Before the Expert Consenting Panel

under: the Fast-track Approvals Act 2024 (*FTAA*)

in the matter of: notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities by the NZ Transport Agency Waka Kotahi to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills Project, a state highway from the intersection of State Highway 1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

applicant: **NZ Transport Agency**

Requiring Authority and Applicant

Statement of Evidence of Dylan van Winkel for NZ Transport Agency Waka Kotahi

Dated: 28 October 2026

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STATEMENT OF EVIDENCE OF DYLAN VAN WINKEL

INTRODUCTION

1 My full name is Dylan van Winkel.

2 I am a Senior Ecologist at Bioresearches (Babbage Consultants Ltd) and have held this position since October 2009. My current position is Technical Director of Terrestrial Ecology & Herpetology. An overview of my relevant experience and qualifications is attached as **Appendix A** to this statement.

3 My evidence has been prepared to support the applications by NZ Transport Agency Waka Kotahi *(NZTA)* for its notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities (together, the *Application*) to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills (*Project*), a state highway from the intersection of SH1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipu in the north.

CODE OF CONDUCT

4 Although this matter is not before the Environment Court, I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses in its Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

5 In preparing this evidence I have reviewed and commented on the evidence of Simon Chapman. Where I rely on Mr Chapman's evidence (generally as a reference to the additional work completed since lodgement) this is clearly referenced below, otherwise the views and conclusions set out in this evidence are my own.

SCOPE OF EVIDENCE

6 I have been engaged by NZTA to:

6.1 Review the frog-related sections of the Assessment of Effects on Terrestrial Ecology prepared by Mr Simon Chapman lodged on 8 April 2026 *(Terrestrial Assessment*);[1]

6.2 Assist with the development of an enhanced effects management package to address the potential impacts of the Project on Hochstetter's frogs and frog habitat (*Enhanced*

[1] Volume B – Appendix D06 – Assessment of Effects on Terrestrial Ecology (*Terrestrial Assessment*).

Effects Management Package, Package), following further investigations undertaken since the Terrestrial Assessment was prepared which refines the recommended measures related to relocation, release sites, and compensation;

6.3 Consider the extent to which my recommended Enhanced Effects Management Package addresses the comments on the Application from the Department of Conservation on behalf of the Director General of Conservation (*DOC*), Te Parawhau ti Kai and Patuharakeke and the report prepared by DOC pursuant to section 51 of the Fast-track Approvals Act 2024 for the Project (*Section 51 Report*), and consider whether any further changes to the Package are necessary or appropriate; and

6.4 Provide an overarching view on the appropriateness of the recommended Enhanced Effects Management Package and whether the residual effects on Hochstetter's frogs and frog habitat is an impediment to granting the Project's approvals.

7 My evidence will deal with the following matters:

7.1 Assessment methodology;

7.2 My recommended Enhanced Effects Management Package as it relates to:

(a) Minimising effects on frogs through salvage, relocation and release, including suitability of release sites;

(b) Minimising effects on frog habitat; and

(c) Compensating for any more than minor residual adverse effects related to Hochstetter's frogs and frog habitat;

7.3 Comments from DOC, Te Parawhau ti Kai and Patuharakeke on the Project's effects on Hochstetter's frogs and their habitat; and

7.4 My overall conclusion regarding the appropriateness of the project in light of the recommended Enhanced Effects Management Package for Hochstetter's frogs and their habitat.

EXECUTIVE SUMMARY

8 My evidence addresses the effects of the Project on Hochstetter's frog and its habitat, and whether the Enhanced Effects Management Package appropriately addresses those effects.

9 In my opinion, the surveys and methods informing the Terrestrial Assessment were appropriate and consistent with best practice. The approach to estimating frog numbers is sound and conservative.

10 I agree with Mr Chapman that Hochstetter's frogs in the Project area are of High ecological value. However, it is noteworthy that the surveys undertaken for the Project show that the Brynderwyn population is substantially larger and more widespread than previously understood; frogs were found at all eight sites surveyed outside the Proposed Designation.

11 Full avoidance is neither possible nor necessary, because frogs are abundant throughout the Brynderwyn Hills Range and a realignment would not avoid them. A robust package is therefore required to minimise unavoidable effects, and to compensate for residual effects on frogs.

12 My recommended Enhanced Effects Management Package responds to many of the comments from DOC and hapū. It incorporates measures to minimise effects, and to provide appropriate compensation for residual adverse effects.

13 The recommended Enhanced Effects Management Package provides a two-part approach to compensation:

13.1 An upfront component, delivered regardless of relocation outcomes; and

13.2 A contingent, scalable component, triggered if monitoring shows relocation has not succeeded.

14 Overall, I consider my recommended Enhanced Effects Management Package appropriately addresses the effects of the Project on Hochstetter’s frog and its habitat. In my opinion, with the Enhanced Effects Management Package in place, the residual effects on Hochstetter’s frog should not be an impediment to granting the Project’s approvals.

15 My recommended Enhanced Effects Management Package also addresses most of the concerns raised by DOC, Te Parawhau ki Tai and Patuharakeke, including those relating to release site capacity, pest control duration, monitoring and compensation triggers. I do not share the DOC and hapū view that relocation at the scale proposed is infeasible. It can be achieved through Project staging and appropriately resourced teams and will result in significant advances in the currently very limited understanding of Hochstetter's frogs, which in and of itself is a major benefit of the Project. In all other respects, I consider the Project’s effects on Hochstetter's frogs can and will be appropriately managed.

ASSESSMENT METHODOLOGY

16 I set out below my opinion on the assessment methodology adopted for the Terrestrial Assessment, in particular the:

16.1 Adequacy of the survey approach and extent;

16.2 Approach to estimating frog numbers potentially affected by the Project; and

16.3 Overall findings on the effects of the Project on frogs.

Survey approach

17 Overall, I consider the surveys undertaken and methodologies used to inform the Terrestrial Assessment were appropriate and in line with best practice, subject to two gaps in the survey extents identified below.

18 The assessment methods for effects on frogs (as outlined in the Terrestrial Assessment) included a desktop assessment, site walkovers, habitat assessments, daytime manual habitat searches (*MHSs*), and targeted 50 m frog survey transects. Although not discussed in detail in the Terrestrial Assessment, environmental DNA (*eDNA*) analyses for frog presence were also included as part of the assessment.

19 The Hochstetter's frog surveys and habitat assessments that informed the Terrestrial Assessment were undertaken by herpetologists and ecologists that I am satisfied are experienced with frog survey methodologies.

20 The frog survey methods were in line with best practice for surveying Hochstetter's frog. MHSs were carried out in streams assessed as high-medium, and low-quality frog habitat, so initial detection was not confined to streams expected to support frogs. Dedicated transect surveys then followed wherever frog presence was confirmed through the MHSs. Search effort was recorded, including search time and length of stream searched, which allows results to be compared between sites and standardised by effort.

21 In my opinion, targeted transect surveys represent an appropriate method to quantify relative abundance of Hochstetter's frog, providing a measure of the number of frogs detected per measurement of stream length.

22 I consider the initial survey effort to have been high, with 55 transects, 48.8 hours of person search time, and covering 2.8 km of stream length. This is equivalent to an average of 0.87 hrs (52.3 mins) per 50 m length of stream, which, in my opinion, is adequate survey effort to describe Hochstetter's frog relative abundance.

23 I agree with the assessment approach of standardising the length of stream searched (nominally 50 m transects) so that relative frog abundance can be compared between sites. This is good practice and consistent with published Hochstetter's frog surveys, which use fixed-length stream transects. Care is needed in the application of these methods to frog number assessments to avoid scaling to frogs per 100 m given that doing so assumes frogs are evenly spread along the stream, which is unlikely to be realistic. However, I consider the method nevertheless provides a sound and consistent basis for comparing sites.

24 I agree with the assessment criteria, as outlined in section 2.3.3 of the Terrestrial Assessment, for determining the value of frog habitat quality. The use of the double-observer protocol, with searches of the stream beds and banks (extending up to 2 m above or away from the water level) is a standard and industry accepted method for surveying for frogs.

25 In my opinion, spatial coverage of the frog surveys within the Proposed Designation was generally good. The surveys focused on the Indicative Alignment, which I consider is appropriate, although I acknowledge the alignment may change during detailed design. There are some gaps in the survey extents for the western extent of the Northern Release Site and large areas of the Central Release Site. Ordinarily, I would expect these areas to have been surveyed because both sites are proposed in the Terrestrial Assessment to be the frog release sites. Without survey data from them, the resident frog populations, and therefore the capacity of those sites to receive relocated frogs, cannot be assessed.

26 I understand these areas were not initially surveyed because the strategy for the Project was to allow flexibility in the final location of the release sites and that Mr Chapman’s intention was always that additional surveys would be undertaken of proposed release sites (ie the gaps would be closed) before any relocation commenced. I understand that approach shifted as a result of discussions with DOC and additional investigations have since been conducted, demonstrating there are candidate release sites that can receive frogs. Moreover, I understand from my own discussions with NZTA that NZTA is now proposing to formally offer and ‘lock in’ the Northern and Central Release Sites through the proposed conditions. However, I agree with Mr Chapman that release sites must be subject to site-specific assessment, management and capacity confirmation.

