ topsoils and is no longer wetland (it now supports grazed pasture grasses);
4. Flow through the wetland shows that a stream flows through the wetland – as we have formally assessed previously; and

- As confirmed in the assessment of J Williamson (Water and Land Advisory 20 May 2022), flow to and through the wetland is provided by a combination of headwater groundwater seepage, shallow groundwater along the wetland, and overland flow from the surrounding margins.

The Option B design includes these features:

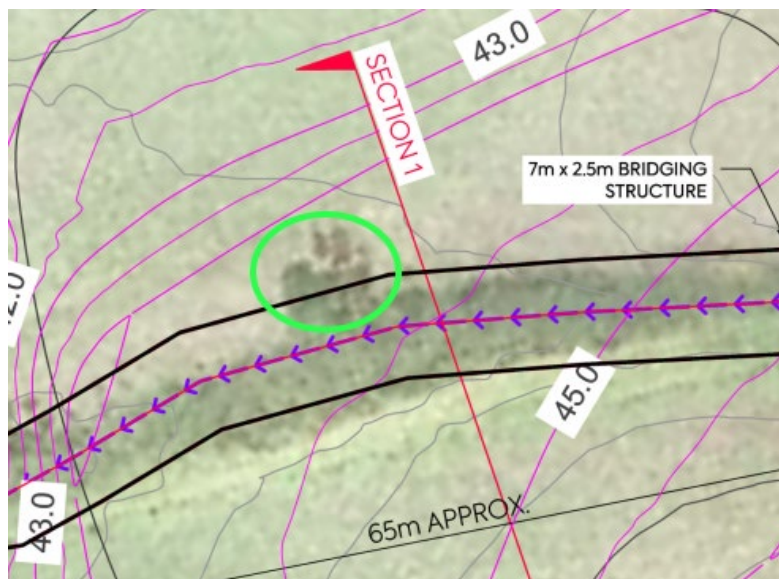
- Two 65 m sections of arch-bridge with a gap of ca. 40 m between;
- The bridge footings are located outside of the extent of the wetland;
- The bridge footings will have perforations to allow groundwater to seep into the wetland along its length;
- Fill over the arch bridge will result in a change to ground levels;
- The height from water level to the underside of the arch-bridge will be between ca. 2 – 2.5 m; and
- The southern arch-bridge structure covers the existing farm road.

Our assessment of the potential adverse effects of Option B on ecological values is as follows:

- On the basis of Mr Williamson’s assessment that the structure will not result in the partial or complete drainage of the wetland, there will, therefore, be no loss of wetland. The volume of surface water entering P3 will remain the same as present. Loss of surface flows entering the wetland along its length are unlikely to result in changes to the hydrology, soils or vegetation of the wetland because the wetland is sustained mostly by groundwater seepage, groundwater flows and headwater catchment overland flows.

The foundations along the two bridging structures are located outside of the wetland and will be within ryegrass pasture along most of its length, apart from a section of the northern arch bridge in its mid-section.

In that section of the watercourse, there is a patch of soft rush and pasture grasses on the true right (see figure below; green circle indicates approximate extent of soft rush-pasture grass patch). This patch is located out of the main channel of the watercourse/ wetland. The patch is a mix of soft rush (55 % cover: FACW), ryegrass (23 % cover: FACU) and Yorkshire fog (20 % cover: FAC) with the remainder red clover and narrow-leaved plantain (1 % each). The patch does not pass the Rapid Test (only 1/ 3 dominant species are OLB or FACW), and fails the Dominance Test (all/ most dominants are FAC; not all/ most dominants are OBL or FACW). Soils within the patch are brown silty sediments in the top 300 mm (19 YR 3/4), with no mottling or pale low chroma colours within the first 400 mm. As assessed against Clarkson *et al.* 2018 this is not a hydric soil. Therefore, this patch does not meet the definition of a natural inland wetland in the NPS-FM.



- Option B will increase shading of the wetland over a length of ca. 130 m –some of that will be partially shaded, with most subject to a substantial decrease in light levels. It is certain that the wetland vegetation currently present will not persist under low light levels. A possible outcome of the bridging structure will be

that the parts of the wetland under the bridging structure in very low light conditions will become un-vegetated. If this occurs, the wetland will still qualify as wetland on the basis of hydrology and the presence of hydric soils, and the environmental processes of both will remain unchanged. We are uncertain if wetland plants could re-establish naturally in the low light conditions that may result. Part of the design of the bridging structure will include a planting programme to establish a range of wetland plants that could survive in low-light conditions under the bridging structure.

