

Review of the
Environmental Impact Assessment for
Proposed Bauxite Mining Operations in the
Special Exclusive Prospecting License 524 (SEPL 524) Area
Located in St. Ann, Jamaica
by UC Rusal Alumina Jamaica Limited (Windalco)
Draft Final
Dated May 21, 2021

EIA prepared by Conrad Douglas & Associates Limited

Review prepared by:
Dr. Susan Koenig
Windsor Research Centre
Sherwood Content P.O., Trelawny
windsor@cwjamaica.com
t: 876-997-3832

21st July 2021

PREFACE SUMMARY:

The commentaries in this review are restricted to the descriptions and risk assessments of a subset of the area's abiotic and biotic properties (primarily hydrology, changes to surface landforms, and bat surveys). The absence of commentary on other aspects of the EIA should not be construed as acceptance: a preliminary reading of the EIA revealed that, as with a previous EIA prepared by Conrad Douglas & Associates Limited (CD&A) for SML 173, faunal surveys were woefully inadequate in spatial and temporal sampling design. Every component of the EIA for SEPL 524 demands professional scrutiny.

Despite the large number of pages, maps, photographs, tables, etc. presented in the EIA, it is almost stunning at how limited and incorrect CD&A's understanding is of the fundamental properties of tropical karst ecosystems, most particularly in relation to the myriad functional roles of bauxitic soils in relation to vegetation communities, hydrology (data of which they present but chose to ignore . . .), the water cycle, and the patterns of human land use. Critically, CD&A attempted to falsely present that historic conversion of forests to agriculture was an equivalent ecological stress to extractive surface mining. This false equivalency appears to be grounded in the fact that CD&A do not understand the functional roles of deep bauxitic soils, whereby their presence even after forest is converted to agriculture ensures that reforestation can be achieved if desired by current or future generations.

I reject this EIA for SEPL-524 as being professionally substandard: the so-called scientific investigation (pg 1-4) was not even used to guide a process to minimize what will be irreversible environmental changes to the karstscape. CD&A give the

appearance of having decided *a priori*, and with no supporting evidence, that mining is necessary for economic stability, despite the fact that there are many other communities across Jamaica which do just fine without mining causing irreversible changes to land productivity and ecosystem services.

DETAILED COMMENTS:

1. Exclusion of details of Winalco's reclamation history

Throughout the EIA, CD&A repeatedly refer to Winalco's history on Jamaica since 1948 (pg 1-2) and the company's mining of the area that is now demarcated as SML-162 (which, to note, was issued on 1st-June-2001) since 1957 (pg 1-17). While providing qualitative descriptions of various post-mining land use categories, the EIA failed to include quantitative details of Winalco's 63 / 64-year mining and reclamation history:

- How many ore bodies have been mined-out by Winalco (and its antecedents) since 1957?
- How many of these mined-out ore bodies have been reclaimed?
- How many reclaimed ore bodies have been rehabilitated since 1957 for each of the land use categories presented under section 4.4 on page 4-16:

“. . . by planting the reclaimed area with crops, fruits trees, pangola grass (*Digitaria decumbens*) or guinea grass (*Panicum maximum*). Occasionally, Caribbean pines (*Pinus caribaea*) or in some instances the area is shaped for relocation housing development . . .”

I ask for the numbers of ore bodies instead of how the industry normally presents information – hectares mined, hectares reclaimed, with percentage calculated by dividing reclaimed by mined. Because of the “swell area” associated with reclamation, this information about percentage-reclaimed will be misinterpreted by the public: 100% (mined = reclaimed) does not, in fact, mean that each-and-every mined out pit has been reclaimed.

Until the Commissioner of Mines at Mines and Geology Division certifies that EVERY mined-out ore body in Winalco's long history in the area has been reclaimed and rehabilitated, SEPL 524 should not be converted to an SML. Winalco needs to repair its historic legacy of damage before anyone should consider issuing a new SML.

I also note that in the land use categories presented on page 4-16, there is no mention of Winalco using Napier Grass (*Pennisetum purpureum*). Can CD&A confirm that Winalco has NEVER planted this globally-recognized invasive alien species? If the company has planted it and rehabilitation certificates have been issued by MGD, why was this grass species not included in the EIA?