27 Overall, therefore I consider the survey design and effort undertaken in the Terrestrial Assessment and work undertaken subsequently was appropriate to provide a broad understanding of the relative abundance, distribution, and habitat quality for Hochstetter’s frog within the Proposed Designation.

Estimation of frog population numbers

28 The initial survey results indicated that the "Brynderwyn Ranges outstanding natural landscape" (*ONL*) identified in the Whangārei District Plan supported high numbers of frogs (relative abundance or linear density and average of up to 50 frogs per 100 m of stream), with one transect recording 60 frogs per 25 m of stream. This result is among the highest relative abundance of Hochstetter's frog I am aware of across any habitat in New Zealand.

29 The highest relative frog abundance recorded in pine forest (generally considered lower quality frog habitat) was 20 frogs per 50m length of stream. This abundance is high compared to previous studies, that have reported between 1–12 frogs per 50m length of stream in pine forests at Mahurangi, North Auckland[2,3] and at Dome Valley (Auckland Regional Landfill site). I do note that Burns & Oates (unpub data) reports relative frog abundances of up to 25 frogs/ 50m in pine forests at Torere in the Bay of Plenty region.

30 Using the results of the above surveys, Mr Chapman then used a multiplier to determine the number of frogs potentially present in the streams. The multiplier was based on empirical data from NZTA's Brynderwyns Emergency Works Recovery Project (a project that is explained in Mr Chapman's evidence), which showed that actual frog densities can be up to 8.2 times higher than those detected during pre-salvage surveys. In my opinion, this approach is sound and presents a conservative approach to determining the number of frogs potentially impacted by the Project and the assessment of effects.

Overall effects on frogs

31 I agree with Mr Chapman that the ecological value assignment for Hochstetter's frogs in the Project area is High. This reflects the value the Environment Institute of Australia and New Zealand's (*EIANZ*) Ecological Impact Assessment Guidelines (2nd edition)[4] assign to species with a threat classification of 'At Risk – Declining'.[5]

32 The Northland clade of Hochstetter's frog (*Leiopelma* aff. *hochstetteri* "Northland") is classified as 'At Risk – Declining' under criterion A(1). That criterion applies to the Northland clade population of 5,000–20,000 mature individuals (estimated here with

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2 Slaven, D. (1997). Management Strategy for *Leiopelma hochstetteri* in the Mahurangi Forest. Report prepared by Carter Holt Harvey for Auckland Council. 26 p.

3 Douglas, L. (1999). A study of two populations of Hochstetter's frog (*Leiopelma hochstetteri*) in pine forests at Mahurangi, north Auckland. 27 p.

4 Roper-Lindsay (2018) Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

5 Burns, R.J., Armstrong, D.P., Bell, B.D., Haigh, A., Germano, J., Rawlence, N.J., Thurley, T., Hitchmough, R.A., Makan, T., Michel, P. (2025). Conservation status of amphibians in Aotearoa New Zealand, 2024. New Zealand Threat Classification Series 44. Department of Conservation, Wellington. 19 p

low confidence) with a predicted decline of 10–30% over 10 years or three generations, whichever is longer. For Hochstetter's frog, three generations is about 30–35 years. The decline is attributed mainly to introduced mammalian predators, with floods, drought and climate change possibly contributing.[6]

33 The surveys described in the Terrestrial Assessment and in Mr Chapman's evidence suggest that frogs in the Brynderwyns may be more abundant than the NZTCS assessment assumed. I consider this suggestion plausible based on my review of the survey data and experience visiting streams in the Brynderwyns and surrounds.

34 Notwithstanding the fact that the Hochstetter's frog population appears to be substantially higher than was known when the threat classification status was applied, in my view, the Terrestrial Assessment's ecological value assessment was sound, and it also adequately identified the range of potential direct and indirect effects on frogs that may result from the Project.

35 The Terrestrial Assessment was undertaken on the basis that frogs occurring within Zentral Pine Plantation would be significantly reduced (up to 90% population loss) as a result of permitted forestry harvesting practice external to the Project and prior to its construction. I understand that forestry harvesting could be undertaken at any time by the forestry operator as a part of its permitted commercial operation and agree that forestry harvesting reduces Hochstetter's frogs numbers in affected streams. However, as pointed out in the Terrestrial Assessment, "actual declines are likely to be influenced by site-and project-specific factors such as harvest methodology and riparian protection" and it is possible that less than 90% of the frogs would be impacted due to forestry harvest. This outcome would mean more frogs could remain in the Project footprint than currently predicted and thus the impacts on the frogs would be higher than estimated. As such, I consider an assumption of 90% population loss due to forestry harvesting may be overstated which in turn may understate the remaining number of frogs impacted by the Project in commercial forest areas.

36 In any event, and irrespective of my view, the Terrestrial Assessment concluded that the unmitigated magnitude of effects of the Project on Hochstetter's frogs is High, and the overall unmitigated level of effects is Very High, both of which I agree with.

37 After mitigation, the Terrestrial Assessment concluded that the level of effects on frogs reduced to Low. While the Brynderwyns Emergency Works Recovery Project has shown continued frog presence and breeding following relocation (as set out in Mr Chapman's evidence), the evidence base for Hochstetter's frog relocation remains limited, and relocation success is difficult to demonstrate because of the cryptic nature of the species. I

[6] https://nztcs.org.nz/assessments/170262

therefore take a more conservative approach than is set out in the Terrestrial Assessment and consider that the residual effects on frogs (as with frog habitat below) are likely to be High. As a result, I consider the residual effects management is required to address those effects on frogs. I go on to discuss the NZTA's proposed effects management package (including the various enhancements I have recommended) as it relates to frogs below.

Overall effects on frog habitat

38 The Terrestrial Assessment concluded that the unmitigated level of effect resulting from the permanent loss of 14.2 km of stream where Hochstetter's frog are recorded is Very High, and that the unmitigated level of effect on frog habitat fragmentation is also Very High. I agree with these assessments.

39 After mitigation, the Terrestrial Assessment assessed the overall level of effect on frog habitat and habitat fragmentation was considered to reduce to High. I agree with this assessment because the proposed mitigation will only partially address the effects on Hochstetter's frog habitat (ie. a High level of residual effect on frog habitat will remain after these mitigation measures).

40 Notwithstanding the reduction in the level of effect on frog habitat to High, I consider that the residual effects of habitat loss and fragmentation remain and that residual effects management is required to address those effects. I discuss NZTA's proposed effects management package (including the various enhancements I have recommended) below.

EFFECTS ON FROGS AND FROG HABITAT

Absolute avoidance is not possible

41 I acknowledge that, given the location of the Proposed Designation, the extent of surveyed frog populations and habitat within that location and adjacent to it (as discussed below), and the inherent challenges in mitigating frog and frog habitat effects, the Project cannot avoid all effects on Hochstetter's frog and/or its habitat. I do not consider full avoidance is possible for the Project.

42 I also do not consider full avoidance is necessary or appropriate given the array of effects management options that are available to include in the enhanced effects management package that I outline below. That package includes various effective minimisation measures, as well as what I consider to be available and appropriate compensation measures.

43 The potential lack of certainty regarding the success of some mitigation measures (specifically salvage and relocation) is principally a function of the very limited scientific knowledge about Hochstetter's frog. For the reasons set out below, I am confident that this Project and its effects management measures will substantially advance scientific knowledge about the Hochstetter's

frog. Given the considerable population size identified within the wider Brynderwyn Hills area (identified due to NZTA's surveying efforts) I am confident that a well-designed effects management package can address uncertainties and advance scientific understanding for the benefit of the Hochstetter's frog.

44 I consider that the aim of any effects management package in a Wildlife Permit context should be to achieve an appropriate outcome for the species and their habitat. This outcome does not necessarily require total avoidance, though avoidance measures will form part of the effects management package (eg. some areas of high-value frog habitat will be avoided through detailed design). In the present case, I consider a no net loss goal for Hochstetter's frog populations and their habitat within the Brynderwyn sub-population of the Northland clade is an appropriate goal. It is with this goal in mind that Mr Chapman and I have collaborated to design what I consider is an appropriate effects management package, which I recommend to support the grant of approvals to the Project.

Summary of mitigation recommended in the Terrestrial Assessment

45 I have reviewed the recommended mitigation in the Terrestrial Assessment (Section 5) as it relates to Hochstetter's frogs. I set out below my views on the type and appropriateness of the mitigation proposed to manage effects on frogs.

46 I understand that some areas of high-value frog habitat may be avoided through detailed design. However, the exact extent of this avoidance cannot be quantified until the final alignment and design of the Project has been completed, and because frogs occur at high numbers throughout large sections of the Proposed Designation, avoiding isolated areas may do little to reduce the Project's overall effects on the species at a population level.

47 The Terrestrial Assessment proposes several mitigation actions for effects on Hochstetter's frogs and habitat. I consider these to be classed as minimisation or rehabilitation measures. These measures include:

47.1 For frogs, minimising potential impacts on frogs by:

(a) Minimising potential impacts from sediment and other contaminants through controls on earthworks;

(b) Salvaging (capturing or recovering) frogs from affected streams and relocating them to suitable release sites elsewhere in the Proposed Designation where habitat will be enhanced (replanted, supplemented with frog refuges), subject to pest control and fencing and protected from future development-related effects through covenants and/or encumbrances (see further

comments on the appropriateness of the release sites below).