Based on our field survey of the Muriwai Downs site, there are several candidate wetland plant species that have been found on other parts of the site to exist under dense canopy cover, and which could be planted around and under the arch bridge to provide for vegetative cover. Light penetration distance under the arch bridge is likely to be greatest near the edges and least in the middle, and therefore the likelihood of these plants successfully establishing will similarly be greatest at the arch bridge ends (ca. 10-15 m from each end) and least in the middle sections (ca. 30 m for each arch bridge).

Candidate plant species are listed below and will form the basis for a planting plan for this part of the site.

- *Asplenium bulbiferum* (wetland edges & mounded soil 'islands' within channel)
 - *Carex uncinata* (wetland edges)
 - *Pakau pennigera* (wetland edges)
 - *Parablechnum minus* (within wetland and on edges)
 - *Parablechnum novae-zelandiae* (wetland edges)
3. The farm culvert is currently sustaining an area of induced NPS-FM qualifying raupo wetland upstream of the culvert (the placement of this culvert in the 1980s has resulted in ponded water upstream of the farm track). This culvert is also likely to be throttling flows into the parts of P3 proposed to be bridged. The current farm culvert may remain through the development in this area. If replacement or upgrade is required then design will ensure flow will be maintained at this location. The treatment of this section of P3 will be such that:
- a. Fish passage will be maintained (or improved) over its current state (the culvert is currently perched and is a partial barrier to fish passage);
 - b. The raupo wetland will not be drained by the removal of the farm culvert; and
 - c. Any treatment of the farm culvert will ensure that flows into the lower parts of P3 will not be substantially increased such that erosion and loss of parts of the vegetation/sediment slurry comprising the wetland may result i.e. flow will be maintained at its current level if that is desired by Auckland Council (i.e. the current artificially throttled state of the stream will be maintained if required).
4. With regard to the stream (which in our opinion, is present irrespective of whether the watercourse is classified by Council as a wetland), the bridging structure will ensure that the stream is retained. Therefore, there will be no loss of stream extent caused by the bridging structure. There is likely to be a change to instream ecological conditions due to increased shading and loss of (excessive, deleterious) nutrient inputs from stock which currently have free access to, and clearly graze and disturb, the stream/ wetland vegetation. Both of these changes resulting from a bridging structure may result in improvements to the state of water quality and instream habitats for native fish. The shading provided by the bridging structure is likely to result in a substantial change to the existing vegetation community, with many or all light-requiring species dying off or thinning out.

The potential adverse effects of the bridging structure on the current state of the stream are likely to be minor when balancing loss of vegetation and improvements to instream state are considered. Where the level of potential adverse effect on ecological values is minor or less, it is usual (e.g. under the EIANZ effects management framework), for good practice mitigation to be followed. An offset or compensation is not required.

Therefore, the offset provided for in the ecological effects assessment report where culverting of the stream was assumed, will be removed under this proposed bridging structure.

We note that if Council's assessment of the level of effect of the bridging structure on the stream concludes a more the minor level of effect that triggers the need for an ecological offset, the areas previously proposed as offset remain available for this purpose.

In conclusion, the proposal to install a bridging structure over ca. 130 m of watercourse P3 will not result in loss of extent or values of a wetland (should the watercourse be classified as wetland), and nor will it significantly impact upon the stream through the alleged wetland.

Specific considerations in the detailed design of this bridging structure will include treatment of the existing farm culvert to maintain up catchment wetland and maintenance of downstream flows, and a planting programme to establish vegetation under the bridging structure within the wetland/ stream margins.

