



WATER RESOURCES AUTHORITY

ESTABLISHED BY THE WATER RESOURCES ACT, 1995

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REF: DR 8-26

March 24, 2021

Chief Executive Officer
National Environment and Planning Agency
10 Caledonia Avenue
Kingston

Attention: Mr. Richard Nelson

Dear Sir,

Re: Mining Operations, Special Mining Lease 173 Area in St. Ann & Trelawny
Universal Application Number: 2018-07017-EIA00196

We are in receipt of your letter dated March 1, 2021 regarding the captioned Environmental Impact Assessment, as well as the comments from the Consultant. The letter stated that items #1, 2, 7, 8, 12, 17 and 18 remain unresolved. The WRA prepared responses to the Consultant's comments on those specific items as stated by NEPA prior to a meeting and discussion with the Consultant which was held on March 12, 2021. The prepared responses were discussed with the Consultant, and both parties arrived at positions of general agreement. CD&A has prepared a document of their stated understanding of the agreement (attached to this letter) and the WRA statements are indicated in the relevant sections below. Comments marked "Post-Meeting" should be considered as the WRA's official response to NEPA:

ITEM #1 (reiterated in item 12).

Consultant Initial Comments

"...ground water resources are at significant depths (more than 100 m) below the surface of SML 173."

WRA Initial Response

The WRA believes that this should not be used as a metric to minimize the risk of contamination. The aquifer beneath SML 173 is karstified and significantly faulted, and these conditions increase the permeability of the aquifer which increases the risks of contamination to groundwater.

Consultant Response:

It would appear that the reviewer has made the assumption that the limestone leading to the aquifer beneath SML 173 is highly permeable. However, permeability (P) and hydraulic conductivity (HC) may vary and depend on the inherent nature of the limestone. Permeability may decrease with both depth and the circulation of water in the aquifer. Conduit permeability is not continuous and does not follow a straight line leading to the aquifer. The variation in both HC and P with depth were noted in the modelling of the Essex Valley limestone aquifer by Schlumberger (formerly Waterloo University). In bauxite mining the volume of material (moisture) that is available for transport into the saturated zone through the thick unsaturated zone is relatively small and will require a large volume of water to reach

Jamaica's Hydrologic Agency

**Board: Dr. Parris Lyew-Ayee Jr. (Chairman), Prof. Michael Taylor, Mr. Michael Brown,
Miss Nadine Spence, Mr. George Grant, Ms. Stephanie Abrahams,
Ms. Georgia Hamilton, Ms. Novelette Howell, Ms. Allison Rangolan.**

the water table. The main and only possible pollutant is particulate material, which may result in increased turbidity. It is correct to say that high permeability increases the pollution risk, in this case soil particles, but this cannot be applied across the aquifer for all types of probable contaminants. Bauxite mining does not involve the use of materials such as caustic soda (NaOH) or any other type of material, which could pollute ground water resources. The Water Quality Atlas 2019 report published by the WRA showed that there was no evidence of water pollution linked to bauxite mining.

WRA Prepared Response to Consultant pre-March 12 Meeting:

The crucial point of the WRA's initial comment remains established, i.e. the aquifer beneath SML 173 is karstified and significantly faulted, and these conditions increase the permeability of the aquifer, which increases the risks of contamination to groundwater. The Consultant admits in their response that high permeability increases the pollution risk, thus affirming the WRA's comment, and also admits that particulate material is a possible pollutant. The WRA maintains that the risks of any form of potential pollution should be acknowledged and addressed, not diminished nor excused.

WRA Post-Consultation Comments:

The WRA agrees that there is currently no evidence to support or refute the occurrence of water contamination from toxic or hazardous substances associated with the **mining of bauxite**, and the most likely pollutant due to bauxite mining in this region would be increased turbidity due to bauxite soil particles. The WRA agrees with the turbidity monitoring statement.

