Comments on:
Environmental Impact Assessment for proposed MINING OPERATIONS in the SPECIAL MINING LEASE 173 (SML 173) AREA
Located in the Parishes of St. Ann and Trelawny, Jamaica
by Noranda Jamaica Bauxite Partners II (NJBP II), VOLUME 1, DRAFT FINAL.
Prepared by Conrad Douglas & Associates Limited, November 6, 2020
and the Archaeological Impact Assessment (AIA)
Prepared by the Jamaica National Heritage Trust

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KEY CONCLUSIONS:
By approving this EIA as "acceptable for presentation to the public", Noranda Jamaica Bauxite Partners II (NJBP II) demonstrate that a functional cockpit karst ecosystem, with its myriad ecosystem services, is of little-to-no concern to the Partners and that the EIA process is merely something to "check off from a list" rather than being a process to guide environmentally- and socially-responsible land use practices and governance.

The EIA displayed a profound lack of understanding of the functional roles of bauxitic soils, notably in relation to phytogeography (vegetation structure and land cover in relation to topographic positions) and to the water cycle, especially moisture-holding and water storage capacity and buffering of the limestone component of the aquifer during intense or prolonged rainfall events. This lack of understanding for soil functionalities went so far as to attempt to perpetuate a false premise that forests do not occur on bauxitic soils.

Faunal surveys were wholly inadequate both in terms of methodologies and deployment practices. Surveys were not timed to biologically-relevant periods, species lists presented substantially lower diversity compared to other independent surveys which are available for this area, and species were incorrectly identified. For bat surveys, the consultants failed to demonstrate a minimum requisite knowledge for using ultrasonic detectors and analytic software. These baseline surveys failed to correctly describe the current composition and distribution of faunal biodiversity. Consequently, the EIA failed to use data-driven results to identify all areas which should not be subjected to mining operations. In the absence of quantitative baselines, any attempts to detect, much less monitor impacts are rendered impossible. Conclusions that mining operations (incl. the construction of haul roads) will have minimal or no impacts on fauna were presented without supporting evidence, either from the

literature or from the field surveys. Worse, conclusions of "no impact" were asserted in full contradiction of published literature and the EIA's own survey results.

The EIA also was notable for other important information and questions it omitted, including:

- Why was the area's geomorphology not explicitly identified, namely that it is cockpit karst?
- Why were landscape-level features of Maroon-British history excluded?
- Why did the EIA exclude mapping the proven underground flow from Cave River Sink to Dornoch (Dornock) Head Rising at the source of the Rio Bueno and attempt to dismiss its own description that changes in water flows have been detected in the Rio Bueno Sub Basin over the past 50 years of mining?
- Why were no quantitative data presented for heavy metal concentrations in the bauxitic soils and why were there no toxicity risk estimates (esp. cadmium, chromium, and mercury) for ecological receptors and the public with regards to exposure concentrations in fugitive dust?
- In claiming that post-mining rehabilitation represents climate change mitigation, why did the EIA not include data on the amounts of CO_2 which will be emitted in association with this SML for the complete cycle of bauxite-extraction-to-processed-aluminum? Why did the EIA not present data on the carbon sequestration capacity of post-mined rehabilitated lands (incl. soil storage capacity) of Napier grass? And why did the EIA not present carbon storage data for an alternative scenario of "no mining, restoration of native forest land cover"?

I reject this EIA for its inadequate, data-deficient, and incorrect descriptions of the karstscape and for its myriad unsupported conclusions that no-to-minimal impact will be experienced to key functional components when bauxitic soils are removed and limestone corridors are eliminated from the landscape. In my opinion, this EIA was not fit for presentation to the public and it is unacceptable that we should have been required to invest time and resources having to review it in its current condition.

DETAILED COMMENTS AND QUESTIONS:

1. Since the 1950s, geologists, geomorphologists, and geographers have classified the area under SML-173 as cockpit karst. Despite repeatedly using the terms "cockpits" and "hillocks", why does the EIA not name the landscape as cockpit karst in its description of geomorphology? Why during the Dec 8th 2020 Public Meeting did Dr. Douglas entirely avoid using the word "cockpit" to otherwise describe enclosed depressions between the hillocks? Is this to avoid the conclusion that the area of SML 173 **IS** part of Cockpit Country?

2. The EIA does not contain the results of modelling to quantify the morphology (landform) of the karst White Limestone of the area. One relevance of modelling is for planning how haul roads will be configured, particularly in relation to how many saddle-corridors or hill slopes will be dynamited and / or bulldozed. Was modelling done? If not, why not? If it was done, why are the results not included in the EIA?

