



Memorandum

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Attention: Karen Bell (cc. Pam Butler)

Company: Stantec (cc. KiwiRail Limited)

Date: 15 February 2021

From: Jeremy Garrett-Walker

Message Ref: KiwiRail Regional Freight Hub NoR – S92 response Ecology

Project No: BM200256

ECOLOGY	REASON FOR QUESTION	RESPONSE
5.1 Landscape ecology context		
65)	<i>Given the location of the NoR between two developed/developing areas, please provide further information as to the actual and potential effects of the NoR on ecology at a landscape level (including for example, connectivity, habitat fragmentation, etc).</i>	The Ecology Assessment has been carried out at a “landscape” level with acknowledgment of the large agricultural plains land use. As such the assessment has already considered the actual and potential landscape-scale effects, including for example connectivity and habitat fragmentation.
5.2 Terrestrial ecology		
66)	<i>In Technical Report F - Assessment of Ecological Values and Effects ('AEE'), it appears there are some anomalies between the method for assessment (outlined within section 3.1) and the ecological values and magnitude of effects obtained. Please review these and provide updated values that align with the method used and recognising the limitations to the survey approach used.</i>	The methods and values have been reviewed and it is confirmed that the Not Threatened avifauna and herpetofauna (and aquatic) species have a Low Ecological Value rather than the Negligible Value stated in the report. The report has been amended to reflect this. This change does not alter the outcome of the assessment of effects due to the prescribed landscape-scale low magnitude of effects expected still resulting in an overall low level of effect irrespective of a low or negligible ecological value.
5.2.1 Fauna		
67)	<i>Please provide an assessment of whether any consideration was made as to bats being affected by the project.</i>	Bats were not considered as part of the assessment due to the absence of suitable habitat (such as mature forest with many trees with cavities/hollows) coupled with no known nearby populations (10km radius) (supported by extensive recent surveys for windfarms, etc).
68)	<i>Please clarify what insects were included in the assessment of effects (noting the</i>	No specific terrestrial insect assessment was undertaken as part of the assessment. The reference to insects on page 27

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<p><i>conclusion includes reference to insects at page 27 but no further information is included in the report).</i></p>		<p>of the Ecology Assessment reflects the lack of suitable vegetation/habitat for notable insect habitation and the absence of nearby habitats that the change in land use may impact access to/from/through those habitats. We consider notable insects to include those taxa with a Threatened conservation status (Nationally Critical, Nationally Endangered, or Nationally Vulnerable) according to DOCs New Zealand Threat Classification System¹. In many cases their threatened status is due to only a single (or very few) populations existing which do not reside within or near the designation extent, or in response to a lack of suitable remnant vegetation existing which the designation does not provide.</p>
<p>69) <i>A substantial amount of planting seems to be proposed to be undertaken across the site. Much of this is landscape planting. Please explain whether any of this vegetation might contribute to benefits to fauna post development.</i></p>		<p>While the planting is not intended as ecological planting, and has not be assessed as such, it will inevitably provide habitat for indigenous (and introduced) fauna. However, as noted above in response to question 65, the wider land use is agricultural and has little in the way of indigenous species assemblages that might make use of the planting.</p>
<p>70) <i>Please identify whether or how KiwiRail intends to manage birdlife during construction.</i></p>	<p>Recommendations are provided for management of lizards during construction, however no reference is made to managing birds (also protected under the Wildlife Act 1953). Further, there appear to be no conditions proposed to address the effects on wildlife.</p>	<p>Where required, prior to any vegetation clearance during the nesting season, investigations will be undertaken for nesting indigenous avifauna and, if found, measures will be put in place to ensure the nest is not disturbed (i.e. exclusions zones established and clearance delayed within that zone). Exact details will be captured and considered at the regional consenting phase (including any obligations under the Wildlife Act 1953).</p>

5.2.2 Wetlands

¹ Stick insects - (Buckley et al., 2016); Earthworms - (Buckley et al., 2015); Orthoptera - (Trewick et al., 2016); Onychophora - (Trewick et al., 2018); Lepidoptera - (Hoare et al., 2017); Hymenoptera - (Ward et al., 2017).