ITEM #2 (reiterated in #17 and part of #18)**Consultant Initial Comments**

“Nationally, the baseline associated with ground water quality and quantity in proximity to bauxite mining operations for over 60 years have shown that there has been no pollution of ground water caused by bauxite mining. It is highly improbable that the water resources will be impacted by the mining of bauxite in areas of similar karstic geomorphology. This is supported by evidence gathered from monitoring wells in St. Elizabeth, Manchester, St. Ann and Clarendon.”

WRA Initial Comments

The WRA re-affirms its comments from the August 30, 2019 letter in that this assertion is not yet definitively proven, and the purported evidence was not presented to support the assertion. The Retreat well is a stated example of pollution impacting groundwater in the region, although it has not been determined what the source of that pollution was/is. The EIA should mention and address this particular matter of the Retreat well.

Consultant Response re: Retreat Well

The Retreat Well is not located in SML 173... The Retreat well was not polluted by bauxite mining and it is wrong to intimate that bauxite mining is the cause of any contamination. The nature of the contaminant has never been determined. It is therefore ridiculous to now seek to put the onus on NJBP II to determine the level and type of contamination. This should be the task of the WRA in its management of [sic] the Jamaica's water resources.

WRA Prepared Response to Consultant pre-March 12 Meeting on Retreat Well:

The context of the WRA's response was "*in proximity to bauxite mining.*" Figure 1 presents the location of the Retreat well in proximity to SML 173, and shows that the Retreat well is approximately 200 metres from the SML 173 boundary at its closest point. Additionally, the Retreat well was previously owned by the Kaiser Bauxite Company, which is now replaced by Noranda Jamaica Bauxite Partners. The WRA well records indicate that the well was abandoned due to pollution. It stands to reason that the owner of the well (Kaiser) would have information as to why they abandoned the well, and that the replacement owners (NJBP) would be able to access that information. If the nature of the contaminant has never been determined, then it cannot yet be stated that the cause is **not** bauxite mining. It may be more accurate to say that the cause is not likely to be bauxite mining; but without the actual assessment of the pollution, it cannot be ruled out. It should also be noted that the Retreat well is located within a designated bauxite deposit zone (see Figure 1).

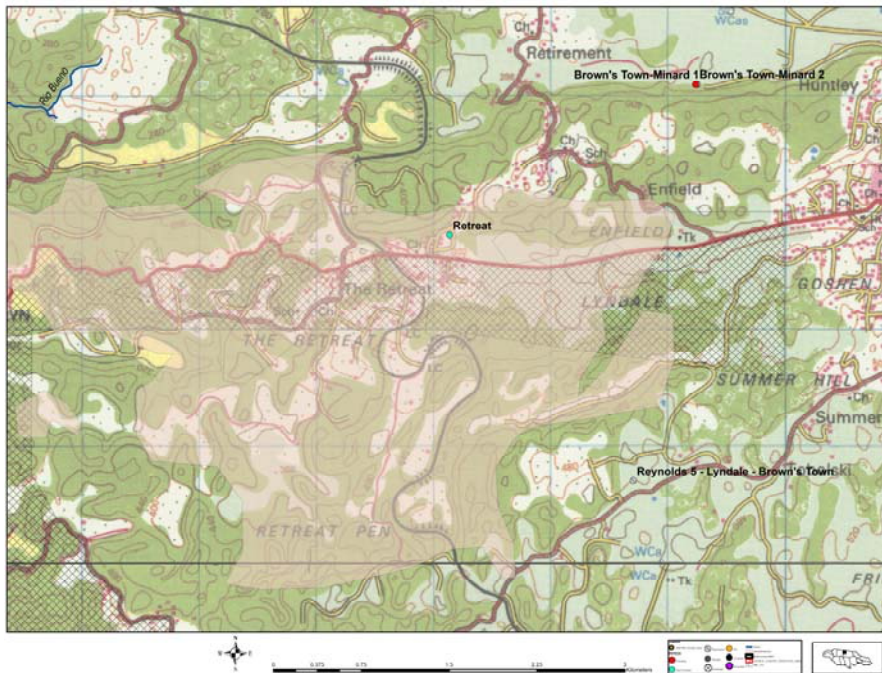


Figure 1: Location of Retreat Well in relation to SML 173

WRA Post-Consultation Comments on Retreat Well:

