WELLINGTON CITY COUNCIL

Proposed Plan Change 83
Kiwi Point Quarry

s42A Report – Appendix 6

Ecology

Report Date
19 November 2018

Hearing Date
10 December 2018

Table of Contents

Attachments

Interpretation

This report utilises several abbreviations as set out in the glossary below:

Abbreviation	Means
"the Act"	Resource Management Act 1991
"PC83"	Proposed Plan Change 83
"RMA"	Resource Management Act 1991
"RPS"	Regional Policy Statement for the Wellington Region (2013)
"PNRP"	Proposed Natural Resources Plan (2017)
"the Council"	Wellington City Council
"the Operative Plan"	Operative Wellington District Plan 2001
"the plan change"	Proposed Plan Change 83
"the Assessment"	Wildland Consultants 2017. Assessment of Ecological Effects for Proposed Expansion of The Kiwi Point Quarry, Ngauranga Gorge, Wellington. Contract Report No. 4378 July 2017.
"Draft Mitigation options report"	Wildland Consultants 2018. Mitigation Options for the Potential Loss of Indigenous Vegetation and Habitat at the Proposed Kiwi Point Quarry, Wellington. Contract Report No. 4378d August 2018
"Revised Draft Mitigation options report"	Wildland Consultants 2018. Revised Draft - Mitigation Options for the Potential Loss of Indigenous Vegetation and Habitat at the Proposed Kiwi Point Quarry, Wellington. Contract Report No. 4378d October 2018.
"November Revised Draft Mitigation options report"	Wildland Consultants 2018. November Revised Draft - Mitigation Options for the Potential Loss of Indigenous Vegetation and Habitat at the Proposed Kiwi Point Quarry, Wellington. Contract Report No. 4378d November 2018.
"QMP"	Quarry Management Plan (June 2014).
"Waitohi Stream"	The true left branch of Waitohi Stream which flows through the quarry site.
"Tyers Stream"	The true right branch of Waitohi Stream which flows through Tyers Stream Reserve.

1.0 S42A Report Introduction & Summary

Report Author

1.1. My name is Stephen Fuller. I am a Senior Ecologist and Partner with Boffa Miskell Limited ('BML').

1.2. I have worked as an ecologist over much of the last 30 years, including employment with the Department of Lands and Survey, and Botany Division DSIR, where I conducted biological surveys of scenic reserves in the lower and central North Island. From 1992 to 1997 I ran my own ecological consultancy. From 1997 to 2002 I was the project manager responsible for the design and development of the Karori Wildlife Sanctuary. In November 2002 I joined BML.

1.3. I work primarily in the area of ecological impact assessment, project shaping, the determination of ecological value and significance, quantifying mitigation requirements, and the design and implementation of ecological restoration. My work covers a range of fields, including the mapping and description of terrestrial and wetland flora and fauna, freshwater habitat descriptions, monitoring, and avifauna studies. I work primarily in the lower North Island but have carried out assessments and assisted colleagues throughout New Zealand.

1.4. I hold a Bachelor of Science in Zoology and Botany, and a Diploma of Applied Science in Ecology from Victoria University of Wellington. I am a Certified Environmental Practitioner with the Environment Institute of Australia and New Zealand.

1.5. My professional memberships include:

a) The Environment Institute of Australia and New Zealand;

b) The New Zealand Ecological Society; and

c) The Wellington Botanical Society.

1.6. I have been asked by the Council to prepare this addendum to the s42A report on Proposed Plan Change 83.

1.7. Along with contextual information and other matters of fact, this report includes my professional views and recommendations on the proposal. These views and recommendations are my own, except where I indicate otherwise.

1.8. Though not a requirement of Council Plan Change hearings, I have read and agree to abide by the Code of Conduct for Expert Witnesses and have prepared this report in accordance with it. The report content is within my area of expertise except where stated otherwise. I have not omitted to consider the material facts known to me that might alter or detract from the opinion expressed in this report.

Report Scope and Structure

1.9. This report reviews the ecological significance, values and assessment of effects provided as part of this plan change. My report specifically provides:

a) Section 2: a discussion of the ecological reports provided with the plan change, or received subsequently, confirming their completeness.

b) Section 3: a summary of the submissions received, and the issues raised.

c) Section 4: a detailed response to each matter raised by submissions, confirming my agreement or otherwise.

d) Section 5: A discussion of the mitigation options for this site, what is being proposed and the issues raised.

e) Section 6: A discussion on issues raised by submitters relating to streams and freshwater.

f) Section 7: Conclusions and recommendations

The Plan Change

1.10. The plan change contains a number of documents which relate to ecological issues. the Plan Change documentation WCC (2017), which included the current Quarry Management Plan (2014) as well as two reports prepared for the options assessment which are limited in scope

(Terrestrial Ecology by Emeny (2016), and Freshwater Ecology by MWH-Stantec (2016)), and a more complete ecological assessment prepared by Wildland Consultants (2017). I have reviewed these reports.

1.11. I have also referenced an earlier report prepared by Boffa Miskell; the Kiwi Point Quarry Progressive Rehabilitation Plan (2005). This is an assessment and plan I co-authored for the same site and similar activity in 2004-2005.

1.12. I have reviewed relevant WCC Management Plans covering the site and environs including the Northern Reserves Management Plan (2008), the Suburban Reserves Management Plan (2015), Capital Spaces (2013).

1.13. I have considered the evidence of Mr. Evans (Landscape) on the basis that an integrated rehabilitation approach is most likely to deliver overall benefits. This includes consideration of the Landscape Expert Conferencing (B Evans and G Lister 12/07/2018).

1.14. I have contributed to suggested changes to Policies and Rules of the proposed plant change as are detailed in the Plan Change Section 42A Report as prepared by Mr J Jones.

Subsequent Work

Notification

1.15. On 3 September the hearing was postponed in order to notify additional residences to the south of the Quarry site. One additional submission was received. This submission did not raise any additional matters relating to ecological effects that were not already raised by others.

Mitigation Options Reports

1.16. In the time between close of submissions and preparation of this evidence three draft mitigation options reports have been prepared and circulated (8 August, 8 October, and 13 November).

1.17. On 9 October a pre-hearing meeting was held seeking to resolve disagreements and seek a mitigation solution acceptable to both the s42A Report Authors and expert advisors to the Council (in its capacity as proponent) and other council experts.

1.18. This additional work by the applicant is described in Section 2.0.

Attachments

1.19. My report concludes with three attachments:

a) Attachment 1: Quarry Face Rehabilitation: A quarry face rehabilitation plan prepared by Boffa Miskell (2005) as part of Plan Change 64;

b) Attachment 2: Rehabilitation Quarry Plan: A plan from the application showing the likely extent of the final south quarry platform (RL 67).

c) Attachment 3: Alternative Mitigation Option: A plan I have prepared (for this report) showing a proposed additional extent of planting / mitigation as a suggested option for meeting the mitigation needs of this site.

Summary of key findings and recommendations

1.20. Considering the ecological assessment provided with the Section 32 Report, the mitigation options report provided in August, October and November 2018, the agreements at a pre-hearing meeting, the Plan Change text changes, and submissions, I conclude the following:

a) There has been an agreement that rehabilitation of Waitohi Stream should be one of the mitigation actions that will contribute to the total mitigation package. I support this decision.

b) However, other options for site rehabilitation have not been agreed. Rehabilitation and naturalisation of the quarry site is required in the Quarry management plan and the Plan Change policies and methods, and I believe more mitigation is required within the project footprint to adequately mitigate for ecological effects of this Project.

c) In particular, I believe the impact on wildlife has been under-represented in the Assessment. Policy 47 of the RPS requires consideration of corridors, buffering, and the loss of core and seasonal habitat. I do not believe these matters have been adequately addressed but could be with additional rehabilitation of the finished quarry surface.

d) Wildlands in their latest mitigation options report has suggested limited site remediation through direct transfer of plants onto rock benches, and remediation of cut benches. In my experience, irrespective of the amount of site preparation, north-westerly gales and summer droughts will lead to a very high likelihood of failure. I do not believe direct transfer should form part of the mitigation package. And I question the value of planting the benches given previous experience in the Ngauranga Gorge.

e) Overall, I believe there remains uncertainty that the mitigation proposed, which largely occurs outside the project footprint, will address potential adverse ecological effects that will occur within the site.

f) Finally, due to the challenges of the site I recommend an integrated mitigation design.

g) Several changes to the plan change objectives, methods and rules are recommended in Mr Jones' report. I support these changes.

