

BEFORE THE OTAGO REGIONAL COUNCIL

IN THE MATTER

of the Resource Management Act
1991

AND

IN THE MATTER OF

Discharge Permit, Water Permit and
Landuse Consent Application
RM20.024

Oceana Gold Limited

STATEMENT OF EVIDENCE OF DR MICHAEL JOHN CRAWSHAW GREER

ON BEHALF OF OTAGO REGIONAL COUNCIL

20/07/2020

TABLE OF CONTENTS

1. INTRODUCTION3
2. CODE OF CONDUCT.....5
3. SCOPE.....5
4. EFFECTS OF THE PROPOSED ACTIVITY ON WATER QUALITY AND ECOLOGY.....7
5. RECOMMENDATIONS ON CONSENT CONDITIONS16
6. SUMMARY17

1. INTRODUCTION

QUALIFICATIONS AND EXPERIENCE

- 1.1 My name is Michael John Crashaw Greer. I work for Aquanet Consulting Ltd as a Senior Freshwater Scientist.
- 1.2 I hold a PhD degree in Ecology and a Bachelor of Science in Zoology from the University of Otago.
- 1.3 I have worked for local government, the Department of Conservation and NIWA. I have over 9 years of work experience in freshwater ecology. Since the 4th of March 2018, I have been employed by Aquanet Consulting Ltd. Prior to that I was employed by the Greater Wellington Regional Council as a Senior Environmental Scientist and Environment Canterbury as an Ecology Scientist.
- 1.4 I have worked as a technical advisor on behalf of both consenting authorities and applicants on well over 120 resource consent applications, compliance assessments and/or prosecution cases. These applications have been for a wide range of activities, including stream reclamation, water abstraction and discharges to land and water.
- 1.5 My work routinely involves providing assessment of effects on water quality and/or aquatic ecology, recommending or assessing compliance with resource consent conditions, and designing or implementing water quality/aquatic ecology monitoring programmes.

BACKGROUND AND ROLE

1.6 In February 2020 I was engaged by the Otago Regional Council (ORC) to provide a technical review of a suite of resource consent applications by Oceana Gold (NZ) Ltd ('the applicant'/'Oceana') that will enable them to:

- a) Mine from the edge of an already back filled pit (the Deepdell North Pit) to create the Deepdell North Stage III Pit;
- b) Create the Deepdell East Waste Rock Stack (WRS) by using waste rock from the Deepdell North Stage III Pit to backfill the existing Deepdell South Pit and build up the relatively flat and developed pastureland to the north; and
- c) Upon completion of mining divert surface flows from the Deepdell East WRS into the Deepdell North Stage III Pit to create a lake (Deepdell North Stage III Pit Lake).

1.7 In February 2020 I documented my preliminary technical assessment of the application in a technical memorandum to ORC. This memorandum included:

- a) An assessment of the appropriateness of the methodologies used in the application to assess the effects of the proposed discharges and stream works on water quality (written by Mr James Blyth of Taylor Collaborations Ltd) and aquatic ecology in Camp Creek (stream works only), Highlay Creek, Deepdell Creek and Shag River;
- b) An initial assessment of the effects of the proposed discharges and stream works on water quality and aquatic ecology in the impacted waterways;
- c) A description of the additional information needed to address my concerns with effects assessment methodologies employed in the application. This was provided so that the identified information could be requested by ORC under S.92 (1) of the RMA; and
- d) Initial recommendations on consent conditions.

1.8 In April 2020 I provided my final assessment of the application to ORC in an update of the February 2020 technical memorandum. The final memorandum included:

- a) My initial assessment;
- b) A critical review of the data provided by the applicant in response to ORC's S.92 request (written by Mr Blyth);
- c) An assessment of the potential effects of the proposed activities on water quality and ecology in Camp Creek, Highlay Creek, Deepdell Creek and Shag River based on information in the original application and the additional data provided by the applicant in response to ORC's S.92 request; and
- d) An updated review of the consent conditions proposed by the applicant.

1.9 This evidence documents the information previously provided to ORC in the technical memorandum produced in February and updated in April 2020.

1.10 I have not undertaken any additional monitoring or field investigations and my review relies on the data and information provided by ORC, Oceana and their advisors.

2. CODE OF CONDUCT

2.1 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note and that I agree to comply with the code. My evidence in this statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter to detract from the opinions which I express.

