ANNEX 3: Information requests for the Goliath Gold Project Environmental Impact Statement related to the June 2018 Human Health Risk Assessment

IR-2 #	TMI ID	IR -1 #	Project Effects Link to CEAA 2012	Reference to EIS guidelines	Reference to EIS (including appendices)	Context and Rationale	Specific Question/ Proposed Follow-up Measure
IR-2 #: HE(2)-01	**TMI ID:** N/A	**IR-1 #:** N/A	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 3.2, 10.1.3	**Reference to EIS:** Section 6; Appendix W-2	**Context and Rationale:** The Agency is aware that additional data such as new receptor locations, not found in Section 6 or the appendices of the revised EIS, are used in the June 2018 HHRA (Appendix W-2 of the revised EIS). For example, Section 3.5.2.1 of the updated HHRA indicates that "the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focussing on possible modelling receptors covering the study areas described in Section 3.1.1." Where any exposure point concentrations used as inputs in the June 2018 HHRA are different from those presented in Section 6 or in appendices of the revised EIS, it is important to explain the factors, data sources, modelling scenarios and assumptions that have changed, such as new receptor locations, to identify the tables or sections in Section 6 or in appendices that are superseded by the new data, and to clearly present the new data in the final HHRA. Section 3.2 of the EIS Guidelines indicates that "Assumptions will be clearly identified and justified. All data, models and studies will be documented such that the analyses are transparent and reproducible."	**Specific Question/ Request for Information:** A. Where exposure point concentrations provided in the final HHRA are different those provided in Section 6 of the revised EIS: - explain the factors, data sources, modelling scenarios and assumptions that have changed; - identify the tables or sections in Section 6 or in appendices of the revised EIS that are superseded by the new data; and - present the new data in the final HHRA.
IR-2 #: HE(2)-02	**TMI ID:** N/A	**IR-1 #:** N/A	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Section 4.1.1	**Context and Rationale:** It is unclear, from the descriptions given in Section 4.1.1 of the June 2018 HHRA, whether access to Blackwater Creek Tributary #1 within the HHRA Local Study Area will be restricted to Indigenous people during any phase of the Project, and whether any country foods that are typically found in wetland areas may be harvested from this area during or after the Project. If harvesting of country foods would be allowed, an assessment of the impact of the effluent on country foods in Blackwater Creek Tributary #1 should be included.	**Specific Question/ Request for Information:** A. Clarify whether access to Blackwater Creek Tributary #1 will be restricted to Indigenous people during any phase of the Project, and whether any country foods that are typically found in wetland areas would be harvested from this area during or after the Project. B. Assess the impact of the effluent on the country foods harvested from Blackwater Creek Tributary #1, if the effluent is discharged directly into an area producing the country foods. C. Describe additional mitigation measures to reduce potential effects on country foods in Blackwater Creek Tributary #1, or on wild rice anywhere at or near the Project.
IR-2 #: HE(2)-03	**TMI ID:** 347, 348, 354, 361, 485, 500, 618, 619,	**IR-1 #:** AC(1)-21, AC(1)-22, AC(1)-28, AC(1)-35,	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Section 3.5.3; Section 5.9, Figure 5.9.3.2-1	**Context and Rationale:** Section 3.5.3 of the June 2018 HHRA (Appendix W-2 of the revised EIS) does not include wild rice as a country food studied in the country foods assessment. Several Indigenous groups indicated in previous comments to the Agency that wild rice is an economic	**Specific Question/ Request for Information:** A. Include wild rice in the country foods assessment, or provide a rationale for excluding it. B. Describe additional mitigation measures to reduce potential effects on wild rice harvested at or near the

	651, 654, 787, 797, 822, 850	AC(1)-159, AC(1)-174, AC(1)-291, AC(1)-292, AC(1)-324, AC(1)-327, AC(1)-368, AC(1)-378, AC(1)-403, AC(1)-431				resource, and consumed by their people. The Agency notes particular concern in relation to contamination of wild rice. Figure 5.9.3.2-1 of the revised EIS shows known locations of wild rice stands near the Project. It is unclear why wild rice was not included in the country foods assessment. To reassure Indigenous groups that the environmental assessment predictions are accurate, in areas where there may be uncertainty in relation to wild rice, follow-up program measures should be identified, such as appropriate follow-up monitoring, notification and regular communication with Indigenous groups.	Project. C. Provide details of the follow-up program related to wild rice, to confirm that EA predictions are acceptable.