2.0 The Application

2.1. There has been considerable work carried out by the applicant since close of submissions to address matters raised. The application and this additional work are described in this section.

Initial Application

2.2. Three documents were provided with the Application that focused in large part on ecological aspects of the proposed plan change.

a) For the Options Assessment a brief Terrestrial Ecology Report was prepared by WCC (Emeny 2016) which assessed the impact of each alternative option for expansion. This report was based largely on a desktop study, supported by a rapid ecological assessment. In addition to brief descriptions of vegetation, avifauna and lizard fauna, it notes that a precautionary approach has been taken pending a more thorough ecological assessment.

b) As part of the same options assessment process a brief report was prepared on water quality (MWH Stantec 2016) which also included some information on stream ecology. This again was not a formal assessment of effects but was focused on an options assessment. It also relied on a desktop information review and no specific stream habitat or fauna surveys were conducted.

c) An assessment of ecological effects for the proposed expansion option was prepared in 2017 (Wildland Consultants 2017). Field investigations were carried out over 5 hours in mid-winter and did not adequately describe local and seasonal populations of fish (desktop only), lizards (desktop only), birds (desktop supported by very limited field observation) and may have missed some spring flowering plant species. It did not include any descriptions of potentially affected streams. The report acknowledged that the field work was insufficient, and additional fieldwork was necessary to confirm the significance and ecological value of habitats potentially affected although this recommendation was limited to fish and lizards.

Additional Site Work

2.3. In April 2018 a lizard survey was completed (Wildland Consultants 2018). This survey satisfied the requirement for a lizard assessment.

Additional Mitigation Reports

2.4. On 8 August, following close of submissions, a draft mitigation options report was circulated by Wildland Consultants for consideration by the s42A Report Authors. This options report sought to address a number of issues with the original assessment that were raised by submitters and myself, by

a) quantifying the areas of vegetation loss;

b) expanding on the options for mitigation; and

c) providing a more detailed calculation of loss and gain for the determination of required mitigation.

2.5. Also, in August 2018, information was provided by WCC on the results of mitigation planting trials that had been carried out at Kiwi Point Quarry. This report recorded that trial planting in pasture on dry exposed sites failed or was not thriving which has implications for the future rehabilitation of the site.

2.6. In mid-August I prepared evidence based on both the application and the August Mitigation Options Report. This was circulated to the parties on 27 August. In my evidence I raised a number of concerns with the mitigation that was proposed in the Options report, and I recommended several items of mitigation that I felt were needed to fully address key adverse effects of this project.

2.7. Following the postponement of the hearing a pre-hearing meeting was scheduled for 9 October. A day prior to that meeting the applicant's ecologist provided a revised draft mitigation options report which updated mitigation site availability and considered my recommendations. It rejected each of my recommendations for various reasons.

2.8. On 9 October the pre-hearing meeting was held seeking to resolve disagreements and seek a mitigation solution acceptable to both the s42A Report Authors and expert advisors to the Council (in its capacity as

proponent) and other council experts. Agreement was reached on one key matter, the inclusion of Waitohi Stream as mitigation. Other matters were discussed but left open. A few matters could not be addressed at this time due to uncertainty over the technology to be used for the ongoing quarry expansion. The minutes of this meeting were circulated and responded to on 18 October.

2.9. On 13 November, Council Wildland Consultants circulated a third draft mitigation options report. This report was a rewrite of the second and covered the wide-ranging discussions at the pre-hearing meeting. I have read this report and consider it further in this evidence. This options report highlights that there are still several matters where there is disagreement.

3.0 Submissions

3.1. Four submissions (20, 28, 29 and 36) raised concerns about ecological effects of the proposed quarry expansion proposed by Plan Change 83. The issues raised were:

a) the plan change will result in a loss of vegetation and habitat for indigenous fauna[1];

b) further assessment of the area's ecological significance is required, including surveys of freshwater fish and reptile fauna;[2]

c) the Plan Change lacks provisions relating to operational phase and post-operational phase ecological effects, including effective monitoring of mitigation/offsetting measures;[3] and

d) the area for mitigation planting should be three times the area affected by vegetation clearance associated with the plan change (rather than two times the area).[4]

3.2. Submissions 20, 29 & 36 were relatively generic and did not specifically identify any relief sought, other than for Council to seek a longer-term option for quarrying.

3.3. Submission 28 is from Greater Wellington Regional Council. It is generally supportive. In particular, it states:

> *"4.1 We recognise the main instrument for giving effect to these policies is through the Quarry Management Plan (QMP), and in particular the following policies:*
>
> - *Policies 25 & 26 – Identification and protection of outstanding natural features and landscape values*
> - *Policies 40–45 – Safeguarding freshwater quality, quantity and ecological health*

[1] Submissions 20, 29, 36
[2] Submission 28
[3] Submission 28
[4] Submission 28

4.3 We particularly note support for the Plan Change due to the requirement to have, and the criteria listed within, the QMP."

3.4. This places a reasonable requirement on the QMP to deliver on rehabilitation of the site and the health of waterways affected by the project.

3.5. The submission also noted

"4.6 The relevant policies of the RPS which address indigenous ecosystems include Policies 23, 24 and 47. These provide criteria to identify ecosystems and habitats with significant indigenous biodiversity values, and require that district plans include policies, rules and methods to protect these areas from inappropriate subdivision, use and development. These policies also require effects to be remediated, mitigated or offset where appropriate."

3.6. With regard to this, I note that an assessment against Policy 47 has not been carried out in the plan change supporting information.

3.7. The GWRC submission then identified a number of shortcomings of the assessments. This can be divided into:

a) Para 4.7 notes the lack of survey data on fish and lizards. This is listed Relief sought, item 1.

b) Para 4.8 notes that due to data omissions and a lack of certainty with regard to site significance, further assessment be undertaken to identify adequate mitigation options. This is listed Relief sought, item 2.

c) Para 4.9 notes a lack of information on operational phase and post-operation phase impacts. This is listed Relief sought, item 3.

d) Para 4.9 also notes a lack of information on how mitigation would be carried out and monitored. This is listed Relief sought, item 3.

e) Relating to item b) and c) above, the submission notes that the proposed mitigation fails to meet the recommendation of the ecological assessment. This is listed Relief sought, item 4. Specifically, this submission identifies failure to meet:

i. The like-for like principal for mitigation/offsetting (Para 4.10).

ii. The area of mitigation recommended to be 3:1 but which is approximately 2:1. (Para 4.11).

3.8. Finally, the submission states in para 4.12

> *"Although this area is not recognised as a significant natural area in the WCC district plan, it has been identified as having significant ngaio-māhoe-māpou forest located within the footprint."*

3.9. And goes on to say:

> *"… and there may be further significant values identified in the further assessments we request."*

3.10. This is a possible outcome of further study.

4.0 Response to Submissions

4.1. Each of the matters identified in the submission summary is addressed below as are problematic aspects of the supporting ecological reports.

Quarry Management Plan

4.2. In its submission, GWRC identified (Submission Para 4.1) that the main instrument for giving effect to these policies is through the Quarry Management Plan (QMP).

4.3. However, GWRC note that the various recommendations of the assessment and proposed sites for mitigation require "*the relevant district plan maps and new text in the QMP method are updated to reflect this*" (Submission Relief Sought 5.2.5).