3. SCOPE

3.1 My evidence addresses the following matters:

- a) The limitations of the technical approaches taken in the application to assess the effects of the proposed activities on ecology. A separate assessment of the water quality modelling methodologies employed by the applicant is provided in Mr Blyth's evidence¹;
- b) The additional information I requested that ORC seek from the Oceana under S.92(1) of the RMA; and

¹ Blyth, J.M. 2020. Statement of evidence of James Mitchell Blyth on behalf of Otago Regional Council in the matter of the Resource Management Act 1991 and in the matter of Discharge Permit, Water Permit and Landuse Consent Application RM20.024 – Oceana Gold Limited

- c) My assessment of the potential effects of the proposed activity on water quality and ecology in Camp Creek, Highlay Creek, Deepdell Creek and Shag River based on all the available information, including the applicants S.92 response.

3.2 My evidence considers information contained in:

- a) The relevant sections of **The Report** "*Oceana Gold (NZ) Ltd - Deepdell North Stage III Project: Assessment of Environmental Effects*" including Chapters 1, 2, 3,5 and 7;
- b) The **Ecology Effects Assessment** (Appendix O of **The Report**);
- c) The **Water Quality Effects Assessment** (Appendix E of **The Report**);
- d) The **Proposed Consent Conditions** (Appendix S of **The Report**);
- e) The **S.92 Response** – "*Oceana Gold (NZ) Ltd - Deepdell North Stage III – Request for further information*"; and
- f) The **Cumulative Effects Assessment** provided by Oceana as part of their Section 92 response for another related application (RM20.130 – Golden Point Underground).

These documents are referred to throughout this evidence using the bolded terms above.

3.3 In this evidence I assess the effects of the discharge as it is described in the documents listed above. Accordingly, I make no comment on how changes to the application, including those recommended by submitters, will alter the effects of the discharge.

3.4 While I have read the submissions by āti Huirapa Rūnaka ki Puketeraki and Te Rūnanga o Ōtākou, The Department of Conservation and Macraes Community Incorporated, they do not contain sufficient technical information for me to provide comment on their relevance at this time. If required, I will provide supplementary evidence prior to the hearing that considers any technical evidence lodged by submitters.

4. EFFECTS OF THE PROPOSED ACTIVITY ON WATER QUALITY AND ECOLOGY

EFFECTS ON WATER QUALITY IN DEEPDELL CREEK AND SHAG RIVER

4.1 The water quality compliance criteria presented in Section 1.3 of the **Proposed Consent Conditions** are the same as those set out in existing consents² held by Oceana. Thus, when those consents are considered as part of the existing environment, the proposed activity will not result in any further degradation of the following parameters in Deepdell Creek or Shag River:

- a) pH;
- b) Arsenic;
- c) CyanideWAD;
- d) Copper;
- e) Iron;
- f) Lead;
- g) Zinc; and
- h) Sulphate.

However the compliance criteria for copper and zinc in Deepdell Creek and Shag River and the arsenic criteria for Deepdell Creek exceed the Default Guideline Values (DGV) set out in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (hereafter referred to as the ANZWQ guidelines) for the protection of 80% of species, and would allow for significant adverse effects in most waterways.

4.2 In both the **Water Quality Effects Assessment** and the **Ecological Effects Assessment** there is discussion about setting nitrate standards that reflect the National Policy Statement for Freshwater Management (NPS-FM) 2014 attribute state B threshold (median = 2.4 mg/L, 95th percentile = 3.5 mg/L). However, based on the nitrate data presented in the **Water Quality Effects Assessment** such standards would allow for a significant increase in nitrate in both the Deepdell Creek and the Shag River (maximum concentration at compliance sites on both waterways in 2018-2019 <0.5 mg/L). Thus, while I agree that nitrate

² 2006.303.V2, 2006.304.V2, 2006.305.V4, RM10.351.33, RM10.351.34, 2006.306.V2, 2006.307.V2, 2006.308.V3, RM10.351.29.V1, RM10.351.31.V1, RM12.378.05, RM12.378.03, RM12.378.04, RM10.351.06.V1, RM10.351.04.V2, RM10.351.05.V2, 2010.159.V1, 2003.640.V2, 2005.341.V2, 2010.158.V1 and 2010.155.V1.

limits should be applied in the consent conditions, it is my opinion that they should be set based on periphyton growth.