3. The AIA lists many human artifacts and relics but is silent about the landform and trails that were important to the Maroons. An example of this is the historic Maroon Path from a British military camp near the Hectors River Bridge (the Trelawny-Manchester border) to Mahogany Hall (near Stewart Town, St. Ann). This Path is depicted by James Robertson's 1803 map following the Second Maroon War. Why was mention of such an important historical Path, which is intrinsically linked to the morphology of the area, omitted from the AIA's and the EIA's Risk Assessments?

4. The success of the Maroons' guerrilla warfare rested, in part, on knowing how to take advantage of the cockpit morphology. This includes understanding how paths develop as humans (starting with the Tainos and continuing) follow elevation contour lines and weave through saddle-corridors between hilltops – known as taking the path-of-least-resistance inside of going uphill, downhill, uphill, downhill. It also includes knowing to climb to a higher elevation in order to look down onto the corridors, to ambush the single-file march of the enemy. That is, saddle-corridors are a key physical element of the Cockpit-Maroon-British narrative. In order to create the network of haul roads, Noranda proposes to dynamite and / or bulldoze through possibly up-to 50-60 saddle-corridors / hillsides during the first 5 years of mining (ref Figure 4-2); the total number of corridors to be obliterated over the entire lease area cannot be calculated from the information presented in the EIA. The EIA concluded that such haul road construction is "minor and reversible" (ref Table 7.1 Impacts to Physical Resources). Has Noranda ever attempted to reconstruct a demolished saddle-corridor so as to re-establish the topographic contour line between two hilltops? That is, what evidence is there to support the assertion that the impacts of haul road construction are "reversible" and not, in fact, physically impossible?

5. Have the Maroons been advised that an area of an historic path is going to be irreversibly destroyed, that some of their heritage is going to be dynamited to oblivion?

6. During the December 8th, 2020 public meeting a Noranda official noted the company's history of social partnership. As a commitment to this ethos, one of being a good corporate citizen, would NJBP II provide to the public GIS shapefiles for all of the haul roads which have been constructed in SML-165 so as to enable an independent, transparent assessment of reclamation and rehabilitation claims? In those shapefiles, I ask that the linked Attribute Table include the status of all road segments (e.g. open for vehicle use; closed to vehicles; reclaimed; rehabilitated, etc.).

7. Given the documented high concentrations of heavy metals in Jamaica's aluminum-bearing soils (e.g. as identified in geochemical maps presented by ICENS (UWI), cadmium concentrations in SML-173 are 20 to > 78 times higher than what the WHO designates as "excessive" for soils) ,why did the EIA omit quantitative data on heavy metal concentrations in its descriptions of the area's soils? Why did the EIA not present toxicity risk estimates for exposure concentrations in fugitive dust on ecological

receptors and to members of the public and industry workers? What evidence is there that workers and the public are not being exposed to harmful levels of air-borne heavy metals (particularly cadmium, chromium, and mercury) during mining operations?

8. With regards to #7 above, in monthly reports of air quality monitoring by Noranda Jamaica Bauxite Partners from 2017 – 2019, for mining operations in SML-165, there is a data column to report lead concentrations (Pb 24 Hr Averages). No data were included in any reports for this 2-year period. Why not? Has NJBP I or II ever measured any air-borne concentrations of heavy metals in fugitive dust?

9. The EIA asserts "*there is a general misconception that bauxite occurs under forested areas*" (pg 5-17) but then quotes literature which directly contradicts this statement. As the EIA subsequently presented from Asprey and Robbins (1953), not only do bottomland cockpit depressions accumulate deep pockets of bauxitic soils but these soils support the growth of the largest trees in comparison to the thin-to-absent-soils of the associated limestone hills. What mineralogical and chemical evidence is there to support the assertion that soils of forest-covered cockpits are not bauxitic in their physical properties?

10. In asserting that forests won't occur over bauxite, the EIA not only ignored its own quotes from Asprey and Robbins (1953; see pp 5-127, 5-130, 5-131) but also ignored a substantial body of literature on the relationships between topography and phytogeography in tropical karst ecosystems. These natural relationships, in turn, explain the patterns of why humans convert forest to agriculture in bottomlands, valleys, glades, dolines, cockpits, poljes (i.e., the topographic areas where soils accumulate) while leaving hillsides and hilltops (which are mostly devoid of soils) with forest cover. The EIA also ignored historic descriptions of Jamaica's central uplands, which include the proposed mining area, (e.g,. Sloane's (1707) 1st sentence: *The greatest Part of the Island of Jamaica was heretofore cover'd with Woods ; the Trees remaining are very tall . . . .*; Browne 1756; Stewart 1823) and historic maps (e.g, Robertson's 1804 and 1828 maps of the island). In asserting forests won't occur on bauxite, the EIA also perpetuates a misreading of the botanic literature associated with bauxite mining in Jamaica, particularly the misreading of Howard and Proctor (1957). In maintaining a false premise that only grasslands occur on bauxite, the EIA not only failed to describe the functional roles of deep pockets of bauxitic soils but also failed to analyze alternative scenarios of: (a) no mining and restoration of native forest; and (b) mining-but-not-down-to-the-full-depth-of-the-ore-body and rehabilitation using native plant species. These scenarios need to be properly evaluated based on a professional review of the literature on tropical karst ecosystems, including the functional roles of bauxitic soils in relation to vegetation and its associated water cycle.