4.4. Having read the relevant sections of the QMP I am satisfied with the objectives and principals it contains, and with the descriptions provided for each type of remedial activity. However, I agree with GWRC that there needs to be certainty that the changes to mitigation requirements that will be confirmed through this plan change are carried through to the QMP. I have provided feedback to Mr Jones on modifications to wording of the plan change to achieve this.

Streams

4.5. In its submission, GWRC identifies Policies 40–45 – "Safeguarding freshwater quality, quantity and ecological health" as relevant to this plan change (Submission Para 4.1).

4.6. Consideration of freshwater issues is outside the District Council's jurisdiction. Also, I note that GWRC has already granted consents and permits for soil disturbance, discharges to land, air and water, and structures in waterways at the quarry (Consent No. WGN170175). Future consents and permits may also be required for future activities in the quarry and proposed extension area. Given freshwater effects have been raised in this submission, I provide some context to this issue for the information of the commissioners later in this evidence (See Section 5.0, page 23).

Policy 23 Assessment

4.7. In its submission, GWRC identifies that the RPS requires consideration (Submission Para 3.2 to 4.3) and highlights Polices 23, 24 and 47 (Submission Para 4.6.). I have considered the significance assessment carried out in the Ecological Assessment. I suggest that this assessment does not clearly identify which of the 9 plant communities present it considers to be significant, leaving it open for at least four communities due to uncertainty regarding the presence of fauna species.

4.8. This is because the assessment of significance on several occasions refers to species that "*are likely to be present*" and so habitat "*may be significant*". This is not an ideal result but if the assessment must progress in the absence of that information then the assessment must take a precautionary approach.

4.9. Overall, I feel that this lack of clarity supports GWRC concern stated in their submission, that insufficient information has been provided to identify the scale of effects and so adequate mitigation.

4.10. I have considered whether additional work is needed to provide greater clarity, however, I note that the Supplementary Assessment treats all indigenous vegetation equally, requiring the same quantum of mitigation irrespective of community type or assessed significance. This approach is therefore conservative and so will not under-estimate mitigation requirements. I do not believe additional work is necessary.

Policy 47 Assessment

4.11. The assessment applies the significance assessment criteria contained in Policy 23 of the RPS and finds that at least 5 of the plant communities are significant. Under the RPS, if significant vegetation or habitats are identified an assessment against Policy 47 is required. An assessment against Policy 47 has not been done.

4.12. Policy 47 is introduced as follows:

> *"Policy 47: When considering an application for a resource consent, notice of requirement, or a change, variation or review of a district or regional plan, a determination shall be made as to whether an activity may affect indigenous ecosystems and habitats with*

significant indigenous biodiversity values, and in determining whether the proposed activity is inappropriate particular regard shall be given to:"

4.13. The policy then lists 8 criteria against which the significant site should be assessed. Each is listed below with a comment from me;

"(a) maintaining connections within, or corridors between, habitats of indigenous flora and fauna, and/or enhancing the connectivity between fragmented indigenous habitats;"

Connectivity for fauna is raised in the assessment in several locations, however, the mitigation currently proposed does not address the protection of corridors and connectivity. This will be relevant for avifauna movement down Tyers Stream Reserve and along the harbours coastal escarpment. It is also relevant for migratory fish movement within Waitohi Stream.

"(b) providing adequate buffering around areas of significant indigenous ecosystems and habitats from other land uses;"

The assessment identifies, in several sections, that vegetation will be susceptible to edge effects without buffering, yet buffering, its location, extent and form, is not identified in the mitigation or remediation recommendations. I note that the QMP and Plan Change Methods both refer to "management of buffer areas" but this relates to management of a defined zone of land between crest cut of the quarry face and neighbouring properties, not ecological management.

"(c) managing wetlands for the purpose of aquatic ecosystem health;"

There are no wetlands within the site. Not relevant.

"(d) avoiding the cumulative adverse effects of the incremental loss of indigenous ecosystems and habitats;"

This has not been addressed in the Assessment or the Section 32 Report.

"(e) providing seasonal or core habitat for indigenous species;"

This has only partially been addressed. Further lizard surveys (Wildlands 2018) have ruled the site out as core habitat for lizards. However, I do not believe there has been sufficient study of birds to draw a similar conclusion.

"(f) protecting the life supporting capacity of indigenous ecosystems and habitat;"

This has not been addressed in the Assessment or the Section 32 Report.

"(g) remedying or mitigating adverse effects on the indigenous biodiversity values where avoiding adverse effects is not practicably achievable; and"

This matter remains unresolved.

"(h) the need for a precautionary approach when assessing the potential for adverse effects on indigenous ecosystems and habitats."

Neither the Assessment nor the Section 32 Report have explicitly considered whether a precautionary approach is required. I would note, however, that a conservative approach has been taken to the calculation of the quantum of mitigation as discussed above.

4.14. Overall, I consider that failure to assess the proposal against Policy 47 is an omission in the s32 Report. The consideration of potential amendments to the plan change provisions in response to submissions should have regard to the matters under Policy 47 as highlighted above.

Field Investigations

4.15. The authors of the Assessment acknowledge that "*There is a reasonable likelihood that additional indigenous lizard and freshwater fish values are present in habitats within the site, and surveys for this fauna should be undertaken.*"

Freshwater Fish

4.16. As mentioned above I provide some context to this issue for the information of the commissioners later in this evidence (See Section 5.0, page 23).

Lizards

4.17. Regarding lizards, a follow-up lizard survey was carried out (Wildlands 2018) and no lizards were found.

4.18. I have viewed the methods and results of this follow up lizard survey and consider the search effort to be adequate for the purposes of this assessment. No further lizard work should be needed.

Other - Birds

4.19. In the GWRC submission the adequacy of the bird surveys was not raised. However, like lizards, the Assessment of Ecological effects wrote *"However the brief period over which the survey was undertaken would only provide a snapshot of bird use of habitats at the site."*

4.20. Later in the report the authors state *"The most diverse plant habitat within the site is the ngaio-māhoe-māpou forest above State Highway 1. The diversity of indigenous lizards, birds, and fish is not known".*

4.21. The Assessment based its identification of avian fauna on a 5-hour site visit during mid-winter. It added to this using "*citizen science*" observations from the wider area. I note that an earlier report (Emeny 2016) identified three species, kaka, kakariki and karearea (bush falcon) as being present in Tyers Stream Reserve or surrounds. All three species have a threat status. These three species are not identified in the Ecological Assessment.

4.22. Given the expansion of a range of nationally threatened and at-risk bird species through the town belt and bush reserves of Wellington, I believe that a more complete bird survey is necessary to determine the importance of the habitat being lost, to local populations and as a corridor for local bird movement.

4.23. Since close of submissions Wildlands have provided additional discussion on their assessment of avifauna effects, corridors, and habitat connectivity

in their later 2 mitigation options reports. In these reports they affirm their position that their assessment was sufficient, and that "*the loss of connectivity is expected to be minimal*". This is a matter of disagreement that is discussed further in Section 6.0.

4.24. Overall, I consider that failure to fully assess avifauna is an omission in the s32 Report. The consideration of potential amendments to the plan change provisions in response to submissions should have regard to this limitation.

Mitigation Shortfall

4.25. The GWRC submission identifies three aspects of the proposed mitigation that fail to meet the recommendation of the Assessment.

Like for Like Mitigation

4.26. Given the relative rarity reported for the coastal ngaio-māhoe-māpou forest, I agree that like for like mitigation should be the desired goal. This would not be delivered by the original assessment.

4.27. Since close of submissions Wildlands have reworked their mitigation proposals. It includes areas which will deliver like-for-like mitigation.