4.3 As I considered that the nitrate standards mentioned in the **Water Quality Effects Assessment** and the **Ecological Effects Assessment** were inappropriate, as part of my initial assessment I requested that the applicant provide all available nutrient data for the relevant compliance sites on Deepdell Creek (DC08) and Shag River (Loop Road), and provide a detailed assessment of what suitable nutrient guidelines would be to control periphyton growth in those rivers. Furthermore, I recommended that standards be provided for both dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP), as both are important for plant growth.

4.4 In response to the request outlined in para. 4.3, Dr Greg Ryder from Ryder Environmental Ltd analysed the available DIN and DRP data for a number of Oceana and ORC monitoring sites in both Deepdell Creek and Shag River as part of the applicants **S.92 response**³, and suggested some potential water quality standards based on the proposed attribute states in the 2019 draft NPS-FM. Unfortunately, data for the compliance monitoring sites specified in the **Proposed Consent Conditions** (DC08 and Loop Road) were not included in Dr Ryders assessment, and as a result it provides limited insight into what appropriate standards would be. Furthermore, it is my opinion that using the DIN and DRP attribute states set out in the 2019 Draft NPS-FM in this context is not appropriate as:

- a) They not based on cause-effect relationships between nutrients and plant growth, but correlations between DIN and DRP and a range of 'ecosystem health' attributes;
- b) The approach used to develop these attribute states is yet to meet the standard for publication in a peer reviewed journal (based on a search of Google Scholar), or widespread acceptance in the scientific community. The Ministry for the Environment has now confirmed that these attribute states will not be included in the NPS-FM 2020; and
- c) Based on the nitrate data presented the **Water Quality Effects**

³ Appendix F – Aquatic Ecology Letter

Assessment, the standards proposed by Dr Ryder in the **S.92 response** would allow for a significant increase in DIN in both the Deepdell Creek and the Shag River. The maximum nitrate concentrations at both the DC08 and Loop Road compliance sites in 2018-2019 were less than 0.5 mg/L. Thus, the proposed standard for the 95th percentile concentration of 1.1 mg/L may represent a significant degradation.

COMMENTS ON CUMULATIVE WATER QUALITY EFFECTS IN DEEPELL CREEK AND SHAG RIVER

- 4.5 Oceana are currently seeking Resource Consents for another expansion at the Macraes site that could impact water quality in Deepdell Creek and the Shag River; the Golden Point Underground (RM20.130). Based on the **Cumulative Effects Assessment** provided to ORC as part of the Golden Point Underground consent application process, it is my opinion that my assessment in para. 4.1 to para. 4.4 is applicable to both the individual effects of the activities for which consent is sought in this hearing, and the cumulative effects of the Deepdell North Stage III Pit and Golden Point Underground expansions.
- 4.6 The **Cumulative Effects Assessment** demonstrates that the water quality compliance criteria contained in existing consents held by Oceana² are very likely to be met in Deepdell Creek and the Shag River during and after the implementation of both the Deepdell North Stage III Pit and Golden Point Underground expansions. Thus, the cumulative effects of those activities are unlikely to result in a degradation of the parameters listed in para. 4.1 beyond the existing environment permitted by operative resource consents. Nevertheless, it is important to re-iterate that the some of the existing compliance criteria may not protect against significant adverse effects, and in my opinion allow for water quality to be degraded from current state.
- 4.7 The **Cumulative Effects Assessment** assesses the combined effects of the Deepdell North Stage III Pit and Golden Point Underground expansions on nitrate concentration in Deepdell Creek and the Shag River based on future compliance with the NPS-FM 2014 attribute state B thresholds. As outlined above (para. 4.24.3 to para. 4.4), those thresholds allow for a significant increase in nitrate in both waterways and would not protect against significant adverse cumulative effects if adopted as compliance criteria in consent conditions.