IR-2 #: HE(2)-04	**TMI ID:** N/A	**IR-1 #:** N/A	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Section 3.1.1; Appendix EE, Figures 5.1 and 5.2; Section 5.9; Section 13	**Context and Rationale:** It is unclear whether the proponent considered the guidance document published by Health Canada in 2018 when evaluating human health impacts by country foods. This guidance should be followed by the proponent in the development of the final HHRA. Figure 3.1.1-1 of the June 2018 HHRA does not clearly mark the locations of receptors being considered for the study. The locations of all receptors (including locations of traditional use of lands and resources, permanent residences, seasonal cottages/cabins, and recreational areas for determination of potential effects under subsection 5(2) of the *Canadian Environmental Assessment Act, 2012*) should be clearly identified to ensure that the receptors are selected in accordance with the land use in the area. Ensure that any new receptor locations identified through IR# AE(2)-03B are included in Figure 3.1.1-1. In areas where there would be a pathway that could impact human health, in relation to country food harvesting activities that would be permitted to continue, provide a detailed map. The map should include specific locations of country food harvesting activities (i.e., hunting, gathering, fishing etc.). This map, or series of maps, would consolidate and update the information provided in Appendix EE, Figure 5.1 and 5.2, and from maps showing locations of various plants in Section 5.9 of the revised EIS. Areas of potential fish harvesting should also be identified in waterbodies, given the bioaccumulative potential of metals, such as methylmercury. To reassure Indigenous groups that the environmental assessment predictions are accurate, in areas where there may be uncertainty in relation to human health or country foods, follow-up program measures should be identified, such as appropriate follow-up monitoring, notification and regular communication with Indigenous groups. These maps will be useful in developing these follow-up programs, to understand where potentially affected country foods may be found in the vicinity of the Project. It is unclear, at this time,	**Specific Question/ Request for Information:** A. Use the 2018 Health Canada guidance for the final HHRA to evaluate the human health impacts by country foods. B. Update Figure 3.1.1-1 to clearly mark the locations of off-site receptors. Ensure that any new receptor locations identified through IR# AE(2)-03B are included in the figure. C. Categorize the receptor points located in question B to distinguish locations of traditional use of lands and resources, permanent residences, seasonal cottages/cabins, and recreational areas. D. Provide a detailed map of the country foods harvesting areas including areas of potential fish harvesting. The Agency recognizes that some of this information may be confidential, in which case the existence of such areas may be mentioned without locating on the map. E. Provide details of the follow-up programs related to human health and country foods, to confirm that EA predictions made about country foods are acceptable. It is noted that the follow-up program related to wild rice would be provided in response to IR# HE(2)-03C.

						what country foods will be monitored, and at what locations and times. Reference: Health Canada. 2018. Guidance for Evaluating Human Health Impacts in Environmental Assessments: Country Foods. https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidance-evaluating-human-health-impacts-country-foods.html	
IR-2 #: HE(2)-05	**TMI ID:** 207	**IR-1 #:** HE(1)-14	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Sections 10.1.3, 11.4	**Reference to EIS:** Section 13; Appendix W-2, Section 3.3.3.4	**Context and Rationale:** Section 3.3.3.4 of the updated HHRA indicates that the Post-Closure (Abandonment) Phase is "when human and ecological receptors may also once again have full access to the project site (i.e. it will no longer be fenced)." The same section also indicates that "the pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO [Provincial Water Quality Objectives] or background if background levels exceed the PWQO". It does not appear that the pit lake will be monitored against health-based guidelines to protect human receptors from ingestion of pit water, or receiving surface water (i.e., Blackwater Creek Tributary #1) of groundwater affected by the Project. No information was provided to indicated that Indigenous people would not be in contact with surface water, or that exposure would be limited or minimized (e.g. signage, fencing, risk communication strategies).	**Specific Question/ Request for Information:** A. Update monitoring and follow up plans to assume that local human receptors will fully resume the traditional land use at the site during the abandonment phase, and that Indigenous people may be in contact with surface water unless additional justification can be presented to indicate that exposure will be limited/minimized (e.g. signage, fencing, risk communication strategies etc.).