No net loss

4.28. The PNRP, Policy 47, and the recommendation of the reporting ecologist have a goal or recommendation that there be no net loss of (indigenous) biodiversity. The proposed mitigation does not currently meet a no-net-loss goal. I agree that no-net-loss should be the goal; whichever way we choose to measure it.

4.29. Since close of submissions Wildlands have reworked their mitigation proposals and the issue of insufficient mitigation has been resolved. The third mitigation options paper presents options that combined provide a surplus. While I disagree with aspects of the mitigation proposed, I am satisfied that sufficient mitigation is available to ensure no net loss.

Mitigation Area (3:1)

4.30. GWRC seek for the mitigation area to be increased to at least 3 times the size of the affected area. I agree that the initial assessment presented a mitigation shortfall.

4.31. Since close of submissions Wildlands have reworked their mitigation proposals. While I disagree with aspects of the mitigation proposed, I am satisfied that the issue of mitigation area identified by GWRC has been resolved.

Adequacy of mitigation options

4.32. The GWRC submission concluded that insufficient information had been provided to identify adequate mitigation options.

4.33. Since close of submissions Wildlands have reworked their mitigation proposals. While I disagree with aspects of the mitigation proposed, I am satisfied that a range of relevant mitigation options have been identified and sufficient information is available on each to give confidence that GWRCs concerns can be resolved.

4.34. Furthermore, I understand that this plan change will require further ecological assessments and mitigation design development as part of subsequent consent applications to the District and Regional Councils. I also note that the proposed Rules include the following matter of control for future applications, for example:

> *34.2.3.4. optimising the standard, location and staging of ecological mitigation through the provision of an ecological restoration plan;*

4.35. I suggest that the Plan Change should provide confidence that the quantum of necessary mitigation has been accurately assessed, the proposed mitigation activities are sufficient, and the sites for that mitigation are available. The design details can then be left for the QMP and clarification as part of future consents. I don't believe the notified Plan Change provides greater detail than is currently being presented.

Operational and post operation impacts

4.36. The GWRC submission seeks further information on operational and post operational phase impacts as well as a monitoring regime.

4.37. In this instance I would suggest that operational impacts should be dealt with by way of future consents. I also believe construction monitoring of vegetation clearance and stream effects, can be safely provided by way of the QMP or equivalent management plan.

4.38. However, I agree with GWRC that the aspects of the post-operational phase which requires land availability, a package of mitigation activities, and sufficient funds to be set aside, should be clarified and confirmed as part of the plan change process.

5.0 Freshwater

5.1. While consideration of streams and rivers lies outside the jurisdiction of Council, the issue of the ecological health of the streams was raised by GWRC in their submission as a matter requiring consideration. To provide additional context to the panel, I respond below to the GWRC submission and their consent conditions.

Regional Policy Statement (Policies 40-45)

5.2. In their submission GWRC, identified Policies 40−45 of the QMP – *"Safeguarding freshwater quality, quantity and ecological health"* as relevant to the consideration of this plan change (Para 4.1).

5.3. Because these considerations fall outside the remit of the Plan Change the two potentially affected waterways were not identified in the proposed plan change. They are briefly mentioned in The Assessment, but are not described, nor is additional study, monitoring or mitigation recommended.

5.4. I am comfortable that the issue of water quality and quantity and ecological health can be addressed through future regional consents. This is because the footprint of PC83 does not directly impact either stream. Only indirect, construction related effects are a risk and these can be managed by normal construction management processes.

Regional Policy Statement (Policy 47)

5.5. In their submission GWRC identified Policy 47 of the RPS as a matter for consideration by the assessment. However, as discussed in Section 4.0, this was not done.

5.6. Policy 47(a) relates to connectivity which is relevant to the movement of fish within Waitohi Stream, particularly if fish passage is already compromised due to stream modification or is potentially compromised by future activities.

5.7. I am comfortable that the issue of fish passage be addressed through future regional consents, again because no streams are directly affected by this plan change.

5.8. However, I would suggest that this information will be essential for the design and delivery of fish passage to and through the wider site. Giving this matter thought now may avoid expensive design requirements in the future.

Freshwater Fish surveys

5.9. In the Assessment it was stated that "*There is a reasonable likelihood that additional indigenous lizard and freshwater fish values are present in habitats within the site, and surveys for these fauna should be undertaken.*" Due to this uncertainty, the GWRC submission sought further freshwater fish surveys (Submission relief sought para 5.2.1).

5.10. I do not believe that fish presence in these streams needs to be addressed for this plan change process, again because, the footprint of PC83 does not directly impact either stream.

5.11. However, I would again suggest that this information will be essential to design and delivery of future stream mitigation for the wider site.

Regional Consents

5.12. On 7 August 2017 GWRC granted a 25-year consent for the land use activities and associated discharges at the quarry described above. Conditions of consent 66, 67 and 68 detail required site rehabilitation. Specifically, conditions 66 covers terrestrial rehabilitation and simply refers to the Quarry Management Plan; Condition 67 requires preparation of a Stream Rehabilitation Plan (SRP), and Condition 68 requires progressive rehabilitation to occur.

5.13. In terms of the SRP condition 67 requires:

"Stream remediation

67. By the 1 July 2027 the consent holder shall submit for approval to the satisfaction of the Manager a Stream Rehabilitation Plan (SRP). The SRP shall be designed by a suitably qualified person such as a freshwater ecologist in consultation with Ngati Toa Rangatira and Port Nicholson Block Settlement Trust and may include (but not be limited to);

- *Riparian planting plans;*

- *Enhancement for cultural values ;*
- *Rehabilitation of concrete lined/highly modified sections;*
- *Provision of fish habitat features (e.g. water, pools and cover); and*
- *Ensuring fish passage.*
- *Timeframes for the completion of rehabilitation activities.*

The SRP must, at a minimum, provide for rehabilitation activities on an equivalent length of stream equal to that contained within the site (including the Ngauranga Stream and tributaries)."

5.14. However, condition 67 and 68 allow for this 'rehabilitation / remediation' to be carried out at another location within the Ngauranga Stream and its tributaries, including "downstream of the site", or in "Tyers Stream".

"The SRP must, at a minimum, provide for rehabilitation activities on an equivalent length of stream equal to that contained within the site (including the Ngauranga Stream and tributaries). Remediation may be undertaken within the site or downstream of the site.

Alternatively, the SRP may provide for activities to be undertaken on the Tyres Stream (tributary to the Ngauranga Stream) if it is recommended by a suitably qualified person such as an ecologist that the benefit (to the catchment) of undertaking the remediation on the Tyres Stream is of greater ecological value to than undertaking remediation on the Ngauranga Stream within the site."

5.15. Technically, this would not be remediation, but rather offset mitigation and would not address the habitat loss and modification within the site. I therefore remain concerned that remediation of Ngauranga Stream may not be undertaken within the quarry footprint unless the wording of the Plan Change requires it.

5.16. In summary and putting aside the option of mitigation elsewhere in the catchment, the Quarry Management Plan (2014) and the Regional Consents (2017) combined specify the following rehabilitation activities for Waitohi Stream.

a) Before specific rehabilitation is initiated under the annual implementation plan, consultation with affected parties including:

- *the Taylor Preston management*

- *Greater Wellington Regional Council*
- *Ngati Toa Rangatira, and*
- *Port Nicholson Block Settlement Trust iwi.*

b) Preparation of a Stream Rehabilitation Plan (SRP) which includes

- *Riparian planting plans*
- *Enhancement for cultural values*
- *Rehabilitation of concrete lined/highly modified sections*
- *Provision of fish habitat features (e.g. water, pools and cover)*
- *Ensuring fish passage*
- *Timeframes for the completion of rehabilitation activities*

c) And rehabilitation should also address

- *The removal of any introduced industrial waste from the streambed and slopes,*
- *Diversion and treatment of contaminated runoff*
- *Pest plant removal*

Pre-Hearing Meeting

5.17. Until the pre-hearing meeting, the position of the Council as proponent was that mitigation of Waitohi Stream was outside the scope of the project. However, in my initial evidence I argued that:

a) integrated design of freshwater and terrestrial mitigation would result in better environmental outcomes than treating each in a consenting silo.

b) a quantum of stream rehabilitation should be identified as part of the overall mitigation package, and this requirement protected through wording in the PC83 methods.

c) any changes to the QMP needed to encompass the protection, management and future rehabilitation of the two potentially affected waterways. This could only be guaranteed through the PC83 methods.