47.2 For frog habitat:

(a) minimising the loss of native vegetation and native fauna species habitat, where practicable, through detailed design and construction methodology;

(b) rehabilitation through enhancement and protection of riparian vegetation at the Northern and Central Release Sites; and

(c) reducing fragmentation and edge effects at the North and Central Release Site through riparian habitat enhancement.

Mitigation for effects on frogs

48 I agree that minimising effects from earthworks and other activities on sediment and contaminants affecting frogs is an appropriate effects management measure. I recommend that this is reflected in conditions such that, so far as is practicable:

48.1 Spoil disposal within the ONL and into other high value frog streams is avoided;

48.2 Stormwater runoff is managed so as to not affect frogs and frog habitat in streams adjacent to the Project area, and

48.3 Culvert designs consider frog movement potential and limit fragmentation effects.

49 I also strongly support salvage and relocation as the most appropriate measure to reduce effects on frogs. To ensure salvage and relocation has the greatest possible likelihood of success, the programme needs to be carefully designed. Consequently, as discussed below, Mr Chapman and I have worked closely together on the Enhanced Effects Management Package to design salvage and relocation measures that I consider improves on previous Hochstetter's frog relocation practice and contributes to the management of the Project's effects on frogs, recognising uncertainty of relocation outcomes remain.

Mitigation for effects on habitat

50 Recommended mitigation for effects on frog habitat (ie., loss or fragmentation of frog habitat) includes measures such as habitat protection and enhancement, particularly of riparian vegetation, at two of the three release sites identified in the Terrestrial Assessment.

51 I agree that these measures will contribute to improving habitat condition for Hochstetter's frogs at these sites, specifically through

the land protection measures, stock exclusion, and riparian enhancements and protections, which can reduce sediment inputs and maintain higher stream habitat conditions for frogs.

Overall view

52 Overall, I consider the proposed mitigation measures to be appropriate for the Project. That is, I agree that the effects mitigation proposed appropriately focus on the salvage and relocation of frogs to protected and managed sites outside of the impact footprint, and habitat protection and restoration measures to protect and enhance frog populations and frog habitat in the surrounding landscape.

53 However, considering the uncertainty surrounding some of these mitigation measures (notably the unknown outcomes and difficulty measuring success of relocations), I consider there to be residual effects on frogs and their habitat. Consequently, I consider that additional requirements should be incorporated in an Enhanced Effects Management Package.

ENHANCED EFFECTS MANAGEMENT PACKAGE

54 Given my views above, I have worked with Mr Chapman to develop the Enhanced Effects Management Package. The Package deliberately takes a precautionary approach to managing the effects of the Project on frogs and frog habitat.

55 I recommend this approach because although relocation may help minimise harm to individual frogs during construction, outcomes remain uncertain. Consequently, I recommend further effects management measures to address uncertain/potential residual effects on frogs and frog habitat.

56 My recommended Enhanced Effects Management Package, therefore, includes:

56.1 Salvage and relocation of Hochstetter's frogs to the highest practicable standard, implementing the recommendations set out above and below, to minimise harm to individual frogs during construction; and

56.2 A two-part compensation package for residual effects, comprising:

(a) Up-front compensation in the form of new, protected and enhanced frog habitat areas, delivered before works affect frog habitat and regardless of whether relocation succeeds; and

(b) Contingent compensation, assessed and released at set intervals and stages, if post-relocation monitoring shows that relocation has not succeeded.

57 More specifically, I recommend an Enhanced Effects Management Package that involves the following:

57.1 Salvage and relocation of all frogs affected by the Project;

57.2 Relocation of all affected frogs to the best available release sites for frogs, each of which having been assessed and identified following the application of specific release site selection criteria and supported by professional judgement of a suitably qualified and experienced person (*SQEP*);

57.3 Application of habitat enhancement measures at all frog release sites, including the relocation of supplementary rock refuges, woody debris piles, and leaf litter packs;

57.4 Provision of in perpetuity land protection mechanisms at all frog release sites, where not already in place;

57.5 Provision of pre- and post-relocation mammalian pest control at all frog release sites, with the type and duration of pest control aligning with Hochstetter's frog habitat quality and life history characteristics and demonstrating pest control targets are adequately met (as opposed to generic pest control operations and arbitrary durations);

57.6 Post-release monitoring of Hochstetter's frogs using methods that allow for the determination of relocation success and for a duration that allows relocation success to be determined. This monitoring will identify whether populations have reached pre-Project levels and therefore inform the ongoing need to continue pest control measures; and

57.7 A two-part compensation framework that includes:

(a) an **upfront component**, committed regardless of success or otherwise of frog relocation efforts, that comprises two aspects being (i) permanent improvements to address the permanent loss and fragmentation of frog habitat and (ii) measures that will address effects frogs directly, by delivering measurable gains in survival and recruitment in existing populations of the Brynderwyn subpopulation outside the Proposed Designation footprint; and

(b) a **contingent scalable component**, triggered in the event the frog relocation programme is unsuccessful and scaled proportionally to the scale of any shortfall that programme-level monitoring identifies.

58 Mr Chapman's evidence outlines the additional investigation and assessment work (undertaken in response to initial feedback and formal comments from DOC and hapū) which has been relied on to

develop the above Enhanced Effects Management Package. In the sections immediately below, I address aspects of the Package that have been revised to address mitigation measures particularly related to the frog release sites, translocation criteria and post relocation monitoring, and ultimately the compensation measures proposed to address the reduced but unavoidable and inevitable residual effects on frogs.

Salvage methods

59 I have reviewed and agree with the Project's proposed frog salvage measures (as set out in the Draft Ecological Management Plan), including the methods, effort, and hygiene protocols.

60 In addition, I recommend the salvage methods specifically provide for the collection of leaf litter and debris from debris dams and stream sides.

61 I consider the careful collection and relocation of leaf litter packs and debris from debris dams and stream sides will improve the success of the frog salvage. Leaf litter and debris may contain young (recently metamorphosed froglets) that would otherwise be very difficult to detect and likely missed during salvage activities. Furthermore, the leaf litter packs will carry invertebrate food items and provide supplementary refuge for frogs at the relocation site.

62 I also recommend that searches during the salvage operation target stream-bank seep habitats where Hochstetter's frogs frequently lay their eggs. The frog survey work undertaken as part of this Project has developed methods that frequently and successfully detect egg laying sites. I recommend that these methods be used to salvage and relocate eggs, tadpoles, and froglets to minimise potential effects as far as practicable.

Suitability of frog release sites

63 In this section, I:

63.1 Provide a brief overview of the proposed (at lodgement) frog release sites and the appropriateness of these sites (ie., the Northern and Central Release Sites);

63.2 Outline my views on the pre-lodgement/ Terrestrial Assessment's frog release site selection process; and

63.3 Comment on the process taken since lodgement to develop relevant aspects of the Enhanced Effects Management Package which:

(a) Increases confidence in the suitability of the proposed Release Sites, and

(b) Provides for potential additional release sites.

Improvements to outcomes at the initial proposed release sites (at lodgement)

64 At the time of lodgement, two main frog relocation sites were identified: the Northern and Central Release Sites. A third release site, the Southern Release Site, was assessed for frog habitat as part of the Terrestrial Assessment but was not considered appropriate due to underlying geology potentially influencing pH levels within streams, which could make them unsuitable habitat for frogs.

65 General summaries of the Northern and Central Release Sites (as more fully described and assessed in the Terrestrial Assessment) are provided below:

65.1 The Northern Release Site contains approximately 7.7 km of "Moderate" quality stream habitat in Kauri-podocarp and broadleaf-podocarp forests that is considered suitable for frog relocations. Two 50 m lengths of stream were specifically surveyed for frogs at the Northern Release Site. These stream sections support suitable frog habitat and relatively abundant populations of resident frogs (1–10 frogs per 50 m stream length).

65.2 The Central Release Site predominantly supports existing rotational pine forestry, with small, scattered pockets of indigenous forest. Two main sub-catchments contain ephemeral, intermittent and perennial streams, which support existing low density populations of Hochstetter's frog. The proposal is to release frogs into suitable habitat streams in a staged manner, progressively from south to north.

66 At the Northern Release Site, ecological enhancement, including legal land protection, stock-exclusion, provision of supplementary rocks and frog refuges, and mammalian predator control (at least three months prior to, and for three years following release), was proposed to benefit frogs.

67 At the Central Release Site, forestry clearance setbacks (10 m) from frog streams, erosion and sediment controls, habitat enhancement provisions, if identified as necessary during pre-release surveys, and mammalian predator control (at least three months prior to, and for three years following release), was proposed to benefit frogs.

68 In my view the general methods employed to select the potential frog release sites were appropriate, combining habitat suitability assessments (which included habitat quality categorisation) with in-stream surveys to detect and quantify relative frog abundance for frogs.