2. How much topsoil is removed; how much is returned reconstructed?

On page 2-3, under section 2.2.1. Land Clearing, the EIA states that “Between 6-18 inches of top soil is removed . . . “. But on page 4-2, the EIA states that “ . . .the pit will be reshaped, graded and the 18” to 24” topsoil previously removed and stored will be replaced in order to restore it to a productive level of use in accordance with the regulations of the Mining Act. “

Bearing in mind the “swell area” associated with reclamation, and which for Winalco-Ewarton has increased the surface area of a pit by > 20% on-average, can CD&A explain how a deeper layer of reconstructed topsoil is returned than what was removed? Is Winalco sourcing the material from elsewhere? Or is CD&A merely guessing at what is done? If the latter, this is unprofessional and irresponsible for an EIA.

For myself or any member of the public to have any confidence about claims of reconstructed soils, CD&A need to provide for the EIA real data from field measurements: what are the depth-gradients, from the center of a reclaimed pit to the edges of the pit for ALL reclaimed ore bodies. Winalco should have these data in electronic form as they keep track of their reclamation process and the associated expenses.

With regards to the reported planting of fruit tree (ref page 4-16, as cited above), what is the minimum depth of reconstructed soil which Winalco returns when tree cover is planned and what measures-of-success do they monitor for tree survival, growth, and productivity? If, as the EIA proposes, that planting of trees is a mitigation action, then the EIA needs to provide factual evidence that Winalco has, indeed, achieved this other than for a few “show plots” of stunted trees near Faith’s Pen. The EIA is riddled with unsupported claims of company successes – evidential data are required.

3. Hydrology & water cycles, esp. for agricultural productivity

REF: “*Figure 5-2: Caves located within the Area of SEPL 524 and the 5km radius zone of influence*” on page 5-5:

Ignoring the fact that there is no 5km radius zone of influence showing on this figure, it appears to be the only map in the EIA which includes the Watershed Management Unit (WMU) boundary line between the Rio Bueno – White River WMU and the Rio Cobre WMU, the latter of which occurs across the entire southern boundary of the SEPL-524. The absence of discussion about the Rio Cobre WMU is such a HUGE, GLARING omission, that I must assume Water Resources Authority will cover this in their review. The numerous cave openings (i.e the windows into the complex aquifer . . .) in the southwestern zone of influence demand a correct description and risk assessment.

Ref *Figure 5-11, Groundwater Level Contours in White River Sub-basin :*

Why did CD&A show this information for Moneague, which is east of SEPL 524, but not provide comparable information for the entire SEPL and an associated 5 km zone of influence?

Is a circular 5 km zone of influence the correct way to describe the flow gradient of karst? A 5-km upwards-gradient will have entirely different hydrologic responses to 5-km down-gradient. This is clearly a sampling range determined by a computer algorithm, not a demonstration of understanding dynamic karst hydrology.

CD&A also need to properly review Alan Fincham's *Jamaica Underground*, not only for descriptions of known hydrology but also for bat roosts (e.g. in the hydrology section, they didn't say anything about Ken Connell Hole, which Fincham describes as a cave that "carries a stream in rains" and which, consequently, has implications with regards to insights for the hydrodynamics of this part of the basin; additionally, Ken Connell Hole had guano deposits as per Fincham).

Everything I described in my review of the EIA for SML-173 (submitted to NEPA on 28-December-2020), about CD&A's failures to understand the role of deep bauxitic soils in the water cycle (e.g., buffering infiltration rates of rainfall into the limestone component of the aquifer, water storage capacity, site-based micro-climate, esp. provisioning of moisture via capillary actions to plants during periods without rainfall), have not been addressed in this EIA for SEPL-524. Given the 20-25% moisture-holding properties of the bauxite as reported by CD&A, how many liters of water will cease being stored if all the desired ore bodies are mined-out? How will this loss of functionality irreversibly affect future land uses that would be desired by current or future generations? (Most notably, for generations who may want to have forest cover for carbon sequestration and climate change mitigation.) How does the loss of deep, soil-held moisture affect sustainable agricultural productivity, particularly during drought cycles? Given the globally-recognized importance of bauxitic soils by all competent tropical karst experts, both for the soils' roles in shaping forest structure, diversity, and, therefore, functionality, and for driving patterns of human settlement and agricultural capabilities, CD&A's assertion that the residual ecological effects of removing soils are "minor" (pg 8-22 and elsewhere in the EIA) is not supported by the peer-reviewed literature.

CD&A present no data to support their many qualitative claims about Winalco's agricultural productivity (e.g., see page 5-279 for claims about dairy and beef cattle . . . we need to see the data for stocking densities and relevant health parameters, comparing pastures on reconstructed soils managed intensively by Winalco vs. reconstructed soils returned to tenant farmers vs. productivity in areas where ore bodies remain un-mined). Where Winalco actively planned to rehabilitate areas for the company's own herds, what was the depth-of-reconstructed-soil? Was it, indeed, the same as for areas that they, themselves, were not intending to use?