11. Aub (1969) deployed 69 rain gauges in Cockpit Country and documented the phenomenon that 14% more rainfall reaches forested cockpit floors compared to forested hilltops. Figure 5-18 in the EIA shows that only 1 weather station was deployed

inside the area proposed for mining. That station, Sawyers, is located ~ 5 km northeast of Block 1, which would be mined first under the SML. The Watt Town, Water Valley and Ulster Spring stations are ~ 3, 7, and 6.5 km, respectively, from the borders of Block 1. How, exactly, will any changes in micro-site, localized rainfall be detected over the course of mining across the entire area given that the baseline assessment is determined from so few stations which are not even capable of detecting topographic variations as documented by Aub (1969)? Another way to phrase this question is: given the extremely coarse spatial resolution associated with the deployment of so few weather stations and no recording of data as a function of topographic positioning, how, exactly, will an Environmental Monitoring Plan (ref pg 11-2) be capable of detecting and providing an early warning system for impact prevention to the karstscape's water cycle? Micro-site patterns of rainfall do, of course, have significance for agriculture and forest land cover.

12. The EIA reports that the moisture content of bauxite *in situ* ranges from about 20% to 25% (pg 2-3). Was any assessment undertaken to evaluate how moisture stored across the full vertical depth of bauxitic soils influences survival and growth of terrestrial vegetation (including but not restricted to agricultural root crops, fruit trees, and forest trees) during periods of no rainfall? That is, was an assessment undertaken to evaluate the upwards movement of deeply-stored water via capillary action during drought cycles in relation to plant survival and growth? If not, why not? There is an extensive body of literature on this topic, not only for Neotropical forests but also for rehabilitated mining areas, most notably in Australia. Why was assessment of this major functional role of bauxitic soils omitted?

13. When the adjacent SML-165 was signed on 1 October 2004, total "Bauxite Reserves" were estimated at 117 million dry metric tons (= metric tonne) (4.5 million dry metric tons x 26 years, as per the lease). This means that, when the ore is removed from the ground with the EIA's reported average 22% hydration, the extracted material weight would be 127.5 million metric tonnes, of which 99 million metric tonnes are solids and 28 million metric tonnes are water. Thus, when the karstscape under SML-165 is fully mined-out, the area will have lost the capacity to hold and store 28,056,600,000 liters of water at any given moment.

14. The EIA states that there are "approximately 150 million tonnes of bauxite in the SML 173 area" (pg 2-2). Given the accepted practice of presenting this information as dry metric tonnes, ~ 163.5 million metric tonnes of material would be extracted, of which 127.5 million metric tonnes would be solid and 38 million metric tonnes would be water. Thus, if the area were mined as outlined by SML-173, 35,970,000,000 liters of water-holding capacity of the soils will be irreversibly lost from the karstscape. Why did the EIA omit discussion of the functional importance associated with percentage moisture content of *in situ* bauxitic soils? Why was this functionality excluded from the Risk Assessment?

15. In relation to SML-165, on pg 5-28, the EIA describes the flow of the Rio Bueno, including:

    The trend line indicates a slight increase in flow despite the diversion of the Cave River and the mining of bauxite within the Rio Bueno Sub Basin by Kaiser Bauxite, and successive companies over the past 50 years.

    During the public meeting on 8th December 2020, Dr. Conrad Douglas stated that he was confident that there is "no risk to the flow rates and water quality" of the Rio Bueno if mining were to occur under SML-173. Why did he contradict the information in the EIA, namely that changes in flow have, indeed, been detected within the Rio Bueno Sub Basin over decades of mining?

16. With regards to proven underground drainage, why did the EIA refer only to WRA's 2018 dye tracing effort (pg 5-24 and associated Figure 5-15) and not also the literature which documented in 1966 a hydrologic connection between Cave River Sink and Dornock (Dornoch) Head Rising, where the Rio Bueno surfaces? That is why was the third proven underground flow omitted from Figure 5-15? Or, more correctly, why was the injection site and detection site (with a straight line drawn between them but the actual wet season and dry season conduit routes remaining unknown) of this dye tracing omitted from Figure 5-15?