69 As noted above, I consider that survey effort for frogs within the core of the Central Release Site was low. Survey effort appears to have been focused along the western boundary of the site within the

Indicative Alignment, and a single survey transect at the eastern extent. While some assumptions of frog presence and distribution within pine forest habitats may be appropriate, verification is necessary before this area can be considered as a release site. Therefore, I recommended that, before any site (including the Central Release Site) is considered for, or used as, a relocation site, it is subject to detailed site-specific surveys and assessment against clear relocation site assessment criteria.

70 I generally agree with the Terrestrial Assessment's proposed habitat protection and enhancement measures at the frog release sites and expect they will deliver benefits for both released and resident frogs. However, I have recommended the following improvements as part of the Enhanced Effects Management Package:

70.1 *Exclusion of harvest in preference for a 10 m setback in pine forest*: The Terrestrial Assessment provided for commercial forestry harvest activities/works to be subject to a 10 m setback from all Hochstetter's frog habitat within the sub catchment, with the setback applying to all habitat, including ephemeral, intermittent, and headwater streams. In my opinion, this 10 m setback is inadequate to provide necessary protections for frogs from sediment inputs, debris, and other potential contaminants entering pine forest streams during felling. I consider that continued forestry operations around the frog relocation streams, even with the recommended 10 m stream setbacks, would compromise the long-term quality and quantity of available frog habitat at the Central Release Site. I therefore recommended the cessation of harvest activities in any relocation site and advised NZTA that if rotational harvesting were discontinued, my concerns about the long-term security of the frog population would be addressed. I understand that NZTA has taken up that recommendation and NZTA's proposal now provides for no harvesting to occur within the Central Release Site (or indeed any other release site within pine forest that is to be used). I consider this to be a material benefit of the Project for frogs, noting that without the Project, the setback of harvest works would be determined by only a 5 m standard setback (being the permitted setback under the Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2017); and

70.2 *Extended mammalian predator control*: The Terrestrial Assessment proposed pest control for "at least three months prior to, and for three years following release". I consider the three-month pre-release period to be sufficient to reduce pest mammal numbers at the frog release sites. However, I consider that a longer period of mammalian predator control and monitoring at release sites following release is needed. A five-year control period would provide short-term, temporary benefits for frogs during the post-release establishment stage

> but may be insufficient to sustain frog populations at the release streams above their pre-release densities over the longer term. I consider the pest control programme should be designed and implemented to achieve pest control targets that deliver measurable positive outcomes for Hochstetter's frog based on their specific ecological/life cycle factors. I recommend at least 11 years of mammalian predator control following release to cover both the frog establishment phase and at least one generation length for Hochstetter's frogs.

71 I consider this is an appropriate enhancement in the proposed mitigation and I understand that NZTA is considering this recommendation, subject to further consideration regarding end point for mammalian predator controls.

72 Overall, with the above recommended modifications, I support both the Northern Release Site and the Central Release Site as effective frog release sites and recommend that these sites are included in the Enhanced Effects Management Package.

73 I also recommend that the actual number of released frogs into any release sites (including the Northern and the Central Release Sites) should be commensurate to the quality and extent of habitat available in each stream reach at the relevant site, and the existing and expected carrying capacity of the site must be considered before frogs are released.

74 I understand NZTA's proposal is that the extent and suitability of the release sites will be confirmed following detailed design prior to release of any frogs into the sites and that further work has been undertaken since lodgement to confirm suitability of existing/ additional release sites. I support this approach, as detailed further in my comments below.

Post-lodgement work to improve confidence in successful outcomes for frogs

75 As outlined in Mr Chapman's evidence, in response to feedback from DOC and hapū in relation to NZTA's proposed frog management approach, NZTA undertook additional work to supplement the information about the proposed Release Sites and improve confidence in the success of the proposed frog relocation process.

76 Since lodgement, I have discussed the suitability of the release sites proposed in the Terrestrial Assessment for receiving the high numbers of salvaged frogs with Mr Chapman. Together, we have agreed that further information on both the currently proposed and identified potential additional release sites (discussed in Mr Chapman's evidence and addressed below) is desired to improve confidence in the outcome of frog relocations.

77 Mr Chapman and I worked on various enhancements of the frog relocation programme to enhance its likelihood of success. We have

considered a range of matters including release site selection, monitoring successful outcomes at release sites, and measures to improve confidence around the distribution and relative abundance of the Northland Clade (Brynderwyns subpopulation) frogs. These matters are discussed in the sections that follow and they are included in my recommended Enhanced Effects Management Package.

78 Mr Chapman has developed a "release site suitability assessment" method for assessing the quality of frog habitat at potential release sites, using a range of environmental measurements, including the physical characteristics of streams and water quality. In my view, the method is thorough and appropriate, and I recommended that it be incorporated in the Enhanced Effects Management Package. I understand that NZTA's has accepted this recommendation and intends to require any proposed relocation/ release site to have been assessed pursuant to the release site suitability assessment before it can be recommended or used as a release site. I consider that the use of this method will allow habitat quality at the potential release sites to be assessed more consistently and in more detail and will improve understanding of the suitability of those sites for Hochstetter's frog.

79 The release site suitability assessment provides a useful foundation for defining acceptable receiving-environment conditions for Hochstetter's frog. It establishes reference ranges for ecological parameters that are likely to be important to frogs, which can be used to screen the suitability of future release sites. However, the relationship between these parameters (physical stream characteristics and water quality) and frog occurrence and density has not been tested. The reference ranges therefore provide useful context but cannot be relied on alone. In my opinion, the final selection of release sites will need to rely on the expert view of a SQEP, with Hochstetter's frog expertise, and be informed by frog surveys at each candidate site.

80 I also recommend that the release site selection process consider potential future effects on streams that may arise as a result of the Project. For example, sedimentation risk in the Northern release site should be considered given that some streams are downstream of proposed spoil disposal areas. Preference should also be given to release sites that occur in native-dominated forest and, where plantation forestry release sites are required, forestry operations at those sites should be discontinued.

81 In addition to the Northern and Central Release Sites discussed above, I worked with Mr Chapman to select a list of six general areas containing eight additional sites, to undertake frog surveys as part of the post-lodgement work. These sites were selected to:

81.1 Provide additional information on the distribution and relative abundance of Hochstetter's frog in the landscape surrounding the Proposed Designation;

81.2 Demonstrate that the Proposed Designation will not affect the highest-quality Hochstetter's frog population within the Brynderwyn subpopulation, and

81.3 Identify additional potential frog release sites, including sites currently supporting resident frogs and/ or those without frogs but where suitable frog habitat is present.

82 The additional areas and sites include:

82.1 AHI Group Limited (private land) (1 site);

82.2 Waipu Gorge Forest DOC conservation land (state forest) (1 site);

82.3 Brynderwyn Reserve East of SH1 Brynderwyn hills - DOC conservation land (2 sites);

82.4 Marunui Conservation Limited (2 sites);

82.5 Brynderwyn Reserve West of SH1 Brynderwyn hills - DOC conservation land (1 site); and

82.6 Pukekaroro Reserve (1 site).

83 All sites were visited by experienced ecologists and kaitiaki between 30 September and 5 October 2026.

84 The additional surveys found Hochstetter's frogs across the wider landscape beyond the Proposed Designation. Frogs were found in all six areas and at all eight sites surveyed.[7] They were also recorded at Pukekaroro, beyond the extent of existing occurrence records. This suggests that the distribution and population size of the Brynderwyn subpopulation, and the Northland clade, may be larger than existing records indicate.

85 The surveys also showed that high-quality frog habitat occurs at many sites within the wider Brynderwyn area. The AHI site in particular, which shares connections with the ONL and is located approximately 1.5 km to the west, supports high-quality frog habitat, has high frog abundance (72 frogs/ 100 m), and evidence of breeding (including three egg string clusters, larvae/ tadpoles, and froglets) was recorded within the 50 m survey reach.

86 Surveys to the east and west, but outside of the Proposed Designation, found frogs to be abundant (eg., 22–72 frogs/ 100 m)

[7] WSP (2026). Frog survey technical memo.

indicating that any potential shift in the alignment would not result in the avoidance of frog populations, nor would a re-alignment reduce (and could potentially increase) the potential impacts on frogs because frog populations are abundant throughout all areas of the Brynderwyn Range.

Frog translocation criteria

87 To determine whether the Project's proposed methods for translocation could be enhanced, I assessed the methods against the International Union for Conservation of Nature's (IUCN) guidelines for reintroductions and other conservation translocations.[8] These guidelines include criteria for the success of relocations, being:

87.1 Clear justification for the relocation;

87.2 Rigorous pre-release assessments to confirm the suitability of release sites;

87.3 The elimination or management of threats to the species; and

87.4 Monitoring and adaptive management.

88 In my opinion the Project has gone some way to meeting these criteria, including:

88.1 Outlining a clear reason for the relocation: As outlined above, pre- and post-lodgement surveys have demonstrated that there are high numbers of frogs across a range of different habitats in the Brynderwyn Hills area (both inside and outside of the Proposed Designation). As such, impacts on frogs cannot be avoided and relocation is required to minimise effects.