5.18. At the pre-hearing meeting the issue of Waitohi Stream was discussed at some length. At this meeting the following were agreed to:

a) An integrated mitigation design incorporating both stream (regional consents) and terrestrial (designation consents) mitigation was best practice.

b) Rehabilitation and daylighting of Waitohi Stream was an important element of site remediation which should be explicitly required and included in the mitigation area totals;

c) A staged approach to stream rehabilitation was necessary;

d) Regional consents have already been granted for some quarry operations which require rehabilitation of Waitohi Stream, but are quite general;

e) While there are jurisdictional limitations of the plan change process with regards to streams, certainty of outcome can be provided by way of additional wording in the objectives and management plan requirements;

5.19. As a result of this discussion the most recent version of the Mitigation Options report includes Waitohi Stream riparian planting and daylighting as part of the mitigation package.

5.20. At the meeting it was identified that there are limitations to meeting an ideal 20 m riparian buffer area, particularly in the location of Taylor Preston. I acknowledge that not all planting can be as wide as ideal, and the extent of daylighting cannot at this stage be confirmed. However, most importantly, the proposed planting will be continuous, and the mitigation area is wide enough along most of the stream length to provide continuous shade to the stream. I also accept that this restoration will occur as a staged approach over a number of years as sections of the quarry are exhausted, and it is likely to require additional resource consents.

5.21. The final November Mitigation Options report has now added a section on the remediation and protection of this stream (Section 3.1) which is comprehensive and which I am supportive of. I am comfortable that the proposal addresses my concerns and will lead to effective restoration of this waterway.

6.0 Mitigation Options

6.1. Since notification of the application three successive Mitigation Options Report (in August, October and November). These in part respond to concerns raised by submitters, my initial evidence and the matters discussed at a pre-hearing meeting in October.

6.2. Since the initial assessment these Mitigation Options Reports have introduced several additional mitigation methods including weed control and pest control, vegetation enrichment, seed collection, and legal protection. I agree that these are all options that should be considered as part of an overall mitigation plan.

6.3. Furthermore, there has been agreement to my proposal for the need to embed mitigation of Waitohi Stream into the Plan Change, and agreement on the benefits of integrating this aspect of site mitigation with the other revegetation proposed.

6.4. However, there are four aspects of mitigation where disagreement remains.

a) Site rehabilitation remains largely absent as a mitigation option.

b) None of the mitigation options specifically address the effect of vegetation removal on movement of fauna within the site and between adjacent sites.

c) Direct transfer of indigenous vegetation as a form of mitigation, has a very high risk of failure due to site conditions.

d) An integrated design for ecological and landscape mitigation has been rejected.

Site Rehabilitation

6.5. Quarry rehabilitation has always been a requirement at this site. The QMP states in Section 7.1.

> *"The overall objective of the proposed rehabilitation is to establish native vegetation cover that contributes to the Council's vision of Ngauranga Gorge as part of the City's inner green belt network.*

Rehabilitation will focus on bringing all areas where quarry operations have ceased to a state where native vegetation will re-establish."

6.6. The QMP then lists the following rehabilitation principles:

1. To promote Wellington's indigenous biodiversity and rehabilitate natural processes within the site.

2. To conduct rehabilitation concurrently with quarry operations, coordinating progressive completion with rehabilitation.

3. To finish the quarry faces to resemble the steep bluff landforms that would have occurred naturally in the Ngauranga Gorge.

4. To conduct rehabilitation in a manner that encourages rapid vegetation of the slopes, reducing the duration of adverse visual impacts.

5. To revegetate the quarry in a way that supports the vision of the City's Inner Green Belts.

6.7. The Assessment discusses the need for quarry rehabilitation to be a focus for active rehabilitation (Section 12.1). However, it goes on to say that due to the time it would take and site constraints *"Overall, site remediation is important but should be considered to be complementary to mitigation" (Section 13).*

6.8. The brief Ecological assessment (Emeny 2016) similarly considers quarry rehabilitation to have very limited potential due to site constraints. And the GWRC submission doesn't mention rehabilitation of the quarry site, seeking simply for mass planting to be provided elsewhere to meet the 3:1 ratio.

6.9. Finally, the planting trials indicate that on the north facing slopes it is highly unlikely that woody vegetation can be established, other than by long term natural successions, most likely through gorse.

6.10. This presents a conflict for the project with regards to staged rehabilitation of the quarry. On the one hand there is agreement that this rehabilitation is important to do, and the QMP and the Plan Change documentation describe the required outcomes. On the other hand, an argument is being

made that any efforts to achieve this rehabilitation outcome are uncertain, and therefore they cannot be counted as part of the sites mitigation package.

6.11. I have discussed this with Mr Evans and we share the view that rehabilitation of the southern quarry face will be very unlikely to succeed in meaningful timeframes (See Error! Reference source not found., page Error! Bookmark not defined.). However, I would argue that the principals and objectives are not limited solely to the cut face. Other areas of the quarry site lend themselves to rehabilitation and therefore to ecological mitigation. I suggest there are at least three key opportunities for revegetation which will contribute to the QMP's overall objective to establish native vegetation cover and will also target specific ecological effects of the proposal. They are:

a) Planting of a riparian margin along a restored Waitohi Stream. This has now been agreed and is included in the mitigation design.

b) Planting to create corridors for fauna movement and provide connectivity within and across the site. This has not been agreed.

c) Planting of a bunded buffer separating the quarry site from SH1. This has not been agreed.

6.12. Wildlands also propose to carry out up to 0.71 ha of direct transfer, and an indeterminate area of quarry bench planting, which are discussed below.

Wildlife Corridors

6.13. As described in Section 4.0 I believe the original impact assessment undervalued the potential impact of this project on wildlife movement. Currently, the distance between native vegetation on either side of Ngauranga Gorge is approximately 70 m. If the quarry extension is approved it will create a zone of barren rock, commercial and industrial buildings, roads and carparks between 285m and 400m wide (derived from Attachment 2). In the absence of information to the contrary, I conclude that this is likely to create a barrier for the movement of some indigenous species, specifically small forest passerines which move seasonally across the landscape to forage. Therefore a precautionary approach is needed.

6.14. I believe the only way to appropriately mitigate for the likely impact of the quarry expansion on avifauna is to set aside a block of the bed of the quarry to provide a stepping stone from Tyers Reserve to the North face of Ngauranga Gorge. I recommend this be a large block at the south end of the site to provide nearly direct connection between Tyers Stream Reserve and the SH1 buffer. This planting needs to be of a large size, to ensure an adequate core for birds to inhabit and traverse. I have proposed a strip of forest, extending from the toe of the southern cut 180m to SH1, and 100m wide (See Attachment 3).

6.15. In all cases the planting must meet good ecological design so that the vegetation is sustainable, a marginal buffer is provided between the core habitat and the business activities they will lie adjacent to, and the core will be of sufficient size and diversity to provide the necessary habitat.

6.16. I consider the time, cost, and commitment needed to rehabilitate the quarry well, makes the above outcomes more valuable than planting a larger area of pasture elsewhere.