EFFECTS ON WATER QUALITY IN HIGHLAY CREEK

- 4.8 Contaminants discharged from the proposed Deepdell East WRS will enter a western tributary (location shown in Figure 1) of Highlay Creek via surface drainage (flowing through sediment ponds) and groundwater contaminated with seepage. Given the presence of kōura (*Paranephrops zealandicus*) and ‘Threatened’ (nationally vulnerable)⁴ Taieri flathead galaxias (*Galaxias depressiceps*) in both of these streams and the “good” condition of the macroinvertebrate community (Macroinvertebrate Community Index (MCI) = 108 to 111)^{5,6} it is my opinion that understanding and managing the effects of contaminants discharged from the Deepdell East WRS is very important. However, the **Water Quality Effects Assessment** does little to quantify how water quality in Highlay Creek catchment will change as a result of the proposed activities.
- 4.9 In Section 5.12.8 of **The Report** it is stated that “there may be some elevation in contaminant levels in Highlay Creek overtime, however not to the extent that these would be beyond compliance values applicable at DC08”(Deepdell Creek). In my opinion the existing compliance standards for Deepdell Creek (site DC08) will not protect against significant adverse effects in Highlay Creek (see para. 4.1). Accordingly, in my initial assessment I requested the applicant assess the future contaminant concentrations in Highlay Creek and propose appropriate water quality standards that can be applied in consent conditions. For nutrients, I suggested that these standards be set to control plant growth rather than toxicity.

⁴ Dunn, N.R., Allibone, R.M., Closs, G.P., Crow, S.K., David, B.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters J.M. and Rolfe, J.R. 2017. Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington, New Zealand.

⁵ Stark, J.D., Boothroyd, and Maxted, J.R. 2007. A User Guide for the Macroinvertebrate Community Index. Ministry for the Environment, Wellington, New Zealand.

⁶ Based on fish and macroinvertebrate data presented in the Ecology Effects Assessment