88.2 Suitability of release sites: I consider the frog release site assessment framework discussed above, provides a useful foundation for defining acceptable receiving-environment conditions for Hochstetter's frog. Adopting this framework, with input from a SQEP, would provide a rigorous assessment for confirming suitable release sites.

88.3 Threat elimination: I consider, the proposed (and enhanced) mammalian predator control discussed above, along with other habitat protection and enhancements (mentioned in my comments above and below), will manage threats to frogs at relocation sites.

[8] IUCN/SSC (2013). *Guidelines for Reintroductions and Other Conservation. Translocations. Version 1.0*. Gland, Switzerland: IUCN Species Survival Commission, viiii + 57 pp.

88.4 Monitoring and adaptive management: Monitoring of relocated and resident frogs in release streams is proposed to determine the outcomes of the relocations. The compensation package proposed also provides for further measures which respond to the outcomes of that monitoring (i.e. if monitoring shows relocation is unsuccessful, further compensation is triggered).

89 Overall, I consider the Project's proposed frog relocation measures align well with the IUCN guidelines, and I consider that Hochstetter's frogs can be successfully relocated.

90 However, in my view, to ensure the highest probability of relocation success, I recommend that all frog release sites should:

90.1 Support medium/ moderate to high-quality frog habitat (as defined in Table 2, p. 12 of the Terrestrial Assessment);

90.2 Preferentially, but not exclusively, occur in native forest-dominated environments (recognising my advice, which NZTA has accepted, regarding discontinuing rotational harvesting if release sites occur in pine forest habitats);

90.3 Be subject to a range of management measures (which are set out below) that not only enhance frog habitat but also protect and ensure persistence of frog populations; and

90.4 Be subject to post-release monitoring to describe the outcome.

91 I also recommend the following minimum management measures should be applied to all release sites:

91.1 Provision for 'in perpetuity' legal protection mechanisms of all frog relocation sites;

91.2 Fencing around all frog release sites that prevent stock and pig ingress, and long-term maintenance of these fences;

91.3 Extended mammalian predator control, including rodents, for the following periods discussed above necessary to achieve desired pest target levels (generally <5% tracking rates) three months prior to release and at least 11 years following release to cover both the frog establishment phase and at least one generation length for Hochstetter's frogs[9,10];

[9] Generation length as the defined by the IUCN is "the average age of parents of the current cohort (i.e., newborn individuals in the population)". Effectively, it is the time it takes for a hatchling to grow up and replace its parent.

[10] Hochstetter's frog generation length is approximately 11 years. https://nztcs.org.nz/assessments/21482

91.4 Habitat enhancement measures including the placement of rocks[11] and other suitable microhabitat (eg., leaf litter and woody debris) at frog release sites; and

91.5 Monitoring of the relocated frog populations for at least 11 years to align with one generation length for Hochstetter's frog. My recommendations for potential monitoring techniques are set out below.

92 I understand that NZTA is supportive of most of the above recommendations but is considering appropriate conditions related to the timing/end point of mammalian pest control.

93 Another important consideration in assessing the suitability of release sites is carrying capacity. Carrying capacity is the maximum number of individuals of a species that an environment can sustain over time without degrading the habitat or resources on which that species depends. Where a recipient population is already at or near carrying capacity, the addition of individuals is unlikely to increase population size. Instead, surplus animals (i.e. animal numbers exceeding the carrying capacity) would be expected to die, disperse or displace resident frogs, giving no net benefit and potentially harming the resident population. The capacity of a release site to absorb additional frogs is therefore a fundamental consideration determining the success of a relocation.

94 It is my opinion that Hochstetter's frog populations on mainland New Zealand are likely to be held below the carrying capacity wherever introduced mammalian predators are present and where other unnatural pressures occur (eg., habitat degradation due to plantation harvest, stock access, human-altered water quality).

95 Reducing or removing these pressures, as is already proposed for the frog release sites, is in my view a practical way of creating additional carrying capacity at those sites. In particular, suppressing introduced mammalian predators is likely to create headroom into which frog populations can grow. I base this view on evidence that a suite of mammals are known to prey on Hochstetter's frogs[12] and sites where mammalian predators have been suppressed typically

[11] As outlined in the Draft EMP (pg. 32), Hochstetter's frogs were found under 18% of rocks deployed at relocation sites approximately one month after their relocation during the Brynderwyn Hills Recovery project salvage and relocation.

[12] Thurley, T., & Bell, B. D. (1994). Habitat distribution and predation on a western population of terrestrial Leiopelma (Anura: Leiopelmatidae) in the northern King Country, New Zealand. New Zealand journal of zoology, 21(4), 431-436; Egeter, et al. (2015). Detecting frogs as prey in the diets of introduced mammals: A comparison between morphological and DNA-based diet analyses. Molecular Ecology Resources, 15(2), 306-316; Egeter et al (2019). Using molecular diet analysis to inform invasive species management: A case study of introduced rats consuming endemic New Zealand frogs. *Ecology and Evolution*, *9*(9), 5032-5048.

support higher frog abundances.[13] For that headroom to be available to released frogs in the release sites, predator suppression would need to be in place and meeting its targets before any release of frogs into those sites. In my opinion, this pest control should be maintained for at least the frog establishment phase and at least one generation length for Hochstetter's frog.

96 In my opinion, it is necessary to estimate how much additional capacity (headroom) predator control will create at each proposed release site. That estimate should be based on the observed response of frog densities to predator control at other sites (eg. up to four-fold increases have been shown)[14] and measured against pre-release baseline surveys and habitat assessments. It indicates how many frogs each stream can receive without exceeding its capacity. Exceeding capacity could harm resident frogs through competition for refuges and food and through disruption of established home ranges and would leave no room for the resident population's own growth.

97 I also recommend that a precautionary cap on the number of frogs released into each stream is established prior to any frog releases. This cap may represent no more than 25% of the resident population, estimated from detection-corrected pre-release surveys (ie., factoring in the 8.2 x multiplier described in the Terrestrial Assessment). This would ensure that release numbers align with natural population densities expected under the applied management regimes (eg. pest control and habitat enhancement).

98 In setting release numbers, consideration should also be given to the number of released frogs needed to be detectable in post-release monitoring, but capacity should take precedence (see my comments on genetic monitoring below). Release sites should also be at least 500 m from the source population, to reduce the risk of homing identified by Wren *et al*. (2023).[15]

Portfolio approach to release sites

99 I agree with Mr Chapman that a portfolio of release sites should be used for relocation of frogs. I consider that, in addition to the suitable release sites identified above, other release sites could be added to the portfolio, provided they are assessed against objective criteria and determined to be suitable by a SQEP.

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13 Longson, et al. (2017). Rapid recovery of a population of the cryptic and evolutionarily distinct Hochstetter's Frog, Leiopelma hochstetteri, in a pest-free environment. Ecological Management & Restoration, 18(1), 26-31.

14 Longson, et al. (2017). Rapid recovery of a population of the cryptic and evolutionarily distinct Hochstetter's Frog, *Leiopelma hochstetteri*, in a pest-free environment. *Ecological Management & Restoration*, 18(1), 26-31.

15 Wren, S., Bishop, P. J., Beauchamp, A. J., Bell, B. D., Bell, E., Cisternas, J., ... & Germano, J. M. (2023). A review of New Zealand native frog translocations. *New Zealand Journal of Ecology*, 47(2), 1-22.

100 I agree with Mr Chapman that the suitability of all proposed release sites, and required habitat treatments, should be confirmed prior to any frog release. I consider the release site assessment framework and criteria developed by Mr Chapman and included in the Enhanced Effects Management Package is appropriate for this exercise, noting that the criteria include my recommended requirements for frog release sites noted above.

101 I agree that the habitat treatments required at each release site can be determined by a SQEP.

102 I also agree that the carrying capacity of each release site can be estimated from existing relative abundance measures and from predicted population growth in response to management of the release streams.

Determining the success of frog relocations

103 Determining the success of frog relocations is a crucial step in assessing whether the proposed mitigation is effective and guiding adaptive management or compensation if it is not. Consideration needs to be given to appropriate methods and timeframes to measure success to ensure desired outcomes are adequately achieved and in an appropriate time.

104 Using traditional methods such as capture-mark-recapture (assuming frogs are individually marked) and population monitoring, determining translocation success will take decades for species like Hochstetter's frog,[16] due to:

104.1 Relatively slow rates of reproduction;

104.2 Cryptic (secretive) nature of the frogs which inherently reduces the ability to detect/ recapture relocated individuals; and

104.3 Long lifespans, which means that even if relocated adults continue to be recorded for many years after release, they may never breed. Finding relocated adults alone is not evidence that a population has established.

105 Using novel or unconventional methods for measuring success such as genetic monitoring could potentially reduce the monitoring timeframes substantially, eg., to under a decade. While these methods are novel, pilot work can be undertaken to ensure their validity. I have provided more discussion on genetic monitoring below.

[16] Wren *et al.* (2023) recommended post-release monitoring for more than 25 years for long-lived, slow-reproducing species such as *Leiopelma* frogs.

106 Measuring the success of a translocation is comparatively straightforward where animals are released into a site where the species does not already occur.