17. The EIA asserts that "*it is very easy to identity sinkholes prior to mining and ensure buffer zones are created to prevent any infiltration of material*" (pg 7-24) and further states that "*Depressions that are sinkholes will not contain bauxite. Hence, no mining activities will be carried out in these areas*." (pg 7-7).

The EIA's assertion that mining doesn't breach sinkholes is demonstrably false.

Is NJBP II required to report to regulatory agencies when sinkholes are encountered? If so, how many encounters have been reported for SML-165 and SML-172? If sinkhole reporting is not required, why not?

18. The removal of deep bauxite soils eliminates the soils' buffering of intense rainfall events and water storage capacity of the aquifer. Without these soils, rainfall enters the limestone component of an aquifer faster. Consequently, less *in situ*, soil-retained moisture will be available to cycle upwards (from what would have been associated with capillary action and surface evaporation at the soil / surface air interface) from where the rain actually fell This reduction in soil-derived, return-of-moisture-to-the-atmosphere will result in a drier micro-climate. Why did the EIA omit any discussion about the rainfall-buffering and water storage capacity of bauxitic soils in its risk assessment of the Rio Bueno Sub Basin?

19. The AIA describes the eco-hydrological associations of Giant Bamboo (*Bambusa vulgaris*), namely that "where water tables appear close to the surface, bamboo plants thrive." (pg 32 of the AIA). Given that In Table 5-14, *Bambusa vulgaris* is classifed as "Abundant" why did the EIA omit discussion of this species in relation to the assessments of hydrology? Have any test bores been drilled for ore bodies with Giant Bamboo land cover? If yes, when were they drilled, and on what date and at what depth was the water table reached? If test borings have not been undertaken in areas of *Bambusa vulgaris*, why not? Have hydrologic test drillings been undertaken at any time during the past 50 years, anywhere within the area of SML-173, that are not included in WRA's online Water Information System database and mapping service? If yes, why was such information omitted from the EIA?

20. Although the consultants were not permitted to enter the Forest Reserves, did they request plant checklists from Forestry Department's BioPhysical Inventory for the reserves? If requested, why is the information not included? This information will be vastly more relevant for describing the area and for determining the "potential restoration condition under alternative scenarios" than the species' lists presented for more-distant areas of Cockpit Country.

21. On page 5-82, the EIA states that faunal assessments were undertaken during Phase 2 of field surveys, during the period of August 17-19, August 24-26, 2019 and September 14-16, 2019. "December 2019" also was included on pg 5-66, but it remains unnoted what was surveyed during that period. What ecologically-relevant criteria were used to determine the timing of faunal surveys so as to ensure that all fauna present in the area were detectable, especially in relation to the survey methods utilized? The timing of mid-to-late August and mid-September suggests that the consultants are not aware of the abiotic factors to which breeding seasons, insect emergence patterns, and seasonal intra-island and international migration patters are linked i.e., those conditions which influence species' presence and detectability. Why were surveys not conducted in association with the cyclic bimodal rainfall pattern (e.g. pg 5-34), which drives faunal ecologies and detectability?

22. Because of their failure to survey in April and May, the EIA consultants failed to document the occupancy of the area by the Jamaican (Blue) Kite Swallowtail

(*Protographium* (*Eurytides*) *marcellinus*), which is endemic to Jamaica, on the Third Schedule of the Wild Life Protection Act, 1945 and listed by the IUCN Red List as Vulnerable. Consequently, the EIA provides no baseline information to identify all areas which must be excluded from mining in order to conserve the habitat (incl. forest corridors to connect to other known locations beyond SML-173) of this protected species.

23. On page 5-195, the EIA makes reference to the Giant Swallowtail's (*Pterourus homerus*) food plant, the Water Mahoe (*Hernandia catalpifolia*), and on page 5-196, the EIA reports that "No Water Mahoe was observed." This observation is no surprise given that *H. catalpifolia* is restricted to the parishes of Portland and St. Thomas. They should have been looking for *Hernandia jamaicensis*, which is known by the common names of Pumpkin Wood or Suck Axe. A critical point which the EIA failed to address: as long as mining is prohibited and the deep bauxitic soils are left *in situ*, the area retains the potential for forest habitat restoration for this Endangered swallowtail. If the bauxitic soils are removed, rehabilitation of forest and the microclimate required by the Giant Swallowtail will be impossible.

24. Re: Figure 5-134 - Distribution Map for Giant Swallowtail. Recognizing the need to not publish precise location data for this species, there are several points on this map which clearly place this species in unoccupiable habitat locations. EIAs have a responsibility not to disseminate inaccurate or false information. Why was this map of clearly-incorrect information included?