After discussion, the WRA agrees that there is insufficient evidence to link the unknown contamination at Retreat well with bauxite activities or to imply a potential link at this time, as there was no known bauxite mining in the region. Steps should be taken to identify the contamination at Retreat well, and this most likely should be spear-headed by the government regulators with the assistance of the well owner. However, this would not be connected to bauxite mining activities at this time.

Consultant Response re Bauxite Mining and Groundwater Pollution

It is an established fact, across Jamaica for the past 60 years since bauxite mining began, that bauxite mining has not resulted in the pollution of groundwater resources. This was arrived at from actual measurements and

observations. There is no evidence to disprove this fact. For example in flood prone areas such as Porus/Harmons, Mile Gully and Clapham/Moneague where active mining was in place before and after heavy rains which flooded the mines, it is known that the WRA monitored the outflow of water from each of these areas on a regular basis and found no contamination. The floodwater from Porus/Harmons went to Alligator Hole River and springs along Canoe Valley. The floodwaters from Mile Gully went to St Toolies/St Jago Springs and the floodwaters from Clapham/Moneague went to the White River above the National Water Commission (NWC) treatment plant at Labyrinth. At none of the monitoring points was any discoloured or turbid water seen and recorded by WRA's Technical Staff. In all instances, the water from the flows was "crystal clear" and did not interfere with the NWC's operations along the White River or the NIC's operations at Milk River/Toolies. In fact they shut down the six (6) wells along the fault zone, a highly permeable flow path, and used the spring flow for irrigation and domestic consumption. There has never been a report and/or recording of any pollution of ground and/or surface waters from bauxite mining.

WRA Pre-consultation Response to Consultant's Response

The WRA prepared a report on the 2002 flood event entitled "Resurgence of Flooding at Porus-Harmons, Manchester" dated November 6, 2002. The following observations are summarized from the report in response to the Consultant's comments:

- The groundwater flow to Porus and environs was delineated along the Williamsfield Trough/Graben as seen in figure 2:

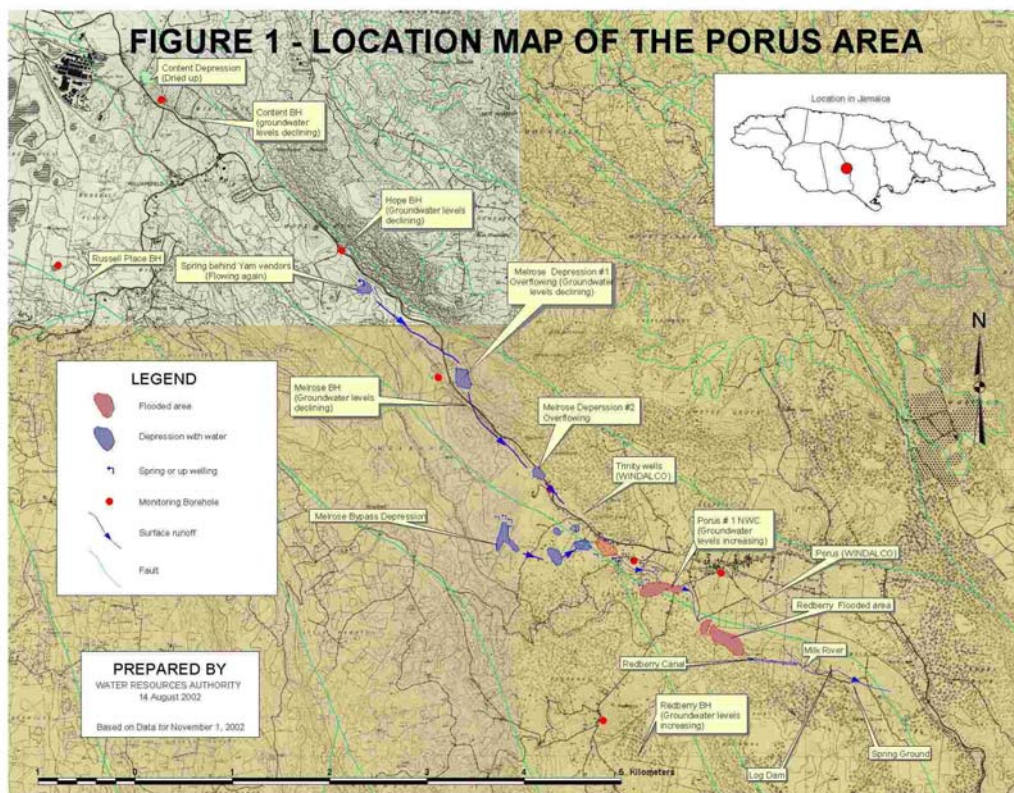


Figure 2: Location map of Porus Area from November 2002 Report

The report does not mention any active mining along the delineation paths identified, and specifies

mined-out depressions in the region for these floodwaters.

- The report did not mention any record of water quality analysis being performed for any of the observed flows, did not state any observations of water turbidity either positively or negatively, and did not comment on water quality in a positive or negative sense.
- The report mentioned flooding in Harmons, and stated that the Harmons area was an active bauxite mining zone. However, the report also stated that the flooding in that area did not react in a similar fashion to the Porus flooding. Instead, the Harmons flooding had to move through the sub-surface to the sea, and did not appear to contribute flow to the St. Toolies/Milk River system. The report quotes: *“For the Harmons area, it is not expected that a decrease in the flooded area will occur until after the groundwater levels have fallen to allow drainage to the subsurface and outflow to the Clarendon Plains. It is not possible at this moment, based on the available data, to make any predictions on the time it will take for the water level to peak and fall.”* Thus, any conditions which may have been observed at St. Toolies/Milk River over the period of observation would not have reflected much (if any) contributions from the active mining area of Harmons.
- For a fulsome conclusion to be made that bauxite mining would not have any impact on water quality, it would have been best to have taken water quality samples at all flood emergence and discharge sites over the period of observation and beyond, especially with the delayed outflow of the Harmons flooding which would have been the best case study of the matter. It does not appear that any further studies/observations on the flooding were done after the November 2002 report. As such, there is no evidence to definitively conclude that bauxite mining did not have any impact on the water quality in this flooding event. It is POSSIBLE that the mining did not have any effect, but the WRA does not believe this can be conclusively stated based on the available data.

WRA Post-Consultation Comments:

The WRA agrees that there is currently no evidence to support or refute the occurrence of water contamination from toxic or hazardous substances associated with the **mining of bauxite**, and the most likely pollutant due to bauxite mining in this region would be increased turbidity due to bauxite soil particles. Any mention of the Porus Flooding Incident in the EIA would be addressed by the WRA’s pre-consultation comment above.

ITEM #7

Initial Consultant Comments: Various maps of the study area designating a boundary for the ‘*Rio Bueno sub-basin*’

WRA Initial Response

The WRA did **not** provide the *Rio Bueno sub-basin* boundary indicated on these maps. The boundary appears to be a generated watershed based on the topography of the region around the Dornoch Spring; however, it ignores the contributing flows of the Cave, Lowe and Quashie Rivers and their watersheds. The EIA should state clearly the origin of the “*Rio Bueno sub-basin*” boundary, and not attribute it to the WRA.