6.17. However, the Wildlands third Options paper rejects this approach. The reasons given were:

> *"The option to develop a bird corridor close to State Highway 1 is not favoured for a number of reasons:*
>
> - *Providing bird habitat adjacent to a busy road is likely to result in high bird mortality through bird strike with cars. For instance, NZ Transport Agency is currently spending a lot of money removing vegetation attractive to birds from along SH2 to reduce bird strike.*
> - *The proposed bird corridor could largely not be established until after the quarry is exhausted, which is predicted to be some 15 to 20 years away. By then the birds would be habituated to using other routes.*
> - *Some of the site identified as bird corridor is likely to be rezoned as industrial and this is likely to cause a lot of activity and other disturbance that would make such a corridor less bird friendly.*
>
> *Overall, the loss of connectivity is expected to be less than minor for birds, as they can fly between habitats, and likely to be mitigated*

through the planting of strategically placed mitigation and rehabilitation areas for less mobile terrestrial fauna.

6.18. With regard to the first matter, and as I noted at the pre-hearing meeting, over the years I have observed bird movement across SH1 at this location, so it is already happening. I am therefore aware of the risk. However, the terraces upon which I propose the mitigation planting will lie between 10m and 25m above SH1 lifting any bird movement some distance above traffic.

6.19. Furthermore, no evidence has been presented supporting the claim that there will be "high bird mortality". The available research (Brockie 2007, Brockie et al 2009, Freeman 2010) shows that bird strike on roads is generally restricted to common and abundant species (harrier hawk, pukeko, magpie) or occurs at blackspots where certain species are particularly susceptible (weka, little blue penguin, gull). None of these situations apply at this site.

6.20. I am aware and have observed tui that have been struck by cars where mass planting of flax occurs alongside a busy road (e.g. the inner-city bypass). Mass planting of flax along a road if not proposed. My proposed planting is of appropriate native trees.

6.21. With regard to the statement that there will be 15 to 20-year delay, meaning that birds would be habituated to using other routes. This suggests firstly that there are other routes, and that once habituation they will not return to the site. These claims are not supported by any evidence that has been presented. In my experience on a number of restoration projects including restoration of Zealandia, that wildlife will rapidly colonise restored vegetation once it is established, assuming the correct mix of trees are used. And a look at SH1 immediately north and south of the quarry (and assuming this project proceeds) shows very little sufficiently large and connected alternative crossing points for native forest passerines will remain. In the absence of data, I suggest this should not be presented as a reason for not carrying out this mitigation and a precautionary approach is needed.

6.22. With regard to the future rezoning of the site as industrial, I am aware of this, and that is why I have recommended this width of planting. With

appropriate width I do not believe, based on experience, that human disturbance would make the corridor less bird friendly for most species.

6.23. With regard to the suggestion that loss of connectivity is expected to be less than minor for birds. Again, this is not based on any evidence that has been presented, and so again this should not be presented as a reason for not carrying out this mitigation.

6.24. Wildlands report also refers to a 70m width of planting which it considers to be excessive. This width was chosen to ensure that any resident fauna, are adequately buffered from human activity and resistant to edge effects. I have, however, given this additional thought and would be comfortable reducing the width if an internal barrier were to be placed between the forest margin and the adjacent commercial activities. The barrier could be a solid wall, an earth bund, or a combination of the two. It needs to be solid to provide both visual screening and a reduction in noise. A barrier 3 metres high would be sufficient. This would allow the width of the planting between the edge bend and internal bund to be reduced to 50m.

6.25. Wildlands is correct that a riparian planting width of 40m was proposed for Waitohi Stream. As described in section 5.0, I am comfortable that the width be allowed to vary as necessary to account for site limitations and tenure issues.

6.26. Wildlands is also correct that I sought a strip of planting of 40m width paralleling SH1. As an alternative they suggest that by combining an 8m wide bench with an area of backfilling a width of planting of 30m could be achieved. I would be comfortable with localised reductions of the planting width as dictated by the site, as I am for the riparian planting. However, as I noted at the pre-hearing meeting, I have major concerns that the 8m bench would not support planting.

6.27. Wildlands suggest in relation to a possible 30m zone of planting that "*the species that will establish or be planted are likely to be lower-stature species rather than tall forest trees to reduce potential future risks to State Highway 1*". Firstly, this is counterintuitive; taller trees are more likely to lift bird movement away from traffic. Secondly, if Wildlands are suggesting grasses and shrub species, then this would not deliver the benefits that I believe are necessary. However, if they are proposing lower

coastal forest, then we are in agreement that this community is representative and appropriate.

Direct Transfer

6.28. The November Mitigation Options Report adds direct transfer of indigenous vegetation to five rock benches (three at the top of the cut, on the lower terrace) as a mitigation method that will return 0.71 ha of benefit. These sites are labelled 15 & 16 on the mitigation map. They propose that if direct transfer is not successful, then these sites would be planted.

6.29. This is an extremely arid and windy site which will challenge planting, even in favourable soils and with some shelter. The proposed direct transfer of indigenous vegetation onto quarry benches and any follow-up planting is, in my experience, unlikely to succeed, despite the methodology proposed. In this matter my views are shared by Mr Evans who mentions it in Para 3.99 of his evidence.

6.30. Our concerns on this matter were also expressed at the pre-heating meeting.

6.31. To support our concern, we note the findings of WCC staff on the results of mitigation planting trials where they recorded:

> *"Section A completely failed which didn't surprise me as it is north facing, extremely dry and very windy, … The plants put in around the base of some of the broom and gorse have grown all right, but not thriving (WCC, Email dated 26 July 2018)."*

6.32. I therefore do not believe direct transfer can be relied upon as mitigation in the locations shown. There would be some hope of success if direct transfer was to a south facing site with deep soils and good shelter, but I am not aware of any.

6.33. While I do not believe direct transfer will succeed at the sites identified, I note that the original Assessment briefly discusses the creation of lizard habitat (Section 12.2) but this has not been included as part of the mitigation package. The logical location for constructed habitat are the benches, where rock piles and organic debris can be located.

Remediation of Cut Benches

6.34. In the latest version of the Mitigation Options Report Wildlands have added "Remediation of Cut Benches" as a mitigation method. This treatment is not shown on the map or given a number of the mitigation tables.

6.35. As discussed above (paragraph 6.11), both Mr Evans and myself believe, based on our experience and observations at this and other sites, that any attempt to establish native vegetation on the cut benches of this rock face have a very high likelihood of failure. In the Quarry Restoration Plan we proposed bench planting on the Northern face (see Attachment 1), which is south facing and sheltered from the worst of the summer sun and wind. We do not believe it is viable for the proposed south face.

6.36. We suggest that this will be costly exercise that will yield little or no benefit. This effort should be applied to a site or sites where success is assured.

Integrated Mitigation Design

6.37. In my original evidence I advocated for an integrated approach to mitigation design. There are clearly opportunities for synergies between the reforestation of parts of this site for the mitigation of vegetation and habitat loss, and planting of parts of the site for visual screening and softening / healing of the landscape.

6.38. I argued for a single integrated plan for the site developed collaboratively between an ecologist, landscape architect, planting contractor (in recognition of the difficulty of the site), and the site engineer responsible for final engineered form. It is my experience that separate plans required by TA and Regional consents, each tasked with looking at just one aspect of site rehabilitation, do not necessarily lead to the best environmental outcomes for the site as a whole.

6.39. However, the Wildlands 3rd Mitigation Options Report rejects this approach stating:

> *"Rehabilitation of the site once the quarry is exhausted will certainly provide some ecological benefits. However, the main focus is rehabilitation or amenity planting and not indigenous habitat creation. Under Biodiversity Offsetting guidance the purpose of the*

mitigation or offset needs to be considered, and each area can only be counted once (e.g. for amenity planting OR mitigation) (BBOP 2012, Department of Conservation 2014)."

6.40. What is being claimed by Wildlands is that if mitigation planting provides both visual and habitat value, either the landscape architect can claim the benefit of that planting, or the ecologist can; but not both. If the landscape architect claims the benefit, the ecologist must 'accept' that the real ecological benefits don't exist. If the ecologist claims the benefit the landscape architect must accept that the real landscape benefits don't exist. This is, in my opinion, an incorrect interpretation of the additionality principal.