25. The EIA detected 46 bird species. Checklists from eBird (www.ebird.org) for this same area report 86 species. Thus, the EIA, with its inadequate temporal sampling effort, recorded just barely more than half of the bird species which are known to occur in the area, and, by extension, failed to account for their contributions to ecosystem services. Of particular concern is the EIA's failure to detect the following IUCN Red Listed Near-Threatened (NT) and Vulnerable (VU) species, which are on eBird checklists:

    Ring-tailed Pigeon (*Patagioenas caribaea*) VU
    Plain Pigeon (*Patagioenas inornata*) NT
    Crested Quail-Dove (*Geotrygon versicolor*) NT
    Black-billed Parrot (*Amazona agilis*) VU
    Blue Mountain Vireo (*Vireo osburni*) NT

26. With regards to the failure to detect Black-billed Parrots, a statement about an arboreal termitary mound raises questions as to how familiar the consultants are with wild Black-billed and Yellow-billed parrots in particular, and to wild birds in general:

    It was concluded that the nest most likely belonged to a Parakeet, as the Amazon Parrots are known to be non-excavating cavity nesters (Koenig 2001) (ref pp 5-207 & 208).

Can the EIA consultants explain how to distinguish Yellow-billed Parrots and Black-billed Parrots, both by their vocalizations and when they are in-flight without vocalizing? That is, how confident can we be that Black-billed Parrots weren't mis-identified during the surveys, esp. given all of the reports of this species on eBird?

27. Creating drivable access roads facilitates poaching / illegal harvesting of protected flora and fauna, incl. parrots, butterflies, and orchids. Why did the EIA fail to address this with regards to species in the Risk Assessment as a permanent threat associated with the network of haul roads which remain usable after mining ceases? One of the consequences of their failure to detect Black-billed Parrots is that they failed to refer to the relevant Population Viability Assessment (PVA; Koenig 2008) which address this issue of mining roads and poaching.

28. The EIA asserts that during pre-operations, operations and rehabilitation, wildlife such as birds will not be impacted because of their mobility (ref Table 7.2 and pg 8-4). The "mitigation" that animals will just move is both simplistic and misses substantial bodies of literature on habitat carrying capacity (incl. density as a misleading indicator of habitat quality), disturbance-mediated changes in activity budgets (e.g., changes in territorial defense, predator vigilance, and foraging time budgets), and how disturbance affects an individual's fitness, reproductive performance, and lifespan. What evidence is there to support the assertion that mining does not affect avifauna? Have any mark-recapture / resighting studies been conducted for birds (or, indeed, for any faunal species) in areas currently being mined and rehabilitated in Jamaica? There is, of course, an extensive body of literature on banded Neotropical migrants over-wintering in Jamaica which addresses these questions on how habitat quality affects home range size requirements, individual fitness, and species demography.

29. The EIA reports on two floral and faunal transects, one undertaken in a mined-out ore body which was reclaimed and rehabilitated 17 years ago in Tobolski, St Ann and one which is actively being mined in Gibraltar, St. Ann. Only 4 bird species were detected in the rehabilitated site, and a set of 4 different bird species was detected in the active-mining site (Table 8-3). Given these results and in comparison to the un-mined areas surveyed in SML-173, how does the EIA defend its assertion that birds are not impacted by mining, both by short-term impacts and long-term effects? That is, why was the Risk Assessment not driven by the field data?

30. The EIA is riddled with its presentation of internal contradictory statements. For example, on pg 5-178 it states:

    This study area (Figure 5-121) was defined by its dense, closed canopy with relatively high humidity (75.2%). There was almost no evidence of human disturbance, placing this among the pristine areas. The most abundant species along the transect was bracken fern, Pteridium *sp. This presented as evidence of disturbance. However, it was*

also noted that a significant amount of plants observed were dried up and burnt between 20-30m of the transect. It is possible that a recent fire could have brought about this disturbance.

So, which was it – no evidence of human disturbance or abundant evidence of disturbance? What baseline description would a monitoring program use to detect mining impacts?

31. I acknowledge Dr. M. Brock Fenton's submission to NEPA, of his comments on the bat components of the EIA (attached as an Appendix in this document). I fully endorse Dr. Fenton's comments and conclusions. I also have additional concerns for site- and species-specific details.