Consultant Response

The boundary maps were obtained from the WRA. If the maps have been updated, then such updates would be appreciated. All reasonable efforts were made to obtain all relevant data from the WRA by conducting research and consultations. This does not detract from the contents of the EIA. The WRA general question appears to be subjective. It would be useful to the process if the WRA being the Authority on the management of Jamaica’s water resources, provide any additional information of which

the Agency may be aware. In previous communications, the WRA insisted that the flows beneath SML 173, are included in the EIA. This has been done.

WRA Pre-Consultation Response to Consultant's Response:

The Consultant's boundary map is presented in Figure 3, showing the claimed boundary map of the Rio Bueno sub-Basin.

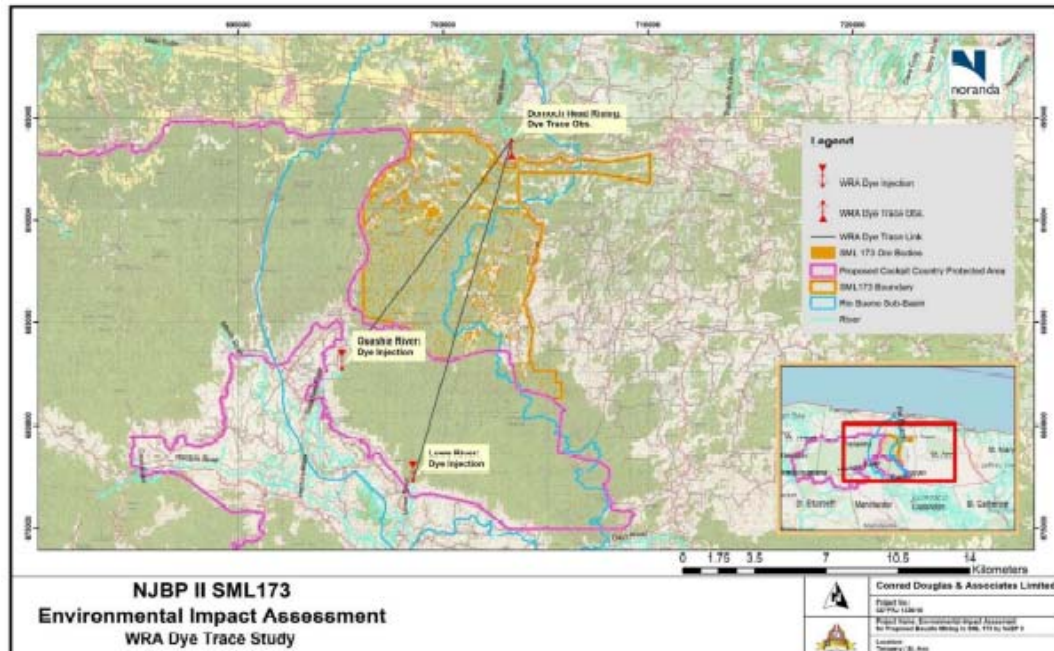


Figure 3: Rio Bueno Basin Delineation from Consultant

The WRA's current boundary of the Rio Bueno sub-WMU is presented in Figure 4.