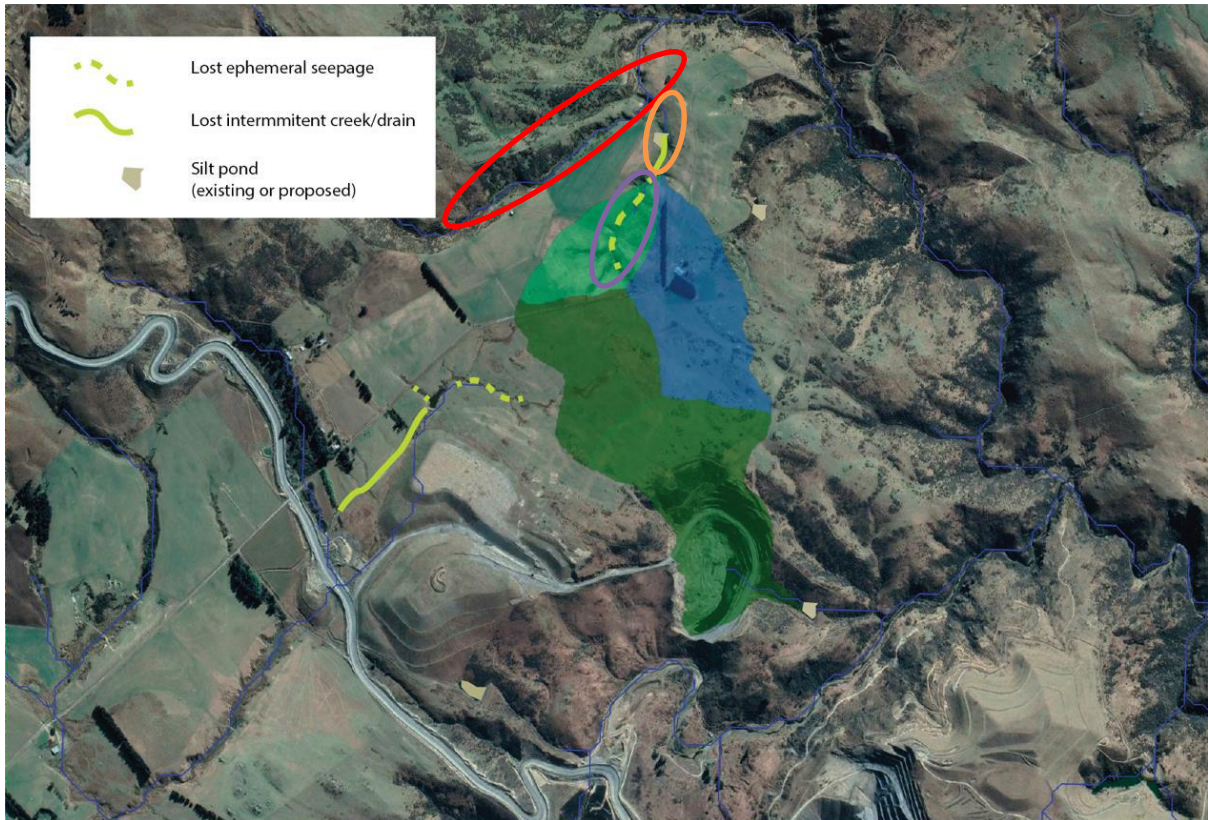


Figure 1: Watercourse map. The western tributary of Highlay Creek that could be impacted by discharges is indicated by red oval, the Gully Stream which will be reclaimed is indicated by the purple oval and the Highlay Tributary that will be culverted is indicate by the orange oval.

4.10 In response to my request for the additional information described in para. 4.9, the applicant provided a detailed assessment of future water quality in Highlay Creek as part of their **S.92 response**⁷. This assessment supports my view that that the DC08 compliance standards would not protect against significant adverse effects in Highlay Creek. Specifically, they would allow arsenic, copper and zinc concentrations in Highlay Creek to exceed the ANZWQ DGVs for the protection of 80% of species when concentrations of those parameters are currently sufficiently low to protect 95% of species (Table 1). Nevertheless, the water quality analysis provided with the **S.92 response** does show that the discharge of contaminants from the proposed Deepdell East WRS is not likely to cause significant adverse toxicity effects in Highlay Creek or its tributary. My reasoning for this assessment is:

a) In my opinion, Highlay Creek meets the definition of a 'slightly to

⁷ Appendix E – Water Quality Letter

moderately disturbed ecosystem⁸ under the Water Quality Management Framework provided in the ANZWQ Guidelines as:

- i) Aerial photographs reveal that landcover in the catchment is primarily pasture and shrub, with indigenous vegetation historically cleared to make way for the grazing of livestock;
 - ii) The **Aquatic Ecology Effects Assessment** reports (with photographic evidence) that stock access occurs through much of the catchment and has resulted in pugging in some locations. It also contains evidence of bank contouring works in the lower catchment which has constrained the stream channel; and
 - iii) The **Aquatic Ecology Effects Assessment** demonstrates that Highlay Creek continues to support the 'Threatened'⁴ Taieri flathead galaxias as well as kōura. The Macroinvertebrate monitoring data from 2011, 2013 and 2018 presented in the **Aquatic Ecology Effects Assessment** also demonstrates that macroinvertebrate community health is frequently indicative of good water quality (MCI>100)^{5,6}
- b) The ANZWQ Guidelines advises that the 95% species protection DGVs provide an appropriate level for protection for 'slightly to moderately disturbed ecosystems' like Highlay Creek;
- c) An assessment of the current and future (provided in Appendix E of the **S.92 response**) 95th percentile toxicant concentrations for Highlay Creek, against the DGVs in the ANZWQ guidelines and Hickey (2013)⁹ (nitrate only) are provided in Table 1. These data show that toxicant concentrations are unlikely to exceed the relevant guidelines for the protection of 95% of species once the Deepdell East WRS is fully implemented. The exception being cyanide, for which I am unable to undertake an assessment as the applicant is yet to provide any data for this parameter that applies to Highlay Creek .

⁸ Ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained.

⁹ Hickey, C.W. 2013. Updating nitrate toxicity effects on freshwater aquatic species (Client Report No. HAM2013- 009). NIWA, Hamilton, New Zealand.

Table 1: Current and future (provided in Appendix E of the S.92 response) contaminant concentrations in Highlay Creek, and suggested compliance criteria. Note standards are based on existing species protection thresholds.

Parameter	DC08 standard	Loop Rd. standard	Current 95 th %ile conc. Highlay Creek	Future 95 th %ile conc. Highlay Creek	Current species protection level Highlay Creek	Future species protection level Highlay Creek	Rec. stand. (protection level)	% species protection guidelines (ANZWQ/Hickey (2013))			
								80%	90%	95%	99%
Arsenic	0.15	0.01	0.002	0.013	95%	95%	0.013 (95%)	0.14	0.042	0.013	0.0008
Cyanide	0.1	0.1	-	-	N/A	N/A	0.018 (80%)	0.018	0.011	0.007	0.004
Copper	0.009	0.009	0.0013	0.001	95%	99%	0.0014 (95%)	0.0025	0.0018	0.0014	0.001
Lead	0.0025	0.0025	0.0001	0.002	99%	95%	0.0034 (95%)	0.0094	0.0056	0.0034	0.001
Zinc	0.12	0.12	0.0025	0.002	99%	99%	0.008 (95%)	0.031	0.015	0.008	0.0024
Nitrate (med./95 th %ile)	N/A	N/A	0.09/0.41	0.9/4.1	99%	95%	2.4/3.5 (95%)	1.0/1.5	2.4/3.4	3.8/5.6	6.9/9.8