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<p>71) <i>Given the limitations of the site access and the timing of the field survey in the context of the newly released National Policy Statement for Freshwater Management 2020 (NPS FM) and National Environmental Standards for Freshwater (NES Freshwater), please provide further information regarding the wetland assessment to provide confidence that there are in fact no wetlands (as defined within the NPS FM) within the NoR site. If wetlands were to be identified during future consenting phases, has there been any consideration of how effects on these may be addressed, considering relevant provisions of the NPS FM and Horizons One Plan?</i></p>		<p>Since the ecology assessment was prepared, further Site investigations over the designation extent have been undertaken; however, due to landowner approval not being given not all sites were able to be accessed. The areas accessed at some stage during the two (July 2020 and January 2021) site visits are shown in Figure 1. During the second site visit conducted in January 2021, two sites towards the northern extent of the designation (surrounding Stream System 1) and another site along the southwestern boundary were observed from the road as shown in Figure 2. It is possible that these may technically qualify as wetlands according to the (Clarkson, 2013) wetlands delineation method based on their prevalence and/or dominance scores (which are tools used to indicate the vegetation community's affinity with wetted soils). However, further investigation is required to confirm this. From the vantage that was gained, it is likely these wetlands would have, at most, low ecological value because they are likely to be dominated by exotic species, are small, and are effectively induced – they will not be indigenous-representative wetlands.</p> <p>Further, our understanding, (see the Question 86 response for further details) is that the Freight Hub is considered “specified infrastructure” according to the NPS-FM definition due to it being:</p> <ul style="list-style-type: none"> i. Infrastructure that delivers a service operated by a lifeline utility (as defined in the Civil Defence Emergency Management Act 2002)) (which KiwiRail is captured by); and ii. Regionally significant infrastructure identified as such in a regional policy statement or regional plan.

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		<p>Therefore, a consenting pathway is provided for through 3.22 of the NPS-FM 2020. This provides that effects are managed through the “effects management hierarchy”. If wetlands are confirmed to be present within the site, we consider there is sufficient space and scope within the site to sufficiently manage the effects, through the effects management hierarchy set out in the NPS-FM. The details of the effects management hierarchy application will be included and confirmed with Council during the regional consenting phase. At this stage, we do not believe it appropriate to speculate on the location and/or ratio for any such effects management, but in our view there is potential that the site may contain only poor (if any) exotic induced wetlands and has sufficient space and scope to adequately manage any effects on those wetlands. It is unlikely that aquatic compensation would need to be applied, but our interpretation is that the NPS-FM definition of “effects management hierarchy” does provide for this to be utilised if needed.</p>