107 However, when animals are released into an existing population (augmentation or population reinforcement) where they cannot be differentiated from residents, it is difficult to determine success. This scenario appears relatively likely for the Project, given the high frog population densities and wide spatial extent of frog populations in the release areas.

108 Ultimately, the goals of augmentation differ from those of typical relocations in that they aim to increase overall population size, restore or boost genetic diversity, and/ or boost specific demographic groups (breeding-age females). Establishing these contributions with certainty is complex.

109 I outline potential options available for measuring success of relocations (including augmentation and population reinforcement) of Hochstetter's frogs below:

109.1 Relative abundance using a BACI design: Success can be measured as an increase in the relative abundance of frogs at release sites, and, importantly, maintenance of elevated abundance over time. This is best achieved through a before–after–control–impact (*BACI*) design, in which each release stream is paired with a comparable control stream that receives the same management (eg., pest control) but no relocated frogs. If the release-site population persists and maintains a higher relative abundance than the control population, this indicates that relocated frogs have contributed to the resident population, for example through increased breeding. The monitoring should be designed in collaboration with a biostatistician to ensure there is enough statistical power to detect meaningful differences between release and control sites.

109.2 Demographic measures: Monitoring can also track changes in population structure at release sites relative to control sites, for example an increase in the proportion of breeding females or higher recruitment of juveniles in the years following release. Together with abundance, these measures provide supporting evidence of successful establishment.

109.3 Matching release and control sites: The strength of these methods depends on how closely control sites match release sites. Both should receive the same management, such as pest control and habitat protection, and have comparable habitat quality, so that the release of frogs is the main difference between them. Careful selection of control sites is therefore an important part of the monitoring design.

109.4 Individual genotyping: Genetic monitoring adds a further, more direct line of evidence. It can show whether relocated frogs are breeding with resident frogs and contributing to the breeding population, and whether genetic diversity at release sites increases as a result. NZTA's proposed genetic monitoring involves taking a mouth swab from each relocated frog before release and genotyping a substantial proportion of the resident population at each release site. Frogs recaptured in later surveys, and their offspring, can then be matched to released individuals by genotype or parentage. Where relocated frogs or their offspring are found persisting in the population, this provides direct evidence that the relocation has been at least partially successful. This is a resource-intensive approach, given the number of frogs likely to be relocated and the sampling effort needed in later years, but it gives the most robust measure of relocation success currently available and would significantly advance scientific understanding of frog populations.

109.5 Pre-relocation genetic survey: Before genetic monitoring begins, source and recipient populations can be sampled to establish their genetic profiles. This confirms which markers will be most informative and, where the populations differ genetically (for example, through private alleles), allows relocated and resident frogs to be distinguished at the population level as well as individually. Some frogs, particularly small individuals, may be too small to swab safely. The protocol should therefore set out how these frogs will be handled, and the analysis should take into account the proportion of frogs that are not genotyped.

109.6 Sampling intensity: A reduced-effort version, in which only a sub-sample of relocated frogs is genotyped, is possible. However, the fewer frogs that are genotyped, the lower the chance of re-detecting them in later surveys. In my opinion, the genotyping and follow-up sampling effort should be set through a power analysis[17] before relocation begins, so that the programme can reliably estimate establishment.

110 In my opinion the above methods are collectively capable of supporting assessments of the success of the relocation programme. A combination of the methods (genetic monitoring used alongside the BACI and demographic monitoring methods) will further increase confidence in the ability to measure relocation success.

111 I also recommend that a biostatistician be involved in designing the monitoring programme and analysing the data. This will help ensure the monitoring has sufficient statistical power and rigour, and that

[17] A power analysis is a statistical calculation used to determine the minimum sample size required for a study or experiment so that it has an adequate probability of detecting a true effect.

the data collected can answer the questions it is intended to address.

112 I consider that the above methods should be used to measure the success of the relocation programme at defined points following relocation (e.g. at year 1, 3, 6, and 11 post relocation) with the results of such success assessments being recorded and reported as set out below.

113 I consider there to be substantial benefits from undertaking carefully designed and well monitored Hochstetter's frog relocations, even if outcomes are not completely successful. Knowledge gained from relocation and monitoring would make a significant contribution to the understanding of future Hochstetter's frog management.

Reporting on success and ongoing monitoring

114 I recommend a report be prepared by a SQEP, with input on statistical analyses from a biostatistician, within 6 months of each of the defined monitoring points. These reports will outline the results of the post-relocation monitoring and assess the outcome of the relocations based on established translocation criteria[18]. The success of relocations will be reported to DOC and hapū, and these reports will also outline any compensation triggered as a result of any unsuccessful relocation outcomes (see my comments on Compensation Framework below).

Compensation Framework:

115 As mentioned above, my recommended Enhanced Effects Management Package includes a frog salvage and relocation programme to minimise effects and a compensation framework to address residual effects and any unexpected outcomes of relocations. Here I outline my recommended proposed compensation framework which has been designed to achieve a precautionary 'no net loss' goal which I set out at the outset of this evidence.

116 My precautionary recommended compensation framework comprises two-parts:

116.1 An **upfront component**, which is required to be provided regardless of the success or otherwise of frog relocation efforts, which comprises two aspects being:

(a) Measures to address the permanent loss and fragmentation of frog habitat; and

[18] IUCN Guidelines for reintroductions and other conservation translocations; Wren, S., Bishop, P. J., Beauchamp, A. J., Bell, B. D., Bell, E., Cisternas, J., ... & Germano, J. M. (2023). A review of New Zealand native frog translocations. *New Zealand Journal of Ecology*, 47(2), 1-22.

(b) Measures that will address effects on frogs directly, by delivering measurable gains in survival and recruitment in existing populations of the Brynderwyn subpopulation outside the Proposed Designation footprint; and

116.2 A **contingent scalable capped component**, triggered in the event the frog relocation programme is unsuccessful and scaled proportionally up to a population-based cap to the scale of any shortfall that programme-level monitoring identifies.

117 Each of these components of the compensation package are addressed below.

Upfront compensation

118 The upfront element of the compensation package means the effects management package is "front-loaded". By this I mean it includes a component that is delivered regardless of whether the relocation programme succeeds, and that is defined, secured and underway before construction affects frog habitat. Because the outcome for frogs does not depend on relocation succeeding, this gives a high degree of confidence that the package will achieve positive outcomes for Hochstetter's frogs and their habitat in the Brynderwyns subpopulation of the Northland clade.

119 The upfront compensation package will include:

119.1 Protection of frog values, through in perpetuity land protection, where the land and its watercourses support existing Hochstetter's frog populations.

119.2 The land parcel(s) should occur in the wider Brynderwyns area to encapsulate frogs that are part of the Brynderwyns subpopulation.

119.3 The protected areas should support the equivalent length of watercourse (including permanent, intermittent, ephemeral, and seepages) lost as part of the Project, where Hochstetter's frog can persist, offering a compensation ratio of 1:1 for permanent frog habitat loss resulting from the Project.

119.4 The land parcel(s) should be subject to stock-proof fencing to limit future impacts of large mammals, including pigs.

119.5 If the land occurs in pine plantation, commercial forestry harvest operations should cease to prevent (avert) the future loss of frog populations and habitat during felling operations and associated sediment inputs into streams.

119.6 A pest control operation, like that at frog relocation sites, should be implemented and maintained on the land parcel(s)

for at least 11 years to align with one generation length for Hochstetter's frog.

119.7 Frog monitoring should be established to monitor the persistence frogs in these streams over time. Monitoring should continue in line with the monitoring carried out as at defined points aligning with the relocation monitoring, that is, at year 1, 3, 5, 6, and 11 post relocation. The frog monitoring at these sites will contribute the control sites needed to validate the relocation outcomes (see my comments under "Determining the success of frog relocations" above).

119.8 The package may include research or other compensatory elements (eg., iwi capability and partnership support), with the weighting of these elements determined through discussions with stakeholders.

120 The upfront compensation package will legally protect one or more frog populations, and their habitat, within the Brynderwyn subpopulation. It is also expected to enhance those populations through predator control. Legal protection will prevent the future loss of their habitat through development, clearance, or harvest, and predator control will reduce the risk of the populations declining.

Contingent compensation

121 In my opinion, applying a precautionary approach and a 'no net loss' approach to compensation means that a compensation package should also include a further compensation element that is contingent and will be triggered if the Hochstetter's frog salvage and relocation cannot be proven to be successful.

122 I consider any such contingent compensation should:

122.1 Be directed towards measurable benefits for Hochstetter's frog or their habitat, preferentially for the Brynderwyn subpopulation or Northland clade. This may include the direct implementation of management such as pest control, frog habitat protection or enhancement, or fiscal contributions towards such kinds of frog management measures (eg. funding non-profit organisations who have frog protection objectives, or funding forestry transition to reduce harvest impacts on frog streams in plantation catchments);

122.2 Be scalable and proportional to any shortfall in the outcomes of the salvage and relocation monitoring. That is, the amount of compensation is directly related to any shortfall in outcomes of the frog relocation(s), at any of the defined monitoring periods (Years 1, 3, 6, and 11) and taking account of a reasonable population assessment; and

122.3 Have certainty that compensation will be provided if it is required under a triggered scenario (ie., demonstration that relocation fails at any defined monitoring period at any relocation site).