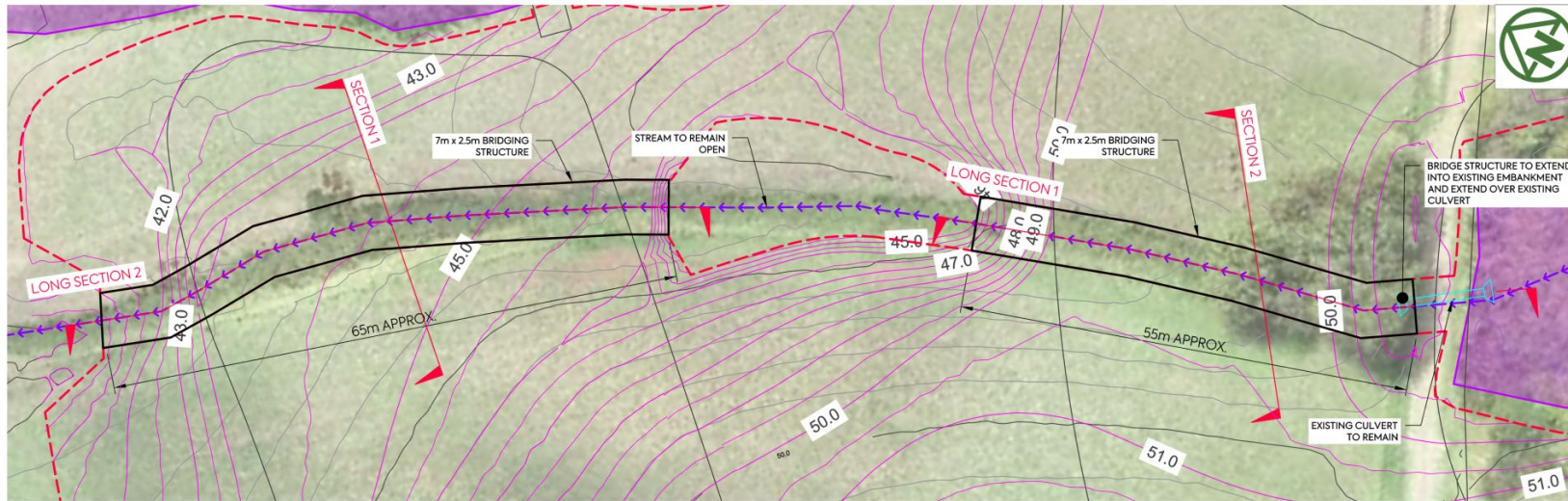


Graham Ussher

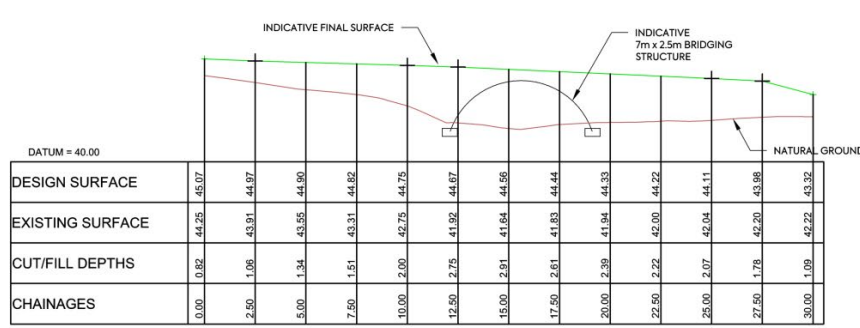
Principal Ecologist

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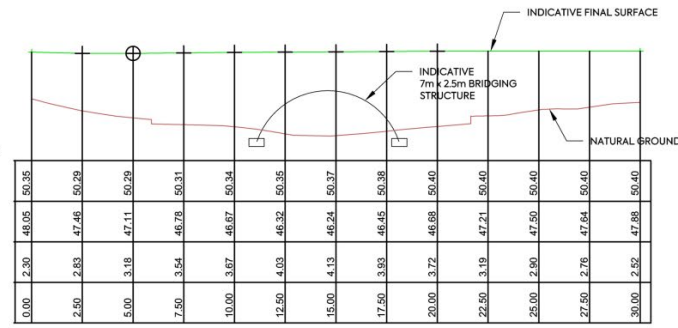
Appendix A – arch culvert drawings