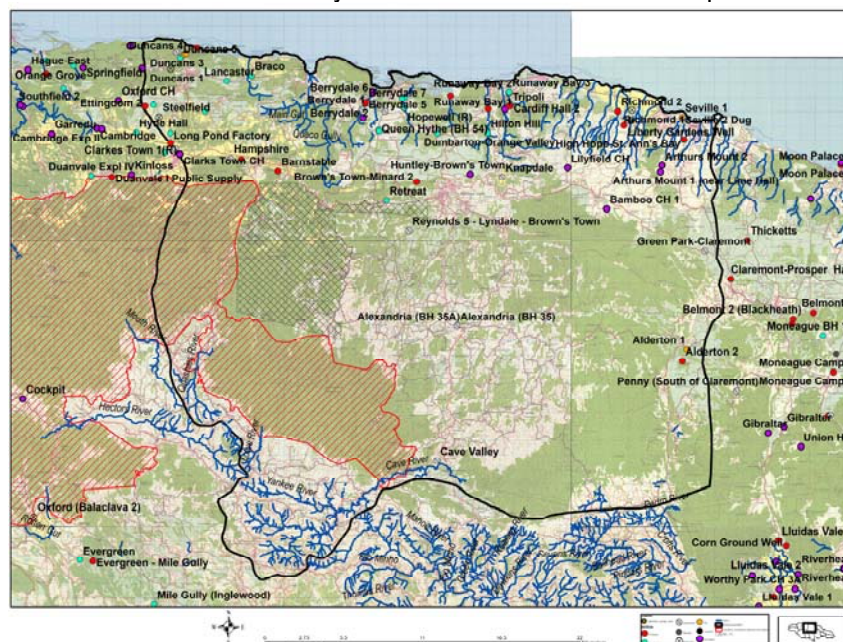


Figure 4: Rio Bueno Delineation from WRA

Any boundary that may have been obtained from the WRA regarding the Rio Bueno sub-WMU would have reflected the features of figure 3, and not that of figure 2. The WRA would ask the Consultant to establish the means and details by which they obtained the boundaries of Figure 2 in order to clarify any errors or misunderstandings from either party.

WRA Post-Consultation Comment on Boundary:

The Consultant's post-Consultation statement presents the delineation as the Rio Bueno Surface Water Catchment. This delineation would have been delineated by CDA from elevation data, as opposed to delineated and provided to them by the WRA. While this delineation would capture runoff for the Rio Bueno rising at Dornoch, it would not account for the contributions from sinking stream contributions from Quashie, Lowe and Cave Rivers to Dornoch. However, the Consultant has recognized the contributions from Quashie and Lowe Rivers, and the WRA has informed both NEPA and the Consultant about the historical and recent dye traces on Cave River which confirmed its contribution to the Rio Bueno (see item #8).

ITEM #8

WRA Initial Comment: The historical Cave River dye trace connection should be included. The WRA has repeated the Cave River trace and re-confirmed the results. The WRA has also confirmed that flows from the Cave River appear to go only to the Rio Bueno, and do not flow to either the Pear Tree Bottom River or the Laughland Great River.

Consultant Response:

All reasonable efforts were made to obtain all relevant data from the WRA by conducting research and through consultations. This does not detract from the contents of the EIA. We would be grateful if the WRA could provide the information containing the connections between the Cave River and the Head Waters of the Rio Bueno, including the date of the most recent study. Cave River will not be impacted by the proposed bauxite mining activity in SML 173. We maintain that the groundwater resources beneath SML 173 will not be impacted by bauxite mining.

WRA Pre-consultation Response to Consultant:

The WRA performed a dye trace injection on the Cave River on October 16, 2019, and collected receptors from the Rio Bueno at Dornoch on the following dates: October 2, October 22, October 28, November 26 2019 and January 3, 2020. The injected dye was detected on the receptors for October 28 and November 26, 2019, and not detected on the other receptors. This was a replication of a historical spore trace test of the Cave River as mentioned in "Jamaica Underground" (pg 36). The full report will be presented in the near future. The WRA's initial comment was to reemphasize the fact that the Cave River sinks and flows towards and underneath SML 173 en route to Dornoch Head in a similar fashion to the Quashie and Lowe River flows. As such, this flow should be indicated on the map along with the Quashie and Lowe River Flows.

WRA Post-Consultation Comments:

The information above was presented to the Consultant. Figure 7 in this document presents the WRA's current awareness of proven dye trace connections in the Dry Harbour Mountain Basin to date.