5.3 Freshwater ecology

5.3.1 Classification of streams

<p>72) <i>Please clarify the approach taken to classifying streams and provide further information as to the justification for the classification and values of streams that have not been visually inspected and, where appropriate, identify whether or how any uncertainty pertaining to affected stream length and values has factored into the assessment.</i></p>	<p>The AEE states that the definitions within the Auckland Unitary Plan were referred to (page 9) however, the descriptions of the streams and the associated photos do not align with these definitions. For example, an ephemeral stream always has its bed above the water table, however Image 1 shows an 'ephemeral stream' which has water present. Conclusions are drawn that the entire Stream 1</p>	<p>The ecological valuation of aquatic systems is a synthesis of site data and other information, drawn from a range of sources and criterion (such as those contained in the EIANZ guidelines) and the classification of a stream into one of three hydrological regimes is of minor importance and does not always reflect a particular value.</p> <p>As discussed in Technical Report F – Assessment of Ecological Values and Effects, the One Plan does not contain stream classification definitions. As such, the Auckland Unitary Plan definitions were developed for</p>
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	<p>catchment is ephemeral, based on the small amount of stream length that could be accessed. When comparing the size of this catchment (623ha) and adjacent catchments (including the central perennial 'Northern tributary', with a catchment area of 596ha), it is expected that at least some of the stream is intermittent or permanent. The stormwater report identifies that much of the stream length is activity eroding (page 8), suggesting flows may be more than ephemeral. Further, some stream length appears to have been excluded from the site maps.</p>	<p>permanent (commonly called perennial), intermittent, and ephemeral streams/reaches and applied in the context of landscape and the One Plan objectives and policies. Appendix 1 includes the relevant definitions and how these have been interpreted and applied.</p> <p>Following a further site visit in January 2021, we have reclassified the northern most branch of Stream system 1 as intermittent but retained the other branches as ephemeral. These changes do not alter the overall valuation and outcomes of the ecological impact assessment. There are still sections of this system (particularly downstream of the various confluences) that we have not been able to visit and have therefore not classified. These changes are portrayed in Figure 2.</p>
<p>5.3.2 Freshwater fauna</p>		
<p>73) <i>Noting the above, what level of certainty can be given to the conclusions as to the ecological values of the site, including as to the presence of fish species.</i></p>	<p>In the absence of field surveys, the AEE relies on the NZ Freshwater Fish Database and the 'surveyors experience' to inform the potential species present within the NoR. Six species of native fish, kōura and kākahi being present within the wider catchment (table 7, page 19), but the AEE concludes that only one species would likely be present within the NoR. The size of the upstream catchments intuitively suggests it is likely that multiple species would be present, either permanently or</p>	<p>Although catchment size is an attribute considered under the “representative” and “ecological context” EIANZ matters, it is not a reasonable predictor, in itself, of instream ecological value and taxonomic richness.</p> <p>The site visits undertaken combined with both the review of aerals and sighting of some areas from a distance is sufficient to accurately estimate the conditions and flow patterns of unvisited sections. This is also sufficient to estimate (given the similarities in land uses and land modifications across the catchment) the instream flora and fauna values. We have a high level of confidence at this stage of those estimates based on the work carried out to date.</p>

ECOLOGY	REASON FOR QUESTION	RESPONSE
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temporarily passing through to upper reaches.

5.3.3 Macroinvertebrate communities

74) *Please undertake sampling if possible to inform the current ecological values of the site.*

No macroinvertebrate sampling was undertaken to inform the AEE and the report considers that the community composition could be reliably estimated without sampling. While it is accepted that the existing environment is degraded, macroinvertebrate community indices aid in determining the extent of degradation and can guide effects management approaches.

Macroinvertebrate sampling was carried out in January 2021 in the northern tributary of Stream system 2 as well as within the upper extent of Branch D of stream system 1. The results indicate the watercourses are in poor quality and have probable severe pollution (Stark & Maxted, 2007). Further details of the sampling are provided in **Appendix 2**. They also fall well below the National bottom lines contained within Table 14 (Appendix 2B) of the NPS-FM. Further, the macroinvertebrate communities resemble what would be expected in intermittent reaches typified by standing rather than flowing water. Overall, the results are consistent with our Low Ecological Valuation of the watercourses (when also considering the condition of the bed substrate, vegetation, water, etc) in the Ecological Assessment.

Fish sampling has not been undertaken as the prevailing weather and stream conditions at the time of the second site visit in January 2021 were considered extreme (in terms of temperature, depth etc). We concluded that effective survey techniques would unduly stress any captured fish. The addition of site-specific fish data was not considered necessary enough to warrant applying undue stress (including possible death) on any resident fish (perhaps a few eels). In any event, we are comfortable with the assessment.