Also, why in chapter 8 does CD&A show so many photographs of reclamation and farming for Manchester? The original topography and depositional type of bauxite (blanket-type) in Manchester bears no resemblance to the landform in SEPL 524. I present that these images do not accurately represent reclamation of cockpit karst and, as such, will deceive the public.

With regards to hydrology, CD&A conveniently ignore their own facts: On page 5-269, they noted:

“However, reports from the Water Resources Authority (WRA) indicates a slight increase in groundwater flow within the Rio Bueno Catchment despite bauxite mining operations in the upper watershed areas over the past 50 years.”

To detect a change in infiltration rates at the spatial scale of a karst watershed means that there has been a SUBSTANTIAL (and completely irreversible) change to the hydrodynamics, which correlates to the cumulative impacts of mining.

4. Contamination of water resources due to the processing of bauxite to alumina.

RE: *Figure 3.1 Status of Jamaica's Watersheds*, Given the Severely Degraded status of the Hope River Watershed Management Unit specifically because of industrial pollution associated with Winalco's processing factory, I am stunned that a Risk Assessment evaluating the supply of bauxite from the SEPL-524 area was not required for the EIA. For Winalco's assets, it is entirely inappropriate and irresponsible to present mining and processing activities as discrete activities with regards to contamination risks to communities and the watershed.

5. Changing industry-recognized terminology

CD&A's attempt to change the dictionary definition of “restore” / “restoration” presents a novel approach to pretending that surface mining doesn't irreversibly change geology, geo-chemistry, land morphology, soil structure (incl. formation of new soils over time), and hydrology. To restore anything, by definition, means to return it to its original condition. The only way an original forest or the pre-mining agricultural productivity of an area converted from forest cover can be “restored” is if no dynamiting, bulldozing, backhoe scraping or mining occurs. It is a simple definitional fact that the extraction of surface minerals irreversibly alters the original state of the environment where mining occurs. Because the functional roles of bauxitic soils were not correctly understood when The Mining Act was promulgated in 1947, the framers of the legislation failed to understand that, by definition, restoration could never be achieved. Instead, what occurs is reclamation and rehabilitation to whatever end-use is desired, whether to a self-sustaining ecosystem of native and endemic biota, production forestry, agriculture, recreational parkland, residential community, etc. A consequence of CD&A's failure to understand recognized dictionary definitions is that their Risk Assessment incorrectly assumes that various degrees of damage will be minimal because it can be “restored”. Usage of the term “restoration” is deceitful to the public.

6. Damage by cuts and haul roads are not “Minor and Reversible” (ref Item A-2 in Table 7.1); roads are, in fact, an anthropogenic stress according to CD&A.

On page 1-8, under section 1.4.3., CD&A described the SEPL 524 as:

“... not pristine and has been subjected to various anthropogenic stresses, both historically and ongoing. These stresses include establishment of plantations in the early 1700s, hunting, human settlements, access roads for both plantations and settlements as well as agricultural practices.”

If historic access roads are deemed to be a stress by CD&A, how can they then defend their assertion that roadways created for haulage are a “residual positive impact” because “of the improved access within the area.” (ref page 8-23)?

There is, of course, a fundamental flaw in CD&A’s attempt to equate the damage caused by mining activities to historic land use practices. While black powder explosives were in existence in the early 1700s, it was not until Alfred Nobel invented a stabilized form of nitroglycerin (aka dynamite) that high explosives could be used for blasting through rock formations to create roadways. Thus, in the absence of high explosives altering the landform, unpaved tracks and roads (which frequently have their origins in trails humans used by following natural features or topographical contour lines, and which gave access for agricultural clearing and the agricultural areas) can be restored to forest if anyone so desires.

The images presented on pages 5-10 and 5-11 are exemplary and represent a full repudiation of CD&A’s assertion that damage by haul roads will be “minor and reversible”. The images of Camperdon Tydixon Area and South Tydixon show clearly how saddle-corridors in cockpit karst connect the forest of one hillside / hilltop to the adjacent hillsides. Even when cleared for alternate land use, the potential for restoration of connectivity remains.