ITEM #18**WRA Initial Comment**

The WRA believes that this section of the EIA is not objectively presented, seeks to minimize and otherwise “spin” the interpretation of the data currently available, and makes significant conclusions based on the absence of data as opposed to the presence of data. The potential impacts of mining on water resources (along with all other potential impacts and concerns in other spheres) requires that decisions be made on the best data available, not on the absence of data or the projection of data. In the absence of data, then the most conservative approach should be taken, and data should be gathered to guide the best decision possible. Any decision made to mine bauxite in SML 173 should not be based on exaggerated optimism, subjective/biased analysis, or a dismissal of the concerns of stakeholders. For example, the section mentions the noted turbidity observed in Sherwood Content and Lluidas Vale NWC well, but then goes to say “*it is highly unlikely that this would occur in the Rio Bueno catchment*” IF certain ore bodies are not mined. This observation should not be dismissed or downplayed. At minimum, the EIA should present a fulsome analysis of the available data to buttress the assertions made in this section, and the EIA should also determine what, if any, observed historical impacts may or may not be attributable to bauxite activities.

Consultant Response on Turbidity:

The turbidity at Sherwood Content and Lluidas vale well is due to the deforestation and the subsequent erosion of soil into sinkholes that are directly connected to the spring and well source...

WRA pre-consultation Response:

The WRA provides selected quotations from the article linked at the following website which refers to a study determining the impact of bauxite on deforestation: <http://www.ipsnews.net/2001/04/environment-jamaica-bauxite-mining-blamed-for-deforestation/>

“A land use and forest cover study to determine the rate of deforestation and to kick-start a forestry conservation programme here has revealed that bauxite mining is the single largest contributor to deforestation in Jamaica.

In 50 years of operation the industry has stripped 5,099 hectares land of trees, including some 3,218 hectares of forest. It has also caused the destruction of an undetermined number of hectares by opening access roads into forests... The study corroborates earlier Jamaica Bauxite Institute (JBI) and watershed management maps that show significant degradation of forests and watersheds in mining areas in the parishes of Trelawny and St. Ann on the island’s north coast and St. Elizabeth, Manchester, Clarendon and St. Catherine on the south coast.

Most affected are the parishes of St. Ann and Manchester mined by Kaiser and Alumina Partners (Alpart) respectively...Once access roads are cut, however, loggers, coal burners and yam stick traders move in, taking the trees in and around the designated mining areas. These activities are among the biggest contributors to deforestation on this northern Caribbean island.

It is quite possible that the impacts of bauxite mining in SML 173 may lead to the conditions observed at Sherwood Content/Lluidas Vale Wells due to impacts of deforestation as facilitated by the access roads and other activities, even if the actual bauxite deposits do not provide support for forest growth. This risk must be acknowledged and addressed, not diminished or excused. Figures 5 and 6 are photographs of Dornoch Head taken on May 9, 2017, when the river was in spate due to heavy rains. The turbidity seen illustrates the vulnerability of the Rio Bueno to particulate pollution during heavy rains, and any impacts from deforestation in

SML 173 may likely lead to increased turbidity and further contamination even without the assistance of heavy rainfall.



Figure 5: Dornoch Head as of May 2017



Figure 6: Dornoch Head as of May 2017

WRA Post-Consultation Comments:

The WRA agrees that there is currently no evidence to support or refute the occurrence of water contamination from toxic or hazardous substances associated with the **mining of bauxite**, and the most likely pollutant due to bauxite mining in this region would be increased turbidity due to bauxite soil particles. The WRA agrees with the turbidity monitoring statement. The pre-consultation comments and pictures for point #18 should be maintained as a basis for monitoring of turbidity.

We trust that these responses based on consultation with the Consultant will prove informative and relevant to your deliberations, and we remain available for any future discussions on this matter.