5.3.4 Overall stream values

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<p>75) <i>Did the assessment take into account the adapted criteria as set out in Appendix A, and if not, please make comment on the suitability of this approach for the affected streams.</i></p>	<p>While the use of the Ecological Impact Assessment (EclA). EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems (2nd ed.) 2018 (EclAG) is helpful, the criteria within the EclAG for freshwater systems are not as easy to apply as those for terrestrial systems. In other projects, Boffa Miskell have adapted those criteria to utilise standard measures of freshwater ecosystem health (refer for example to the table appended to these questions). This approach does not include 'negligible' ecological value, which is more typically associated with concrete lined channels that completely lack in-stream habitat or riparian margin.</p>	<p>The assessment did not take into account the criteria provided in Appendix A of the section 92 request.</p> <p>The approach provided in Appendix A of the Council's section 92 request appears to focus on biological (e.g. benthic macroinvertebrate community indices) and morphological features (e.g. bank stability, channelisation). We consider this to be a subset of the more holistic EIANZ criteria that we included in our assessment. We consider that the application of the more holistic EIANZ criteria are more appropriate in the context of a Notice of Requirement as they consider the potential landscape-wide ecological effect of the proposed change in land-use. Some of the metrics contained within the Appendix A criteria would be better suited to the regional consenting phase (in terms of informing the EIANZ criteria).</p>

5.3.5 Receiving environments

76) *Please provide assessment of the environment that will receive flows from the proposed freight hub, including but not limited to, those areas that would be impacted by sediment discharges, water quality changes, changes in flow regime resulting from the proposed modification and stormwater management approach. Note that this receiving environment includes stream reaches outside of the NoR.*

Overall, we consider a detailed assessment of the receiving environment and its sensitivities to stormwater inputs is appropriate at the regional consent phase when there is a better understanding of the project's details including the details of the stormwater treatment approach and resulting potential contaminants.

The southern stormwater basin is proposed to discharge into the northern tributary of Stream System 2. This inadvertently coincides with the lower sections of the already assessed length. In addition, macroinvertebrate samples were collected from here during the site visit in January 2021 and

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<p>77) <i>Please provide further information on the link between what is expected to be discharged from the sediment controls and the receiving environment, how this is measured, and what is considered an acceptable discharge from the site to the receiving environment.</i></p>	<p>There does not appear to be a clear link between what ultimately comes off the site and the resulting effects on the receiving environment.</p>	<p>have confirmed our initial assessment of its value and sensitivity – both of which are low.</p> <p>This information will be captured at the regional consenting phase once detailed design of the Regional Freight Hub has been undertaken and a better understanding of the discharges, and the mechanism for discharge into the receiving environment are known.</p> <p>However, based on our site investigations and the desktop review work undertaken, we are confident there are no sensitive areas in the receiving environment that will be potentially within the zone of reasonable mixing.</p> <p>Furthermore, any discharges and relevant controls will be subject to New Zealand industry standard and the One Plan - Schedule E: Surface Water Quality Targets requirements as a minimum (Schedule E includes a range of water quality metrics and the required concentrations/measures beyond the zone of reasonable mixing). The level of compliance with Schedule E will be considered at the regional consenting stage.</p>
<p>78) <i>Please assess stream erosion in light of relevant policies of the NPS FM.</i></p>	<p>The stormwater report identifies that stream erosion is a 'limited concern' as the affected streams are already highly modified.</p>	<p>The NPS-FM does not directly address erosion, but does address deposited sediment in rivers (section 3.25). As noted in the AEE the streams are all soft bottomed and probably have always been soft bottomed since forest clearance, if not before, given the gradient and the alluvial plains in which they run. There are no assessments to be made other than the streams have soft bottomed bed and so soft bottomed communities. For a more detailed analysis of provisions of the NPS-FM, please refer to the response to question 177.</p>