32. The photograph in Figure 5-83 showing the positioning of the AudioMoth (and its associated microphone), along with several statements (e.g. pg 5-199 "*Bats emit sound waves within unique and narrow frequency bands . . .*") leads me to question how many hours, if any, of supervised professional training the consultants have had using ultrasonic detection equipment and of practical experience with Jamaican bats (whose acoustic calls, far from being within "narrow" frequency bands, span from an audible range of 18 kHz to ultrasonic exceeding 170 kHz). For example, on page 5-124 with regards to configuring the recording equipment, the EIA notes:

    "*The sound frequency sampling range was set between 0 and 256 kHz.*"

    The consultants have confused two concepts: sampling rate and frequency range. Sonograms shown in the EIA confirm that they programmed the devices to a sampling rate of 256 kHz, with a consequent maximum frequency range up-to 128 kHz. (NB, on pg 5-125, the EIA stated that "*Kaleidoscope automatically sets the analysis range to a maximum of 120 kHz*". The software shows the range as defined by a device's recording parameters i.e., the detector, not Kaleidoscope software "sets" the range.) This sampling rate and consequent frequency range, however, are not appropriate for Jamaica's bat fauna as it results in the truncation of calls of Phyllostomidae and Natalidae. Why did the consultants not program the devices to record at a sampling rate of 384 kHz, the maximum which is available as per manufacturer specifications? Especially as I had already reported on the potential for *Glossophaga soricina* and / or *Chilonatalus micropus* to be present in the Belmont area (Koenig 2019)?

33. In Table 5-30, the EIA reports that *Noctilio leporinus* (common name Bulldog or Fish-eating Bat) was auto-identified by Kaleidoscope Pro software in all three caves. If this identification is correct, why was the ecological and hydrological significance of this species' presence not discussed and analyzed for the Risk Assessment?

34. On the other hand, one also has to question the validity of this identification. How complete is the Kaleidoscope Pro library of calls? For all of the species of Molossidae presented in Table 5-30, are there adequate reference-examples of these species flying

in small enclosed spaces and / or in densely cluttered air space, where there will be functional convergence of acoustic characteristics amongst them and to *Noctilio leporinus*?

35. The absence of any species of Phyllostomidae (aka "whispering" bats) on Table 5-30 make salient the **MAJOR** well-documented problems associated with using auto-classification and identification for this family of bats, in general, and the specific problems known for Wildlife Acoustics' software, namely the mis-classification of files as "NOISE" when they do, indeed, have valid bat calls. Did the consultants review any of the files classified as "NOISE" (ref pg 5-125) to extract any-and-all false negatives and manually identify any of these files? If not, why not?

36. For Figure 5-183, I must ask the consultants to report what species' identifications were assigned by Kaleidoscope Pro for the two species shown in the sonogram and what identities did the consultants manually assign to each of them. Neither Table 5-30 nor Table 5-31 have both species included on the listings (i.e., one table excludes one of the species and the other table excludes the second species which appear in this sonogram). Additionally, the consultants' reported ability to manually distinguish *Glossophaga soricina* from *Chilonatalus micropus* is not reliable given that recordings were truncated at 128 kHz. Based on this sonogram and the question about *Noctilio* vs. the Molossidae discrimination, the Kaleidoscope Pro identifications are not reliable nor should the manual identification be trusted for anything other than one species, *Pteronotus parnellii*.

37. On page 5-124, the EIA notes that:
"The extensive ecological survey of SML 173 did not identify any evidence of tree roosting bats. Therefore, no deliberate setup was done to assess the presence of this type of bat."

    Given the highly cryptic behaviour of tree-roosting bats, which evolved to reduce being detected by diurnal predators and for the need to protect themselves from inclement weather, what evidence was actually looked for? The identification in acoustic recordings of *Ariteus flavescens* (ref Table 5-31), a tree-roosting species which also roosts opportunistically in caves, demanded nocturnal acoustic terrestrial surveys for tree-roosting bats.

38. The EIA asserts that, not only are NJBP II's operations diurnal, not nocturnal, but also because of their mobility, flying animals like bats will not be impacted (ref pg 8-4). The EIA also asserts that haul roads constructed to a maximum width of 11 m (35 feet) will not result in any "substantial" fragmentation (pg 8-5), even though the proposed haul roads for the first 5-year period, alone, could destroy 50 – 60 corridors which connect hillsides (ref Figure 4-2). In light of the fact that: (a) no bat surveys were conducted above-ground, at night, so as to identify bats' travelling and feeding areas across the land-cover gradient; and (b) no terrestrial, nocturnal bat surveys were conducted at the

rehabilitated site at Tobolski nor at the currently-mined site at Gibraltar, what evidence did the consultants use to draw the conclusion that mining and haul roads will not impact bats? Particularly, what evidence did they use to draw their conclusions for the only species which they can reliably identify, *Pteronotus parnellii*? The consultants clearly are not aware of the published literature from Jamaica (and Cuba), which identifies the strong acoustic dependence of this species on densely-cluttered forest for both travel and hunting. Had they conducted proper terrestrial acoustic surveys, they would have confirmed that 11 meters creates an "acoustic barrier" gap for the highly-forest-dependent *Pteronotus parnellii.* This species is, in fact, also a biological indicator for the quality of forest connectivity in any area where it occurs. Further, give SML-173's proximity to the important bat colony in Thatchfield Great Cave, proper attention should have been given to the "soundscape" of forest-connectivity for bats (particularly in relation to the published literature on feeding home range sizes and travel distances for the species definitively confirmed for the area). Why did the EIA omit details about the habitat "soundscape" requirements of each of the species they believed were identified correctly in Tables 5-30 and 5-31?