PROPOSED STRUCTURE PLAN VIEW
SCALE = 1:500 @ A1



CROSS SECTION - SECTION 1
SCALE HORIZ=1:100 @ A1 VERT=1:100 @ A1

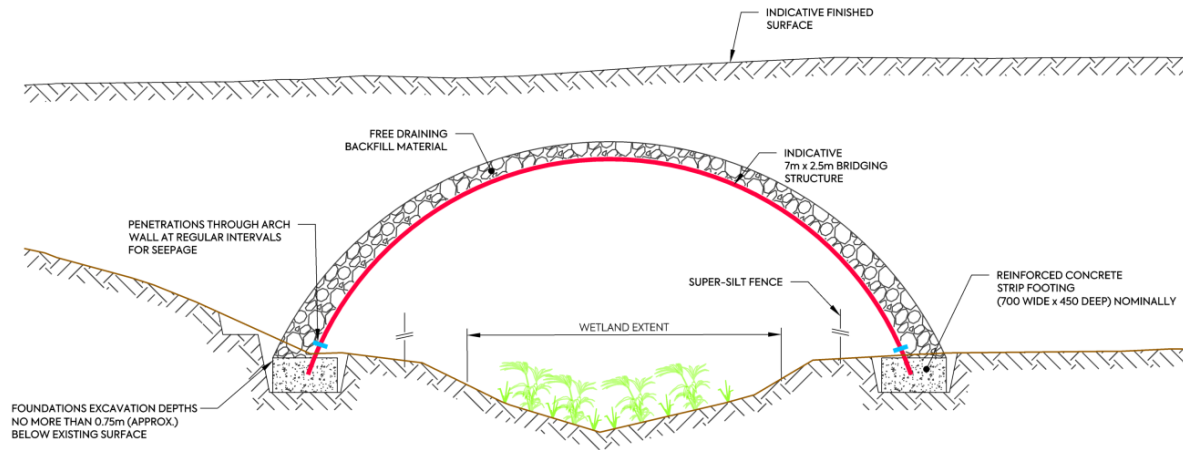


CROSS SECTION - SECTION 2
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CONSTRUCTION METHODOLOGY:

1. IDENTIFY EXTENT OF EXISTING WETLAND WITH ECOLOGIST SUPERVISION.
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3. INSTALL SUPER-SILT FENCES.
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7. INSTALL DRAINAGE PENETRATIONS.
8. INSTALL FREE DRAINING MATERIAL AND GENERAL BACKFILL.



BRIDGING STRUCTURE - CONCEPT CONSTRUCTION DETAIL
SCALE = 1:50 @ A1

CONCEPT DESIGN ONLY, BRIDGING
STRUCTURE DIMENSIONS ARE
INDICATIVE AND MAY CHANGE
SUBJECT TO DETAILED DESIGN

		CLIENT:	PROJECT:	TITLE:	PURPOSE OF ISSUE:												
		THE BEARS HOME PROJECT MANAGEMENT LTD	MURIWAI DOWNS GOLF PROJECT 610 & 697 MURIWAI ROAD MURIWAI VALLEY	CONCEPT BRIDGING STRUCTURE WETLAND CONVEYANCE HOLES 14 & 16 DETAILS PLAN SHEET 3	FOR CONSENT												
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ATTACHMENT D

Landscape and Visual Assessment

Memorandum

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|--|--|---|---|
| <input checked="" type="checkbox"/> Auckland
Level 3, IBM Centre
82 Wyndham Street
Auckland 1010
PO Box 91250
Auckland 1142
+649 358 2526 | <input type="checkbox"/> Whangarei
35 Walton Street
Whangarei 0110
+649 358 2526 | <input type="checkbox"/> Tauranga
PO Box 13373
Tauranga 3141
+647 571 5511 | <input type="checkbox"/> Hamilton
PO Box 1094
Hamilton 3240
+647 960 0006 |
| <input type="checkbox"/> Wellington
PO Box 11340
Wellington 6142
+644 385 9315 | <input type="checkbox"/> Christchurch
PO Box 110
Christchurch 8140
+643 366 8891 | <input type="checkbox"/> Dunedin
49 Water Street
Dunedin 9016
+643 470 0460 | <input type="checkbox"/> Queenstown
PO Box 1028
Queenstown 9348
+643 441 1670 |

Company: The Bears Home Project Management Limited
 c/- Mitchell Daysh
 Attention Mason Jackson
 Date: 20 May 2022
 From: John Goodwin and Tom Lines
 Message Ref: Muriwai - P3 Bridging Structures Options: Landscape Assessment
 Project No: BM210355

Dear Mason,

As part of the Muriwai Downs Golf Course project, the applicant (The Bears Home Project Management Ltd) seeks to modify the watercourse labelled as P3 on the ecology mapping layers provided by RMA Ecology Ltd in their ecological effects assessment report¹.

Watercourse P3 has been the subject of ongoing discussions with Auckland Council, with RMA Ecology considering it be a stream while Council's ecologist is of the opinion that it is a wetland. The proposal put forward in the AEE as part of the application seeks to culvert parts of P3, with the ecology assessment providing for an offset by way of stream enhancement elsewhere on site.