Sincerely,

Water Resources Authority



.....
Geoffrey Marshall (Mr.)
Chief Hydrologist
For Managing Director

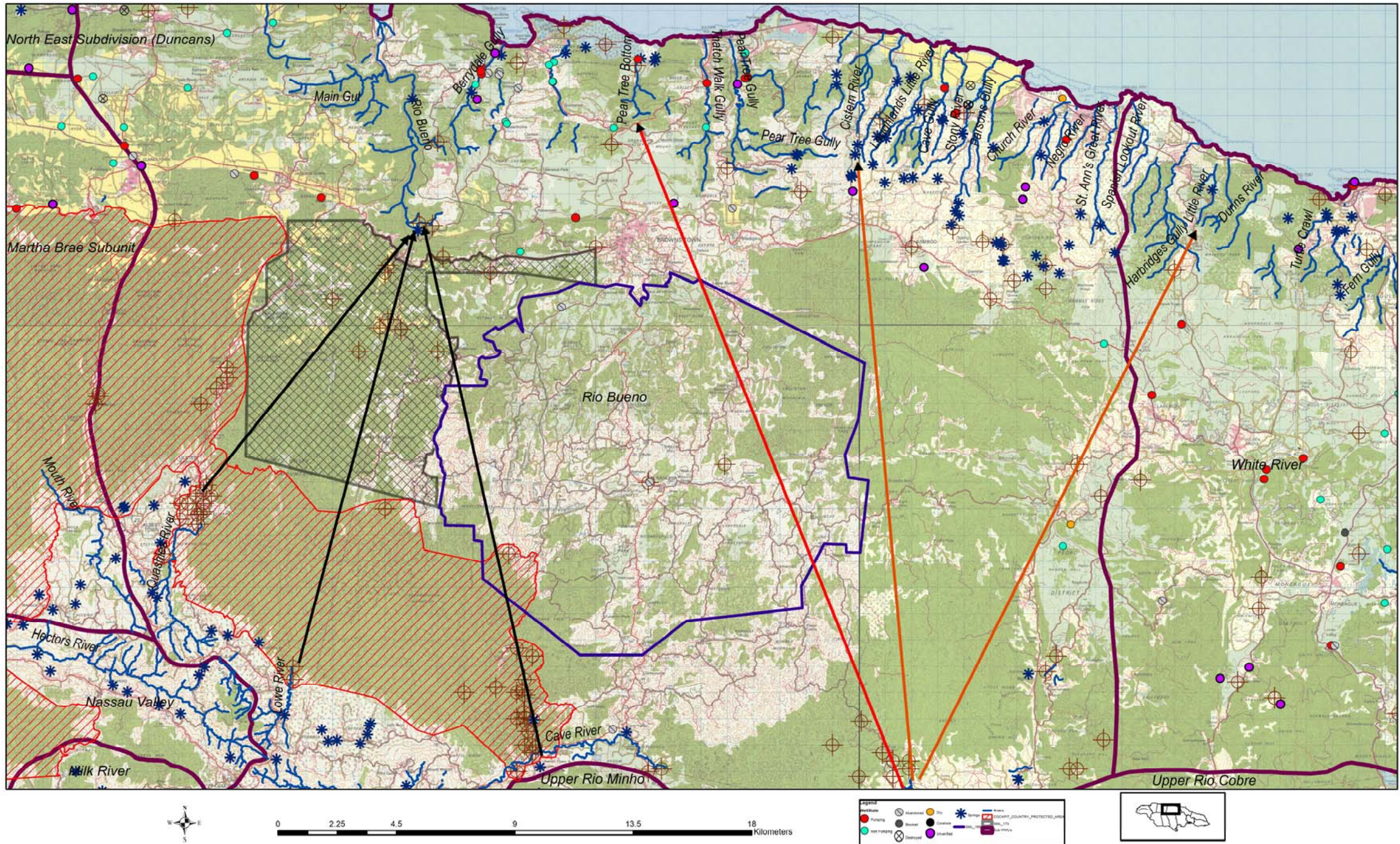


Figure 7: Rio Bueno Sub-WMU showing HISTORICAL dye trace results. WRA recently re-confirmed historical traces of Dornoch Head (black arrows) and Pear Tree Bottom/Laughlands Great River (orange/red arrows).