39. On page 5-237, the EIA noted:
"*At dusk, bats were observed flying around in both populated areas, as well as, in the vicinity of low-lying depressions. The identity of these bats could not be ascertained.*"

    Did it not occur to the consultants that they should deploy their AudioMoths to identify bats flying around at dusk? That is, did it not occur to them to fulfill the Terms of Reference?

40. Figure 5-200 and its associated text on pg 5-263 demonstrate a complete ignorance of the foraging and acoustic ecologies which are published for Jamaican bats and for foraging and home range sizes of these species where they occur and have been studied outside of Jamaica. Let's start with a simple question: of the insectivorous species supposedly identified by Kaleidoscope and manually by CD&A, which species are restricted to cluttered forest, which would utilize forest edges, and which use open space? Do the consultants know what the acoustic signatures are when insectivores are hunting (instead of just guessing that observed bats were "possibly feeding")?

41. Why did the consultants not evaluate the status of Retreat Gully Cave and Croyden Mountain Cave, both of which are reported by Fincham (1997) to have guano deposits? Proximity to the boundary makes it highly likely that bats roosting in these caves will make use of the area of SML-173. For Retreat Gully Cave, its position within SML-172 demands that it be assessed and protected. It's also important to remember that, while historic disturbance by guano collectors can easily cause the death of an entire bat colony, the cave can be re-inhabited over time (i.e. absence of a bat colony at present would not justify destroying a cave).

42. In-depth assessments of invertebrate and herptile surveys and results are beyond the scope of this review. The absence of commentary should not be interpreted as acceptance of these survey efforts nor of conclusions. Indeed, a superficial reading indicates that all have the same flaws of inadequate spatial and temporal sampling, inadequate sampling methods, and incorrect species identifications (e.g. they identified a snail as *Thelidomus cognate* (sic). Not only is the species name spelled incorrectly throughout the EIA – it is *cognata*—but their identification is wrong. *T. cognata* occurs outside of this area; the correct identification is *Thelidomus aspera*. Similarly, the snail in Figure 5-177 belongs to the genus *Lucerna*, not *Pleurodonte*). Thus, of the two shelled gastropod species they managed to find alive, they mis-identified both. Further, they identified empty shells as *Sagda foremaniana* (ref Appendix XX), but SML-173 is not within the known range of this species. Based on previous surveys by Dr. Gary Rosenberg (Academy of Natural Sciences, USA) across the Litchfeld Mountain – Matheson's Run Key Biodiversity Area in which SML-173 is included, there could be up-to 70 species of snails present.

43. The consultants need to explain why the reptile and amphibian lists in Appendix XX don't correspond to the species listed in Table 5-27. As printed in the EIA:
Appendix XX: Fauna Species List for SML 173 Area

    So why does Table 13-3 in the Appendix show 20 species of reptiles for SML 173 Area while Table 5-27 shows that only 8 reptile species were observed during the survey? And why are there 16 species under the heading of Amphibians in the Appendix when Table 5-27 shows only 3 species were detected during the survey? Given that Windsor Research Centre has never conducted any systematic surveys for reptiles or amphibians for SML 173, why is WRC referenced in Appendix XX?

44. The EIA has other sloppy misspellings. For example, the surname of the Senior Agricultural Chemist who first confirmed the high alumina concentrations in Jamaican soils was Innes, not "Ennis" (pg. 2-4). This makes me wonder whether the EIA consultants reviewed the original literature of the industry or whether they merely copied interpretations of summaries that have been handed down, unverified. Their false assertion that forests don't occur on bauxite certainly indicates a mis-reading of the original article published by Howard and Proctor (1957).

45. As a mitigation the EIA proposes that: *Pre-operation activities will also include the removal and relocation of sensitive species such as epiphytes to NJBP II's existing greenhouses.* (pg 4-4).

    In Table 7.2 Impacts to Biological Resources, the EIA also notes: *During the EIA, epiphytes, Wild Pine, Bromeliad and God Okra were identified.* (pg 7-11).