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79) <i>Please clarify whether KiwiRail intends to include an Erosion and Sediment Control Plan as part of a construction management plan.</i>	The Stormwater Flooding Assessment (page 9) recommends an Erosion and Sediment Control Plan as part of the construction management but there is no reference to this in conditions.	Erosion and sediment control will be assessed as part of the regional consent process with any appropriate conditions prepared at that stage.
5.3.6 Fish passage		
80) <i>Please provide further clarification and/or technical justification to support this assertion, considering:</i>	The AEE report states that if designed correctly, culverts can have a positive magnitude of effect on fish passage (page 29). Please clarify what was considered to be an "upgrade" for the purposes of the AEE.	<p>The assertion that correctly installed culverts will have a positive magnitude of effect considers the existing habitat quality and passage difficulties against the habitat opportunity in the upstream areas of the northern tributary of Stream system 2.</p> <p>The following current conditions were considered relevant to this assertion:</p> <ol style="list-style-type: none"> a. Stock have free and ready access to the stream throughout the site which has resulted in homogenous instream conditions (slumped and pugged banks, soft benthos with often >10 cm thick fine sediment (<2 mm) layer, predominant slow run habitats). b. No riparian vegetation exists to provide shade (and mitigate temperatures) and organic inputs (apart from a small vegetated patch towards the downstream extent (near where the southern stormwater drain is proposed to discharge)). c. Landowners spoken to on the site visits have stated the stream is prone to drying in areas (i.e. not throughout), particularly downstream of the Railway Rd and existing railway culvert. Based on these

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		<p>accounts, it appears drying occurs as water is held up/retained behind the existing culvert structures and velocities are not enough during extended dry/low flow periods to cause continual flow through the structures (essentially it appears evaporation exceeds the flow rate). During these times, migrating fish need to either reside within the stressful conditions in the stream through the NoR site or return downstream to the main stem of Mangaone Stream.</p> <p>Overall, the current passageway to the better upstream habitats is considered stressful, and potentially obstructed for periods.</p> <p>The construction of culverts as per the NES-FW (which follows the approach of the New Zealand Fish Passage Guidelines) will provide for, in our opinion, better passageway for fish through the site (as well as better resting/inhabiting habitat in the culverts than currently exists provided an adequate streambed is included through the culverts/pipes). Therefore, when considering the current passage issues/stressors compared with what is likely from the development of the land, we maintain our view that there will be a positive magnitude of effect and subsequent net gain in fish passage.</p>
<p>(i) <i>The extent of proposed piping relative to total length of streams;</i></p>		<p>Pipe length, in and of itself, is often the sole consideration for ascertaining fish passage likelihood. However, there are a number of other factors which should be considered, especially in the flat topography offered by this site. Culvert width and gradient are other important factors. While the exact culvert metrics will be confirmed as part of the regional consent phase, we are confident the culverts can be sized</p>

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		<p>and at such a low gradient that a “natural stream channel” can form along the base of the culvert. Fish passage is expected to be easily and readily available to fish throughout the year (where currently, landowners suggest small sections dry out in the height of summer due to flow modifications from existing structures).</p>
<p>(ii) <i>The overall length of culverted sections that fish will be expected to traverse;</i></p>		<p>Stream system 1: Total culverted length: to reach D subcatchment - 449 m; broken into 27 m, 302 m, and 120 m sections To reach A, B, and C subcatchments 432 m, where the upper section is a 103 m culvert rather than the 120 m (culvert branches).</p> <p>Stream system 2, northern tributary: Total culvert length 678 m.</p> <p>The flat topography of the site means (assuming culverts/pipes are sized and installed as per the NES-FW) there are not expected to be any velocity and/or gradient barriers within the culverts/pipes.</p>
<p>(iii) <i>The lack of definitive aquatic ecology assessment for affected areas; and</i></p>		<p>We are unsure what the reviewer is referring to here, though we note the following that has contributed to the assessment:</p> <ul style="list-style-type: none"> - Qualitative site-specific information and descriptions (including landowner insight where gathered) - Subsequent macroinvertebrate community analyses following the January 2021 site visit - Desktop review of existing information, both locally (near the designation) and regionally.
<p>(iv) <i>The New Zealand Fish Passage Guidelines, the NPS FM and NES Freshwater.</i></p>		<p>The details from the New Zealand Fish Passage Guidelines provided in the NPS-FM and NES-FW will be followed as now required by these policy documents. The details and</p>