In contrast, haul roads will be blasted through the corridors in order to access the ore bodies in each discrete bottomland (aka cockpit). This will irreversibly change patterns of air flow, microclimate, and create gaps which will not be reconnected. Contrary to CD&A’s assertions that gaps will be temporary, they will in fact be permanent under current reclamation practices and will impact all terrestrial invertebrate fauna (populations will be restricted to hillsides, with gene flow restricted or eliminated) and highly-dependent forest invertebrates and vertebrates (esp. bats such as *Pteronotus parnellii* (more below) will not be able to maintain flight routes because of the badly fragmented landscape left by the wide open scars of the haul roads. The EIA completely failed to describe and assess this aspect of mining.

RE: *Figure 5-7: Topography for the SEPL 524* on page 51-14:

Why are the intervals for the elevation ranges so unequal, ranging from 26 to 83 meters? By what criteria were these non-uniform ranges chosen?

Based on this map and the 25-year mining plan, how many saddle-corridors are going to be irreversibly destroyed by haul road construction?

7. Faunal surveys: bats

It is clear from the section of bat survey results that CD&A are so under-trained in the principles of bat echolocation and bat ecologies that they couldn't even understand the criticisms presented by Dr. Brock Fenton and myself of their EIA for SML-173. Everything Dr. Fenton and I wrote in our respective reviews applies to the EIA for SEPL-524. To re-emphasize the inadequacies and CD&A's abuse of automated call identification software for species identification:

- A sampling rate of 256 kHz is too low for surveying the range of frequencies used by Jamaican bats.
- While ultrasonic bat detectors are an invaluable tool for confirming the presence of many species of bats, experienced bat ecologists are fully aware of the methodology's limitations owing to the acoustic characteristics of many species, most notably those in the family Phyllostomidae. The absence of any species of Phyllostomidae, esp. the absence of the very common *Artibeus jamaicensis*, in the EIA's results table raises a major red flag that either CD&A failed to position the detectors correctly or the automated software misclassified valid files as "Noise".
- Equally disturbing, CD&A failed to present the reporting in the historic literature of the IUCN-Endangered *Phyllonycteris aphylla* (family: Phyllostomidae) for Pedro (River) Cave in St. Catherine. This needs to be addressed, particularly in the context of their failure to detect it and the weaknesses of acoustic surveys for Phyllostomidae (ref Table 5-39 on page 5-207).
- While the Kaleidoscope software CD&A used may be popular with temperate bat researchers, experienced researchers who stay up-to-date with guidelines for processing acoustic data are fully aware that identification accuracy rates are low for a number of species in the Molossidae family. This is owing not only to overlap in inter-specific call structures but also because there is intra-specific variation when bats are flying individually (as is required for recordings in call libraries) versus when they are flying with conspecifics and whether they are flying through open- or cluttered / narrow spaces. Experienced researchers also will be aware of matrices of "Potentially Confused Species" and know that four of the species on Table 5-39 are acoustically indistinguishable in various natural settings and are frequently misclassified. These species are *Eptesicus fuscus*, *Nyctinomops macrotus*, *Tadarida brasiliensis*, and *Molossus molossus*. CD&A need to correctly address this well-known issue of misclassification with automated software packages in-general and with Kaleidoscope in-particular in relation to the limitations of its call library. Based on various historic surveys in Jamaica, where bats emerging from caves were captured for in-hand inspection and species relative abundances were estimated, the identification of *Eptesicus* and *Nyctinomops* are highly suspect. CD&A need to present the quantitative parameters of call characteristics which were used to confirm these species . . .not just report "because Kaleidoscope said so."

- With additional concerns over the misuse of automated identification software, CD&A need to confirm whether Kaleidoscope's call library for *Molossus molossus* includes examples from Jamaica. This is because the species on Jamaica is now recognized as *Molossus milleri* and, consequently, the call library will not be valid if Jamaican bats are not included. (We must also bear in mind that, because of the enormous variability of *Molossus* species' flight, hunting and social call repertoires, responsible North American bat monitoring programmes don't even include classifiers for *Molossus* species when deploying auto-identification software.)
- **RE: Figure 5-72: Bat Calls Frequency Profiles for Local Jamaican Bats - Windsor Research** : Given that frequency is not shown on the y-axis and time is not shown on the x-axis of this image, CD&A must explain what quantitative parameters they utilized when they used this image to identify bat species.
- Although CD&A report that all bats were insectivores, Table 5-39 includes the fish-eating *Noctilio leporinus*. If this identification is correct, then why did CD&A fail to discuss the profound importance of what this species' presence indicates for the hydrodynamics of the area? Conversely, and as I outlined in my criticism of their bat surveys for SML-173, there is functional convergence of Molossidae bat calls in narrow spaces to *Noctilio leporinus*' call, so there is an equal possibility that the software mis-classified these calls. CD&A need to demonstrate that they know how to resolve this issue.
- The presence of *Pteronotus parnellii* demands full attention as to how forest fragmentation of haul roads will create acoustic barriers to this highly forest-dependent species, particular as it relates to estimated foraging home ranges and flight travel corridor distances for this species. *Figure 5-154: Approximate Range of Occurrence of Bats Detected Within the SEPL 524* reveals how woefully ignorant CD&A are of the foraging ecologies of the species they presented in Table 5-39 and of the flight travel distances bats fly during the night to reach feeding areas.