    Given that "wild pine" is the local name for bromeliads (Bromeliaceae), which are epiphytes, I can't but wonder why the EIA presented the list in this fashion. Beyond

that, what evidence is there that survival and growth rates are not impacted for each species of epiphyte which will be translocated, both to greenhouses and to their return to the wild? For this mitigation to be valid, the EIA needs to present data on sunlight requirements (i.e, light-tolerance ranges), moisture requirements, and nutrient requirements for the stage classes of each epiphyte species. There also needs to be pre-defined Measures-of-Success for growth and survival rates in the nurseries and following return to the wild.

46. On page 8-35, the EIA states that:
"*Currently 2,889 hectares of the total 3,123 hectares (91%) disturbed by Kaiser/Noranda/NJBP II has been certified rehabilitated*."

This was reiterated during the December 8th, 2020 public meeting by Mr. Delroy Dell, who confirmed that 92% of land disturbed since 1967 have been rehabilitated.

Presented as such, this information will be **highly-misleading** to anyone who is not familiar with the concept of "percentage-swell", the increase in surface area which occurs during the stage of reclamation. One hundred percent (100%), that is, where hectares disturbed equals hectares reclaimed, does not mean that every single mined-out ore body has been reclaimed and rehabilitated. Based on data obtained from Mines and Geology Division using an Access To Information request, Noranda's average swell is about 43-53% (with a range of 1% to over 200%). Thus, the reclamation and rehabilitation goal is towards upwards of 150%, not 100% To ensure that the public and decision-makers are not confused or misled, the numbers of ore bodies mined-out and the numbers of mined-out pits reclaimed need to be included with the above-quoted sentence from the EIA, not just the numbers of hectares.

47. In line with the ethos of good corporate social responsibility and commitment to openness and transparency, will NJBP II provide to the public GIS shapefiles for all areas that Kaiser/Noranda/NJBP I/NJBP II have disturbed with mining since 1967 to-date so as to enable independent verification of their claims for hectares mined and hectares rehabilitated? I would ask that the Attribute Table include:

- Ore body unique ID number
- SML Number under which mining occurred
- Area Disturbed (ha)
- Area Mined Out (ha)
- Pit Area Certified as Reclaimed (ha)
- Rehabilitated Area Certified (ha)
- Date of Rehabilitation Certificate
- Rehabilitation Land Use

48. The EIA states that the planting of grass "*plus the planting of several trees in the vicinity and a major tree planting programme of 200,000 trees*" for land rehabilitation

after mining will increase the size of grasslands and increase carbon sequestration. The EIA does not, however, present calculations to support this. From 2006 – 2012, bauxite mining and limestone quarrying across Jamaica emitted a total of 17,694 Gigagrams (Gg) of carbon dioxide (CO_2) into the atmosphere (Ministry of Economic Growth and Job Creation, GoJ, undated biennial update report). That's 17,694,000 tonnes of CO_2 or 4,825,636 tonnes of carbon which Jamaica must capture and store for this reported 6 year period. There's also the entire 70+ year history of bauxite mining in Jamaica and the 25-30 years of this proposed lease which must be accounted for. Is this mitigation for carbon emissions genuinely feasible and valid?

49. Why did the EIA fail to articulate that the grass species currently planted by Noranda and which (presumably) will be planted for rehabilitation is Napier (Elephant) Grass (*Pennisetum purpureum*), an introduced plant which is designated by NEPA to be "Category 2 – Highly Invasive"? Does the promotion of this species by the mining industry contravene Jamaica's responsibilities to the International Convention on Biological Diversity?

50. Where are the 200,000 trees (ref above, #47) going to be planted? The EIA needs to include a map and notation as to whether this will occur on rehabilitated mined-out ore bodies or will planting occur in unmined soils? If they won't be planted in rehabilitated pits, why not? What is the minimum depth-of-reconstructed soil required for trees? What are the pre-defined metrics for seedling survival and growth rates which Noranda will use to monitor the short- , medium-, and long-term success of this activity?

51. Tropical forests growing on deep soils are at least 10 times more effective at storing carbon than Napier Grass. Did the EIA consultants examine alternative scenarios to mining and planting of grass for climate change mitigation? Alternatives such as keeping the bauxitic soils in the ground and promoting restoration of native forest cover in the area, particularly on those lands entrusted to the Commissioner of Lands to be looked after on behalf of the public. If alternative scenarios for climate change mitigation were evaluated, why were results not presented in the EIA?

52. As mitigation, the AIA proposes delineation of boundaries around communities and "compensation for damages on private property including archaeological sites." Under what law would compensation be calculated? Will compensation go solely to the current title-holder? What about families whose ancestors created the artifacts? What about future land owners who will be denied the experience associated with having history and heritage left *in situ*?

53. What are the chances of UNESCO accepting an application for World Heritage Site, given the high risks of destruction of historical and archeological sites as well as of the cockpit landform?

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APPENDIX 1. REMOVED FOR POSTING TO THE INTERNET
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