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81) <i>Has sufficient space been allocated in the NoR for proper measures to be implemented?</i>		<p>design of the pipe features will be included and considered as part of the regional consent phase rather than the NoR process.</p> <p>In terms of fish passage, we consider there is sufficient space within the site to provide for features/structures, especially given the flat topography of the site. This includes the ability to size culverts to allow for the “stream simulation” approach to culverting to be utilised. The exact metrics and design of the culverts will be captured and assessed at the regional consent phase.</p>
5.3.7 Stream loss and modification		
82) <i>Please provide an assessment of the magnitude of effect at this scale and outline what measures are available to address these effects, through either mitigation, offset or compensation. Please also identify the likely area requirements/ location for any identified measures, taking into account all relevant provisions of the NPS FM, if any.</i>	The proposed development will result in the loss of at least 3.8 km of stream. Some of this stream will retain some hydrological function through culverts, however some length will be lost entirely. The AEE states that this will have a 'negligible magnitude of effect' at the Mangaone catchment scale and a 'low magnitude of effect' at the more local stream catchment scale (being Stream System 1 and Stream System 2) (page 27 and 28). At the point of impact and within the NoR, the stream systems will be altered through development.	We consider it is appropriate for a NoR process to focus on the potential landscape-wide ecological effects of the development. Any such site-specific assessment of the magnitude of effect is more appropriately considered at the regional consenting phase once a detailed design is in place. That said, we consider there is enough scope within the Site to manage effects using the effects management hierarchy in the NPS FM should it be required. At this stage of the process, no such mitigation is required to account for landscape-wide ecological effects other than that already discussed, recommended, and/or accounted for in the ecology assessment and design.

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<p>83) <i>Please identify numerically the likely length of streams that will remain available for enhancement following the development, as intended by the draft indicative Landscape Plan.</i></p>	<p>The stormwater report states that there is opportunity to enhance retained or reconstructed stream length (page 9).</p>	<p>Approximately 445 lineal meters.</p> <p>However, the potential width in which stream(s) can be created is as much as 20 m – 30 m meaning meanders can be included in the design. Therefore, the as-built stream length is likely to be sufficiently longer than the straight line 445 m the current design suggests.</p>
<p>5.3.10 Policy direction</p>		
<p>86) <i>Please identify all relevant provisions of the NPS FM, and provide an assessment of the proposal against any identified provisions, including as to the proposed stream loss and associated considerations including sediment, water quality and flow regime change.</i></p>		<p>See response to Q 177) in the Planning s92 Response.</p>
<p>5.4 Effects management and conditions</p>		
<p>87) <i>Please clarify whether and how KiwiRail intends to implement the recommendations contained within the AEE, particularly in relation to fauna salvage and the maximisation of ecological enhancement opportunities within the site to address effects resulting from terrestrial and freshwater habitat loss.</i></p>	<p>Recommendations are made within the AEE concerning management of effects which do not appear to have been carried through into the conditions of consent.</p>	<p>It is expected the recommendations will be captured and accommodated at the detailed design phase and/or as conditions of consent at the regional consenting phase. For example, it is expected the consent conditions will require the development and certification of management plan(s) that detail the required management actions (such as fauna salvage).</p>