6.41. Furthermore, the assertion made by Wildlands that "*the main focus is rehabilitation or amenity planting and not indigenous habitat creation"* is inconsistent with the objectives and principals of the QMP and Plan Change documents. It appears that, to secure this position Wildlands have identified two sites (labelled 17) within the latest Mitigation Options Plan and described these sites as visual amenity maintenance, thereby, under their interpretation, making them unavailable for ecological mitigation.

6.42. 'Additionality' is a core principal of mitigation design or biodiversity offsetting. In simple terms it states that an ecological or biodiversity gain cannot be claimed more than once. The DOC guidelines(New Zealand Government, 2014) state:

"BBOP Principle 5 states that a biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. This is because conservation actions already planned and funded, in place, or required by law do not deliver any extra biodiversity gains to balance biodiversity lost at an impact site. Without additional conservation actions demonstrated at point of design, it is not possible to achieve a no net loss outcome. This aspect of the process is called 'additionality'.

6.43. Similarly the recent document on biodiversity (Maseyk, Ussher, Kessels, Christensen, & Brown, 2018) speaks to the need to achieve biodiversity gains:

> *"A biodiversity offset must achieve gains in biodiversity above and beyond gains that would have occurred anyway in the absence of the offset. This requires evaluating the change in biodiversity value under both a 'with offset' and a 'without offset' scenario to estimate the the amount of additional gain that can be attributable to the offset action."*

6.44. Both of these, as well as the international guidance on biodiversity offsetting (Business and Biodiversity Offsets Programme (BBOP), 2012), clearly apply the additionality principal to "biodiversity gains". None of these state that if a social gain is also achieved, it will negate the biodiversity gain. None present social and biodiversity benefits as an either/or decision. Instead, all state that biodiversity offsetting *"encompasses multiple dimensions including technical, social, ethical, cultural, and governance aspects".*

6.45. Where I have recommended integration of ecological and landscape design, it is my opinion that the planting will provide both a conservation benefit, and a social (landscape) benefit. The conservation benefit is being claimed once. The benefit claimed does not rely on *"conservation actions already planned and funded, in place, or required by law".* Nor would the applicant have invested in this planting if not for the need for mitigation for this project. The fact that both ecological and social benefits can accrue from integrated design should be embraced, not dismissed.

6.46. For all these reasons I reject the position held by Wildlands that integrated design breaks the additionality principal. It remains my position that a single integrated plan should be developed for this challenging site, where it will almost certainly lead to better environmental outcomes than treating each aspect of site mitigation in isolation.

7.0 Recommendations & Conclusions

7.1. A summary of my conclusions and my recommendations are provided at the outset of the report.

7.2. I Identify throughout the body of the report a range of concerns with the original application and ecological assessment.

7.3. Further information, followed by a pre-hearing meeting with the applicant has addressed many issues raised by submitters, and my own concerns regarding the rehabilitation of Waitohi Stream.

7.4. However, I remain concerned at the lack of site remediation and the loss of habitat and connectivity for terrestrial fauna. I believe this can be easily addressed.

7.5. I am also concerned regarding the high likelihood of failure of several aspects of mitigation design.

7.6. Finally, I strongly recommend an integrated approach to mitigation design, despite Wildlands objections.

7.7. I have discussed the plan change text with Mr Jones and endorse the changes to the plan provisions Mr Jones has noted in his Attachment 2.

Stephen Fuller
Certified Environmental Practitioner
Boffa Miskell Limited

8.0 References used in Evidence

Boffa Miskell Ltd. (2005). Kiwi Point Quarry, Progressive Rehabilitation Plan (No. W03167) (p. 48). Prepared by Boffa Miskell Ltd. for Wellington City Council.

Brockie, R.E. (2007) Notes on New Zealand mammals 4. Animal road-kill "blackspots" New Zealand Journal of Zoology, Vol. 34:4, 311-316.

Brockie, R.E., Richard M. F. S. Sadleir & Wayne L. Linklater (2009) "Long-term wildlife road-kill counts in New Zealand" New Zealand Journal of Zoology, 2009, Vol. 36: 123-134

Business and Biodiversity Offsets Programme (BBOP). (2012). Guidance notes to the standard on biodiversity offsets. Washington, D.C.: Business and Biodiversity Offsets Programme (BBOP).

Emeny, M. (20016). Kiwi Point Quarry Expansion - Alternatives Workshop. Terrestrial Ecology Report (p. 10). Prepared for Wellington City Council.

Freeman, S. (2010) Western weka road-kill at Cape Foulwind, Buller, New Zealand. New Zealand Journal of Zoology, 37:2, 131-146

Incite. (2017). Proposed District Plan Change 83: Kiwi Point Quarry Extension. Section 32 Report: Consideration of alternatives, benefits and costs. (p. 63). Prepared by Incite for Wellington City Council.

Maseyk, F. J. F., Ussher, G. T., Kessels, G., Christensen, M., & Brown, M. (2018). Biodiversity offsetting under the Resource Management Act: A guidance document. Prepared for the Biodiversity Working Group on behalf of the BioManagers Group.

MWH-Stantec. (2016). Kiwi Point Quarry Expansion - Alternatives Assessment. Water Quality (p. 11). Prepared by Stantec for Wellington City Council.

New Zealand Government. (2014). Guidance on good practice biodiversity offsetting in New Zealand. New Zealand Government.

Wellington City Council. (2008). Northern Reserves Management PLAND (p. 135). Wellington City Council.

Wellington City Council. (2013). Our capital spaces: An open spaces and recreation framework for Wellington: 2013-23. Wellington: Wellington City Council.

Wellington City Council. (2014). Kiwi Point Quarry, Quarry Management Plan June 2014 (p. 417 incl. appendices).

Wellington City Council. (2015). Suburban Reserves Management Plan 2015 (p. 156). Wellington City Council.

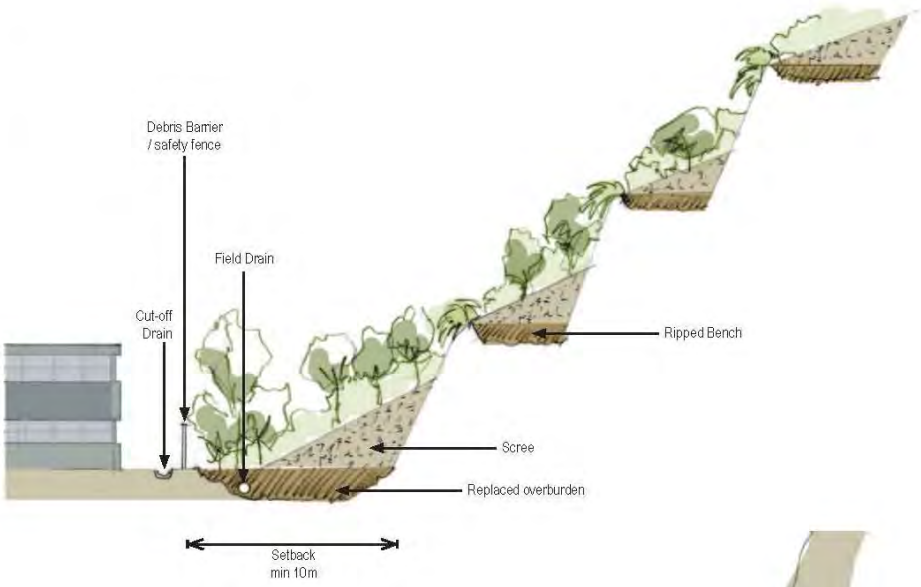
Wildland Consultants Ltd. (2017). Assessment of ecological effects for proposed expansion of the Kiwi Point Quarry, Ngauranga Gorge, Wellington (No. 4378) (p. 31). Prepared by Wildland Consultants Ltd for Wellington City Council.