123 I recommend that this contingent compensation be calculated as a monetary value initially, prior to it being assigned to a management action of frogs or provided as a fiscal contribution.

124 To ensure the compensation value is proportional to the shortfall in relocation outcome, the monetary value may be calculated based on a formula that considers:

124.1 The number of frogs relocated; and

124.2 Either the cost of salvaging and relocating those frogs to the specific site or stream reach where the relocation has been demonstrated to be unsuccessful, or the cost of 'generating' a frog through management actions (eg., pest control).

RESPONSE TO COMMENTS ON THE APPLICATION

125 The following section of my evidence responds to comments made on the Application relating to Project effects on frogs and frog habitat. I have grouped my comments under headings to address common themes raised in the comments.

Extent of frog habitat and avoidance

126 DOC retains its view that the Project will have irreversible and permanent effects on frogs that cannot be fully addressed.[19] I agree that the loss of high-quality stream habitat, and of the frogs it supports, will be permanent. I also agree that relocation outcomes are uncertain. However, I do not agree that these effects cannot be appropriately addressed. In my opinion, the recommended Enhanced Effects Management Package will ensure that effects on frogs and frog habitat are appropriately addressed, with a precautionary 'no net loss' goal, via a compensation package that will contribute a range of upfront and contingent outcomes that will benefit Hochstetter's frog in the Brynderwyns area, and significant knowledge contributions to the understanding of future Hochstetter's frog management.

127 DOC also identify fragmentation of upper and lower catchments in the Central (Zentral) area as an effect not fully addressed in the Terrestrial Assessment.[20] I agree that the road will separate upper catchment frog populations from lower catchment habitat, potentially affecting high numbers of frogs through indirect effects,

[19] Summary, points 11–13.

[20] Point 33p of Dr Burns statement of advice.

including fragmentation. I also agree that this fragmentation of frog populations warrants consideration.

128 There is no information available on the movement and dispersal of Hochstetter's frog within and between catchments and the potential effects of habitat fragmentation on frog populations is uncertain. Not accounting for potential fragmentation impacts risks underplaying effects.

129 However, habitat quality for frogs is higher in upper catchment streams and the Proposed Designation crosses low in the catchment, so a large area of higher quality upstream habitat remains outside the footprint. Downstream movement of frogs through culverts may still occur during high flows (i.e., frogs flushed downstream during high flows) but upstream dispersal through culverts will likely be reduced or prevented. I consider the fragmentation to be partial as there is still potential for population and genetic mixing within the wider catchment, in the downstream direction. That said, I agree that fragmentation effects should be considered and addressed in the mitigation package. I provide more discussion on how these effects should be addressed in my comments below.

130 Related to fragmentation, I consider that a shift in the Proposed Designation to the west of the current area would result in much greater fragmentation effects as the road would bisect several more upper catchment streams, with greater impacts on higher value frog habitat. In my opinion, where fragmentation is unavoidable, such construction should occur low in the catchment to reduce fragmentation effects as far as practicable.

Release site suitability and capacity

131 Patuharakeke consider the Central Release Site in plantation pine to be inappropriate.[21] I agree that releasing frogs into a production forest exposes them to harvest, which removes canopy, increases sedimentation and is associated with large declines in frogs at harvested sites. As noted above, I therefore recommended (and NZTA has accepted) that this release site not be harvested. Given the Central Release Site supports some moderate quality habitat for frogs, I consider this outcome presents an overall positive effect of the Project on frogs and will increase the value of the Central Release Site as a suitable release site for frogs.

132 I agree with DOC, that on their own, the Northern and Central Release Sites are unlikely to be able to accommodate all the frogs that will be salvaged from the impact footprint.[22] The additional work undertaken by Mr Chapman, which I have reviewed and concur with (on the basis set out above), has focussed on developing release site criteria, based on numerous environmental metrics, that

[21] Point 227 of Patuharakeke comments.

[22] Point 56 of Dr Burns statement of advice.

can be used to select other appropriate frog release sites. In addition, recent surveys outside the Proposed Designation, within the wider surrounding landscape, have identified several additional sites that could potentially receive salvaged frogs. The Enhanced Effects Management Package will ensure that multiple release sites additional to the Northern and Central Release Sites will be identified and assessed as to their appropriateness for use to receive salvaged frogs.

133 Relocating frogs into streams that are already occupied will inevitably increase frog densities. The extent to which streams can accommodate additional frogs (their carrying capacity) depends on the quantity and quality of available habitat. Hochstetter's frog, including the Northland clade, is declining across its range, and introduced predatory mammals are considered a primary driver of that decline.[23] It is therefore reasonable to assume that where predatory mammals are present and have access to frogs, frog populations are below carrying capacity (i.e., under appropriate management, streams have meaningful additional capacity). Research has shown that Hochstetter's frog populations can increase up to four-fold (a 300% increase) following mammalian predator control[24]. This indicates that removing predation pressure can create capacity to receive additional frogs. This is a simplified example, and carrying capacity will also be governed by other factors that need to be considered before release. However, given the extent of stream habitat within and outside the Proposed Designation, including streams with complex, high-quality habitat, and the enhancement measures that can be implemented to further improve habitat quality (e.g., pest control, refuge supplementation and stream protection), I consider there will be ample stream habitat with capacity to receive salvaged frogs, provided appropriate management (in terms of type, duration, and effectiveness) accompanies the release.

134 I agree with DOC that more release sites are needed so that 'stocking' densities can be kept as low as practicable. The number of sites should be calculated, not assumed. It should depend on the number of frogs needed to reinforce or establish a population at each site and on the existing density at each site, measured in pre-release baseline surveys.

135 Patuharakeke point out that suitable release sites have not been confirmed and are to be determined later.[25] That is correct, and in my view, appropriate, particularly when the final design of the

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23 https://nztcs.org.nz/assessments/170262

24 Longson, C. G., Brejaart, R., Baber, M. J., & Babbitt, K. J. (2017). Rapid recovery of a population of the cryptic and evolutionarily distinct Hochstetter's Frog, *Leiopelma hochstetteri*, in a pest-free environment. *Ecological Management & Restoration*, 18(1), 26-31.

25 Point 253 of the Rural Design report prepared for Patuharakeke Te Iwi Trust Board.

Project is not yet known. Since lodgement, and DOC's section 51 report, a release site selection protocol has been developed by Mr Chapman, which I support. The protocol addresses habitat quality, ecological function, connectivity, and frog specific requirements. The protocol also allows sites outside the Proposed Designation to be considered. In my opinion, release sites should be identified, surveyed and confirmed as suitable (utilising the protocol) before any works that affect frog habitat begin. Without confirmed sites, it cannot be determined whether there is enough capacity to receive salvaged frogs, and the salvage numbers, monitoring design and pest-control commitments cannot be set.

136 Therefore, I consider the developed framework for selecting release sites for frogs (which I understand NZTA has accepted) is appropriate and based on the recent survey work, I consider there are sufficient sites in the Proposed Designation and surrounding landscape to accommodate salvaged frogs. However, I agree that sites must be selected and confirmed ahead of the works programme.

137 I agree with Te Parawhau ki Tai that release sites should be chosen for their ecological and cultural suitability, not because they are within the Proposed Designation. However, as noted above, I consider there are sufficient release sites within the Proposed Designation and surrounding landscape, that are ecologically suitable for frog release. NZTA is proposing a portfolio approach to release sites, where potential release sites are assessed and determined to be suitable prior to release of frogs, based on a comprehensive assessment framework. Sites will be chosen based on that framework, not because they are located within the Proposed Designation. I support that approach and consider it addresses Te Parawhau ki Tai's concern.

138 I agree with Patuharakeke that baseline population monitoring at release sites is required. Without pre-release data, carrying capacity cannot be estimated and changes in relative abundance at release sites cannot be measured. Baseline surveys using the same methods as post-release monitoring should be completed at every release site and every control site before any frogs are released. Pre-release surveys should ideally cover at least two seasons so that natural variation can be determined.

139 Submitters raised concerns about the suitability of the Central Release Site, the capacity of the proposed release sites, the absence of confirmed sites, and the lack of baseline data. I agree with most of these concerns, and as set out above have recommended responses in the Enhanced Effects Management Package to addresses them. Harvest risk at the Central Release Site has been removed. Multiple additional release sites will be selected using Mr Chapman's release site protocol, based on ecological suitability rather than location. The number of sites, and the number of frogs released at each, will be calculated from pre-release baseline

surveys and the additional capacity created by predator control, so that relocation densities are kept as low as practicable. Recent surveys indicate that there is likely to be enough suitable stream habitat in and around the Proposed Designation to receive salvaged frogs, but this can only be confirmed through site assessment. For that reason, I consider it essential that all release sites are surveyed and confirmed before any works affect frog habitat.

Monitoring

140 DOC and Patuharakeke raise that no method has been set out to monitor relocation success or post-release survival, the mortality rate of released frogs cannot be measured directly, and the proposed monitoring design is inadequate. I agree that such detail is appropriate and I have addressed it above, including my recommended measures of success using a range of methods and expertise, and how that success should be recorded and reported. I understand those measures have been accepted by NZTA and are reflected in its proposed conditions that will give effect to my recommended Enhanced Effects Management Package.