Site figures



Figure 1

Appendix 1 – stream classification definitions and interpretations

Auckland Unitary Plan definition		Our interpretation of the definition and how we have applied it
Permanent river or stream	<p>The continually flowing reaches of any river or stream</p>	<p>Landowners have indicated/suggested that the flow regime within and surrounding the NoR site (but not including the main stem of Mangaone Stream) are heavily influenced by the flat topography, clay-based soils (and corresponding shallow topsoil layer), lowland-originating headwaters, and various human-made structures. For example, the northern tributary of Stream system 2 is prone to drying in isolated places (particularly downstream of structures) during prolonged dry periods as inputs from the headwaters are not sufficient to “overtop” even shallow barriers. There was a common perception from landowners that evaporation must therefore be greater than the rate of upstream replenishment; however, it is likely more complex than this (i.e. some water loss to soakage).</p> <p>To avoid a scenario where a given reach is broken down into a lineal mosaic of different flow classifications, we approached the classification by considering what the flow regime would likely be in the absence of these structures which inhibit downstream migration of flows. For example, we have assessed the Northern tributary of stream system 2 as being perennial throughout rather than intermittent in places, as this provides us a better understanding of the spatial and temporal habitat potential of a given reach.</p>
Intermittent stream	<p>Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definitions of permanent river or stream and meet at least three of the following criteria:</p> <ul style="list-style-type: none"> (a) It has natural pools; (b) It has a well-defined channel, such that the bed and banks can be distinguished; (c) It contains surface water more than 48 hours after 	<p>For consistency with the above application of the permanent classification, we have considered what the flow regime would likely be in the absence of human-made structures. To assist, we ignored water (or otherwise) near structures. The following is how we have interpreted each criterion accordingly:</p> <ul style="list-style-type: none"> (a) This excludes pools immediately upstream or downstream of structures (we have considered these artificial pools) (b) This also includes areas where the banks and beds have been impacted by stock access (pugging, slumping, etc) such that there is only a moderately-defined channel as a result

	<p>a rain event which results in stream flow;</p> <p>(d) Rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;</p> <p>(e) Organic debris resulting from flood can be seen on the floodplain; or</p> <p>(f) There is evidence of substrate sorting process, including score and deposition.</p>	<p>(c) The combination of the clay layer, low gradient, and numerous structures mean water is sometimes retained within channels for longer than 48 hours following rainfall but that water does not flow. Where possible, landowner experience was used to identify these potential areas. These areas were not considered to satisfy this criterion.</p> <p>(d) As is</p> <p>(e) This was extended to include any signs of floodwaters on the floodplain (not just organic material) due to the absence of upstream riparian vegetation considered enough to provide enough inputs to be visible on the floodplain.</p> <p>(f) The prevailing soft-bottom conditions make assessing this criterion difficult. Therefore, this criterion was largely unassessed.</p>
<p>Ephemeral stream</p>	<p>Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream.</p>	<p>The presence of the clay layer below the typically thin topsoil layer makes assessing the water table level difficult. It also means water following rain is likely to be retained longer than typical as it cannot readily be conveyed (flow) downstream or soak to ground (i.e. areas may remain wet beyond the 48 hour timeframe provided in the intermittent definition but still be considered an ephemeral system.</p> <p>We also consider reaches to be classified ephemeral when they do not fit the permanent or intermittent definition. This is because we perceive the definitions to encourage a stepwise process to classifying streams. In other words, the first “test” attempts to satisfy the <i>permanent</i> definition. For reaches that don’t, the second test is if it satisfies the <i>intermittent</i> definition. Where the reach cannot be classified as either permanent or intermittent, then it is considered <i>ephemeral</i> (which is supported in the wording of the ephemeral definition).</p>

Appendix 2 – macroinvertebrate sampling methods and results

Introduction

Macroinvertebrate community sampling was undertaken in January 2021 in response to the section 92 request for further information relating to the KiwiRail Regional Freight Hub Notice of Requirement application. The specific question this sampling seeks to address is:

74) *Please undertake sampling if possible to inform the current ecological values of the site.*

This memo outlines the locations where sampling was possible and the sampling method used. It then summarises the results and relates these back to the ecological value of these water courses provided in the Ecological Impact Assessment.