4.11 The applicant is yet to provide specific water quality standards for most parameters in Highlay Creek as (Dr Ryder does suggest DIN and DRP standards in Appendix F of the **S.92 response**). Accordingly, Table 1 includes my recommendations on compliance criteria. These criteria should not only provide an adequate level of protection (as per the ANZWQ Guidelines), but, based on the applicant’s own assessment of future water quality, should also be achievable. However, I would be comfortable with the applicant developing their own standards in accordance with the Water Quality Management Framework set out in the ANZWQ Guidelines.

4.12 While I have suggested a nitrate standard for toxicity in Table 1, it must be noted that this will not control for periphyton growth. Indeed, looking at the predicted nitrate concentrations in Appendix F of the **S.92 Response**, it is clear that the activity may increase nutrient concentrations to the extent that the risk of periphyton growth will be significantly increased. While Appendix F of the S.92 response does propose DIN and DRP standards, they align with 2019 draft NPS-FM attribute state C thresholds which are not appropriate for the reasons set out in para. 4.4. Furthermore, based on the analysis provided in Appendix E of the S.92 response, it is very unlikely that the proposed DIN standards could be met (95th percentile concentrations at the Highlay Creek HC02 monitoring site = 3.4 mg/L; standard = 2.05 mg/L).

4.13 As the increase in nitrogen concentrations may increase the risk of periphyton

growth in Highlay Creek, it is my opinion that periphyton targets or standards should be included in the conditions of the consent. I note that in response to an unrelated query from another ORC technical expert Dr Ryder recommends a periphyton target of 30% cover of long green filamentous algae in Appendix F of the **S.92 Response**. In my opinion this would be an appropriate standard to use, although periphyton biomass is becoming a more commonly used measure.

RECLAMATION OF TRIBUTARIES OF HIGHLAY CREEK

4.14 The applicant is proposing to reclaim approximately 480 metres of stream in the Highlay Creek catchment (hereafter referred to as the “Gully Stream” (location shown in Figure 1)) that runs down a gully within the proposed project footprint. In the **Ecological Effects Assessment**, it is estimated that approximately 250 metres of this is ephemeral and the remaining 130 metres is potentially intermittent. The **Ecological Effects Assessment** also suggests that these reaches do not support fish or typical stream invertebrate habitat and associated communities and are unlikely to carry surface flow during warmer months of the year. Based on this assessment it is concluded that the effects of reclamation will be minor in **The Report**.

4.15 The photographs presented in the **Ecological Effects Assessment** support the applicant’s assessment of flow permanence, as does a review of the available aerial imagery. Furthermore, point 23 of Appendix F to the **S.92 Response** confirms that the length of new reclamation is negligible in terms of total catchment length (0.28%) and the length of stream already reclaimed (3.5%). As such the effects are unlikely to be more than minor at the catchment scale.

CULVERTING OF A TRIBUTARY OF HIGHLAY CREEK.

4.16 In addition to reclaiming 480 metres of the Gully Stream, the applicant is proposing to construct a 51 metre culvert in an intermittent reach further downstream (location shown in Figure 1) as part of a road realignment. The effects of this culvert were not explicitly assessed in the **Ecological Effects Assessment**, but in Point 21 of Appendix F of the **S.92 Response** Dr Ryder indicates that construction will be undertaken under ‘off-line’ conditions, which will probably involve establishing a coffer dam and, if necessary, pumping water around the construction area. Provided that construction is undertaken in a

manner consistent with the methodology described by Dr Ryder then it is my opinion that the installation of the culvert will not have more than minor effects on aquatic life as:

- a) Construction phase sediment release will be managed by working “off-line’; and
- b) It will only result in a negligible loss of habitat at the catchment scale (for the same reasons as described in para. 4.15.)