On Pg 5-206, CD&A report:

“At dusk, bats were observed flying around in populated areas of the SEPL, as well as, in the vicinity of low-lying depressions in the remote parts of the SEPL. The identity of these bats could not be ascertained from visual observations at dusk.

Flying bats were observed during the at a number of sampling sites for the ecology studies within the SEPL and the adjoining SML 162. “

They have ultrasonic detectors so there is absolutely no excuse whatsoever for CD&A not to have done their job and identify bats foraging and traveling outside of their cave roosts.

In my experienced opinion, the bat survey results do not present an accurate description of the area's bat fauna and species' foraging habitat requirements; as such, the survey results are not reliable for drawing conclusions about the potential impacts of mining nor can they be used as baselines for monitoring the impacts of mining. CD&A have yet to demonstrate a minimal requisite understanding of bat echolocation and ecologies which enable the professional deployment of ultrasonic detectors as one component of a correct survey protocol for tropical bat communities.

Further, in section 5.8 Comparative Baseline (beginning on page 5-285), CD&A present very limited data for an area being actively mined, a fully rehabilitated area, and an area undergoing rehabilitation. I wonder why they didn't include bat surveys? On the other hand, their bird species observations showed stunningly low diversity compared to un-mined areas and an obvious change in hydrodynamics by the presence of two wading bird species . . .so any claims that mining doesn't impact faunal diversity are not supported by the (extremely spatially- and temporally-limited) data presented by CD&A.

Based on the inadequate bat surveys and sub-standard analyses, I chose not to waste any more of my voluntary time reviewing the floral and faunal sections of the EIA, beyond noting that the timing of other faunal surveys is woefully inadequate for assessing temporal patterns of faunal groups, gastropod identification is entirely inadequate . . . basically, the criticisms submitted by Heather Kostick for SML-173 apply to this EIA for SEPL-524.

8. Ecosystem Services

CD&A's qualitative listing of the many services is necessary, but not sufficient: in order to conduct an **objective** Risk Assessment of the FULL costs and benefits of mining to each of these services, the EIA needs to quantify the value of these services. For example, what have been Windalco's CO₂ emissions for ALL of its mining activities in Jamaica since 1948 (ref page 1-2)? How much CO₂ has been re-absorbed by the vegetation in all mined-out ore bodies, whether they have been reclaimed and rehabilitated or not? How will the removal of deep soils, which enable the growth of the largest-sized trees in a karst-scape, impact future potentials for carbon capture and storage in Jamaica (i.e., how much less-capacity will Jamaica have for a climate change mitigation action of reforestation if mining is allowed to occur in the area of SEPL-524)? What if Jamaica decides that restoring the Spinal Forest (esp. to restore the range-of-occupancy of the *Pterourus homerus* (Jamaican Giant Swallowtail)) is the appropriate climate change mitigation? Mining through the cockpit karst of the area will, of course, obliterate this potential.

9. Analysis of Alternatives

The "Proposed Mining Activity" demonstrates CD&A's very clear bias towards Windalco's viability (which, by the way, is not the function of an EIA). Why is there no inclusion of the MAJOR IRREVERSIBLE ECOLOGICAL CHANGES to the environment in this section? Is it because CD&A don't truly understand the functional roles of

bauxitic soils? In which case, they are not qualified to conduct an EIA for bauxite mining. Or do they chose to ignore basic facts as published by karst experts in the peer-reviewed literature?

Why did CD&A not present a valid alternative which demonstrates the correct deployment of an EIA: what depth of bauxitic soils must be left in-place, undisturbed by mining so as to ensure that karst functionality and ecosystem services are not irreversibly compromised? That is the question which should drive how much of an individual ore body might be extracted and determine which ore bodies are accessible without a new haul road irreversibly destroying connectivity in the matrix of cockpit hillsides.