IR-2 #: HE(2)-06	**TMI ID:** N/A	**IR-1 #:** N/A	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3, 12.1.2	**Reference to EIS:** Appendix W-2, Section 3.2.4	**Context and Rationale:** The Agency is aware that the submitted HHRA is a draft document. Section 3.2.4 of the June 2018 HHRA (Appendix W-2 of the revised EIS) indicates that the human health is currently not included in the cumulative effects assessment. If residual effects to human health are predicted from the final HHRA (Appendix W-2 of the revised EIS), then the cumulative effects assessment should be updated to reflect this.	**Specific Question/ Request for Information:** A. Update the cumulative health effects section to include any residual effects predicted in the final HHRA.
IR-2 #: HE(2)-07	**TMI ID:** 218	**IR-1 #:** HE(1)-25	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Section 4.0	**Context and Rationale:** The proponent provided worked examples for important exposure scenarios, such as the inhalation of fugitive dust, and ingestion of country foods via wild game, fish and plants, in response to IR# HE(1)-25. These examples should be updated to reflect changes in the final HHRA (Appendix W-2 of the revised EIS), and included as an appendix in the final HHRA. Worked examples allow reviewers to validate the formulas and input values used in deriving the estimated exposures.	**Specific Question/ Request for Information:** A. Include updated worked examples for each exposure scenario in the final HHRA, preferably as an appendix to the final HHRA.
IR-2 #: HE(2)-08	**TMI ID:** 204, 328	**IR-1 #:** HE(1)-11, SD(1)-23	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W, Table M and Table 5 Appendix W-2, Table 3.5.2.3-1	**Context and Rationale:** Appendix W, Section 4.4.2, Table M of the revised EIS indicates a toxicological reference value (TRV) for lead of 0.0036 ug/kg- bw/day. It is assumed that the units are erroneous, and were meant to be "mg/kg- bw/day". It is unclear whether this TRV was used in the June 2018 HHRA (Appendix W-2 of the revised EIS). The proponent does not appear to have considered the benchmark dose limit (BMDL) for lead of 0.5 µg/kg-bw/day) published by European Food Safety	**Specific Question/ Request for Information:** A. Use the updated lead TRV and the updated Health Canada CDWQG threshold for selenium in the final HHRA.

						Authority in 2010, which is similar to the reference value proposed by the World Health Organization and the Joint FAO/WHO Expert Committee on Food Additives (WHO/JECFA) in 2011. These TRVs are substantially smaller than the proposed TRV employed by the proponent (3.6 µg/kg bw/day). As such, the health risk of lead exposure could have been underestimated. A Canadian Drinking Water Quality Guideline (CDWQG) threshold of 10 µg/L was provided for selenium in the June 2018 HHRA, Table 3.5.2.3-1, based on a Health Canada reference from 2012. Note that the CDWQG for selenium was updated in 2014 based on recent scientific findings, and is now 50 µg/L. <u>References:</u> European Food Safety Authority. 2010. Scientific Opinion on Lead in Food: EFSA Panel on Contaminants in the Food Chain (CONTAM). EFSA Journal; 8(4):1570. World Health Organization and Joint FAO/ WHO Expert Committee on Food Additives. 2011. Safety evaluation of certain food additives and contaminants: Lead (page 381-497). WHO, Geneva. Health Canada. 2014. Guidelines for Canadian Drinking Water Quality – Summary Table. Ottawa, Ontario. Health Canada. Available online at: https://www.canada.ca/content/dam/hc- sc/migration/hc-sc/ewh- semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf	
IR-2 #: HE(2)-09	**TMI ID:** 207, 217	**IR-1 #:** HE(1)-14, HE(1)-24	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Sections 10.1.3, 11.4	**Reference to EIS:** Appendix W, Section 4.5.6	**Context and Rationale:** The proponent's response to IR# HE(1)-14 indicates that "tissue concentrations in lower-trophic level fish species should represent a conservative estimation of levels in higher-trophic species." This conclusion is unclear and requires additional clarification and, if available, literature references, to ensure that health risks associated with lead from the consumption of fish have been properly modeled. The proponent's response to IR# HE(1)-24 describes how potential risks associated with total exposures of lead and mercury were recalculated. Ensure that the final HHRA reflects these recalculations. In particular, although the estimated change in fish tissue concentrations may be low, human health risks should be determined based on the total concentration of a substance following release, not an incremental concentration change. It is unclear whether any of the contaminants in soil have the potential to bioaccumulate or biomagnify through the food chain, and how this bioaccumulation/biomagnification potential was considered in the screening process.	**Specific Question/ Request for Information:** A. Provide a rationale for why lead concentrations from lower-trophic level fish species would be a reasonable approximation of higher-trophic level species. B. Update the final HHRA to include the recalculations described in IR# HE(1)-24. C. Provide the criteria used to evaluate the uptake of contaminants from soil to country foods, any bioconcentration factors (BCFs) used in the calculations for modelling human exposure, and how bioaccumulation was considered in the screening process for contaminants in soil.