RECLAMATION OF TRIBUTARIES OF CAMP CREEK

4.17 The excavation of the Deepdell North Stage III Pit will result in the loss of approximately 200 metres of ephemeral seepage in the Camp Creek catchment and an approximately 480 metre length of a highly modified, intermittent Camp Creek tributary which will be diverted out of the catchment. This represents the loss of a significant amount of potential habitat. However, Condition 3 of Section 1.2 of the **Proposed Consent Conditions** would require the applicant to develop and submit a Mitigation Plan to the Otago Regional Council that shall identify methods and measures to be carried out to ensure that enough habitat is created to offset the loss of habitat. Providing this plan is developed by a suitably qualified ecologist and is subject to approval by ORC then it is my opinion that the negative effects of stream reclamation in the Camp Creek catchment can be managed to a level that they are negligible. However, in my opinion a consent condition is required that ensures that fish and kōura recovery is undertaken prior to any works in flowing water.

EFFECTS OF SEDIMENT ON HIGHLAY CREEK AND DEEPDELL CREEK

4.18 Provided the discharges comply with the standards set out in Condition 5 and 6 of Section 1.6 of the **Proposed Consent Conditions**, the effects of sediment discharged to Highlay Creek and Deepdell Creek from the proposed silt ponds should not have significant adverse effects (note – most of the standards included in S.107(1) of the RMA are set out in these conditions). However, it is important that appropriate monitoring protocols are established in the Water Quality Management Plan (required by proposed Condition 3 in the same section of the **Proposed Consent Conditions**) to ensure that compliance with these

conditions can be monitored. At a minimum this should include suspended solids monitoring in the discharges; upstream and downstream water clarity, turbidity deposited sediment and suspended solids monitoring; and appropriate ecological monitoring.

5. RECOMMENDATIONS ON CONSENT CONDITIONS

5.1 In my opinion, consent conditions should include:

- a) Water quality limits for DIN and DRP in Deepdell Creek and Shag River. Note, the limits proposed in Appendix F of the S.92 request are not appropriate in my opinion;
- b) The water quality limits for Highlay Creek set out in Table 1. I am also comfortable with the applicant developing their own standards in accordance with the Water Quality Management Framework set out in the ANZWQ Guidelines;
- c) An appropriate cyanide standard for Highlay Creek;
- d) An update to Section 1.10 of the **Proposed Consent Conditions** that stipulates that the culvert on the Highlay Creek tributary will provide for fish passage. A condition should also be included that sets out an agreed construction methodology;
- e) An update to Condition 3 of Section 1.2 of the **Proposed Consent Conditions** that ensures the Mitigation Plan is developed by a suitably qualified ecologist and that it is subject to ORC approval;
- f) Periphyton standards for Highlay Creek, Deepdell Creek and Shag River that reduce the risk of increases in nitrate causing nuisance blooms;
- g) An update to Condition 3 of Section 1.2 of the **Proposed Consent Conditions** so that the reference to *Koura/Paranephrops planifons* is replaced with *kōura/Paranephrops zealandicus*, as that is the species found in the area; and
- h) A requirement for the Water Quality Management Plan required by Condition 3 in Section 1.6 of the **Proposed Consent Conditions** to include appropriate monitoring of the effects of sediment pond discharges to Highlay and Deepdell Creeks. This should include:
 - i) Monitoring of suspended solids in the discharges;
 - ii) Upstream and downstream monitoring of water clarity, turbidity

deposited sediment and suspended solids monitoring; and
iii) Appropriate ecological monitoring.

6. SUMMARY

- 6.1 Discharges Deepdell Creek and Shag River are unlikely to cause toxicity effects on aquatic life that are greater than those allowed by existing consents. However, toxicant compliance criteria are needed for Highlay Creek to prevent significant adverse effects, and these compliance criteria will need to be lower than those currently set for Deepdell Creek and Shag River.
- 6.2 Increases in nitrate in Highlay Creek, Deepdell Creek and Shag River due to the proposed activities could increase the risk of nuisance periphyton growth. Accordingly, periphyton standards should be included in consent conditions to ensure that blooms do not cause significant adverse effects on aquatic life.
- 6.3 The proposed stream reclamation and culverting is unlikely to have more than minor effects at the catchment scale provided that a few basic consent conditions are imposed.