Figure 1: P3 Stream (Source Ecological Effects Assessment, Page 33)

The Boffa Miskell Landscape and Visual Amenity Effects Assessment dated 10 December 2021 which accompanied the application to Auckland Council for resource consent (Appendix 13) addressed the effects of culverting parts of P3 as below:

Earthworks associated with the golf course will be avoided within identified wetlands and of the approximate 13,000m of streams within the Property, 184m will be affected by the Project. A 175m length of a modified permanent stream, considered to be in a highly degraded, 'poor' ecological condition¹ will be impacted through proposed culverting and placing of riprap. It is proposed that 357m of streams within the Property are restored through fencing to exclude stock, weed control and planting of a 20m wide riparian margin; and a 16m reach of stream is to be daylighted (Stream I2 as identified in the Ecological Effects Assessment).²

The landscape assessment went on to say in relation to effects on natural character:

In general, the high value abiotic attributes of the wetlands, lakes and rivers (streams) and their margins will not be adversely affected. There will be no physical effects on the wetlands. As described, some stream impacts are proposed, however one of these is a modified realigned stream (Stream P3).³

Overall, the landscape assessment considered that while there would initially be some low-moderate adverse natural character effects the site wide restoration and enhancement opportunities which are focussed around the wetlands, lakes, streams and their margins would result in overall beneficial effects.

The Bears Home Project Management Ltd has recently proposed an alternative design to cross P3. That design is illustrated in drawings 1976-0-SK430 and 1976-0-SK431 dated 20 May 2022 by McKenzie & Co engineers, and shows two sections of 65 m long arch-bridge over P3.

Boffa Miskell has been asked to provide a brief assessment of the potential landscape effects of this arch-bridge proposal if it is assumed that P3 is a natural inland wetland (as defined in the NPS-FM).

The proposed arch-bridge design includes the following elements:

- Two 65 m sections of arch-bridge with an open length of approximately 40 m in between;
- Bridge footings located outside of the extent of the wetland and with the archway to contain perforations to allow groundwater to seep into the wetland along its length;
- Fill over the arch bridge to result in a change to ground levels, and diversion of overland stormwater flows along the arch-bridge length;
- The height from water level to the underside of the arch-bridge will be between approximately 2 – 2.5 m.

We understand that an arch bridge would be an appropriate solution from a hydrological point of view and that it could be designed so that it would not result in any partial drainage of the stream/wetland.⁴

In terms of ecological effects RMA Ecology states that there will be no loss of stream extent caused by the arch-bridge structures. There is likely to be a change to instream ecological conditions due to increased shading and loss of nutrient inputs from stock which currently have free access to, and graze and disturb, the stream/ wetland vegetation.

Both of these changes resulting from an arch bridge may result in improvements to the state of water quality and instream habitats for native fish. The shading provided by the arch-bridge is likely to result in a substantial change to the existing vegetation community, with many or all light-requiring species located beneath each structure dying off or thinning out. WWLA conclude that the proposal to install an arch bridge over 130 m of watercourse P3 will not result in the partial or complete drainage of wetland (should the watercourse be classified as wetland), and RMA Ecology conclude it will not significantly impact upon the stream through the wetland.⁵

In relation to site wide landscape and visual amenity effects on the golf course and surrounding landscape, it is recognised that the P3 stream is considered to be highly degraded and modified⁶ and overall of very poor

1 Ecological Effects Assessment, Page 72

2 Landscape Assessment, Page 34

3 Landscape Assessment, Page 39

4 Williamson Water and Land Advisory Letter dated 20 May 2022

5 RMA Ecology Memo dated 17 May 2022

6 Ecological Effects Assessment, Page 70

ecological condition⁷. The proposal to partially cover the stream with an arch-bridge will still result in localised effects to the stream margins, although as established the stream has been modified. The retention of a portion of the stream (remaining as daylighted) will mean that some effects are avoided. Vegetation within the stream will still be impacted as part of the project however again, a section of the stream will remain, with the opportunity to provide low riparian margin planting. Overall it is considered that there will be a marginal improved landscape and visual amenity effects outcome as a result of this alternative option through the retention and enhancement of a portion of the P3 Stream.

In terms of effects on natural character, as established the biophysical and experiential values of the stream have been impacted due to its modified and degraded condition. The arch-bridge across two portions of the stream length will result in similar natural character effects to the culvert option when considering the biophysical and experiential values however it is considered that there would be reduced effects on the natural character of the morphology of the stream bed. Further, taking the retained portion of the stream into account, and with enhancement planting established, it is considered that overall, the arch bridge option for P3 would be a slight improvement over culverting a similar length of stream.

In relation to site wide natural character, landscape and visual amenity effects on the golf course and surrounding landscape the proposed changes to P3, whether it is deemed to be a stream or wetland, and irrespective of which modification option is considered (culvert or arch bridge) will in our opinion result in no more than low-moderate adverse effects.



John Goodwin
Partner | Registered Landscape Architect



Tom Lines
Principal | Registered Landscape Architect