IR-2 #: HE(2)-10	**TMI ID:** 173, 212	**IR-1 #:** AE(1)-11,	**Project Effects Link to CEAA 2012:**	**Reference to EIS guidelines:**	**Reference to EIS:** Appendix W,	**Context and Rationale:** It is important to consider all averaging periods for chemicals of	**Specific Question/ Request for Information:** A. Use predicted annual concentrations of NO_2 in the final

		HE(1)-19	5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	Section 10.1.3, 12.1.1	Table 3 Appendix W-2, Section 3.5.2.1	potential concern (COPCs), where available. The Ontario Ministry of the Environment, Conservation and Parks limits and Canadian Ambient Air Quality Standards (CAAQS) are derived for different timescales based upon relevant exposure durations and associated health effects. It is noted that the nickel point of impingement limit cited in the revised EIS Appendix W, Table 3 (0.04 µg/m^3) is based on an annual averaging period, not a 24-hour averaging period.	HHRA. B. Use all air parameters, for all applicable averaging periods, against the most up-to-date applicable provincial and federal health-based standards, particularly the updated CAAQS thresholds for NO_2 and SO_2, in the final HHRA. C. Include any new receptor locations identified through IR# AE(2)-03B (as per IR# AE(2)-03E).
IR-2 #: HE(2)-11	**TMI ID:** N/A	**IR-1 #:** N/A	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3, 12.1.1	**Reference to EIS:** Appendix W-2, Section 3.5.2.1	**Context and Rationale:** Section 3.5.2.1 of the June 2018 HHRA (Appendix W-2 of the revised EIS) does not provide predicted concentrations for total suspended particulate (TSP), PM_{10} and $PM_{2.5}$ during each phase of the project. It is stated in this section that TSP was selected over PM_{10} and $PM_{2.5}$ as the airborne particulate parameter to be evaluated, with a rationale that TSP includes both PM_{10} and $PM_{2.5}$ and thus allows for a conservative estimation of the airborne particulate exposure. However, health effects are most often associated with smaller particle sizes. The risk associated with fine particles, particularly $PM_{2.5}$, is higher than the health risk associated with PM_{10} or TSP (Health Canada, 2016). As such, it would be more appropriate to consider $PM_{2.5}$ and PM_{10} as separate from TSP, or to consider all TSP as $PM_{2.5}$. In addition $PM_{2.5}$ and PM_{10} are non-threshold substances below which there are no known non-effect levels; unlike TSP, which can have threshold and non-threshold effects depending on the particle size. This section also discusses PM_{10} and $PM_{2.5}$ fractions of TSP that are "averaged over the site preparations and construction, operations and closure phases", which may underestimate health risks in a particular phase where a form of particulate would be more prevalent. Assessment of exceedances and health risks of the project during each phase will inform the determination of mitigation measures for each phase of the Project. As requested in IR# AE(2)-02, ensure that the final HHRA accounts for diesel particulate matter (DPM). <u>Reference:</u> Health Canada. 2016. Guidance for Evaluating Human Health Impacts in Environmental Assessment: AIR QUALITY, http://publications.gc.ca/site/eng/9.802343/publication.html	**Specific Question/ Request for Information:** A. Provide exposure point concentrations for TSP, PM_{10} and $PM_{2.5}$ for each phase, using the same format as in Tables 3.5.2.1-1 to 3.5.2.1-3 of the June 2018 HHRA (Appendix W-2). B. Ensure that the final HHRA accounts for diesel PM, PM_{10} and $PM_{2.5}$ for each phase using all averaging times available (24-hour and annual). Include the incremental lifetime cancer risk (ILCR) of diesel PM as part of the final HHRA. Include a discussion on the contribution of this project to the overall ambient levels of TSP, PM_{10} and $PM_{2.5}$ at the nearby receptor locations. C. In the final HHRA, consider PM_{10}, $PM_{2.5}$ and NO_2 are non-threshold pollutants, as any exposure to these contaminants could be considered as a potential residual effect.