This memo is intended as supplementary information to the section 92 response.

Sampling sites

Sampling within Stream system 1 was limited to the road corridor near the intersection of Stoney Creek Road and Ashurst Road in Bunnythorpe. Access was not possible at the time of survey to other sections of the system where water levels may have also been conducive to aquatic macroinvertebrate sample collection.

Sampling in the northern tributary of Stream system 2 was possible in three different locations to reflect:

- i. The lower reach (near where the southern stormwater basin is proposed for discharge)
- ii. The mid reach which is within the proposed NoR site
- iii. The upper reach which is upstream of the proposed NoR site.

The sampling locations are shown on Figure 2 above.

Methods

Samples were collected using the Protocol C4 (Soft-bottomed, Quantitative – macrophytes) methods prescribed in (Stark et al., 2001), modified to suit the local conditions. Modifications included the collection of three replicate samples that represented approximately 0.6 m² of relative stream bed area. This modification allowed for replication in sample effort across sites where the macrophyte assemblage differed. It also allowed for the sampling of all habitat types available, not just macrophytes to encourage the collection of all taxa present rather than just taxa residing on macrophytes.

Individual samples were processed according to Protocol P1 (Coded – Abundance) of the (Stark et al., 2001) guidelines. Upon receipt of the data from the processing lab, site-specific results were determined via averaging the three replicates.

Results

In all cases (see Table 1), the results are indicative of streams that have poor water quality and probable severe pollution with no site registering an MCI score greater than 79 or a QMCI score greater than 3.9 which are the thresholds of the next quality band (fair) in Stark & Maxted (2007). Furthermore, the results are also well below the National Bottom Lines for MCI (90) and QMCI (4.5) presented in the National Policy Statement for Freshwater Management (NPS-FM) 2020. Where scores fall below the bottom line it is considered to have a “Macroinvertebrate community indicative of severe organic pollution or nutrient enrichment. Communities are largely composed of taxa insensitive to inorganic pollution/nutrient enrichment” according to the NPS-FM.

The most abundant taxa are provided in Table 1 as they can be used as a proxy for the prevailing flow/water quantity conditions of the systems. These communities are what might be expected in semi-littoral and/or intermittent conditions rather than representing streams subjected to regular flushing and/or permanently flowing water.

Table 1: Summary results from macroinvertebrate sampling at one site along subcatchment D of Stream system 1 and three sites along the Northern tributary of Stream system 2. Included are the average MCI (Macroinvertebrate Community Indices) and QMCI (Quantitative MCI) scores, and the taxa considered “Very Very Abundant” and “Very Abundant” according to the Stark et al. (2001) Coded - Abundance protocol.

	Stream System 1	Stream System 2 – northern tributary		
	Subcatchment D	Lower	Mid	Upper
Average MCI	69.2	62.7	53.4	63.2
Average QMCI	2.2	3.1	2.4	2.9
Very, very abundant taxa	Potamopyrgus	Oligochaeta Paracalliope Potamopyrgus	Oligochaeta Cladocera Ostracoda Paracalliope	Oligochaeta Cladocera Paracalliope Potamopyrgus
Very abundant taxa	Oligochaeta Cladocera Ostracoda Tanypodinae	Hydra Ostracoda Sphaeriidae	Hirudinea Copepoda Platyhelminthes	Ostracoda

Conclusions

The macroinvertebrate communities can be considered in poor health and reflective of systems which are subjected to poor water quality and severe pollution. Furthermore, it can be assumed the surveyed areas do not provide optimal conditions/habitats for fish habitation.

Overall, these results support our initial assessment that these stream systems are in poor condition and have, at most, **Low Ecological Value** (as per the EIANZ 2018 guidelines (Roper-Lindsay et al., 2018)). Therefore, no changes are recommended to the initial assessment of aquatic value.

References

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