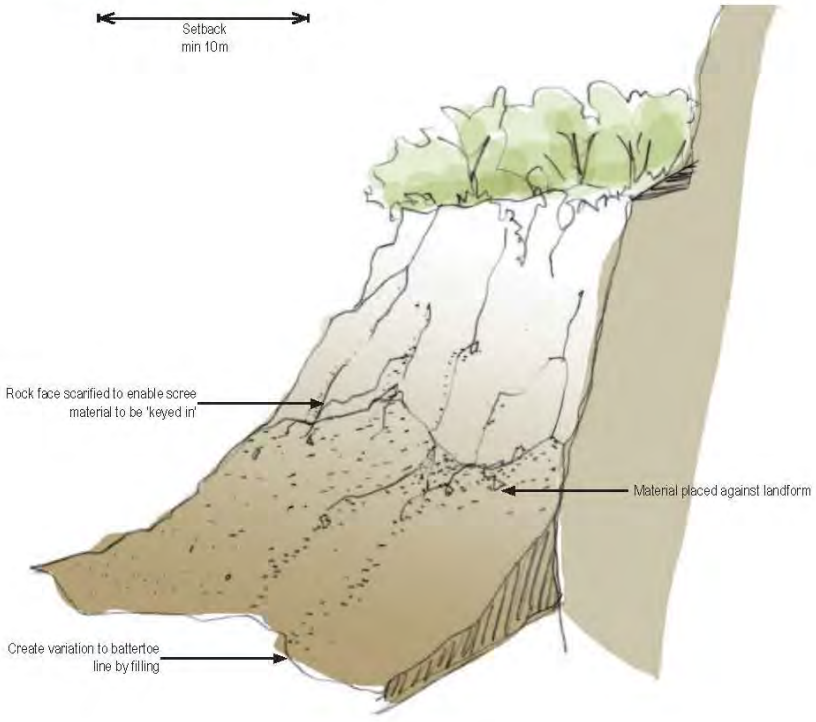
Wildland Consultants Ltd. (2018). Mitigation options for the potential loss of indigenous vegetation and habitat at the proposed Kiwi Point Quarry, Wellington. Draft (Contract Report No. 4378d). Prepared for Wellington City Council.

9.0 Attachments

Attachment 1: Quarry Face Rehabilitation

(Source BML 2005, 3 Images)





BOFFA MISKELL
planning design ecology

KIWI POINT QUARRY
REHABILITATION PLAN

Absolutely POSITIVELY Wellington

Reference:
W03167 Kiwi Pt Rehab A4 Figures v2.indd
June 2004

Landform Toe Slope

Figure 4

From Progressive Rehabilitation Plan 2005
Section 3.4 Kiwi Point Quarry, Site Constraints

The goal for rehabilitation is to match timeframes for natural regeneration on un-modified sites. The following table provides an indicative guide to the timeframes that can be expected at this site, both target timeframes for successful revegetation (based upon estimates of revegetation on a natural landscape), and a worst case situation where revegetation occurs without assistance. North aspect refers to the proposed South Face extension, which will be directly exposed to prevailing northerly winds, and will be arid during summer. South aspect refers to the decommissioned North Face, which will have some shelter from prevailing winds and be less susceptible to summer drought conditions.

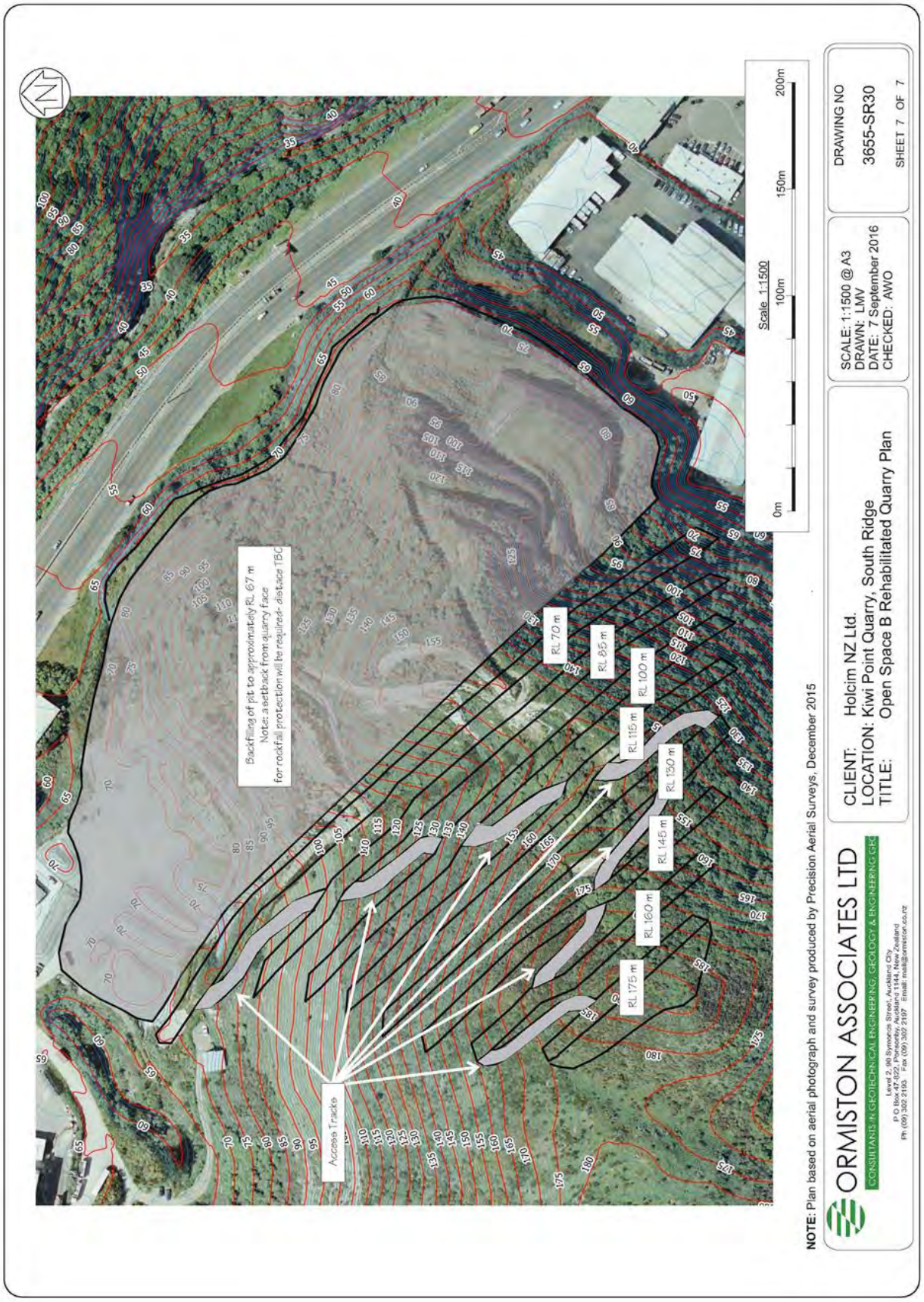
Table 1 Ngauranga Gorge Revegetation

(Time Periods in Years)

Land Cover	Target timeframes with rehabilitation		Expected timeframes without rehabilitation	
	North aspect	South aspect	North aspect	South aspect
Grass Cover	1-2	1	5	3
10% woody cover	10+	5+	30+	20+
50% woody cover	20+	15+	60+	40+
Up to 100% woody cover	40+	30+	80+	60+
Mature second growth forest	80+	60+	150+	120+

(Modified from *Kiwi Point Quarry Open Spaces Assessment* August 2001)

Attachment 2: Rehabilitation Quarry Plan



Attachment 3: Quarry Mitigation Options

Mitigation proposed by Wildlands in Blue & Green. My additions in black hatch.