IR-2 #: HE(2)-12	**TMI ID:** N/A	**IR-1 #:** N/A	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Section 3.5.2.1	**Context and Rationale:** It is unclear whether airborne particulates generated from the Project might settle onto Thunder Lake and associated waterbodies to the west of the operations area, in locations where there might be use by Indigenous peoples for traditional activities. If there is a potential for	**Specific Question/ Request for Information:** A. Assess the impacts of particulates settling on Thunder Lake and associated waterbodies on human health via the direct and indirect pathways, such as the ingestion of fish or other food species sourced from the lakes, as well as the direct

						deposition, then an assessment of potential effects on human health via exposure to water or sediment, and ingestion of fish or other food species sourced from the lakes, should be done.	exposure to water and sediment.
IR-2 #: HE(2)-13	**TMI ID:** 200	**IR-1 #:** HE(1)-07	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W Section 4.3.2, Table J; Appendix W-2, Section 3.5.2.1	**Context and Rationale:** Dose averaging should be considered based on chemical-specific information about dose-metric (concentration- vs. dose-dependent toxicity), persistence of effects, elimination half-life and so on. In proposed intermittent exposure scenarios in Appendix W, Table J of the revised EIS, the exposure received on a given day could be 'diluted' by mathematically averaging the exposure over a longer time period. The amortized values identified were used to calculate the hazard quotients (HQs), which may have resulted in an underestimation of risks to human health at the site. Refer to the memo "Memorandum: A Primer for Evaluating Human Health Risk at Contaminated Sites for Chronic and Less-Than-Chronic Exposures to Chemicals" (Health Canada, 2016) for further information on how to adequately address dose amortization issues in the intermittent exposure scenarios.	**Specific Question/ Request for Information:** A. In the final HHRA, provide a chemical-by-chemical rationale for the application of dose-averaging in the short-term and intermittent exposure scenarios. B. Based on the response to question A, reassess the human exposure and health risk according to the procedures described in Health Canada's 2016 memorandum.
IR-2 #: HE(2)-14	**TMI ID:** 213	**IR-1 #:** HE(1)-20	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Table 3.5.2.1-1 to 3.5.2.1-3	**Context and Rationale:** Ensure that the final HHRA (Appendix W-2 of the revised EIS) uses total exposure concentrations (i.e. baseline + project), to consider existing conditions in determining the overall health effects of the Project. It is unclear why the values found in the project assessment scenario in Table 3.5.2.1-3 are not a sum of the base scenario values given in Table 3.5.2.1-1 and the project alone scenario in Table 3.5.2.1-2.	**Specific Question/ Request for Information:** A. Update the HHRA using the total exposure concentrations (i.e. baseline + project) and calculate total hazard quotients, to properly present the overall health risks. Consider IR# HE(2)-01 when updating any tables in the report.
IR-2 #: HE(2)-15	**TMI ID:** 195	**IR-1 #:** HE(1)-02	**Project Effects Link to CEAA 2012:** 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions	**Reference to EIS guidelines:** Section 10.1.3	**Reference to EIS:** Appendix W-2, Section 3.5.3	**Context and Rationale:** Section 3.5.3 provides a list describing "the COCs [chemicals of concern] identified in any of the media requiring modelling into country foods" The list of chemicals does not include barium, chromium, molybdenum, nickel, selenium and tin, which are all identified in Table 3.5.2.4-1 (predicted exposure point concentrations in ore/tailings and waste rock) as parameters for which "concentration exceeds criteria, parameter carried forward as COC in HHERA". No rationale is provided for not carrying forward these chemicals in the country foods assessment.	**Specific Question/ Request for Information:** A. Include barium, chromium, molybdenum, nickel, selenium, and tin as chemicals of concern in the country foods assessment, or provide a rationale for excluding them.