141 Regarding duration of monitoring, most translocation failures in amphibians become apparent within the first four years.[26] Hochstetter's frogs are long-lived and slow breeding. As set out above, I have recommended that the intensive monitoring should run for at least 11 years after release to align with one generation length for Hochstetter's frog. I understand that recommendation is generally accepted by NZTA (subject to further consideration regarding the timing/end point of mammalian pest control) and will likely be reflected in its proposed conditions that generally give effect to my recommended Enhanced Effects Management Package.

Management and pest control measures

142 I agree with DOC that the management of Hochstetter's frog must be at the scale of the Brynderwyn subpopulation of the Northland clade. The Northland clade of Hochstetter's frog is treated as a taxonomically indeterminate but potentially distinct lineage or Evolutionarily Significant Unit (ESU)[27]. Given the isolation between subpopulations of the Northland clade (e.g., 'Moir Hill', 'Dome Valley', 'Brynderwyn', and 'Mareretū'), managing at the subpopulation level prevents genetic mixing between subpopulations and preserves potentially distinct lineages within the Northland clade. I consider that this is the scale of the management NZTA proposes.

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[26] Bubac, C. M., Johnson, A. C., Fox, J. A., & Cullingham, C. I. (2019). Conservation translocations and post-release monitoring: Identifying trends in failures, biases, and challenges from around the world. *Biological Conservation*, 238, 108239.

[27] Burns, R.J.; Armstrong, D.P.; Bell, B.D.; Haigh, A.; Germano, J.; Rawlence, N.J.; Thurley, T.; Hitchmough, R.A.; Makan, T.; Michel, P. (2025). *Conservation status of amphibians in Aotearoa New Zealand, 2024.* New Zealand Threat Classification Series 44. Department of Conservation, Wellington. 19 p.

143 DOC has indicated that five years of pest control is inadequate to ensure frog populations recover to near pre-existing development levels following their transfer and release. As set out above, I agree and I have recommended a longer 11 year mammalian pest control duration following relocation, which I understand NZTA has largely accepted, subject to considerations regarding the end point of mammalian predator control.

144 Te Parawhau ki Tai also raise that the pest management conditions are inadequate and should include performance targets and response triggers.[28] I agree that both pre-release and post-release pest control is needed as is monitoring. As set out above, in accordance with my recommendation, revised pest control measures have been included in the Enhanced Effects Management Package and condition package. This includes pre-release monitoring and control which allows post-release control to be deployed and measures against targets which will enable NZTA (and the SQEP who oversees the relocation and wider package) to tell whether control is reducing predation enough to benefit frogs, and/ or whether further predator control actions are necessary. My opinion that release sites can support higher frog densities depends on pest control being at its target before and after release and I have made recommendations above regarding the application of pest control measures.

Uncertainty of relocation outcomes (including feasibility of relocation)

145 Both DOC and Patuharakeke have indicated that a frog salvage and relocation of the scale proposed would be operationally infeasible, requiring several years of fulltime work to deliver.[29] I acknowledge that the scale would be unprecedented, but I do not share their view that the scale of the Project is unworkable. I consider the operation could be achieved using large teams of people and Project staging, whereby not all frogs would need to be salvaged and relocated at once.

Compensation – appropriateness

146 DOC and Patuharakeke note that the application moves directly to compensation without explaining why a biodiversity offset is not achievable.[30]

147 In my opinion, an offset that achieves no net loss cannot be demonstrated for this Project. The habitat lost includes some of the highest-density frog populations and highest-quality frog habitat recorded in the Brynderwyns. Hochstetter's frog habitat of this

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28 Point 12.8 of Te Parawhau comments.

29 Point 226 of the Rural Design report prepared for Patuharakeke Te Iwi Trust Board.

30 Point 14 of Dr Burns statement of advice.

quality cannot be recreated or replaced like-for-like meaning it cannot be offset.

148 Consequently, and appropriately, consideration should be given to compensation to the extent there are more than minor residual effects. I have reviewed and recommended a compensation package which I consider to be appropriate and precautionary (applying a no net loss outcome). In my opinion, this recommended compensation will ensure adequate and precautionary management of effects on Hochstetter's frog populations within an acceptable timeframe.

149 I agree with DOC that the compensation package needs to account for all effects on frogs, including frogs and their habitats within the Project impact footprint and those affected by fragmentation and other indirect effects. I consider the Enhanced Effects Management Package as outlined in my evidence has adequately addressed effects on frogs.

150 DOC points out that as initially outlined the draft compensation proposal only provided for compensation after mitigation, and only if mortality of salvaged frogs is detected after 10 years. Patuharakeke submit that the failure of relocation should not be the trigger for compensation. With respect, that compensation proposal was only ever a draft proposal for discussion. As is outlined above, I understand NZTA has generally taken on my recommendations and the recommendations of Mr Chapman as part of its compensation proposal.

151 In my opinion, compensation is an appropriate response to residual effects of the Project provided it includes a component (which is accepted by NZTA) that provides certainty of positive outcomes for frogs and their habitat. My recommended precautionary and contingent component also enables further compensation that can be scaled and successfully delivered. I consider that my recommended package is appropriate.

152 I am comfortable that my recommended approach to compensation is appropriate, and sufficient to enable the Project approvals to be granted and proceed on a precautionary basis.

Conditions

153 DOC and Te Parawhau ki Tai raise that the frog and pest management conditions as lodged need revision to give certainty about outcomes.

154 I am comfortable that the revised conditions appropriately give effect to the Enhanced Effects Management Package.

Dylan van Winkel
28 October 2026

APPENDIX A – RELEVANT QUALIFICATIONS AND EXPERIENCE

1 I have the following qualifications:

1.1 Bachelor of Science (Zoology and Physiology);

1.2 Postgraduate Diploma in Science (Conservation Biology and Entomology); and

1.3 Master of Science (Hons) (Conservation Biology).

2 I am an external member of the Department of Conservation New Zealand Lizard Technical Advisory Group ("NZLizardTAG"), a member of the New Zealand Herpetological Society ("NZHS"), a Council member of the Society for Research on Amphibians and Reptiles in New Zealand ("SRARNZ"), a member of the International Union for Conservation of Nature (IUCN) Skink Specialist Group, and technical advisor (reptiles and amphibians) to the Endangered Species Foundation.

3 I have 18 years of experience as a professional ecological consultant and my primary area expertise is in terrestrial ecology and herpetology. Generally, my work experience includes assessment of ecological values and environmental effects, development of ecological restoration and mitigation programmes, including biodiversity offset and compensation packages, and development and implementation of biodiversity inventory, research, and monitoring programmes. I have developed reptile survey and monitoring programmes for New Zealand governmental organisations and conservation groups, including programmes that have involved threatened (e.g., 'Nationally Critical' and 'Nationally Vulnerable') reptile taxa.

4 Relevant previous work experience includes:

4.1 Technical advisor: lizards and Hochstetter's frog effects management on the Waste Management Auckland Regional Landfill project.

4.2 Consultant ecologist/ technical advisor on Archey's frog effects management for OceanaGold (NZ) Limited's Wharekirauponga-Waihi North project.

4.3 Co-led surveys for Hochstetter's frogs and lizards for the Ara Tūhono – Pūhoi to Warkworth Project and co-authored the Pūhoi to Warkworth Assessment of Terrestrial and Aquatic Ecological Effects report.

4.4 Consultant ecologist/ herpetologist for OceanaGold (NZ) Limited's Macraes operation since February 2022.

4.5 I am the primary consultant herpetologist for the New Zealand Ministry for Primary Industries to whom I provide technical advice and support on reptile and amphibian biosecurity responses, as well the taxonomic determinations of foreign herpetofauna detected at and post-border.

4.6 Have appeared as an expert witness for Council hearings and Environment Court on behalf of applicants.

4.7 Co-authored the 2015, 2021, and 2025 "Conservation status of New Zealand reptiles", a Department of Conservation Technical Series publication that classifies the conservation/ threat status of all recognised New Zealand reptile taxa.

4.8 Co-authored the 2025 "Conservation Status of Herpetofauna in Taitokerau 2025", a Northland Regional Council Technical publication that classifies the conservation/ threat status of Northland's reptile and amphibian taxa.

4.9 Co-authored the 2022 and 2026 "Conservation status of Reptile Species in Tamaki Makaurau/ Auckland", an Auckland Council Technical publication that classifies the conservation/ threat status of Auckland reptile taxa.

4.10 Co-authored the 2022 "Conservation status of Amphibian Species in Tamaki Makaurau/ Auckland", an Auckland Council Technical publication that classifies the conservation/ threat status of Auckland amphibian taxa.

4.11 Co-authored (lead author) of the authoritative book on New Zealand's reptiles and amphibians, published by Auckland University Press in 2018, and by Princeton University Press (USA) and Bloomsbury Publishing (UK) in 2020.

4.12 Invited member on the International Union for Conservation of Nature ("IUCN") Red List assessment panel for New Zealand lizards, including co-authorship on 44 of the Red List assessments, assessed in 2019.